CYCLOPEDIA OF AMERICAN HORTICULTURE

THE BLOSSOMING OF THE APPLE TREES

CYCLOPEDIA OF AMERICAN HORTICULTURE

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

AND

A SYNOPSIS OF THE VEGETABLE KINGDOM

BY

L. H. BAILEY

ASSISTED BY

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Associate Editor

AND MANY EXPERT CULTIVATORS AND BOTANISTS

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

IN SIX VOLUMES—VOLUME I

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PREFACE

IT IS THE PURPOSE OF THIS WORK to make a complete record of the status of North American horticulture as it exists at the close of the nineteenth century. The work discusses the cultivation of fruits, flowers and garden vegetables, describes all the species which are known to be in the horticultural trade, outlines the horticultural possibilities of the various states, territories and provinces, presents biographies of those persons not living who have contributed most to the horticultural progress of North America, and indicates the leading monographic works relating to the various subjects.

It has been the dream of years to close the century with a comprehensive index to American horticulture, and for a long period the Editor, therefore, has collected notes, books, plants and information for the furtherance of the work. Before the active preparation of the manuscript was begun, a year was expended in making indexes and references to plants and literature. Every prominent plant and seed catalogue published in the United States and Canada has been indexed, and the horticultural periodicals have been explored. A dozen artists have been employed in various horticultural centers to draw plants as they grow. Expert cultivators and botanists have contributed on their various specialties. All the important articles are signed, thus giving each author full credit for his work, and holding him responsible for it.

The work is made first-hand, from original sources of information. So far as possible, the botanical matter has been newly elaborated from the plants themselves; and in all cases it is specially prepared directly for this Cyclopedia, and is not the work of copyists nor of space-writers. In many of the most important subjects, two authors have contributed, one writing the culture and the other the botany; and in some cases the culture is presented from two points of view. When it has been necessary to compile in comparatively unfamiliar groups, the greatest pains has been taken to select authentic sources of information; and the proofs always have been submitted to recognized specialists. In fact,

proofs of every article in the work have been read by experts in that subject.

Every effort has been made to present a truthful picture of American horticulture, by describing those plants which are or lately have been in the trade, and by giving cultural directions founded upon American experience. Therefore the Old World cyclopedias, which represent other horticultural floras and other methods of cultivation, have not been followed. Species which are commonly cultivated in the Old World, or which are mentioned prominently in horticultural literature, but which are not known to be in North American commerce, are briefly recorded in smaller type in supplementary lists. The object has been to make the work essentially American and wholly alive.

Particular attention has been given to the tropical and sub-tropical plants which are now being introduced in southern Florida and southern California. These plants already represent the larger part of the cultivated tropical flora; and a knowledge of them will be of increasing interest and importance with the enlargement of our national sphere. The work is intended to cover the entire field from Key West and the Rio Grande to Quebec and Alaska.

North America is a land of outdoor horticulture, and the hardy fruits, trees, shrubs and herbs are given the prominence which they deserve. In most works of this character, the glasshouse and fanciers' plants receive most emphatic attention.

Since it is hoped that the work will be of permanent value, descriptions of varieties are not included; for such descriptions would increase the bulk of the work enormously, and the information would be out of date with the lapse of a few months or years. If the work finds sufficient patronage, it is hoped that a small supplemental volume may be issued annually, to record the new species and varieties and the general progress of horticultural business and science.

The illustrations have been made under the personal supervision of the Editor so far as possible, and, with few exceptions, they are owned and controlled by the publishers. No trade cuts have been purchased. In various confused groups, copies have been made of old prints for the purpose of showing the original or native form of a plant, and thereby to illustrate the course of its evolution; but credit is given to the source of the illustration.

The point of view is the garden, not the herbarium. The herbarium

is the adjunct. In other words, the stress is laid upon the plants as domesticated and cultivated subjects. Special efforts have been made to portray the range of variation under domestication, and to suggest the course of the evolution of the greatly modified forms. Garden plants are worthy subjects of botanical study, notwithstanding the fact that they have been neglected by systematists. It is desired to represent the plants as living, growing, varying things, rather than as mere species or bibliographical formulas.

The Editor desires to say that he considers this book but a beginning. It is the first complete survey of our horticultural activities, and it is published not because it is intended to be complete, but that it may bring together the scattered data in order that further and better studies may be made. A first work is necessarily crude. We must ever improve. To the various articles in the work, the teacher of horticulture may assign his advanced students. The Editor hopes that every entry in this book will be worked over and improved within the next quarter century.

L. H. BAILEY.

HORTICULTURAL DEPARTMENT,
COLLEGE OF AGRICULTURE OF CORNELL UNIVERSITY,
ITHACA, NEW YORK, *December 30, 1899.*

NOTE TO THE SECOND EDITION

In the second edition several changes have been made for the purpose of reducing typographical errors and inconsistencies, a class of shortcomings which is to be found chiefly in the first volume. Perhaps a half-dozen changes have been made in statements of fact in the first volume. There has been no attempt at a revision, since it is the purpose of the Editor, as explained in the preface to Vol. IV of the original issue, to let the work stand as an expression of American horticulture at the time it was made. This expression is very imperfect, as the Editor is well aware, but it cannot be greatly improved by mere changes in the plates. Therefore, Cratægus and other subjects which recently have been much studied are left as they were understood by their authors in 1900.

In typographical matters the Editor desired to use such forms as he thought would help the reader in consulting the articles, without making

any strenuous effort at mere uniformity or so-called consistency in the various entries. For example, the entry-word or caption is usually capitalized in its own article, as Cabbage in the article *Cabbage*, Strawberry in the article *Strawberry*. This enables the reader readily to catch the word—and therefore the leading thought—wherever it occurs. In other articles in which the same word occurs, but when it is a minor note, it is not capitalized. In some instances of general-language terms which are used repeatedly, this rule is not followed (except, perhaps, at the beginning of the article), as it would be of no distinct service to the reader. The article *Bulbs* is an example. In general, generic names of plants, when used in a semi-technical or botanical sense, have been capitalized; when used in a general-language or incidental way they have not been capitalized. In all cases, mere rules have been considered to be of very secondary importance, and they have been broken whenever the interest of the reader seemed to demand it.

The Editor cannot hope that all the errors and shortcomings have been eliminated in this second edition. He will be glad to have readers advise him of needed corrections.

L. H. BAILEY.

August 12, 1902.

PREFACE TO THE FOURTH EDITION

It was never intended that a complete revision should be made of this Cyclopedia. I hoped that its publication would establish and concrete the horticultural activities of its time and become a measure, even though a very imperfect one, of the progress that we had made. Two reprints have been called for, and now a third is wanted. In the two reprints I have corrected such errors as have been called to my attention or as I have discovered, but even these changes have been much fewer than I had anticipated. In the present edition I have made a very few other changes in the plates, after having asked for corrections from practically all the contributors. In addition, I have inserted the conspectus of families and genera (or "key") that was prepared by Wilhelm Miller for the original edition but which was omitted for lack of space; and I am writing this preface, at the request of the publishers, in order to suggest some of the lines of current horticultural progress. Of course I cannot hope that the mere technical errors are eliminated from the work,—these will develop with the further use of the book; but I trust that the number of serious mistakes is proportionally small. Perhaps it is not out of place for me to say that these years intervening since the work was published have only strengthened the wish that I might have the opportunity to make the Cyclopedia all over again from start to finish, so short does it seem to fall of the plans and hopes that I had made for it; but this cannot be, and it must remain for other hands in other years to complete a better and more harmonious effort. This effort, however, must wait for the development of exacter studies in the various fields.

Before passing to the proper subject of my preface, I must repeat that the Cyclopedia does not attempt to include all native wild plants that have merit for domestication, nor even all domesticated plants; it aims to comprise only those that were "in the trade" at the time of the compilation of the book, and the reasons for restricting the work to this field are set forth in the preface to the original Vol. IV. I feel obliged to call attention to this plan in order to answer the questions of many correspondents as to why this or that plant was omitted.

I still hope that the supplementary volumes that are suggested in the original preface may be prepared, in order to keep the horticultural annals

abreast of the times. The increasing multiplicity of horticultural interests and writing seemsto call for a cumulative record; whether such a record is attempted will depend in great part on the desires of the persons who use such a work as this.

THE RECENT PROGRESS IN HORTICULTURE

As I see it, the horticultural progress in the few years since the Cyclopedia was projected lies in the continuous steady evolution of the already established lines of development, rather than in the appearing of wholly new movements or enterprises. What some of the emphatic lines of development are I shall try briefly to indicate.

The most distinct progress that is now making in the general agricultural field is in placing country life subjects on a true pedagogic basis and in adapting them directly to the schools and the lives of the people. In this general progress, horticulture partakes. In fact, horticulture is bound to have a large part in this development because the growing of plants, in school gardens and elsewhere, is easily adaptable to secondary school work and the pedagogical results are direct and certain.

Closely allied to this pedagogical work is the increased effort to place horticultural and country life subjects before the people in an attractive way by means of periodicals and books. Even if this effort is expressed chiefly in pictures, examples and episodes, the effect is bound to be good; and we may expect a larger production of really artistic literature as one result of it. The extension work of the agricultural colleges and the United States Department of Agriculture is a similar effort, and it is producing most far-reaching results. A very marked advance has also been made in civic improvement, whereby towns and cities are to be made to appeal to the esthetic tastes of sensitive persons.

Along with all this interest in education, there has been a satisfactory growth of societies devoting themselves to the many kinds of horticultural interests and to the artistic improvement of cities and villages. The Society for Horticultural Science has been organized for the discussion of technical scientific questions as they affect horticultural thought and practice. As these pages go to press, a National Council of Horticulture is in process of organization as a result of a movement set on foot at the Louisiana Purchase Exposition. This organization will not be a society, but it will attempt to coördinate and concrete the work of the existing national societies, to discuss questions of public policy and administration that are common to them all, and to serve as

a bureau of publicity in the interest of true and useful horticultural information. Aside from the immediate work that this Council hopes to accomplish, the organization is of unusual significance because it is really an effort to unify and harmonize the various societies that lately have come into existence and thus to represent horticulture as a single and somewhat homogeneous subject. It is an experiment to be watched with the keenest interest.

In educational, scientific and literary lines, horticultural progress is now being made in North America chiefly by the horticulturists connected with the agricultural colleges, experiment stations, and United States Department of Agriculture. How large their contributions are may be judged by the fact that my index (no doubt incomplete) shows 576 bulletins issued by them from 1900 to 1904 inclusive, classified roughly as follows:

Fruit subjects	263 bulletins
Pests and diseases	125 bulletins
Vegetable gardening	89 bulletins
Greenhouse subjects	20 bulletins
Ornamental gardening	19 bulletins
Miscellaneous	60 bulletins

In technical horticultural practice, the most definite progress seems to be making in the general subject of plant-breeding. Many persons, particularly in the agricultural colleges, experiment stations and national Department of Agriculture, are devoting a good part of their energies to this work. The subject is passing out of the stage of mere amateurism into serious quest for large economic results; the important large-area crops are being experimented with; we are hoping to pass from fruitless empiricism into the discovery and application of laws that govern more or less definitely the making of new kinds of plants.

In distinctly commercial directions, there has been a remarkable era of development of horticultural regions. This is particularly true of what we are in the habit of calling "the South," comprising the great area from the Atlantic coast to eastern and southern Texas. Peach-tree planting has proceeded on a scale of unprecedented magnitude. The strawberry is also partaking in this extension, particularly in those regions that hope to supply the great eastern markets before the New York and New England fruit is ripe. Strawberry planting is developing with great rapidity in Texas, Arkansas and Missouri, notwithstanding the risks attendant on efficient refrigerator car and transportation service. The interest in pecan culture is extending very rapidly in the Gulf states. Trucking is extending farther and farther southward, with the construction of better transportation service. This is well illustrated in

the growing of Bermuda onions in Texas, a business that is now assuming large proportions. Extreme southern Florida is developing with remarkable rapidity; the orange region is moving farther south; the grape-fruit interest is enlarging; winter trucking is becoming still more important. A few years ago, there was an era of new development in the interior West and on the Central Pacific coast; later came the development of the Atlantic seaboard region; now the farther South (southern and eastern Texas, Louisiana, the Gulf coast) is undergoing great exploitation. With this development in the Gulf region, there has continued a steady filling up and maturing of the great horticultural Northwest (Oregon, Washington and contiguous regions). The governmental control of irrigation work will no doubt still further accelerate the remarkable development in the arid-region states. The great Canadian Northwest is developing with remarkable rapidity, and much of this area, in British Columbia, is already coming to be known for its fruits. Fruit-growing can be extended 300 or 400 miles north of Vancouver. There is no part of the continent which, so far as my knowledge goes, is falling away in its general horticultural activities.

Coördinate with the development of great horticultural regions has come an enlarged and quickened knowledge of the principles underlying the handling and transporting of fruits, flowers and vegetables. The relation of cold storage to the handling of fruits has taken on new significance. Green or unripe fruit is undesirable for storing. It does not mature, remains undeveloped in quality, and is liable to "scald." It is now found that if ripe fruit is put directly into proper cold storage, having been very carefully handled, it will keep a very long time. Examination of the California methods of picking and handling citrous fruits has developed the fact that carelessness in clipping stems, in handling the individual fruits, and delay in putting the fruit into storage, result in a relatively short life and a high percentage of decay. It is natural to extend these findings to other regions and other fruits. In the East, even the shippers of apples are beginning to appreciate in a new way the value of carefulness in growing and handling the fruit and the importance of resorting earlier to cold storage. The fact that low temperature can be utilized for the keeping of fully ripe fruit was demonstrated at the Louisiana Purchase Exposition, St. Louis. Such fall apples (in the mid-continental region) as Grimes and Jonathan, gathered when ripe, in southern Missouri, were kept in excellent condition for one year from the date of picking. Firmer varieties, as Gano and Ben Davis, were exhibited after having been kept for one, two, three and four years, and even the four-year fruits were thoroughly edible.

The general propaganda for better quality and choicer packing in fruits is beginning to have its effect, aided by the gradual increase of wealth and the elevation of taste on the part of consumers. All this is evidenced in the increasing use of small packages and the growing difference in price between fruits of low and of high quality. Even in the large apple-growing regions of the middle West, where we have thought of the Ben Davis as the representative product, this tendency to put up special grades of dessert fruit is becoming marked.

This growing demand for better individual quality is also well exhibited in the flower and plant trade. The increasing importance of the best grades of flowers in the flower stores is evidence of this. The cut-flower trade is now seeing a remarkable development, also, of the wholesaling business. Probably three-fourths of all the cut-flowers reach the retailer, at least in the East, through the commission houses.

The recent progress of orange-growing in California is illustrative of several phases of development in American fruit-growing. The following account of the recent developments in the orange industry in that state is written for this preface by Professor E. J. Wickson, of the University of California:

"In this progress may be mentioned, first, increase in investment and production. The shipments of oranges beyond state lines during the year ending November 1, 1904, was nearly 30,000 car-loads—an increase of about twenty per cent within five years. The increase in investment was perhaps not quite so great because the growth of product is, in part, a realization from eager planting of the preceding decade, but still planting is continued, and the area devoted to orange-growing has largely increased, and it has been distributed through districts widely separated geographically though similar in conditions of soil and climate. In this respect orange-planting in California is an epitome of American fruit-planting generally.

"Second.—Improvement in the commercial aspects of the industry has been very marked in the progress of the orange in California. Organization of growers into coöperative associations for packing the fruit and for placing it on sale in distant markets has accomplished great things and has, in fact, saved the industry from demoralization. While it is true that these organizations have had some sad experiences and have in some cases been deceived in those chosen as organizers and promoters, the scores of coöperative packing houses, the accommodation of growers with needed advances without extortion, the regulation of transportation by appeals of growers' organizations to the Inter-State Commerce Commission, the coöperation of growers' organizations

with dealers' interests on a mutually fair basis, and other similar achievements are plain indications of the effectiveness of intelligent, organized effort among growers which should be instructive to all groups of producers of horticultural merchandise.

"Third.—The orange industry also exhibits the effort which is general in American fruit-growing to improve cultural operations, and to adapt them to local requirements of the trees on various soils and under various climatic conditions. The California orange-growers are probably better cultivators than any other group of fruit-producers, and have become so by the terms of their problem, which is to grow an evergreen tree, which is practically always active, with a combination of rainfall and irrigation, and this necessitates the recourse to tillage in nearly all its forms, and for many different specific purposes. During the last few years the desirability of deeper tillage to admit water to the subsoil, to prevent formation of hardpan and to check surface evaporation, has been widely demonstrated. It is clear that adequately deep tillage must be, at intervals, secured, although the most frequent surface working may be shallow. The orange-growers are also foremost among California horticulturists in large scale insecticidal operations, and in original devices and materials. They also lead in the use of fertilizers, and in the recourse to cover crops to enrich the soil in humus, which the dry climate and constant cultivation, under a hot sun, have a tendency to reduce.

"Fourth.—The orange-growers of California have perhaps gone farther than any other orchardists in holding strictly to a commercial standard in restricting varieties to the smallest number which the market favors, and in producing them in the largest quantity which the trade can profitably handle. This has led, during the last five years, to the rejection of many and the increase of a few—the change being rapidly accomplished by the process of top-grafting, or by budding in the old bark, which is very successful if well done. The result is a vast increase in the acreage of the Washington Navel and the Valencia Late (syn. Hart's Tardif). These two varieties nearly cover the year—the former extending from November until May, and overlapping the latter, which continues by itself during the summer and early autumn, and commands the highest prices of the year. These sales have popularized the Valencia, and the present danger is in excessive production of it, for the consumption of oranges during the height of the deciduous fruit season must needs have limitations. The fact is, however, that all other varieties of oranges have shrunken to very small acreage compared with the two mentioned."

Distinct advance has been made in the treating of insects and diseases.

Sterilizing the soil in greenhouses has come to be a practicable process. The fumigation practices have been steadily perfected. Increased attention is being given to the introduction of beneficial insects of predaceous or parasitic habits. In California, experiments are being made with a parasite of the codlin-moth. San José scale continues to spread with virulence along the Atlantic seaboard, but the first fear of this pest is beginning to pass away. In sprays, the lime-and-sulfur mixture has come into use over a great expanse of the country. It is doubtful, however, whether this material will gain or hold a paramount place. It is relatively expensive, hard on pump and operator, and difficult to make. There is a marked rise of confidence in the ability of man to control pests and diseases.

A good many special methods and special crops have come to the fore. The growing of plants under shade of cheese-cloth has received much attention. The growing of dwarf apples and other special forms of garden fruits has aroused new interest. The interest in ginseng continues to spread. Golden-seal and snakeroot have come to rank as commercial plants. The whole subject of specialty-farming seems to be receiving increased attention.

It is evident that there is a growing taste for ornamental plantings and a rising appreciation of what constitutes intrinsic beauty in plants. This progress is of course most marked in what we formerly considered as the West,—the states of the prairies and the plains. These countries are maturing; the epoch of pioneering has passed; physical wants are being met; the old houses are being replaced: consequently, there is reason and opportunity for giving attention to the environs of the home-seat. Throughout the country I think that I see a distinct tendency to better treatment of the home-grounds,—the gradual giving up of mere "beds" and meaningless scattered plants, and the making of an open-centered lawn with attractive border planting. There is increasing appreciation of our native plants, as distinguished from imported "novelties" and from merely curious and striking horticultural varieties. The interest in native plants is well illustrated in the great attention that has been given recently to the hawthorns, or members of the genus Cratægus. These bushes and small trees are peculiarly characteristic of eastern North America. The botanists have always been confused as to the number of species, and the tendency has been to regard them conservatively. Now, however, the freest interpretation of specific lines has come into vogue, as a result of more careful study, and it is considered that we have several hundred species in our flora. The present interest in the genus is bound to call attention

to the forms that have horticultural value and to result in an increased planting of them. This will be a great gain, for the Cratægi are bold and attractive plants throughout the year. These plants have been recognized in Europe as having first-rate ornamental value, and most of the American species have been first described from plants cultivated in European gardens. Of late years the Cratægi have been extensively raised from seeds in the Arnold Arboretum, and the collection at that institution is probably the largest in existence. The plants are being studied as to their horticultural values and also to determine what botanical characters hold in parents and offspring. These seedlings have been distributed to European and other gardens, and especially to the Park Department of Rochester, New York, where, next to the Arnold Arboretum, there is the largest collection in America. So far as the introduction of beautiful hardy American trees and shrubs is concerned, the general dissemination of native Cratægi is the best work that has been done at the Arnold Arboretum.

Perhaps this is the proper time to call attention to the very high-class work that is being done at the Arnold Arboretum, and to express the wish that every American might have the opportunity to visit the place. Year by year the hardy trees and shrubs have been collected with a patience and completeness that command the utmost confidence and respect; and these diverse materials have been assembled with the finest sensitiveness to their artistic merits. This Arboretum has come to be a great proving ground and exhibition ground, from which the entire country is sure to draw very important horticultural as well as dendrological lessons.

INTRODUCTIONS OF PLANTS

There has been a steady introduction of good horticultural novelties, although I do not recall the introduction within the last three or four years of any botanical species not heretofore in our trade that promises unusual results. The novelties have been disseminated through the usual sources,—the plantsmen and seedsmen,—and these concerns are constantly giving greater scrutiny to the acquisitions; but aside from these agencies, there are now several others that are introducing new plants or testing old ones in a new way. These other agencies are the botanical gardens, the United States Department of Agriculture, and the private establishments of many wealthy persons. Amongst the semi-public scientific gardens the Missouri Botanic Garden and the New York Botanic Garden should be very prominently mentioned as doing horticultural work of the greatest value. These and similar institutions are

certain to exert a profound influence on public taste, as well as to extend the knowledge of the subjects that they represent.

Two years ago Professor Sargent, of the Arnold Arboretum, paid a visit to Pekin for the purpose of securing various trees and shrubs either indigenous to northern China or cultivated in the neighborhood of that city. Out of this journey there are now growing in the Arboretum the true *Catalpa Bungei*, which has long been sought by American and European dendrologists, the very fine forms of *Vitis vinifera* cultivated at Pekin and almost hardy there, a new white-flowered lilac, the hardy persimmon of northern China (a first-class fruit tree), the flat peach of northern China, *Diospyros Lotus*, the wild form of *Juglans regia* which it is thought will be hardy in the northern states, the very fine edible chestnut of northern China, and a number of other plants important from an economic and ornamental point of view. For the last two or three years, also, an unusually large number of novelties have been received from Manchuria. Many new plants have come to the Arboretum from western China; and every effort is being made to increase the collections of Chinese plants, which promise to prove more successful here than any other exotic trees or shrubs.

Probably the most striking horticultural discussion of the past few years has been the exploiting of Luther Burbank in the periodical and other press. The breeding work of Mr. Burbank is remarkable and significant; but it has often been sensationalized and over-stated. The number of new forms that Mr. Burbank has produced is very large and varied, and we may expect that some of them will be of permanent value. He gives me the following running list of some of the old and new plants that he is now working with: "There are a great number of new plants, trees, shrubs, vines, fruits, nuts, grains, grasses, vegetables and flowers. The following may be mentioned: a series of hybrids of Japanese and English walnuts, California black and English walnuts, the American black and California black walnuts, many of which grow with very great rapidity, some of them having very many curious kinds of foliage; some strange hybrid forms of *Papaver orientale* and *P. somniferum*, the tulip poppy, meconopsis, Shirley poppy and *P. pilosum*, of very numerous crosses and recrosses producing some wonderful results; some remarkable crosses among solanums, especially the different species of potatoes; a double Shasta daisy and some greatly improved forms of the Shasta daisy; improved grasses; a great number of new stoneless plums having different qualities; a number of new plumcots; some gigantic, improved multiplying amaryllis and crinums; some entirely new hybrids of hippeastrum and amaryllis; new forms

of fragrant verbena and fragrant dahlia; improved Australian star-flower (Cephalipterum ?); many thousands of new hybrid plums and prunes, not only those in cultivation but many not in cultivation; some strange hybrid forms of delphinium; new hybrid watsonias; new cherries, peaches, plums, apricots, nectarines, quinces, elæagnus; very remarkable hybrid grapes, among them seedless varieties and the earliest grape known; numerous mesembryanthemums; some very striking new hybrid cacti, among them some entirely new opuntias which have lost the bristles as well as the spines; and also some unusual novelties in pentstemons, trifoliums, brodiæas, etc."

It is not my purpose to make a record here of all the new horticultural plants that have been introduced to North America since the Cyclopedia was written. If such an attempt were made, it should really call for a new study of the cultivated plants of southern Florida and California in order to determine the horticultural status of those regions. The horticultural plants of California, in particular, are not completely represented in the Cyclopedia, chiefly because very many of them are not definitely "in the trade" in the sense of being listed in catalogues, partly because they have not been carefully studied, and partly because I had not myself visited California until the initial plans for the Cyclopedia had been completed. I cannot close this part of my preface, however, without making a brief record of the work that the national Department of Agriculture is doing in the introducing of new agricultural and horticultural plants, for the enterprise there under way is probably the most distinct and methodical effort now making to enrich our cultivated flora. I have asked Mr. David Fairchild, the agricultural explorer in charge of foreign explorations, to make a report on this work; and his statement now follows:

"The government Department of Agriculture has an organized office for the introduction of new plants. This office, called the Office of Seed and Plant Introduction and Distribution, has a corps of botanists, agricultural explorers, plant distributors, plant propagators, record clerks, field aids and a photographer, who are engaged in the work of discovering, in different parts of the world, new and valuable plants, and of importing these into America and placing them in the hands of trained experimenters throughout the country.

"Since its organization in 1897 under the direction of the writer, this office has grown, and become a prominent feature of the Departmental work. Although the very limited funds appropriated by Congress have made impossible a proper working out of a comprehensive plan of Government Plant Introduction for the whole country, much has been done by those to whom the work has been successively entrusted,—Mr. O. F. Cook, Mr. Jared G. Smith,

Mr. Ernst E. Bessey and Mr. A. J. Pieters,—to organize this promising branch of the Government's activities.

"Over fourteen thousand selected entries appear on the Inventory of the Office, the majority of them representing new or untried varieties, or strains, of species already in America. Agricultural explorers have been sent to Africa, Asia, South America, Europe and the Pacific Islands, and, through the beneficence and keen interest of Mr. Barbour Lathrop, of Chicago, a remarkable tour of reconnaissance of the whole world was made, with the writer as his agricultural explorer, which has established correspondents for the Office in all the most important countries in the world.

"Every new plant introduced is properly catalogued and numbered, and of every seed or plant sent out to the thousands of experimenters scattered through the country a careful record is kept for reference in future years. It is fair to say that no government in the world has inaugurated and carried out such a system of systematic plant introduction as that now in operation in this Office. The plan, as here begun, is capable of great extension, and, it is believed, will result in materially increasing the permanent agricultural wealth of the country.

"To the ordinary mind, the principal reason for the introduction of useful plants into this country is to establish in America the profitable plant industries which already exist in foreign countries. The establishment of the Algerian and Arabian date palm in California and Arizona, and the transplanting of the Smyrna fig industry, are examples of this feature of the work. Through this class of introductions it is expected that the United States will become independent of other nations, in so far, at least, as concerns all the important plant cultures, since within its boundaries are to be found almost all possible ranges of climatic and soil conditions of the globe.

"There are, however, other objects fully as important as the transplanting of new industries, in which the work of introduction will play as large a rôle. The average American has knowledge of only about a dozen vegetables for his every-day use, and, although the number of species of plants now cultivated and used by the average American farmer is greater than it was ten years ago, it is yet ridiculously small when compared with the number that could be grown and utilized. The chief reason why the number of plants upon which we depend for subsistence remains limited lies in the persistent and unreasoning conservatism of taste, which is extremely difficult to surmount. It is against this conservatism that the efforts of plant introduction are directed, and the history of former successful introductions shows conclusively that it can be

overcome, and that a new and valuable fruit, vegetable or grain can be so brought before the American people that they will learn to use it, and give it a permanent place in the plantation. The quick appreciation of such new fruits as the grape-fruit, or pomelo, which has become popular since 1886, the growing favor of the Japanese persimmon, and the established popularity of the tomato, are proofs of this fact. One factor which is more important than any other in this part of the work is the growing interest of the wealthy classes in agricultural pursuits. It is well-nigh impossible to interest the general farmers in the cultivation of a new fruit, vegetable or grain for their own consumption; but the wealthy classes, accustomed to a wider range of foods, are, as a rule, interested in the cultivation of new forms for their own table use. It is they who set the fashion in all new foods, rather than the farming classes, and it is to them that we must look for the most valuable assistance in bringing into common use the hundreds of new plant foods which can be, and are, rapidly being introduced and grown in this country.

"Still another, and, perhaps, the most rapidly growing need for plant-introduction work, has arisen from the demand, created by the increasing numbers of plant-breeders of the country, for plants to be used for crossing purposes. Some of the most remarkable hybrids which have been produced by Luther Burbank combine in their parentage plants gathered from as widely separated regions as Siberia, France and California. The Office of Seed and Plant Introduction, with its agricultural explorers in various foreign countries, and its correspondents all over the world, is in a better position than any other organization in the world to secure for plant-breeders seeds which will assist them in their work of creating new and valuable plant forms.

"The Office of Plant Introduction is located in Washington, D. C., and its green-houses, trial grounds and seed building are under the general supervision of Mr. A. J. Pieters. It has a Plant Introduction Garden at Chico, California, to which Oriental shipments are made, and at which plants are propagated for distribution; as also date gardens at Tempe, Arizona, and Mecca, California, in coöperation with the Experiment Stations of these respective states; and it is carrying on very numerous coöperative experiments in the different states of the Union."

WHAT IS HORTICULTURE?

Perhaps I cannot do better, in closing this preface, than to define and explain the field that we in America consider to belong to the domain of horticulture. In doing this I shall use a paper that I read as the presidential

address before the Society for Horticultural Science at Philadelphia, December 27, 1904. This paper follows, and concludes the preface:

The members of this Society are interested in horticulture from its so-called "professional" side,—from the point of view of teaching and research. In this sense, the subject has been born, in this country, within the past thirty years. So far as I know, the person who has had the longest continuous teaching service with horticulture as his leading profession is W. R. Lazenby, who, now in the prime of life, occupies a seat before me. He began his professional work in 1874 in Cornell University. The states that first gave horticulture a distinct and separate place in teaching and research are Michigan, New York, Iowa, Ohio and Massachusetts. I do not know what teaching institution first established a full chair in which horticulture was the only subject in the title, but there are few such chairs even yet. The first Experiment Station to engage a "horticulturist" was probably the State Station at Geneva, New York, and the lamented E. S. Goff was the person chosen. In most of the early professorships, horticulture was associated with botany, entomology, forestry or landscape gardening. I make the above remarks not for the purpose of recording history—for I have made no careful survey of the field,—but only to call attention to the newness of these subjects in the curricula of our colleges. We are forcibly reminded of the novelty of the subject from the fact that we just now record the first death among our veteran colleagues,—the death of Professor Budd, which occurred on the 20th of this month. Professor Budd was a pioneer in a pioneer country. He made us to enlarge our horizon and helped to open the gates of promise.

As a college subject, the origin of horticulture has been various. In the early days, it was associated oftenest with botany and split off from that subject. One of my old teachers told me, as a student, that "botany and horticulture" was a good professorship because I could gradually magnify the botany. When I was asked to take the chair of horticulture at the Michigan Agricultural College, a prominent botanist, who is now known personally or by reputation to every one of you, said to me that he did not see "how under heaven any man can take such a professorship as that." My dear old preceptor Asa Gray was surprised, and I think, disappointed. When I sought to minimize the disgrace of it by saying that a horticulturist needs to be a botanist, he replied, "Yes, but he needs to be a horticulturist, too."

Latterly, horticulture has been correlated with agriculture rather than with botany. It has taken hold of affairs and is no longer a "chair,"—for the professorial "chair" typifies the old sit-still method of teaching.

Agriculture has divided by fission into a half dozen or more organisms, and each of these now shows signs of further segmentation. If pigs, cows, horses, machinery, underdrains, and field crops lack pedagogical and scientific harmony, what shall we say of orchids, onions, oranges, greenhouses, canning factories, cover-crops, plant-breeding, landscape gardening and cold storage? What is horticulture?

Although horticulture touches affairs at every point, it is primarily a biological subject. It rests on a knowledge of plants. Its fundamental relationship, therefore, is with botany. Its biological phase is botany; its business phase is agriculture. Botany, however, has declined until recently to extend its sphere to subjects that come too near to real human affairs, and therefore has left a very large part of its domain uncultivated. Horticulture has seized some of this territory. It should hold the territory.

Botany has not been alone in holding itself aloof from subjects that are made unclean by serving a direct purpose in the lives of men. All academic subjects have considered themselves worthy in proportion as they serve no concrete purpose. We even yet speak of "pure science," as if some science were impure. It is curious that subjects sought by human minds and hands are not "pure" when they serve those minds and hands in the affairs of life. Howbeit, a working and practicable knowledge of plants must be had by those who engage in the developing of plant industries. A few days ago I saw a professor of botany in a commercial greenhouse, asking the florist many questions about the growth and behavior of plants. I asked him why. He replied, "Those men know more real plant physiology than we do." Those men were horticulturists.

I have not the least desire to confine any person's efforts to so-called "applied science." On the other hand, I have no desire to confine it to "pure science." I object to the classification of the ideas and to what this classification connotes. All knowledge is knowledge.

Botany must escape its integuments of the laboratory and find part of its sphere in the field and the garden and on the farm. This is precisely the trend of its development to-day. Yet so great practical knowledge of plant-growing is required for this work that it would seem to demand the skill of one who is trained as a plantsman as well as an investigator. Horticulture would seem to stand in some such relation to botany as electrical and other engineering stands to physics. The engineer must be somewhat of a physicist, but he must also be an engineer. The multiplicity of botanical subjects and the intricacy of subject-matter are increasing with great rapidity. There will

be an opportunity for several teaching and investigational professions in the realm now known as botany. I should not be surprised if we should give up the term botanist as designating the occupant of a professorship. There is now a tendency to return to unit courses in biology, with special biologists employed in various phases of the subject. Of these special biologists, the horticulturist will be one of the remoter groups, connecting plant biology with the affairs of men.

But even so, there must be horticulturists and horticulturists; and I doubt whether the term horticulturist will long persist in highly developed schemes of education and investigation. There will be fruit-growing horticulturists, flower-growing horticulturists, nursery-growing horticulturists, and others. The manufacturing interests will be segregated, such as canning industries, manufacture of fruit wines and juices and the like, as dairy manufacture has now been separated from animal husbandry.

I once edited a cyclopedia of horticulture. I do not know that it has left any impression on the mind of the very select public that chanced to hear of it; but the one strong impression that it left on my mind is its heterogeneousness. The most perplexing problem in its preparation was what to include. No doubt the reader is impressed with what might have been omitted. My own conclusion was that we should never see another large cyclopedia of horticulture; for such a work marks an unspecialized age.

Just how the field will divide itself in the colleges and experiment stations it is yet too early to predict. As the reason for its division rests on its touch with affairs, and as affairs differ in every great geographical region, I see no reason why it should divide everywhere into identical parts. In New York we need a professor of pomology; another of plant propagation; another of greenhouse business; another of ornamental gardening; another of seed-growing, drawing from both agriculture and horticulture; another of fruit manufacture.

Horticulture is contributing greatly to the national wealth. It supplies much important food; but these foods are to a large extent non-necessities, and their increasing use is a good criterion of the development of our civilization,—for the progress of the refinement of civilization is marked by the transferal of articles from the class of occasional luxuries to the class of essentials. Practically all the fruits, particularly in temperate climates, belong to the class of non-necessitous foods; yet their consumption is increasing with enormous rapidity. All the growth of floriculture and of ornamental gardening—largely the work of one generation—stands in a very intimate relation

to the broadening sensitiveness of our lives. The number of fruit and forest trees grown in nurseries in 1900 was nearly twice as great as in 1890. In 1900 there were more than sixty-eight millions of square feet of glass in florists' establishments in the United States. The increase of the staple food-stuffs must bear a fairly definite ratio to the increase of population, but the increase in nearly all of the horticultural products is conditioned on our attainment of relative ease and the growth of ideals.

Horticulture also represents intensive tillage and high-class effort at farming. In 1900 the earning power of land devoted to vegetables and small fruits in the United States was four times as great as the average earning power of all other crops. The perfection of tillage is the pot-growing of the florist, who produces as great results from a handful of soil as the general farmer produces from a bushel. It is no mere accident that one of the staple phrases of our language is, "As rich as a garden."

How the subject of horticulture shall be divided and classified is of far less importance than what the subject shall include. Neither is it important what a man is called who does a certain piece of work. What is to be done in that field now indefinitely covered by the American term horticulture, in that domain of plant knowledge as related to the lives of men?

Everything is to be done, for everything is yet unfinished. There is not one subject that we can say is even fairly completed. We need to know the bases of every existing condition in which plants grow. The conditions under which plants grow will be new and perhaps revolutionary in time to come, for wholly new plant industries are no doubt to develop. Our very civilization depends on man's relation to plants, and a good part of this relationship falls in the domain of the horticulturist.

The opportunities of the horticulturist are just beginning to be recognized. Some years ago a person who had been made horticulturist in one of our institutions wrote me asking whether I knew of any subjects that could be investigated and what he would better do. I told him that he would better quit. It is needless to say to this company that we have not yet lived up to our opportunities. Most of our work has been of a temporary and superficial character. Real horticultural research is only begun. The field is concreting itself and trained men are coming to the work.

On the biological side, the concern of the horticulturist is twofold: to make two blades of grass grow where only one grew before; to make each blade better than its parents were. Our definite and methodical work has been directed chiefly toward the former end. We have tried to increase production

by augmenting the capabilities of the soil, and by extra care of the plant. We shall now attempt similar effort by making better plants. Of course there has been remarkable progress in varieties of plants; but for the most part it has been fortuitous and unpredicted. The new plant-breeding is more important than the old insistence on fertilizing of the land. But we are even yet mostly concerned with the production of concrete varieties, following the age-long conception that species and varieties are entities. Very likely we shall find that the best plant-breeding is that which produces gradual improvements inside the variety, until a variety shall develop into something better than itself. We seem now to care more for something that we can name, than for something that we can measure. We shall work out such constants that each grower will know how to increase the efficiency of a crop, as well by breeding the plant as by manipulating the soil. The grower will not need to rely solely on a professional maker of new kinds. Plant-breeding will be valuable in proportion as it gives every man the power to breed plants for himself.

We need a new plant physiology,—a broader, keener, more vital body of knowledge than the laboratory alone can give us; for physiology is the science of life, and this life relates itself to every condition in which the plant lives. It includes ecology and ethology and other special fields. Part of this new knowledge will come from the botanists, part from the horticulturists, and there will be no clear line of demarcation. Suppose the botanists give us the fundamental histological and physiological data: we horticulturists will work them out in plant forms that will help the race in its progress.

In working out these practical breeding problems we will also be reconstructing the route by which the vegetable kingdom has arrived at its present stage. The plant-breeder and the animal-breeder are exponents of the organic evolution idea. They participate in the progress. They see the pageant. Working forward for definite ends, they also work backward to the beginning. I know of no persons who so much need to be philosophers. Inevitably they will contribute much to the discussion of evolution, for these discussions must tend to emerge from speculation into definite experiment.

Up to this time, the evolution of plant forms has been essentially undirected by man. If such marvelous transformations have taken place in cultivated plants under such conditions, what may be expected under the explicit efforts of the future? We have every reason for saying that the progress will be remarkable. We shall work on the species that we now cultivate, and we shall extend our effort to species not yet domesticated. All

plants are ours. All forms, all colors, all perfumes, all flavors shall appeal to the senses of man; and we cannot tell what shall be.

But the horticulturist's work is not alone biological. He touches the art-impulse. Rob the race of the art-suggestions that it has had from plants, and you rob it of its architecture and its decoration. Once, furniture was not a part of the home—only mere rude benches and chairs. Decoration was not a part of the home. Nor was music—the Greek ideal of music was music in the fields or in the meeting places, rather than in the homes. Books were not a part of the home. Every generation sees some great addition to the depth and meaning of the home. Plants are a part of the developing centralized idea of home. I do not mean plants in vases alone, nor cut-flowers alone,—but plants in gardens outdoors and indoors in their proper places, as books are in their proper places on tables and library shelves. Every perfect home has its library; so in time it must have its garden,—a room, perhaps out of doors, in which plants grow.

Last summer I drove through a beautiful well-wooded road in south-eastern England. At one place the rear of a house stood close against the highway, presenting no unusual point of interest to the passer-by. I drove in at the gate, and behold! a garden such as poets dream of! And in truth it is a poet's garden. An open space of velvet lawn, sides piled high with lusty growth of tree and shrub and herbaceous plants, in the distance wide sweep of farm lands, at its back the fine old English residence set with pleasant vines—this was the picture. I thought I had never seen so choice a bit, and yet there was nothing over-wrought or high-strung in it. I saw many beautiful plants, but the effect of the whole was supreme. It was as truly a picture as if the image of it had been put on canvas. If you have read "In Veronica's Garden," or "The Garden I Love," you will know what garden I mean.

This garden illustrates a fundamental difference, I think, between the English and the American garden. The Englishman's garden is well-nigh as essential as his house. It is like an extra room to the residence. It is for the family rather than for the public. It therefore works itself into the developing consciousness of children, and garden-love becomes as much a part of the person as books and furniture and music do. An English teacher recently inspected our nature-study work. 'What surprises me,' she said, 'is that you need to do this work. The English child loves nature as if by instinct.' The American garden is likely to be all in the front yard. It is usually of the look-at-me kind. It is made for the public to see. This may contribute to public

spirit and civic betterment, but it loses in originality and vitality and in homefulness.

One-third of our city and village improvement work is horticulture. Another third is architecture; and the other third is common cleanliness and decency. We are gradually developing toward social community. All public and quasi-public property belongs in a very real sense to every one of the people who comes into relationship with it. It is your concern and mine how the streets look, and what is the esthetic character of churchyards, highways, railway property, open spaces, vacant lots. It is the work of the artist to touch all these commonplaces into life; but the horticulturist must furnish part of the materials, and if he rises to his opportunities he himself will be in some important sense an artist.

As a teaching profession, horticulture has two great phases: it must teach the things of the art and the craft; it must aid in bringing the child into relations with its environment. In all these generations we have been training the reflective and passive faculties. We shall now train also the creative and active faculties. It is the development of the active and constructive faculties that makes the farm boy so effective when he goes to the city. The coming school will deal with live objects and real phenomena. It will not be confined within walls. Growing plants will be prominent among these objects. The child will be trained to use his hands, to plan and to reason from actual problems. Then he will be resourceful and will have power; for no man who lacks power is an educated man even though he knows all languages and has the finest academic manners.

I have now suggested the three phases or sides of the field that we know as horticulture:

I. The biological or science side.

(*a*) Physiology of plants, in its broadest phases—relations to the place in which the plant grows and to the artificial conditions imposed upon it.

(*b*) The modification of plants,—acclimatization, breeding, evolution.

II. The affairs side.

(*a*) The manipulation of plants,—grafting, pruning, training.

(*b*) The rearing and sale of plants and plant products as a commercial enterprise.

(*c*) The manufacture of certain plant products,—the canning, evaporating and similar industries.

III. The art and home side.

(*a*) The love of plants.

(*b*) The love of gardens.

(*c*) The use of plants to heighten the beauty and meaning of the landscape.

It would be violence, no doubt, to draw conclusions from this rambling discourse; but if I were asked what is the domain of the horticulturist I would reply in some such way as this: the horticulturist is one of the men who join hands with the plant biologist on one side and with affairs on the other, and whose energies are expended in every way in which plants appeal to men

L. H. BAILEY.

July 26, 1905.

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DUGGAR, B. M., Div. Veg. Phys. & Path., U. S. Dept. Agric., Washington, D. C. (*Photosynthesis. Physiology of Plants. Pollen.*)

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

DUPUY, LOUIS, Wholesale florist and specialist in hard-wooded plants, Whitestone, N. Y. (*Erica. Has read other articles on heath-like plants.*)

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

EARLE, PARKER, Horticulturist, Roswell, N. M. (*New Mexico.*)

*EGAN, W. C., Amateur, Highland Park, Ill. (*Eremurus. Rose. Rudbeckia. Winter Protection. Has helped on hardy plants.*)

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

ELLIOTT, WILLIAM H., Florist, Brighton, Mass. (*Asparagus plumosus.*)

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

ENDICOTT, JOHN, Bulb-grower, Canton, Mass (*Littonia.*)

ENDICOTT, W. E., Teacher, Canton, Mass. (*Achimenes. Acidanthera. Ixia. Has made important corrections in many articles on bulbs.*)

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

EVANS, WALTER H., Office of Exp. Stations, U. S. Dept. Agric., Washington, D. C. (*Alaska.*)

*FALCONER, WILLIAM, Supt. Bureau of Parks, Pittsburg, Pa. (*Romneya.*)

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

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

FINLAYSON, KENNETH, Gardener, Brookline, Mass. (*Diosma.*)

FLETCHER, Prof. S. W., Horticulturist, Wash. Exp. Sta., Pullman, Wash. (*Ipomœa and various other Convolvulaceæ. Helianthus and related genera. Nemophila. Nierembergia. Nolana. Pollination.*)

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

FRANCESCHI, Dr. F., Manager S. Calif. Acclimatizing Ass'n, Santa Barbara, Calif. (*Rare plants grown in S. Calif., as Dasylirion, Flacourtia, Fouquiera, Furcræa, 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 Sec'y to President of the U. S. Philippine Commission. (*Philippine Islands.*)

GARCIA, PROF. FABIAN, Horticulturist New Mex. Exp. Sta., Mesilla Park, N. M. (*New Mexico*).

GARFIELD, CHAS. W., Horticulturist, Grand Rapids, Mich. (*Michigan.*)

GERARD, J. N., Amateur, Elizabeth, N. J. (*Various articles, especially on bulbous plants, as Crocus, Iris, Muscari, Narcissus.*)

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, H. P., Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Brussels Sprouts. Celeriac.*)

GOULD, Mrs. THOS., Petunia specialist, Ventura, Calif. (*Petunia.*)

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

GREEN, WM. J. Horticulturist, Ohio Exp. Sta., Wooster, Ohio. (*Ohio. Greenhouse sub-irrigation.*)

GREENE, EDWARD L., Prof. of Botany, Catholic Univ. of America, Washington, D. C. (*Dodecatheon. Help on Viola.*)

GREENLEE, Miss LENNIE, Bulb-grower, Garden City, N. C. (*Ixia.*)

*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, Odontoglossom, Oncidium, Orchid, Phalænopsis, Sacco labium, Stanhopea, Zygopetalum.*)

GROFF, H. H., Gladiolus specialist, Simcoe, 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. Fungus.*)

HANSEN, GEO., Landscape Architect and botanist, Berkeley, Calif. (*Epidendrum.*)

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

HARRIS, FREDERICK L., Gardener, Wellesley, Mass. (*Lisianthus. Medinilla.*)

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

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

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

*HARSHBERGER, J. W., Instructor in Botany, Univ. of Penn., Philadelphia, Pa. (*Rust. Saprophyte. Scilla. Smut. Symbiosis.*)

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

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

HASTINGS, G. T., formerly Asst. in Botany, Cornell Univ., Ithaca, N. Y.; now Science Teacher, Santiago, Chile. (*Some tropical plants, as Berria, Bertholletia. A few grasses, as Hierochloe, Holcus, Hordeum.*)

*HATFIELD, T. D., Gardener, Wellesley, Mass. (*Numerous and varied contributions, as Gesnera, Gloxinia, Lachenalia, Lcea, Macrozamia, Œnothera, Oxalis, Pelargonium, Reinwardtia, Rhexia, Richardia, Rondeletia. Has read many proofs.*)

HEDRICK, U. P., Asst. Prof. of Horticulture, Agricultural College, Mich. (*Evaporation of Fruit. Prune. Help on Utah.*)

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

HENDERSON & Co., PETER, Seedsmen, New York, N. Y. (*Bulbs. Eccremocarpus. Polianthes. Much help on proofs and many suggestions.*)

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

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

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

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

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

*HICKS, HENRY, Nurseryman, Westport, L. I. (*Ligustrum. Transplanting.*)

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

HILL, E. G., Florist, Richmond, Ind. (*Begonia.*)

*HITCHCOCK, A. S., Agrostologist, U. S. Dept. Agric., Washington D. C. (*Most of the genera of grasses from E to Z.*)

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

HOOPES, JOSIAH, Nurseryman, West Chester, Pa. (*Hedges.*)

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

*HUEY, ROBERT, Amateur rosarian, Philadelphia, Pa. (*Rose.*)

*HUNN, CHARLES E., Gardener, Cornell Exp. Sta. Ithaca, N. Y. (*Forcing of Vegetables. Mignonette. Strawberry.*)

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

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

*IRISH, H. C., Horticulturist, Mo. Botanical Gardeu, St. Louis, Mo. (*Capsicum. Lactuca. Pepper. Tetragonia.*)

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

*JACKSON & PERKINS Co., Nurserymen and specialists in Clematis, Newark, N. Y. (*Clematis. Rose.*)

JAENICKE, ADOLPH, Manager propagating dept., J. L. Childs, Floral Park, N. Y. (*Primula.*)

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

JORDAN, A. T., Asst. Horticulturist, New Brunswick, N. J. (*New Jersey.*)

*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 Horse-Radish, Okra and Roquette. The article Sweet Herbs, also Sage, Savory, Scurvy Grass, Tansy, and other sweet, pot or medicinal herbs. Also Chicory, Ginseng and Glycyrrhiza.*)

KEARNEY, T. H., Div. of Veg. Phys. and Path., U. S. Dept. Agric., Washington, D. C. (*Three orchid genera, Grammangis, Grammatophyllum, Habenaria.*)

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

KELSEY, HARLAN P., Nurseryman, Boston, Mass. (*North Carolina plants, as Galax, Leucothoë and Paronychia. Help on proofs.*)

KENNEDY, P. BEVERIDGE, Horticulturist, Nev. Exp. Sta., Reno, Nev. (*Many genera of grasses in Vols. I and II. Begonia.*)

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

KIFT, ROBERT, Florist, Philadelphia, Pa. (*Cut flowers.*)

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

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

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

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

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

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

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

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

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

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

LONSDALE, EDWIN, Florist, 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.) (*Pear.*)

*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. (*Euphorbia. Has read proofs of several orchid genera.*)

MCFARLAND, J. HORACE, Horticultural printer and expert in photography, Harrisburg, Pa. (*Border. Photography. Help on illustrations.*)

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

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

MCWILLIAM, GEO., Gardener, Whitinsville, Mass. (*Dipladenia. Luculia.*)

*MANNING, J. WOODWARD, Landscape Architect, Boston, Mass. (*Pachysandra. Pyrethrum. Rhododendron. Hardy herbs. Many proofs.*)

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

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

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

MATHEWS, Prof. C. 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, Selenipedium, 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. (*Crinum. Orange. Has helped in matters of southern horticulture.*)

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

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

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

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

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

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

*NEHRLING, H., Milwaukee, Wis. (*Phœnix, Sabal, Serenoa, Tabernæmontana, Tecoma, Thunbergia and other plants cultivated in his garden at Gotha, Fla.*)

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

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

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

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

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

*OLIVER, G. W., Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Many articles on palms, aroids, succulents and rare plants, and much help on proofs. Alstræmeria. Amaryllis. Nepenthes. Ochna. Pennisetum. Petrea. Sarracenia.*)

OLMSTED, Jr., F. L., Landscape Architect, Brookline, Mass. (*Park. Help on Landscape and Railroad Gardening.*)

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.*)

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

*PETERSON, WM. A., of the firm of P. S. Peterson & Son, Nurserymen, Chicago, Ill. (*Paonia. 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.*)

*PIETERS, A. J., Botanist in charge of Seed Laboratory, Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Seed Testing.*)

POWELL, Prof. G. HAROLD, Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Cherry. Delaware. Help on Peach, etc.*)

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

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

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

*PURDY, CARL, Specialist in California bulbs, Ukiah, Calif. (*California native plants, as Brodiæa, Calochortus, Erythronium, Fritillaria, Stropholirion. Help on Lilium.*)

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

RAWSON, GROVE P., Florist, Elmira, N. Y. (*Lantana.*)

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

*REASONER, E. N., Nurseryman and horticulturist, Oneco, Fla. (*Many articles, and much help on extreme southern horticulture. Casalpinia. Cocos. Guava. Kumquat. Lemon. Lime. Mango. Musa. Orange. Sabal. Tamarindus.*)

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

ROBERTS, Prof. I. P., Dir. College of Agric., Cornell Univ., Ithaca, N. Y. (*Drainage. Fertility. Manure. Potato.*)

ROLFS, Prof. P. H., Botanist, S. C. Exp. Sta., Clemson College, S. C. (*Eggplant. Florida. Okra. Onion. Pineapple.*)

ROSE, J. N., Asst. Curator, U. S. Nat. Herb., Smithsonian Institution, Washington, D. C. (*Agave. Prochnyanthes.*)

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. (*Fagus.*)

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

ROYLE, Mrs. EMILY TAPLIN, Asst. Ed. "Rural New-Yorker," New York, N. Y. (*Nepenthes.*)

*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, Convallaria, Cyclamen, Cytisus, Smilax, Metrosideros, Peperomia, Perilla, Piqueria, Stephanotis, Syringa, Verbena, etc. Also Packing Flowers.*)

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

*SCRIBNER, F. LAMSON, Dir. Dept. of Agric., Philippine Islands, formerly Chief Div. of Agrostology, U. S. Dept. Agric., Washington, D. C. (*Tesosinte.*)

*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.*)

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

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

*SHEPARD, CHARLES U., Special agent U. S. Dept. Agric. in charge of experiments in tea culture, Summerville, S. C. (*Tea.*)

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

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

*SIEBRECHT, HENRY A., Florist and nurseryman, New York and Rose Hill Nurseries, New Rochelle, N. Y. (*Much help on rare greenhouse plants, particularly orchids and palms. Dracæna. Ficus. Fuchsia. Gardenia. Ixora. Lapageria. Laurus. Nerium. Nepenthes. Puya. Sonerila. Tecoca, 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, Cerastium, 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, E. S., Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Perfumery Gardening.*)

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

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

*STUBENRAUCH, ARNOLD V., Instructor in Hort., Univ. of Ill., Urbana, Ill., formerly Calif. Exp. Sta. (*Olive, Plum and Raisin in Calif. Pilocarpus. Pimelea. Platycodon. Sequoia. Tulipa.*)

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

TAFT, Prof. L. R., Horticulturist, Mich. Agric. College, Agricultural College, Mich. (*Greenhouse heating. Hotbeds.*)

*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.*)

TAYLOR, WM. A., Asst. Pomologist, Div. of Pomology, U. S. Dept. Agric., Washingtou, D. C. (*Articles on nuts, as Hickory, Pecan.*)

THILOW, J. OTTO, of H. A. Dreer, Inc., Philadelphia, Pa. (*Leek. Muskmelon.*)

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

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

*TRACY, W. W., Seedsman, D. M. Ferry & Co., Detroit, Mich. (*Cabbage. Lettuce. Michigan. Pea. Radish. Seedage. Help on many vegetables.*)

*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. Oxalis.*)

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

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

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

*VAN DEMAN, H. E., Pomologist, Parksley, Va. (*Date. Nut Culture. Strawberry.*)

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

VICK, JAMES, D. Landreth's Sons, Philadelphia, Pa. (*Malvaviscus. Melothria.*)

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.*)

*WALKER, Prof. ERNEST, Horticulturist, Ark. Exp. Sta., Fayetteville, Ark. (*Annuals. Basket Plants. Heliotrope. Watering.*)

WARD, C. W., Wholesale florist, Queens, L. I. (*Pelargonium. Help on Carnation.*)

*WARDER, R. H., Supt. Lincoln Park, Chicago, Ill. (*Warder.*)

*WATROUS, C. L., Nurseryman and pomologist, Des Moines, Io. (*Iowa. Pear. Trees on Plains.*)

*WATSON, B. M., Instructor in Horticulture, Bussey Inst., Jamaica Plain, Mass. (*Colchicum. Cottage. Forcing Hardy Plants. House Plants. Rhododendron. Rose. Winter Protection.*)

*WATTS, R. L., formerly Horticulturist of Tennessee Exp. Sta., Scalp Level, Pa. (*Tennessee.*)

*WAUGH, Prof. F. A., Horticulturist, Vt. Exp. Sta., Burlington, Vt. (*Beet. Carrot. Cucumber. Greens. Lilium. Plum. Salad Plants. Vermont.*)

*WEBBER, HERBERT J., In charge of Plant Breeding Laboratory, Veg. Phys. and Path. Investigations, Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Citrus. Pomelo. Murraya, Triphasia, and other citrous genera. Plant-Breeding. Help on Zamia.*)

WELLHOUSE, FRED, Fruit-grower, Fairmount, Kans. (*Kansas.*)

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

WHEELER, H. J., Chemist, R. I. Exp. Sta., Kingston, R. I. (*Lime.*)

*WHITNEY, MILTON, Chief. Div. of Soils, U. S. Dept. Agric., Washington, D. C. (*Irrigation. Soils.*)

WHITTEN, Prof. J. C., Horticulturist, Mo. Exp. Sta., Columbia, Mo. (*Missouri.*)

WHYTE, R. B., Amateur, Ottawa, Ont. (*Hemerocallis. Lilium. Narcissus. Papaver. Help on Tagetes, Tulipa, Zinnia, etc.*)

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

*WIEGAND, K. M., Instructor in Botany, Cornell Univ., Ithaca, N. Y. (*Coreopsis. Cordyline. Cyperus. Dracæna. Juncus. Lysimachia. Musa. Myosotis. Potentilla. Scirpus. Stemonema.*)

*WOODS, ALBERT F., Chief of Office of Veg. Phys. Investigations, U. S. Dept. Agric., Washington, D. C. (*Variegation.*)

WOOLSON, G. C., Nurseryman, Specialist in hardy herbaceous perennials, Passaic, N. J. (*Mertensia. Has read numerous proofs.*)

WORTMAN, S. W., Mushroom-grower, Iselin, N. J. (*Mushroom.*)

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

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

*YEOMANS, L. T., Fruit-grower, Walworth, N. Y. (*Pear. Help on Evaporation of Fruits. Raspberry.*)

ZIENGIEBEL, 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. (*Olive.*)

ALVERSON, A. H., Grower of cacti, San Bernardino, Calif. (*Cacti.*)

APGAR, AUSTIN C., Prof. of Botany, N. J. State Normal School, author of "Trees of the Northern U. S.," Trenton, N. J. (*Trees.*)

BAILEY, W. W., Prof. of Botany, Brown Univ., Providence, R. I. (*Rhode Island.*)

BALL, C. D., Wholesale florist, Holmesburg, Philadelphia, Pa. (*Palms and decorative plants.*)

BARKER, CHARLES, Fruit-grower, Milford, Del. (*Peach.*)

BASSETT & SON, Wm. F., Nurserymen, Hammonton, N. J. (*Native plants, as Hibiscus.*)

BEAL, W. H., Office of Experiment Stations, U. S. Dept. Agric., Washington, D. C. (*Vigna.*)

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

BETSCHER, C., Florist, nurseryman and seedsman, Canal Dover, Ohio. (*Gladiolus.*)

BLANC, A., Seedsman and plantsman, Philadelphia, Pa. (*Cacti. Canna. Novelties.*)

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

BRACKETT, G. B., Pomologist, U. S. Dept. Agric., Washington, D. C. (*Hicoria. Hickory. Juglans.*)

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

BREESE, J. S., Nurseryman, Fayetteville, N. C. *North Carolina.*)

BROTHERTON, WILFRED, Mich. Wild Flower Co., Rochester, Mich. (*Native hardy herbaceous perennials.*)

BROWN, O. H., Amateur, Bordentown, N. J. (*Aquatics.*)

BUDLONG & SON CO., J. A., Manufacturers of pickles and vinegar, market-gardeners, Providenee, R. I. (*Cucumber. Martynia.*)

BRUGGERHOF, F. W., Seedsman, Pres. J. M. Thorburn & Co., New York, N. Y. (*Seed Trade. Various suggestions.*)

BURPEE, W. ATLEE, Seedsman, Philadelphia, Pa. (*Seed Testing.*)

BUSH & SONS, Viticulturists, Bushberg, Mo. (*Grapes.*)

CALDWELL, GEO. C., Prof. of Agric. Chemistry, Cornell Univ., Ithaca, N. Y. (*Fertility. Fertilizers. Lime.*)

CHAMBERLIN, JOHN, Journalist, Buffalo, N. Y. (*Native plants. Ranunculus.*)

CLARK, Miss JOSEPHINE A., Librarian, U. S. Dept. Agric., and author of a card index of new species of North American plants, Washington, D. C. (*Information as to species after the date of Index Kewensis.*)

CLARK, J. C., Dreer's nursery, Riverton, N. J. (*Pansy.*)

COVILLE, FREDERICK V., Botanist, Dept. of Agric. Washington, D. C. (*Juniperus. Suggestions on various matters.*)

CRANEFIELD, FREDERIC, Asst. Horticulturist, Wisconsin Exp. Sta., Madison, Wis. (*Irrigation.*)

DAILLEDOUZE BROS., Wholesale florists, Flatbush, Brooklyn, N. Y. (*Mignonette.*)

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

DANBY, CHARLES E., Prune-grower, Salem, Ore. (*Prune.*)

DANDRIDGE, Mrs. DANSKE, Amateur, 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.*)

DEVRON, Dr. G., Amateur of bamboos, New Orleans, La. (*Bamboo.*)

DOCK, Miss M. L., Lecturer on plant life, forestry and village improvement, Harrisburg, Pa. (*Bartram. Village Improvement.*)

DOSCH, H. E., 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, Pittsburg, Pa. (*Kochia, Oak, and some herbaceous perennials.*)

ELLWANGER & BARRY, Nurseryman, Rochester, N. Y. (*Hardy plants.*)

EMERSON, Prof. R. H., Horticulturist, Neb. Exp. Sta., Lincoln, Neb. (*Nebraska.*)

FARNHAM, J. E. C., Ex-Pres. R. I. Hort. Soc., Providence, R. I. (*Rhode Island.*)

FERNALD, M. L., Asst. in Gray Herbarium, Cambridge, Mass. (*Salvia.*)

FIELDS, JOHN, Dir. Agr. Exp. Sta., Stillwater, Okla. (*Oklahoma.*)

FISHER, Dr. JABEZ, Fruit-grower, Fitchburg, Mass. (*Massachusetts.*)

GANONG, W. F., Prof. of Botany, Smith College, Northampton, Mass. (*Cacti, and many proofs of physiological subjects.*)

GIFFORD, JOHN C., Asst. Prof. of Forestry, College of Forestry, Cornell Univ., Ithaca, N. Y. (*Poinciana.*)

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

GREENMAN, J. M., University Museum, Cambridge, Mass. (*Zinnia.*)

HALLIDAY, ROBT. J., Florist, Baltimore, Md. (*Azalea. Camellia.*)

HARRIS, J. S., Fruit-grower, La Crescent, Minn. (*Minnesota.*)

HAYS, WILLET M., Prof. of Agric., Univ. of Minn., Minneapolis, Minn. (*Plant-Breeding.*)

HEIGES, S. B., Pomologist, York, Pa. (*Pennsylvania.*)

HEISS, J. B., Florist, Dayton, Ohio. (*Palms.*)

HELLER, A. A., Botanist, Lancaster, Pa. (*Porto Rico.*)

HERBST, J. L., Fruit-grower, Sparta, Wis. (*Strawberry.*)

HEWSON, WM., Orchid-grower for Wm. Scott, Buffalo, N. Y. (*Odontoglossum. Oncidium.*)

HICKS, D. C., Fruit-grower, No. Clarendon, Vt. (*Vermont.*)

HILL, ROBERT T., U. S. Dept. Agric., Washington, D. C. (*Porto Rico.*)

HOSMER, A. W., Botanist, Concord, Mass. (*Polygala, and some other native plants.*)

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

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

JACK, Mrs. ANNIE L., Chateauguay Basin, Prov. Que. (*Nature Plants.*)

JEPSON, WILLIS L., Botanical Dept., Univ. Calif., Berkeley, Calif. (*A few Californian subjects.*)

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

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

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

KATZENSTEIN, OTTO, Manager Pinehurst Nurseries, Pinehurst, N. C. (*Stillingia.*)

KEDZIE, Dr. R. C., Prof. of Chemistry, Mich. Agric. College, Agricultural College, Mich. (*Fertility. Fertilizers. Lime.*)

KELLOGG, GEO. J., Pomologist, Lake Mills, Wis. (*Wisconsin.*)

KERMAN, JOHN, Market-gardener, Grimsby, Ont. (*Tomato*).

KINNEY, T. L., Fruit-grower, South Hero, Vt. (*Vermont.*)

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. (*Minnesota.*)

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

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

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

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

LYON, WM. S., Census Bureau, Washington, D. C. (*Palms.*)

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

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

MACKENZIE, R. R., Sec. J. M. Thorburn & Co., New York, N. Y. (*Many important bulbs.*)

MAKEPEACE, A. D., Cranberry-grower, West Barnstable, Mass. (*Cranberry.*)

MANDA, W. A., Horticultural expert, South Orange, N. J. (*Orchid pictures.*)

MANNING, C. H., Sheridan, Wyo. (*Wyoming.*)

MANNING, JACOB W., Nurseryman, Reading, Mass. (*Dried specimens of herbaceous perennial plants.*)

MANNING, ROBERT, Sec. Mass. Hort. Soc., Boston, Mass. (*Biographical sketches. Horticulture.*)

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

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

MCTEAR, JOHN, Gardener, Montecito, Calif. (*Some plants cult. in Calif.*)

MEAD, Prof. ELWOOD, Cheyenne, Wyoming. (*Wyoming.*)

MEEHAN, THOS., Nurseryman, Germantown, Pa. (deceased). (*The article "Horticulture."*)

MERIAM, Dr. HORATIO C., Salem, Mass. (*Pæonia. Papaver.*)

MERRILL, L. H., Prof. of Chemistry, Me. Agric. Coll., Orono, Me. (*Maine.*)

MILLER, E. S., Specialist in Bulbs, Floral Park, L. I. (*Many articles on bulbs.*)

MILLER, H H, Paw Paw., W. Va. (*West Virginia.*)

MOON, WM. H., Nurseryman, Morrisville, Pa. (*Pennsylvania.*)

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

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

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

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

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

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

OHMER, NICHOLAS, Fruit-grower, Dayton, Ohio. (*Ohio.*)

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

PARSONS, SAMUEL B., Nurseryman, Flushing, L. I. (*The articles "Horticulture" and "Pomology."*)

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

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

PERICAT, ALPHONSE, Gardener, West Philadelphia, Pa. (*Lælio-cattleya.*)

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

RAGAN, W. H., Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Indiana.*)

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

REA, FREDERIC J., Nurseryman, Norwood, Mass. (*Polemonium.*)

REBMANN, JEREMIAH, Lincoln, Neb. (*Philippine Islands.*)

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

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

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

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

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

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

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

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

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

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

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

SALTFORD, 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.*)

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

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

SHADY HILL NURSERY Co., Boston, Mass. (*Herbaceous perennials.*)

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

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

SIEVERS, JOHN H., Specialist in pelargoniums, San Francisco, Calif. (*Pelargonium.*)

SIMPSON, J. H., Botanist, Braidentown, Fla. (*Vitis, 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.*)

STEWART, W. J., Sec. Soc. American Florists, Boston, Mass. (*Syringa.*)

SOLTAU, CHRIS, Grower of pansy seed, Jersey City, N. J. (*Pansy.*)

STANTON, GEO., Ginseng specialist, Apulia Station, N. Y. (*Ginseng.*)

STOCKBRIDGE, Prof. H. E., Dir. Fla. Exp. Sta., Lake City, Fla. (*Tomato.*)

STORRS & HARRISON, Nurserymen, Painesville, Ohio. (*Various plants.*)

STURTEVANT, EDMUND D., Specialist in aquatics, Station E., Los Angeles, Calif. (*Victoria and other aquatics.*)

SUZUKI & IIDA, Yokohama Nursery Co., New York, N. Y. (*Japanese plants.*)

THOMPSON, Mrs. J. S. R., Spartanburg, S. C. (*Perfumery Gardening.*)

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

TODD, FREDERICK G., Landscape Architect. Montreal, P. Q. (*Hardy trees and shrubs.*)

TROTH, HENRY, Photographer of plants and landscapes, Philadelphia, Pa. (*Photography.*)

VICK'S SONS, JAMES, Seedsmen, Rochester, N. Y. (*Various plants.*)

WATSON, H. D., Farmer and fruit-grower, Kearney, Neb. (*Trees for the Plains.*)

WEBB, Prof. WESLEY, Dover, Del. (*Delaware.*)

WEDGE, CLARENCE, Fruit-grower, Albert Lea, Minn. (*Minnesota.*)

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.*)

WITTBOLD Co., The GEO., Florists, Chicago, Ill. (*Palms and ferns. Nephrolepis Wittboldi.*)

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.
fls. . . . . . flowers.
fld. . . . . . flowered.
fr. . . . . . fruit.
h. . . . . . height.
lf. . . . . . leaf.
lft. . . . . . leaflet.
lvs. . . . . . leaves.
st. . . . . . stem.
sts. . . . . . stems.
syn. . . . . . synonym.
var. . . . . . variety.

III. OF BOOKS AND PERIODICALS

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

An arbitrary and brief method of citation has been chosen. At the outset it seemed best to indicate whether the cited picture is colored or not. This accounts for the two ways of citing certain publications containing both kinds of pictures, as The Garden, Revue Horticole, and Gartenflora. The figures given below explain the method of citation, and incidentally give some hints as to the number of volumes to date, and of the number of pages or plates in one of the latest volumes.

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

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

A.G. . . . American Gardening. New York. Represents 14 extinct horticultural periodicals, including The American Garden (1888–1890). Founded 1879(?) (20:896=vol. and page.)

B. . . . . The Botanist. Edited by Maund. No years on title pages. Founded 1839. 8 vols., 50 colored plates in each vol. (8:400=vol. and col. plate.) Cumulative index.

B.B. . . . Britton & Brown. An illustrated Flora of the Northern U. S., etc. New York. 1896–1898. (3:588=vol. and page.)

B.F. . . . See F.

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

B.M. . . . Curtis' Botanical Magazine. London. Founded 1787. The oldest current periodical devoted to garden plants. The vol. for 1899 is vol. 125 of the whole work. Index to first 107 volumes by E. Touks. London. (7690=col. plate.)

B.R. . . . Botanical Register (1815–1847). Vols. 1–14 edited by Edwards: vols. 15–33 by Lindley. In vols. 1–23 the plates are numbered from 1–2014. In vols. 24–33 they are numbered independently in each vol. There are 688 plates in vols. 24–33. "An Appendix to the First Twenty-three Volumes" (bound separately or with the 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.)

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

F. . . . . The Florist. London. 1840–1884. (1884: 192=year and page opp. col. plate. (Editors and title pages changed many times. Known as the Florist, Florist's Journal and Florist and Pomologist. Sometimes improperly called British Florist.

F.C. . . . Floral Cabinet. Knowles & Westcott. London. 1837–1840. (3:137 vol. and col. plate).

F.E. . . . The Florists' Exchange. New York. A trade paper, whose pictures sometimes are repeated in "A.G." Founded Dec. 8, 1888. (11:1298=vol. and page.)

F.J. . . . See F.

F.M. . . . Floral Magazine. London. Series I. 1861–1871, 8vo. Series II. 1872–1881, 4to. (1881:450=year and col. plate.)

F.P. . . . See F.

F.R. . . . Florists' Review. Chicago. A trade paper. Vol. 1, Dec. 2, 1897, to May 26, 1898. Two vols. a year. (4:660=vol. and page.)

F.S. . . . Flore des Serres. Ghent. (1845–1880.) Inconsistent in numbering, but the plate numbers are always found on the plate itself or on the page opposite. Valuable but perplexing indexes in vols. 15 and 19. (23:2481=vol. and col. plate.)

G.C. . . . The Gardeners' Chronicle. London. Series I. (1841–1873) is cited by year and page. Series II. or "New Series" (1874–1886), is cited thus: II. 26:824=series, volume and page. Series III. is cited thus: III. 26:416. Two vols. a year, beginning 1874. A select index is scattered through 1879 and 1880. Consult II. 12:viii (1879), and similar places in subsequent vols.

G.F. . . . Garden and Forest. New York. 1888–1897. (10:518=vol. and page.)

G.M. . . . Gardeners' Magazine. London. Ed. by Shirley Hibberd. Founded 1860. Vols. 31–42 are cited. (42:872=vol. and page.)

Gn. . . . The Garden. London. Founded 1871. Two vols. a year. (56:1254=vol. and col. plate. 56, p. 458=vol. and page containing black figure.) An Index of the first 20 vols. was separately published. Complete Index of Colored Plates to end of 1888 in vol. 54, p. 334.

Gng. . . . Gardening. Chicago. Founded Sept. 15, 1892. Vols. end Sept. 1. (7:384=vol. and page.)

Gt. . . . . Gartenflora. Berlin. Founded 1852. (Gt. 48:1470=vol. and col. plate. Gt. 48, p. 670=vol. and page containing black figure.)

G.W.F. . . Goodale's Wild Flowers of America. Boston, 1886. (50=col. plate.)

HBK. . . Humboldt, Bonpland & Kunth. Nova Genera et Species, etc. Paris. 1815–25. 7 vols. Folio.

I.H. . . . L'Illustration Horticole. Ghent. (1854–1896.) (43:72=vol. and col. plate.) The volumes were numbered continuously, but there were 6 series. Series I.=1854–63. Series II.=1864–69. Series III.=1870–80. Series IV. = 1881–86. Series V. = 1887–93. Series VI. = 1894–96. The plates were numbered continuously in the first 16 vols. from 1 to 614; in vols. 17–33 they run from 1 to 619; in series V. from 1 to 190; in Series VI. they begin anew with each vol. Valuable indexes in vols. 10 and 20. Series V. in 4to, the rest 8vo.

J.H. . . . Journal of Horticulture. London. Founded in 1848 as The Cottage Gardener. Series III. only is cited, beginning 1880. (III. 39:504=series, vol., page.)

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

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

L.B.C. . . The Botanical Cabinet. Loddiges. 1817–33. 100 plates in each vol. Complete index in last vol. (20:2000=vol. and col. plate.)

Lind. . . . Lindenia, Ghent. Founded 1885. Folio. Devoted to orchids.

Lowe . . . Beautiful Leaved Plants. E. J. Lowe and Howard. London. 1864. (60=col. plate.)

M. . . . . A. B. Freeman-Mitford. The Bamboo Garden. London. 1896. (224=page.)

M.D.G. . . Möller's Deutsche Gärtner-Zeitung. Erfurt. Founded 1886. (1897:425=year and page.)

Mn. . . . Meehan's Monthly. Germantown, Philadelphia. Founded 1891. (9:192 = vol. and page opposite col. plate.)

N. . . . . Nicholson. Dictionary of Gardening. Vols. 1–4 (1884–1887). Vol. 5 in preparation.

P.F.G. . . Lindley & Paxton. Flower Garden. London. 1851–53. 3 vols. 4to.

P.G. . . . Popular Gardening. Buffalo. 1885–90. (5:270=vol. and page.)

P.M. . . Paxton's Magazine of Botany. London. 1834–49. (16:376=vol. and page opposite col. plate.) Vol. 15 has index of first 15 vols.

R. . . . . Reichenbachia. Ed. by Fred. Sander. London. Founded 1886. Folio.

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

R.H. . . . Revue Horticole. Dates from 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 opposite black figure.)

S. . . . . Schneider. The Book of Choice Ferns. London. In 3 vols. Vol. 1, 1892. Vol. 2, 1893.

S.B.F.G. . Sweet British Flower Garden. London. Series I., 1823–29, 3 vols. Series II., 1831–38, 4 vols.

S.H. . . . Semaine Horticole. Ghent. Founded 1897 (3:548=year and page.)

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

S.S. . . . Sargent. The Silva of North America. 13 vols. Vol. 1, 1891. Vol. 12, 1898. (12:620=vol. and plate, not colored.)

S.Z. . . . Siebold & Zuccarini. Flora Japonica. Vol. 1, 1835–44. Vol. 2 by Miquel, 1870. (2:150=vol. and plate.)

V. or V. M. Vick's Magazine. Rochester, N. Y. Founded 1878. Vols. numbered continuously through the 3 series. Vols. begin with Nov. (23:250=vol. and page.) Sometimes cited as "Vick."

*** *Additional abbreviations and explanations will be found in the introductory pages of Vol. I.*

A SYNOPSIS OF THE VEGETABLE KINGDOM.

By WILHELM MILLER.

The following Synopsis attempts to supply what is probably the greatest deficiency in cyclopedic works on Horticulture published in the English language. It fills a twofold need:

(1) It helps the botanist find out the name of any plant cultivated in America, including the wild flowers and other plants native to the United States and Canada that are offered for sale.

(2) It helps the student towards a scientific knowledge of the plant world, since it gives a condensed and orderly account of that part of the vegetable kingdom which is of interest to gardeners, farmers and foresters.

No merely alphabetical work can accomplish either of these results. For example, suppose you have a flower that you know to be an Iris, but of what species of Iris you do not know and wish to find out. Consult the best works in which the species of Iris are arranged alphabetically. It might take you hours to read the pages of description, comparing the items with your specimen, and the chances are that in the end you would not be sure of your determination, since related species are not compared and contrasted.

It was to furnish a short-cut to such information that every group of plants described in the CYCLOPEDIA OF AMERICAN HORTICULTURE was classified according to shape, color, size, season, height or other character of interest to the gardener. These short-cuts or "keys" have long been in common use among students of botany, but the introduction of them into a work designed primarily for gardeners marks an era in horticultural literature printed in the English language.

No valid objection can be made to keys, synopses or other classified arrangements, since they do three things more clearly and briefly than any other device. (1) They help one find out the name of a plant. (2) They show the difference between this species and every other species of the same genus. (3) They show the relation of each species to every other, i. e. the points of likeness.

But classified schemes alone have one serious limitation. They are not so convenient for ready reference if one knows one's plant and merely wishes to find out the native country or how to spell the name. THE CYCLOPEDIA OF AMERICAN HORTICULTURE met this need by numbering the species and providing an alphabetical list or index in each large genus. It therefore has the unique distinction, among cyclopedic works on Horticulture printed in the English language, of possessing both systems—the classified and the alphabetical—one for science, the other for convenience.

All this supposes that you know the genus to which the plant belongs,—whether it is an Iris, Pæonia or Rhododendron. But you may not know the genus; the Synopsis will aid you to determine it. The Synopsis leads you to the family and the genus; having the genus, you can run down the species in the Cyclopedia itself, for the genera are arranged alphabetically.

This Synopsis, therefore, deals only with families and genera, since the species are described and distinguished elsewhere. It ties the whole work together and makes it an organism instead of a series of detached articles on Iris, Rosa, etc. In other words, the Synopsis is not merely supplementary; it is fundamental.

It must be confessed, however, that the preparation of the Synopsis was undertaken with serious misgivings. During the preparation of the CYCLOPEDIA OF AMERICAN HORTICULTURE, the editor was often importuned for something of the kind, by students, botanists and others who made increasing use of the volumes as issued. In response to these urgent appeals it was necessary to point out three objections: (1) Such a Synopsis would necessarily be highly technical. (2) It would have to use a scheme of arrangement which will pass with another generation. (3) The labor and expense would be great.

In response to this demand the following Synopsis has been prepared and the occasion of a new edition makes it possible to publish it. It is based upon the system of Bentham and Hooker as set forth in their "Genera Plan-

tarum," a work in Latin published in parts from 1862 to 1883. Only those families are included which contain cultivated plants described in this work. The system of Bentham and Hooker is not the latest one, but it is the only one that was practicable at the time this work was prepared, because it was completed. The system of Engler and Prantl was not then complete. The phanerogamic part of this great work is now complete.

"Die Natürlichen Pflanzenfamilien" no doubt presents the best system for the present generation, but in its turn it is likely to be superseded. In Engler and Prantl's system the plants are arranged, as far as possible, in the order in which the various families probably have made their appearance on the earth's surface, or at any rate in accordance with the evolution from simple to complex. Broadly speaking, the new system is better adapted for showing relationship or likeness, while the old system is well adapted for bringing out differences. This furnishes an additional reason for the use of the older system on the present occasion, as most of those who use this part of the Cyclopedia will probably be in search of differences. For an example of the new arrangement, see Britton and Brown's Illustrated Flora of the Northeastern United States and Canada, Vol. III, pages viii to xiv. For a condensed statement of many different systems of botany, see the appendix to Warming's Systematic Botany.

The author of this Synopsis has no credit for the work other than that of translator and editor, but it should be explained that the system of Bentham and Hooker has been modified in some details to harmonize with those parts of the CYCLOPEDIA OF AMERICAN HORTICULTURE that represent later views. For example, the lobelias are here treated, not as a mere tribe of the Campanulaceæ but as a distinct family. Also, the distinction between the different genera of the Spiræa and apple tribes of the rose family were prepared by Mr. Alfred Rehder, and for the orchid family by Mr. Heinrich Hasselbring.

HOW TO USE A SYNOPSIS OR KEY.

Anyone who will devote a few minutes to careful study of a key will find himself richly repaid, for it will unlock many treasures of scientific and practical knowledge. A synopsis is designed chiefly to show relationships; a key to show differences. Two examples will illustrate how both may be used for either purpose.

To find the name of a species.

Let us suppose you have a branch of the common smooth sumach and you wish to know what species it is. Consult Sumach and you are referred to Rhus, where you will find under the index a key to sixteen species. Choose first between A and AA. Is the foliage simple or compound?

A glance at the plant shows that it has compound leaves. Therefore, your plant belongs under AA, and four of the sixteen species have been dismissed from consideration at one stroke, viz, those under A.

Next choose between B and BB under AA. Are the leaflets normally three or are they many? The plant answers the questions at once. It has more than three leaflets.

Now choose between C and CC. Are the leaves smooth on both sides or pubescent beneath? (Pubescent means minutely hairy.) Look closely at the leaf and run your finger over it. It is smooth.

Therefore your plant is one of three species, Nos. 8, 9 or 10. It does not take long to read the descriptions of these three species and to come to the conclusion that the scientific name of your sumach is *Rhus glabra*.

With a little practice you can often determine a name in two minutes with the aid of a key which might take you half an hour if you had to read sixteen descriptions arranged in alphabetical order, even if the alphabetic descriptions were contrasted.

To comprehend a genus.

Suppose now that you wish to understand a large and complicated group in the shortest possible time. You know enough about lupines to pique your curiosity; you want to know how many species there are in cultivation, what they are good for and which ones you would like to grow.

Consult Lupinus and in the usual place (under the index) you find a key to twenty species. Observe A and AA. There are eight species of perennials and twelve of annuals. This shows at once that there are two cultural groups—a point of great value to the gardener. This bit of information alone justifies a key.

Now compare B and BB under A and you will see that one species is a shrub while the other seven perennials are herbs.

Compare C and CC and you learn the interesting fact that in a certain species the leaflets are reduced to one.

Under AA, compare B, BB and BBB, and you will see that the twelve annual species can be thrown into three groups based on color. The surprisingly wide color range among lupines thus comes to light.

With a little practice these dry synopses can be transformed into revelations of scientific truth that are as interesting as stories. In no other way can you grasp a genus and hold it as in the hollow of your hand.

To master a family.

Suppose you know enough about rhododendrons and laurel to wish to know more about the whole family to which they belong. This is natural, because the heath family happens to be a cultural unit as well as a botanical one. That is, the members of this family are mostly shallow-rooting, lovers of moisture and shade and leaf mold; and usually need to be mulched both summer and winter.

Turn to page 38 and you will see how many genera compose the family, what they are, how they are related to one another and how they differ. By studying them further you may satisfy yourself as to their relative importance in horticulture, their different requirements, and the like.

The distinctions between families.

Although no apology for a synopsis or key is required by the botanist it has seemed necessary to make such a defense, because experience has shown that the general public has not been using its volumes of the CYCLOPEDIA OF AMERICAN HORTICULTURE to their full value, apparently from a feeling that a key is an unnecessarily technical affair and that the information it contains could be better expressed in paragraph form.

We are compelled to admit that the distinctions between families are highly technical, in many cases depending on microscopical characters, but there is no help for it. The more species there are to be be differentiated, the smaller the distinctions must be, and there are thousands of species described in the Cyclopedia. There are several hundred families in the vegetable kingdom.

TECHNICAL TERMS.

Very few technical terms are used in the CYCLOPEDIA OF AMERICAN HORTICULTURE which are not explained in the popular text-books of Botany, such as Gray's Manual. Therefore, it has not seemed worth while to add a glossary of botanical terms.

Only one arbitary sign is used: "∞" means "indefinite."

FRAMEWORK OF THE WHOLE PLAN.
VEGETABLE KINGDOM

PART I.—SYNOPSIS OF ORDERS OR FAMILIES.

Division 1. FLOWERING PLANTS OR PHANEROGAMS: those producing real flowers and seeds.

Subdivision 1. DICOTYLEDONS OR EXOGENS. Stems formed of bark, wood and pith; the wood forming a zone between the other two, and increasing when the stem continues from year to year by the annual addition of a new layer to the outside, next the bark. Leaves usually netted-veined. Embryo with a pair of opposite cotyledons or in Subdivision 2 often 3 or more in a whorl. Parts of the flower mostly in fours or fives.

Class 1. ANGIOSPERMS. Pistil consisting of a closed ovary, which contains the ovules: cotyledons only 2.

Subclass 1. POLYPETALÆ. Calyx and corolla both present, the latter of separate petals. (Certain forms without petals or without perianth must be ranked here instead of with the Apetalæ.)

Series 1. THALAMIFLORÆ. Calyx mostly free from ovary: petals often in 2 or more series, sometimes 1

series: stamens ∞ or definite, inserted on the often small or raised or stipitate receptacle: ovary very generally free.

Cohort 1. RANALES. Stamens ∞ or if definite then the perianth in 3– ∞ series: carpels distinct from each other, or immersed in receptacle: endosperm usually abundant, fleshy.

A. Sepals 5 or fewer: petals in about 1 series .....
B. Seeds not arillate: sepals deciduous, usually colored. Herbs or shrubs.1. RANUNCULACEÆ.
BB. Seeds arillate: sepals persistent herbaceous. Shrubs or trees. .....2. DILLENIACEÆ.
AA. Sepals or petals in 2– ∞ series: perianth of 3– ∞ series, sometimes wanting.
B. Plants not aquatic. .....
C. Perianth wanting: stamens numerous: fls. polygamous, dioecious or perfect. .....3. TROCHODENDRACEÆ.
CC. Perianth present. ....
D. Petals and stamens mostly indefinite. .
E. Torus tubular, inclosing carpels: albumen 0: leaves opposite. Shrubs.3a. CALYCANTHACEÆ.
EE. Torus short or long, bearing carpels outside: albumen copious: lvs. alternate. Woody plants. .....4. MAGNOLIACEÆ.
DD. Petals and stamens mostly multiples of 3 or 2: leaves alternate. .....
E. Stamens and carpels usually numerous. Shrubs or trees. .....5. ANONACEÆ.
EE. Stamens usually 6: ovule solitary: carpels 3. Mostly woody or herbaceous vines .....6. MENISPERMACEÆ.
EEE. Stamens 4 or 6: ovules anatropous with an inferior micropyle, or orthotropous: carpels 1 or 3. Herbs or shrubs .....7. BERBERIDACEÆ.
BB. Plants aquatic .....8. NYMPHÆACEÆ.

Cohort 2. PARIETALES. Stamens ∞ or definite: ovary 1-celled, or divided into cells by spurious partitions; placentæ parietal: endosperm absent or fleshy.

A. Embryo minute, near the base of the fleshy albumen .....
B. Pitcher plants. .....9. SARRACENIACEÆ.
BB. Not pitcher plants .....
C. Petals all alike, or nearly so .....10. PAPAVERACEÆ.
CC. Petals in two series, the inner unlike the outer .....11. FUMARIACEÆ.
AA. Embryo curved: albumen 0. .....
B. Stamens 6, tetradynamous, rarely 4 .....12. CRUCIFERÆ.
BB. Stamens indefinite or if few not tetradynamous.13. CAPPARIDACEÆ.
BBB. Stamens usually indefinite, not covered in æstivation by the small petals .....14. RESEDACEÆ.
AAA. Embryo rather large: albumen fleshy .....
B. Radicle remote from hilum: ovule generally orthotropous .....15. CISTACEÆ.
BB. Radicle very near hilum: ovule anatropous, or in No. 16 sometimes amphitropous .....
C. Anthers dehisce introrsely .....16. VIOLACEÆ.
CC. Anthers dehisce by apical cracks or pores. Woody plants .....17. BIXACEÆ.

Cohort 3. POLYGALALES. Stamens as many or twice as many as petals: carpels usually 2: ovary usually perfectly or imperfectly 2-celled: micropyle superior: endosperm very often abundant and fleshy.

A. Fls. regular or slightly oblique. .....
B. Stamens 5, as many as sepals or petals. Woody plants. .....18 PITTOSPORACEÆ.
BB. Stamens twice as many as sepals or petals, which are usually 4–5, rarely 3. Woody plants .....19. TREMANDRACEÆ.
AA. Fls. irregular; herbaceous or woody .....20 POLYGALACEÆ.

Cohort 4. CARYOPHYLLALES. Stamens definite, rarely ∞: ovary 1-celled or imperfectly septate: placenta central, rarely parietal: micropyle inferior: embryo curved, rarely straight: endosperm farinaceous.

A. Petals as many as sepals or rarely 0: sepals free or calyx gamosepalous. .21. CARYOPHYLLACEÆ.
AA. Petals more numerous than sepals, 4–5, rarely ∞: sepals commonly 2, rarely 0 .....22. PORTULACACEÆ.
AAA. Petals as many as sepals, free or grown into a tube: sepals 5, rarely 4. Mostly woody plants. .23. TAMARISCACEÆ.

Cohort 5. GUTTIFERALES Sepals imbricate: stamens usually ∞: ovary septate: placentæ on the inner angles of the cells: endosperm absent or fleshy.

Cohort 6. MALVALES. Sepals valvate: stamens usually ∞ or monadelphous: ovary septate: placentæ on inner angles of cells: endosperm absent or fleshy.

A. Inflorescence commonly tri-chotomous, cymose, or paniculed .....
B. Fls. hermaphrodite .....24. HYPERICACEÆ.
BB. Fls. unisexual or polygamous. Woody .....25. GUTTIFERACEÆ.
AA. Inflorescence commonly racemose, rarely panicled. Woody. .....26. TERNSTRŒMIACEÆ.
A. Anthers 1-celled .....27. MALVACEÆ.
AA. Anthers 2-celled. .....
B. Stamens monadelphous above, opposite the petals, anthers single or in clusters: ovules ascending or horizontal. Mostly woody. .28. STERCULIACEÆ.
BB. Stamens free or connate only at base: ovule often pendulous. Mostly woody. .....29. TILIACEÆ.

Series 2. DISCIFLORÆ. Calyx usually free from ovary: petals in 1 series: stamens usually definite, inserted within or upon or around receptacle, which is usually expanded as a disc: ovary usually free, or imbedded in disc. (See Nos. 49 and 50 for anomalous families.) Families 30–49.

Cohort 1. GERANIALES. Disc usually a ring between stamens, or adnate to staminal tube, or reduced to glands alternating with petals, rarely 0: gynœcium commonly lobed, or entire or subapocarpous: ovules usually 1–2 in each cell, *pendulous: raphe ventral.*

A. The disc absent in family 30, usually inconspicuous or confluent with the staminal tube in 31: in 32 the torus is hardly expanded into a disc but is usually more or less prom-

inent in the center of the ovary .....
B. Albumen fleshy, rarely 0: ovules solitary in cells: sepals not glandular on back; five glands usually adnate to staminal tube. .....30. LINACEÆ.
BB. Albumen 0, or scant. ...
C. Calyx lobes, 5 all or mostly with 2 glands outside. Woody. ...31. MALPIGHIACEÆ.
CC. Calyx of 5 sepals rarely fewer; torus often with 5 glands. .....32. GERANIACEÆ.
AA. The disc present or in Ochnaceæ the torus broadens after anthesis: disc usually fleshy in Zygophyllaceæ (35); rarely absent between stamens of Rutaceæ (34): ring- or cup- shaped in Burseraceæ (28); various in Meliaceæ (37) but usually a ring, tube or sheath, sometimes in the form of a stipe or cushion. .....
B. Ovary usually lobed, sometimes merely angled or grooved. Woody.
C. Anthers elongate. ....33. OCHNACEÆ.
CC. Anthers normal. ....
D. Foliage glandular-dotted: ovules 2 in a cell: lvs. mostly opposite. .....34. RUTACEÆ.
DD. Foliage not glandular-dotted. .....
E. Ovules 2- ∞ -in a cell: lvs. usually opposite. .....35. ZYGOPHYLLACEÆ.
EE. Ovule 1 in a cell: lvs. mostly alternate. Woody. ..36. SIMARUBACEÆ.
BB. Ovary entire. .....
C. Stamens usually monadelphous. Mostly woody. .....37. MELIACEÆ.
CC. Stamens free. Woody.38. BURSERACEÆ.

Cohort 2. OLACALES. Disc cup-shaped or ring-shaped, free, or bearing the stamens and petals on its edge: gynœcium entire: ovules 1–3 in 1-celled ovaries, or 1–2 in each cell, pendulous, raphe dorsal: lvs. simple.

A. Petals or corolla lobes usually valvate. Woody. ...39. OLACACEÆ.
AA. Petals or corolla lobes imbricate or convolute ....
B. Calyx 3–6-parted: fr. drupaceous, slightly fleshy, 3–18-stoned, stones 1-seeded. Woody.40. AQUIFOLIACEÆ.
BB. Calyx 5-parted: fr. small, crustaceous or spongy: 2–4-celled, 1–4-seeded. Woody. .....41. CYRILLACEÆ.

Cohort 3. CELASTRALES. Disc tumid, adnate to calyx or covering its base: stamens inserted round the disc or affixed to its margin: gynœcium usually entire: ovules usually 2 in each cell, *erect, raphe ventral:* lvs. simple or rarely compound.

A. Calyx valvate: petals small, concave: stamens opposite petals. Woody. .....42. RHAMNACEÆ.
AA. Calyx imbricate. .....
B. Stamens alternate with petals: petals imbricate.
C. Petals spreading: calyx small. Woody .....43. CELASTRACEÆ.
CC. Petals erect, often connate: calyx tube hemispherical. .....44. STACKHOUSIACEÆ
BB. Stamens opposite petals: petals valvate, dropping off early .....
C. Ovary 2-celled; cells 2-ovuled: stamens free. Woody. .....45. VITACEÆ.
CC. Ovary 3–6-celled: cells 1-ovuled: stamens and petals connate with disc. Woody...46. LEEACEÆ.

Cohort 4. SAPINDALES. Disc various: stamens variously inserted on disc: gynœcium entire, or more often lobed, or subapocarpous: ovules commonly 1–2 in each cell, *ascending* with ventral raphe, or reversed, or *solitary* and *pendulous from an ascending funicle*, rarely ∝ horizontal: lvs. pinnate, rarely simple or digitate.

A. Petals 0, or 3–5, rarely more: stamens 8, rarely 5–10 or otherwise .....47. SAPINDACEÆ.
AA. Petals 3–7, rarely 0: stamens usually twice as many as petals. Woody..48. ANACARDIACEÆ.

Anomalous families, which should probably be considered genera of doubtful position.

Disc 0; sepals and petals 5: stamens 10: carpels 5–10, distinct: ovule solitary, pendulous, raphe dorsal. Approaches Thalamifloræ. (Series 1.) .....49. CORIARIACEÆ.

Disc investing calyx tube: stamens 10, of which 5 have no anthers: ovary 1-celled, with 3 parietal placentæ: ovules ∞. Approaches Calycifloræ. (Series 3.) .....50. MORINGACEÆ

Series 3. CALYCIFLORÆ. Calyx tube usually surrounding ovary, or adnate to it: petals in 1 series, inserted on calyx tubes: stamens ∞ or definite, inserted on calyx tube, or more commonly on the disc lining the calyx tube: ovary often inclosed by calyx tube, or inferior. Families 51–73.

Cohort 1. ROSALES. Carpels solitary or free or united at base, sometimes at apex: styles distinct, rarely united in a column and easily separated.

A. Ovules affixed to parietal placentæ. .....51. DROSERACEÆ.
AA. Ovules ascending or affixed by a central angle .....
B. Albumen rare .....
C. Fls. irregular or regular: stamens definite or ∞: carpel 1, excentric: ovules ∞ or 1–2, amphitropous or anatropous. .....52. LEGUMINOSÆ.
CC. Fls. generally regular: stamens mostly ∞: carpels ∞ or 1: ovules generally 2, anatropous .....53. ROSACEÆ.
BB. Albumen usually copious or fleshy. .....
C. Stamens usually definite: carpels coalesced or free at apex, sometimes wholly free. ..54. SAXIFRAGACEÆ.
CC. Stamens 1, petals, 1 or 2 series of stamens and carpels usually free and isomerous. .55. CRASSULACEÆ.
AAA. Ovules pendulous from apex of cell, usually free or solitary. .....
B. Fls. with sepals and petals various or 0: stamens few or ∞: carpels 2, free at apex.56. HAMAMELIDACEÆ.
BB. Fls. regular: calyx lobes, petals and stamens isomerous: ovary syncarpous: ovules 1- ∞..57. BRUNIACEÆ.
BBB. Fls. small, usually incomplete, 2–4-merous: ovary 1–4-celled: styles 1–4, distinct. .....58. HALORAGACEÆ.

Cohort 2. MYRTALES. Ovary syncarpous, inferior or inclosed in calyx tube, usually divided into cells: style undivided ovules 2- ∞ in the cells.

A. Ovules pendulous from apex of cells. .....

B. Ovary 2–6-celled. Woody.59. RHIZOPHORACEÆ.
BB. Ovary 1-celled. Woody..60. COMBRETACEÆ.

AA. Ovules affixed to the inner angle of the cells or to basilar placentæ, ascending, horizontal or pendulous. .....
B. Stamens ∞ rarely definite: woody. .....61. MYRTACEÆ.
BB. Stamens definite, rarely ∞ .....
C. Calyx lobes usually imbricate, anthers usually open by pores at apex; connective usually appendaged or thickened. .....62. MELASTOMACEÆ.
CC. Calyx lobes usually valvate: stamens not appendaged: anthers open longitudinally. .
D Petals corrugated. ..63. LYTHRARIACEÆ.
DD. Petals convolute. ....64. ONAGRACEÆ.

Cohort 3. PASSIFLORALES. Ovary syncarpous, inferior, semi-inferior or enclosed in calyx tube, rarely exserted, 1-celled with parietal placentation or divided into cells: styles, entire or distinct from base.

A. Fls. hermaphrodite; (see also AA.) petals unlike sepals; crown 0. .....65. LOASACEÆ.
AA. Fls. unisexual, often hermaphrodite in Passifloraceæ. .....
B. Crown inserted on calyx tube or within petals, single, double or multiple. .....66. PASSIFLORACEÆ.
BB. Crown 0.
CC. The fls. symmetrical; petals various, often confluent with calyx: stamens usually 3. ..67. CUCURBITACEÆ.
CC. The fls. unsymmetrical: perianth segments all petal-like or outer sepal-like: stamens ∞ . .....68. BEGONIACEÆ.

Cohort 4. FICOIDALES. Ovary syncarpous, inferior or superior divided, into cells with sub-basilar placentæ, or rarely 1 celled with parietal placentæ: styles distinct, or divided at apex: embryo curved or excentric.

A. Calyx lobes, petals and stamens usually ∞ : ovary 1-celled. .....69. CACTACEÆ.
AA. Calyx lobes usually 4–5; ovary 2– ∞ -celled. .....70. MESEMBRYANTHACEÆ.

Cohort 5. UMBELLALES. Ovary syncarpous, inferior, crowned by the disc, divided into cells or 1-carpelled: styles distinct or divided at apex: ovules solitary and pendulous in the cells.

A. Fr. separating into 2 dry indehiscent carpels. .....71. UMBELLIFERÆ.
AA. Fr. usually drupaceous, the stones distinct but not separating naturally. .....
B. Raphe ventral. .....72. ARALIACEÆ.
BB. Raphe dorsal.. .....73. CORNACEÆ.

Subclass 2. GAMOPETALÆ. Calyx and corolla both present, the latter usually more or less united. Stipules present only in Rubiaceæ and Loganiaceæ, rarely in Caprifoliaceæ. Exceptions: Corolla polypetalous in some Ericaceæ, Styracaceæ, and Oleaceæ, Galax, Statice and Lysimachia.

Series 1. INFERÆ. Ovary inferior: stamens as many as lobes of corolla, rarely fewer.

Cohort 1. RUBIALES. Stamens affixed to corolla: ovary 2–∞-celled; cells 1–∞ -ovuled.

A. Fls. regular or irregular: stipules usually absent. ..74. CAPRIFOLIACEÆ.
A. Fls. regular; stipules inter- or intra-petiolar, various in form, sometimes like the leaves and disposed in the same whorl with them. .....75. RUBIACEÆ.

Cohort 2. ASTERALES. Stamens affixed to corolla; ovary of the 2-merous pistil, 1-celled, 1-ovuled.

A. Anthers free. .....
B. Seeds without albumen..76. VALERIANACEÆ.
BB. Seeds albuminous. .....77. DIPSACACEÆ.
AA. Anthers united in a ring around the style. .....78. COMPOSITÆ.

Cohort 3. CAMPANALES. Stamens usually free from corolla: ovary 2–6-celled; cells usually ∞ –ovuled.
A. Anthers united in a ring...79. LOBELIACEÆ.
AA. Anthers not united .....80. CAMPANULACEÆ.

Series 2. HETEROMERÆ. Ovary usually superior: stamens free from corolla, or opposite the lobes, or twice as many, or ∞ , or if borne on the corolla then alternate with its lobes and equal in number: carpels more than 2.

Cohort 1. ERICALES. Stamens twice as many as corolla lobes or opposite them: ovary 2–∞ -celled, fr. fleshy or berry-like.

A. Anthers 2-celled, produced above into tubes which dehisce by a pore or crack: fr. usually capsular. .....81. ERICACEÆ.
AA. Anthers dehisce longitudinally by a single 2-valved crack fr. capsular or drupaceous. .....82. EPACRIDACEÆ.
AAA. Anthers 2-celled, dehiscing by longitudinal or transverse cracks: fr. capsular. .....83. DIAPENSIACEÆ.

Cohort 2. PRIMULALES. Stamens as many as corolla lobes and opposite them: ovary of the ∞ –merous pistil, 1-celled.

A. Ovary 1-ovuled. .....84. PLUMBAGINACEÆ.
AA. Ovary 2– ∞ –ovuled .....
B. Fr. capsular: herbs. ....85. PRIMULACEÆ.
BB. Fr. indehiscent; trees or shrubs. .....86. MYRSINACEÆ.

Cohort 3. EBENALES. Stamens as many as lobes of corolla and opposite them or twice as many, or indefinite: seeds usually few and rather large.

A. Fls. usually hermaphrodite: stamens affixed to corolla. .....
B. Radicles inferior: carpels 1-ovuled. Woody. ...87. SAPOTACEÆ.
BB. Radicles inconstant looking towards hilum: carpels 1-few-ovuled. Woody. .....88. STYRACEÆ.
AA. Fls. dioecious, rarely hermaphrodite: stamens often free from corolla: cells of ovary with as many ovules as carpels, or divided into 2-loculeb which are 1-ovuled: radicles superior. Woody. .....89. EBENACEÆ.

Series 3. BICARPELLATÆ. Ovary usually superior: stamens alternate with corolla lobes, as many as them or fewer: carpels 2 or rarely 1 or 3.

Cohort 1. GENTIANALES. Corolla regular: stamens alternate with corolla lobes and equal in number, or if fewer usually alternate with carpels: lvs. usually opposite.

A. Stamens 2, alternate with carpels, rarely 4: stigma terminal: ovary 2-celled: ovules affixed to septum. Rarely herbaceous. .....90. OLEACEÆ.
AA. Stamens and corolla lobes usually 5, sometimes 4, rarely ∞ .....
B. Ovary usually compound,

with 2 or 3 (rarely 4 or 5) cells or placentæ. . . .
c. Capsule mostly 2-celled; lvs. connected by transverse lines or stipules. . . . . 91. LOGANIACEÆ.
cc. Capsule mostly 1-celled with parietal placentæ; lvs. not connected as above. . . . 92. GENTIANACEÆ.
BB. Ovaries 2, usually becoming follicles. . . . . .
c. Anthers permanently attached to a large stigmatic body; pollen mostly in waxy masses. . . . . 93. ASCLEPIADACEÆ.
cc. Anthers distinct or merely connivent; pollen ordinary. . . . 94. APOCYNACEÆ.

Cohort 2. POLEMONIALES. Corolla regular; stamens as many as lobes of corolla; lvs. usually alternate.

A. Pistil 3-merous; corolla lobes convolute. . . . . 95. POLEMONIACEÆ.
AA. Pistil not 3-merous. . . . . .
B. Corolla lobes imbricate, or rarely convolute. . . .
c. Style usually deeply 2-cut or even split into 2 distinct styles; capsule 1-celled 2-valved with 2 parietal or introflexed placentæ or sometimes 2-celled. . . 96. HYDROPHYLLACEÆ
cc. Style usually entire or shortly 2-cut, rarely otherwise; ovary 4-ovuled usually 4-lobed and maturing as 4 separate or separable nutlets; or not lobed, 2–4-celled and separating when ripe into 2 or 4 nutlets. . . 97. BORRAGINACEÆ.
BB. Corolla limb more or less plicate, or rarely imbricate. . . . . .
c. Ovary 2-(sometimes 3- or spuriously 4-) celled becoming a globular, 4–6-seeded capsule; embryo variously plaited or strongly incurred in scant or no albumen. 98. CONVOLVULACEÆ.
cc. Ovary 2-celled (rarely 3–5-celled), with numerous ovules or axillary placentæ, becoming a pod or berry; embryo circular, spiral or straight in fleshy albumen. . . . . 99. SOLANACEÆ.

Cohort 3. PERSONALES. Corolla usually irregular or oblique; posterior stamen smaller than the others, abortive or even absent; carpels ∝-ovuled or of 2 ovules one above the other.

A. Seeds usually albuminous; ovary perfectly 2-celled, placentæ central. . . . . 100. SCROPHULARIACEÆ.
AA. Seeds not albuminous. . . .
B. Plants insectivorous mostly aquatic or marsh-like; ovary 1-celled, globose, with a central, basilar placenta. . . . . 101. LENTIBULARIACEÆ.
BB. Plants not insectivorous, land-loving. . . . . .
c. Mostly large flowered trees or tall climbing shrubs; ovary sometimes 1-celled with parietal placentæ, oftener 2-celled with placentæ adnate to septum; embryo horizontal; radicle centrifugal. . . . . 102. BIGNONIACEÆ.
cc. Mostly herbs or subshrubs. . . . . .
D. Ovary 1-celled with parietal placentæ or imperfectly 2-celled by the intrusion of placentæ. 103. GESNERACEÆ.
DD. Ovary 1-celled with parietal placentæ, or 2-celled, rarely 4-celled; calyx rarely deeply parted; endocarp of fr. hardened about seeds. . . . . 104. PEDALIACEÆ.
DDD. Ovary 2-celled; calyx often parted to base; capsule loculicidally 2-valved, valves opening elastically from apex. . . 105. ACANTHACEÆ.

Cohort 4. LAMIALES. Corolla usually irregular or oblique; posterior stamen smaller than the others, usually abortive or quite deficient; carpels with 2 ovules placed side by side, or else 1-ovuled.

A. Radicle superior; lvs. usually alternate. . . . . .
B. Fls. axillary; trees or shrubs. . . . . 106. MYOPORACEÆ.
BB. Fls. in spikes or terminal heads; heath-like subshrubs or perennial herbs. . . . . 107. SELAGINACEÆ.
AA. Radicle inferior; lvs. usually opposite. . . . . .
B. Ovary entire; fr. usually 2- or 4 stoned. . . . . 108. VERBENACEÆ.
BB. Ovary 4-lobed or 4-grooved at apex; fr. usually composed of 4 nutlets. . . 109. LABIATÆ.

ANOMALOUS FAMILY. Remarkable for its scarious corolla: stamens alternate with corolla lobes and as many as them, or fewer: ovary entire, 2-lobed. . . . . 110. PLANTAGINACEÆ.

Subclass 3. APETALÆ or MONOCHLAMYDEÆ. Corolla wanting (except in some Euphorbiaceæ and one genus of Phytolaccaceæ) and sometimes also the calyx. Perianth simple, the lobes or segments in 1 or 2 series, similar among themselves and usually calyx-like, sometimes minute or wanting.

Series 1. CURVEMBRYEÆ. Albumen usually farinaceous, embryo curved, excentric, lateral or peripheral, rarely straightish, subcentral and narrow; ovule solitary in the ovary or in each carpel or in the Amarantaceæ more than a few ovules erect in the center of the cell: fls. hermaphrodite or in a few genera unisexual or polygamous: petals very rarely present: stamens as many as the perianth segments or fewer, rarely more.

A. Fr. the hardened or membranous closed base of the corolla-like perianth inclosing a utricle. . . . . 111. NYCTAGINACEÆ.
AA. Fr. a utricle; perianth mostly persistent, small, 4–5-lobed or parted or none. . . . . .
B. Perianth herbaceous, or scarious at the margin, persistent; stamens perigynous; style branches or styles 2–3; stipules scarious. . . . . 112. ILLECEBRACEÆ.
BB. Perianth dry, not herbaceous, raised on a stipe with a bract and 2 bractlets; stamens hypogynous or perigynous; filaments connate at base; style simple or 2–3-fid.; stipules 0. . . . . 113. AMARANTACEÆ.
BBB. Perianth lobes or segments membranous or herbaceous; stamens

hypogynous or perigynous; stamens nearly always free; style simple or 2–3-lobed or styles 2–5; stipules 0. .....114. CHENOPODIACEÆ.

AAA. Fr. composed of several carpels which are crowded or connate in a ring; styles simple; stamens hypogynous; perianth herbaceous or coriaceous, rarely membranous, persisting entire in the fruit or deciduous. .....115. PHYTOLACCACEÆ.

AAAA. Fr. an akene triangular or lens-shaped; perianth herbaceous, membranous or colored, rarely adherent to base of ovary; style branches or styles 2–3. ....116. POLYGONACEÆ.

Series 2. MULTIOVULATÆ TERRESTRES. Terrestrial herbs or shrubs, often climbers; ovary syncarpous; ovules in each cell or placenta numerous.

A. Fls. dioecious; ovary superior; lvs. bear tendrils; pitcher plants. .....117. NEPENTHACEÆ.

AA. Fls. hermaphrodite; ovary inferior; lvs. do not bear tendrils or pitchers. .....118. ARISTOLOCHIACEÆ.

Series 3. MICREMBRYEÆ. Ovary syncarpous, monocarpous or apocarpous; ovules in each carpel solitary, rarely 2 or few; albumen copious, fleshy or mealy; embryo minute.

A. Ovary syncarpous, 1- or few-ovuled; styles or stigmas 2–4, rarely coalesced into a cushion-shaped stigma. .119. PIPERACEÆ.

AA. Ovary carpels solitary or several, distinct and 1-ovuled; stigmas as many as carpels, simple and usually oblique. .....

B. Perianth 0, or adnate to ovary; stamens 1–3; ovule pendulous, orthopterous. .....120. CHLORANTHACEÆ

BB. Perianth calyx-like. .....

C. Carpel solitary; fls. unisexual; perianth 3-lobed, rarely 2 or 4-lobed; stamens monadelphous in bottom of perianth; ovule erect, anatropous. Woody..121. MYRISTICACEÆ.

CC. Carpels several; fls. hermaphrodite or unisexual; perianth calyx-like, 2-∞-toothed or lobed, bearing the stamen-tube on its inner face; ovule erect or pendulous, usually anatropous. Woody....122. MONIMIACEÆ.

Series 4. DAPHNEÆ. Ovary monocarpous, rarely syncarpous with 2–4 cells; ovules in the ovary or in each cell solitary or twin and side by side, rarely a few pairs superposed.

A. Radicle superior; ovules pendulous. .....

B. Anthers dehiscing by uplifted valves, rarely laterally dehiscent; perianth lobes 6 or 4, in 2 series; ovary 1-celled; ovule solitary. Woody.123. LAURACEÆ.

BB. Anthers normal; perianth lobes 4–5, imbricate; ovary 1–2-celled; ovule solitary. Woody..124 THYMELEACEÆ.

AA. Radicle inferior. .....

B. Perianth lobes 4, valvate; stamens as many and opposite; ovule erect or pendulous ....125. PROTEACEÆ.

BB. Perianth constricted above ovary, persistent at base, deciduous above, lobes 2 or 4; stamens twice as many as the lobes, alternate and opposite; ovule erect. Woody. .....126. ELEAGNACEÆ.

Series 5. ACHLAMYDOSPOREÆ. Ovary 1-celled, cells 1–3-ovuled, cell and ovules often inconspicuous before anthesis; albumen of seed without a coat, either free in the pericarp or attached to its walls; mostly parasitic. 127. LORANTHACEÆ.

Series 6 UNISEXUALES. Fls. unisexual; ovary syncarpous or monocarpous; ovules solitary or in pairs side by side in the ovary or in each cell; trees or shrubs, rarely herbs.

A. Ovary 1-celled.

B. Ovule solitary. .....,

C. Radicle inferior; fls. of both sexes in globose heads; stamens in male heads and ovaries in female heads crowded very densely on a central receptacle. Woody..128. PLATANACEÆ.

CC. Radicle superior. ....

D. The male perianth free from the bract; stamens as many as its lobes and opposite or by abortion fewer, rarely numerous..129. URTICACEÆ.

DD. The perianth wanting, sometimes grown to the bract in Juglandaceæ; stamens ∞, often 2 in Myricaceæ. ..

E. Lvs. pinnate; male fls. in catkins. Woody. .....130. JUGLANDACEÆ.

EE. Lvs. simple; male inflorescence spicate, subamentaceous. Woody. ..131. MYRICACEÆ.

BB. Ovules 2; male inflorescence spicate; stamen 1. Woody. .....132. CASUARINACEÆ.

AA. Ovary 2–3-celled, rarely with more cells. .....

B. Albumen usually copious; fr. usually separating into 2-valved berries, sometimes fleshy and indehiscent, or various; inflorescence various. .....133. EUPHORBIACEÆ.

BB. Albumen 0; fr. a nut; male inflorescence usually in catkins. Woody. ..... 134. CUPULIFERÆ.

Series 7. ANOMALOUS FAMILIES. Somewhat related to the Unisexuales.

A. Fls. in catkins; capsule 2–4-valved. Woody. ....135. SALICACEÆ.

AA. Fls. axillary or rarely in a terminal head; drupe 2–∞-stoned, stones 1 seeded. Low shrubs. ....136. EMPETRACEÆ.

Class 2. GYMNOSPERMS. Ovules naked upon a scale, bract or disc; cotyledons 2 or more; fls. unisexual.

A. Lvs. or scales opposite, undivided; fls. in catkin-like or interrupted spikes; male perianth membranous, 2-lobed; female bladdery. ..... 137. GNETACEÆ.

AA. Lvs. undivided, reduced to

scales or needles, rarely flattened out: male fls. in catkins; female in a catkin or cone, rarely solitary. ..... 138. CONIFERÆ.

AAA. Lvs. ample, pinnatisect, crowded at apex of woody caudex: fls. of both sexes in cones. ... 139. CYCADACEÆ.

Subdivision 2. MONOCOTYLEDONS or ENDOGENS. Stems without central pith or annular layers, but having the woody fibres distributed irregularly through them (a transverse section showing the fibres as dots scattered through the cellular tissue). Embryo with a single cotyledon and the early lvs. always alternate; parts of the flower usually in 3's, never in 5's, and the lvs. mostly parallel-veined.

Series 1. MICROSPERMÆ. Perianth corolla-like, at least inside: ovary inferior, 1-celled with 3 parietal placentæ, or rarely 3-celled with axile placentæ: seeds very small and numerous, not albuminous.

A. Fls. regular, usually unisexual; stamens usually 3, 6 or 9: aquatic herbs. 140. HYDROCHARIDACEÆ.

AA. Fls. usually very irregular: androecium and gynecium connate in a column: anther 1, rarely 2: terrestrial or epiphytic herbs, rarely climbers. .. 141. ORCHIDACEÆ.

Series 2. EPIGYNÆ. Perianth corolla-like, at least within: ovary generally inferior: albumen copious.

A. Fls. normally unisexual and regular: stamens 6, or those opposite the inner perianth-lobes imperfect or deficient.... 142. DIOSCOREACEÆ.

AA. Fls. normally hermaphrodite, sometimes polygamous or otherwise. .....

B. Embryo small, included in albumen. .....

C. Ovary 1-celled; albumen solid; embryo minute; stamens 6, hooded: fls. regular.. 143. TACCACEÆ.

CC. Ovary usually 3-celled.

D. Stamens 3 opposite outer lobes; albumen horny: fls. regular or obliquely irregular. ... 144. IRIDACEÆ.

DD. Stamens 6, rarely 3 opposite inner lobes or ∝: albumen fleshy: fls. regular or slightly irregular. ..... 145. AMARYLLIDACEÆ.

BB. Embryo in a central canal of albumen, straight, incurved or horse-shoe-shaped: perfect stamens 1 or 5, the other 5 or 1 variously changed into antherless staminodes. .....146. SCITAMINACEÆ.

BBB. Embryo in a small marginal cave or pit of albumen, rarely long-intruded, never wholly included. .....

C. Albumen mealy: perianth calyx-like outside: stamens 6. ....147. BROMELIACEÆ.

CC. Albumen fleshy: perianth corolla-like or woolly outside: stamens sometimes 6 and equal, sometimes 1–3 slightly dissimilar, or 3 opposite the inner lobes. .....148. HÆMADORACEÆ.

Series 3. CORONARIEÆ. Perianth corolla-like, at least inside; ovary free, rarely shortly adnate at the base; albumen copious.

A. Embryo minute or more or less elongated, included in fleshy or horny albumen. ..... 149. LILIACEÆ.

AA. Embryo straight, in a central canal of mealy albumen ..... 150. PONTEDERIACEÆ.

AAA. Embryo marginal under The "embryostega" in mealy albumen, or little intruded. (An "embryostega," literally embryo-cover, is a callosity in the seed coat of some seeds near the hilum, and is detached by the protrusion of the radicle on germination) .....151. COMMELINACEÆ.

Series 4 CALYCINÆ. Perianth calyx-like, small, somewhat rigid or herbaceous: ovary free: albumen copious.

A. Fr. a 3-valved capsule: embryo included in more or less fleshy albumen. ... 152. JUNCACEÆ.

AA. Fr. berry or drupe-like, 1-seeded, rarely 2–3-seeded: embryo immersed in a small pit near the periphery of the albumen. Mostly woody.153. PALMACEÆ.

Series 5. NUDIFLORÆ. Perianth 0 or reduced to scales or bristles; ovary superior: carpels solitary, or if more syncarpous; 1– ∞ –ovuled; seeds usually albuminous.

A. Plants aquatic: fls. solitary or in pairs from marginal fissures. .....154. LEMNACEÆ.

AA. Plants terrestrial: fls. in spadices. .....

B. Fls. dioecious: perianth 0: carpels usually confluent in clusters: spadices clustered or panicled. .....155. PANDANACEÆ.

BB. Fls. dioecious or monoecious in different spadices: perianth 0: or the short segments distinct or connate: spadices solitary. ..... 156. CYCLANTHACEÆ.

BBB. Fls. monoecious in different spadices, rarely dioecious; perianth reduced to membranous scales or thread-like chaff. Aquatic and marsh plants. ..... 157. TYPHACEÆ.

BBBB. Fls. hermaphrodite or monoecious in same spadix, rarely dioecious; perianth 0, or of 4 membranous, imbricate scales; spadices solitary. ..... 158. ARACEÆ.

Series 6. APOCARPÆ. Perianth in 1–2 series or 0: ovary superior; carpels solitary, or if more, distinct: seeds not albuminous.

A. Embryo complicate or horse-shoe-shaped: perianth segments 6, in 2 series. ..... 159. ALISMACEÆ.

AA. Embyro macropodous: perianth segments 2, 3, 4, 6 or 0. .....160. NAIADACEÆ.

Series 7. GLUMACEÆ. Fls. disposed in heads or spikelets solitary and sessile under bracts (or glumes) which are usually imbricate; perianth segments small, scale-like, ghumaceous or 0: ovary 1-ovuled or divided into 1-ovuled cells; seeds albuminous.

A. Fr. an indehiscent nut: seed free from pericarp; palets and lodicules 0... 161. CYPERACEÆ.

AA. Fr. an indehiscent caryopsis: seed usually adherent to pericarp: palets and lodicules present... 162. GRAMINEÆ.

PART II.—SYNOPSIS OF GENERA.

1. RANUNCULACEÆ.

A. Sepals usually valvate.... 1. CLEMATIS.
AA. Sepals imbricate. .....
B. Carpels one-ovuled: fruit an indehiscent akene. .....
C. Ovule pendulous: raphe dorsal. .....
D. Petals conspicuous...2. ADONIS.
DD. Petals none or very small. .....
E. Fls. not subtended by involucres. ...3. THALICTRUM.
EE. Fls. subtended by involucres remote from the calyx or close under it. ...
F. Involucre remote from calyx. ....4. ANEMONE.
FF. Involucre of 3 simple, sessile lvs. closer under the fl. .....5. HEPATICA.
FFF. Involucre of 3 compound sessile lvs. .....6. SYNDESMON.
CC. Ovules ascending. ....
D. Petals wanting. ....7. TRAUTVETTERIA.
DD. Petals 3-many. .....8. RANUNCULUS.
BB. Carpels several- or many-ovuled: fr. usually dehiscent at maturity, rarely berry-like. .....
C. Petals large and showy. 9. PÆONIA.
CC. Petals medium small, deformed, or 0. .....
D. Fls. irregular. .....
E. Posterior sepal forms a spur. ...10. DELPHINIUM.
EE. Posterior sepal forms a hood. ....11. ACONITUM.
DD. Fls. regular. .....
E. Inflorescence racemose. .....
F. Stamens 5 or 10; shrubs. .....12. XANTHORRHIZA.
FF. Stamens numerous; herbs. ...
G. Fruit a berry. ...13. ACTÆA.
GG. Fruit consisting of follicles, dehiscent. ....14. CIMICIFUGA.
EE. Inflorescence paniculate, or fls. solitary.
F. Lvs. palmately veined or cut: not ternate. ...
G. Petals wanting..
H. Ovules many in two series along the ventral suture. ....15. CALTHA.
HH. Ovules only 2.16. HYDRASTIS.
GG. Petals small or narrow: mostly nectar-bearing.
H. Sepals commonly deciduous: petals not 2-lipped, nor scale bearing.17. TROLLIUS.
HH. Sepals persistent: broad petals 2-lipped or bearing a scale. .....18. HELLEBORUS.
HHH. Sepals deciduous, narrow: petals bearing a scale.19. ERANTHIS.
FF. Lvs. ternately or subpinnately decompound. ....
G. Sepals 5-6. ...
H Petals spurred. .....20. AQUILEGIA.
HH. Petals not spurred: often small or 0. .....
I. The carpels connate at the base or higher.21. NIGELLA.
II. The carpels free. ....
J. Carpels stalked. .22. COPTIS.
JJ. Carpels not stalked. .23. ISOPYRUM.
GG. Sepals and petals numerous.24. ANEMONOPSIS.

2. DILLENIACEÆ.

Lvs. large, pinnately veined or cut. Arborescent. .....1. DILLENIA.

3. CALYCANTHACEÆ.

Woody plants. ..... 1. CALYCANTHUS.

3A. TROCHODENDRACEÆ.

A. Fruit capsular: dehiscent: with numerous seeds: fls. dioecious, lvs. opposite. ..... 1. CERCIDIPHYLLUM.

AA. Fruit a winged nutlet with 1 or few seeds: fls. polygamous: lvs. alternate. ..2. EUPTELEA.

4. MAGNOLIACEÆ.

A. Fls. hermaphrodite. .....
B. Stipules 0. ..... 1. ILLICIUM.
BB. Stipules present, inclosing young lvs. in the bud. .....
C. Anthers face out. ..... 2. LIRIODENDRON.
CC. Anthers face in. .....
D. Structure bearing the carpels stalked. ...3. MICHELIA.
DD. Structure bearing the carpels sessile .....
E. Dehiscence circumscissile. .....4. TALAUMA.
EE. Dehiscence 2-valved. .....5. MAGNOLIA.
AA. Fls. unisexual. .....
B. Carpels after anthesis spicate. .....6. SCHIZANDRA.
BB. Carpels after anthesis globose-capitate. .....7. KADSURA.

5. ANONACEÆ.

A. Ovules solitary. .....
B. Petals connate into a globose 3-6-lobed tube, the inner lobes very small or wanting .....1. ROLLINIA.
BB. Petals 6, subequal, overlapping, spreading during anthesis. .....2. DUGUETIA.
BBB. Petals usually 6, valvate, connivent or somewhat spreading, the inner ones subsimilar unless smaller, or rarely wanting. .....3. ANONA.
AA. Ovules 2. .....4. ARTABOTRYS.
AAA. Ovules numerous. .....
B. Seeds immersed in the general pulp. .....5. CANANGA. (See article *Philippines*).
BB. Seeds arillate. .....6. ASIMINA.

6. MENISPERMACEÆ.

A. Filaments coalesced into a column which is subpeltate at apex. .....
B. Sepals 6; petals 0. .....1. ANAMIRTA. (See article *Cocculus*.)
BB. Sepals 4: petals grown together making a small cup. .....2. CISSAMPELOS.

AA. Filaments free either at base or apex. .....
B. Stamens 12–24. ..... 3. MENISPERMUM.
BB. Stamens 6. .....
c. Petals 6; shorter than sepals: stamens high-monadelphous. .....4. COCCULUS.
cc. Petals 0, unless the 3 inner and larger sepals are regarded as petals: outer stamens free. .....5. ABUTA.

7. BERBERIDACEÆ.

A. Fls. unisexual or polygamous: carpels 3. .....
B. Stamens monadelphous. .....
c. Sepals 6: petals 6, much smaller. .....1. LARDIZABALA.
cc. Sepals 6: petals 0. ...2. STAUNTONIA.
BB. Stamens free. .....
c. Sepals 6: petals 6, minute. .....3. HOLBŒLLIA.
cc. Sepals 3: petals 0 ...4. AKEBIA.
ccc. Sepals and petals 9–15. .....5. BERBERIDOPSIS.
AA. Fls. hermaphrodite: carpel 1. .....
B. Venation or lobing pinnate; lvs. penninerved, pennatisect, pinnately 2–3-ternate or decompound. .....
c. Ovules few, erect from the base. .....
D. Plants are shrubs.....
E. Lvs. simple or pinnate. .....6. BERBERIS.
EE. Lvs. 2–3-pinnate....7. NANDINA.
DD. Plants are herbs.....
E. Petals 6, reduced to small nectaries....8. LEONTICE.
EE. Petals 6, scarcely smaller than sepals and flat.....9. BONGARDIA.
cc. Ovules placed ventrally in 2 series. .....
D. Sepals 12–15; petals 0, reduced to nectaries. .....10. VANCOUVERIA.
DD. Sepals 8; petals 4, reduced to nectaries. .....11. EPIMEDIUM.
DDD. Sepals 7–8; petals 4, a little smaller, flat. .....12. ACERANTHUS.
BB. Venation or lobing palmate: lvs. palminerved, palmilobed, or 2-parted. .....
c. Sepals 6; petals 6; ovules in 2 series....13. DIPHYLLEIA.
cc. Sepals 6; petals 6–9; ovules in many series.14. PODOPHYLLUM.
ccc. Sepals 4; petals 8. ....15. JEFFERSONIA.
cccc. Sepals and petals 0....16. ACHLYS.

8. NYMPHÆACEÆ.

A. Fls. smallish; sepals and petals 3. .....
B. Stamens 6; submerged lvs. dissected. .....1. CABOMBA.
BB. Stamens 12–18; lvs. all peltate. .....2. BRASENIA.
AA. Fls. large and showy; sepals 4–6; petals and stamens indefinite. .....
B. Carpels scattered without order near the top of a torus. .....3. NELUMBO.
BB. Carpels grown together in rings. .....
c. Plants prickly. .....
D. The inner stamens sterile. ..... 4. VICTORIA.
DD. The stamens all fertile. .....5. EURYALE.
cc. Plants not prickly.....
D. Carpels placed on the torus, the sepals, petals and stamens inferior. .....6. NUPHAR.
DD. Carpels more or less immersed in the torus, the sepals and outer petals somewhat inferior: the inner petals and stamens gradually more adnate to the torus. .....7. NYMPHÆA.

9. SARRACENIACEÆ.

A. Style umbrella-shaped. .....1. SARRACENIA
AA. Style 5-cut at apex.....2. DARLINGTONIA.

10. PAPAVERACEÆ.

A. Stigmas distinct: lvs. mainly opposite or whorled: sepals usually 3: petals usually 6, in 2 series: placentæ never separate from the valves. .....
B. Lvs. lobed. .....1. ROMNEYA.
BB. Lvs. entire. .....
c. Filaments dilated: stigmas indefinite, linear: fr. not capsular. ....2. PLATYSTEMON.
cc. Filaments slightly dilated: stigmas 3, broader: fr. capsular.3. PLATYSTIGMA.
AA. Stigmas confluent: lvs. alternate: ternately decompound: sepals 2: petals 4: placentæ remain attached to the margin of the valves. .....
B. Sepals coherent and covering fl. like a candle extinguisher. .....4. ESCHSCHOLZIA.
BB. Sepals separate. .....
c. Lobes of stigma 2, erect. .....5. DENDROMECON.
cc. Lobes of stigma 4, spreading. .....6. HUNNEMANNIA.
AAA. Stigmas confluent: lvs. alternate or mainly so: fls. rarely 3-merous: capsule dehiscing by pores or valves, the placentæ remaining as a frame alternate with and free from the valves. .....
B. Capsule dehiscent by pores near the top ....7. PAPAVER.
BB. Capsule shortly dehiscing by valves. .....
c. Stigmatic lobes radiating on the depressed summit of a very short style. .....8. ARGEMONE.
cc. Stigmatic lobes radiating on the club-shaped top of a distinct style. .....9. MECONOPSIS.
BBB. Capsule dehiscing by valves to the base or nearly so. .....
c. The capsule long and linear. .....
D. Seeds pitted. .....10. GLAUCIUM.
DD. Seeds crested. .....11. CHELIDONIUM.
cc. The capsule ovoid, oblong or cylindrical ..
D. Petals 4.....12. STYLOPHORUM.
E. Style distinct, but short. .....
EE. Style long. .....13. EOMECON.
DD. Petals 8–12. .....14. SANGUINARIA.
DDD. Petals 0. .....15. BOCCONIA.

11. FUMARIACEÆ.

A. Corolla 2-spurred or bigibbous, the 2 outer and larger (lateral) petals similar. .....
B. Seeds crestless: petals permanently united into a subcordate persistent

corolla which incloses the ripe capsule. .....1. ADLUMIA.
BB. Seeds mostly crested; petals less or slightly united into a 2-spurred or bigibbous corolla. ...2. DICENTRA.
AA. Corolla with only one of the outer petals spurred or gibbous by torsion becoming posterior: a nectariferous spur from the base of the filaments projects into the petal-spur.
B. Style mostly persistent...3. CORYDALIS.
BB. Style deciduous; fl. smaller. .....4. FUMARIA.

12. CRUCIFERÆ.

A. The silique transversely 2-jointed, the smaller joint indehiscent, pedicel-shaped, the larger joint globose, 1-loculed, 1-seeded. .....1. CRAMBE.
AA. The silique indehiscent....
B. Siliques in pairs.....2. SENEBIERA.
BB. Siliques not in pairs....
C. Texture horny or bony.3. ISATIS.
CC. Texture leathery. .....
D. Shape straight. .....4 RAPHANUS.
DD. Shape curved. .....5. SOBOLEWSKIA.
AAA. The silique dehiscent for its whole length (except that some Brassicas are not dehiscent at the apex). .....
B. Valves continuous inside, markedly concave, compressed contrary to the septum, which is often very narrow: silique short. .....
C. Cotyledons accumbent..6. IBERIS.
CC. Cotyledons incumbent.
D. The valves usually wingless. .....
E. Fls. rosy or violet..7. IONOPSIDIUM.
EE. Fls. white.....8. LEPIDIUM.
DD. The valves winged...9. ÆTHIONEMA.
BB. Valves continuous inside (septiferous in Anastatica), flat or concave, not compressed contrary to the septum (Smelowskia and certain Vesicarias are laterally compressed): septum as wide as the valves: silique long or short. .....
C. Cotyledons longitudinally conduplicate ...
D. Seeds in 1 series...10. BRASSICA.
DD. Seeds in 2 series....11. ERUCA.
CC. Cotyledons accumbent (sometimes incumbent or convolute in Cheiranthus). .....
D. Seeds in 1 series (except certain species of Nasturtium and Arabis; siliques long and narrow (except in Anastatica and sometimes Nasturtium and Parrya). .....
E. Valves appended..12. ANASTATICA.
EE. Valves not appendaged. .....
F. Stigmatic lobes erect, connate or decurrent along the style..
G. Plants are herbs or branched subshrubs. Woolly. .....13. MATTHIOLA.
GG. Plants are tufted. scape-bearing herbs.14. PARRYA.
FF. Stigma undivided or shortly-lobed.
G. Valves elastic seeds in 1 or 2 series: silique long and linear.15. ARABIS.
GG. Valves not elastic.
H. Sepals unequal, the lateral one saccate at the base. .....16. CHEIRANTHUS.
HH. Sepals equal, ...
I. Seeds in 2 series..17. NASTURTIUM.
II. Seeds in 1 series.
J. Fls. yellow. ...18. BARBAREA.
JJ. Fls. white or purple. .....
K. Plants alpine..19. CARDAMINE.
KK. Plants not alpine. .....20. DENTARIA.
DD. Seeds in 2 series and siliques short and broad, (except in some species of Aubrietia, Draba and Cochlearia)...
E. Siliques 2-locular many-seeded: seeds much compressed; winged or margined. .....
F. Lvs. entire or dentate: siliques long stalked, very broad. ....21. LUNARIA.
FF. Lvs. pinnatifid: siliques sessile..22. SELENIA.
EE. Siliques 1–2-loculed, 2–many-seeded: seeds rarely winged: valves often turgid. .....
F. Sepals often unequal, the lateral saccate at the base. .....
G. Fls. purple: siliques oblong: lateral sepals saccate. ....23. AUBRIETIA.
GG. Fls. generally yellow: siliques mostly oblong: sepals equal or unequal. .....24. VESICARIA.
FF. Sepals equal. ....
G. Stamens often appendaged. .25. ALYSSUM.
GG. Stamens not appendaged.
H. Plants tomentose. .....26. DRABA.
HH. Plants glabrous. .....27. COCHLEARIA.

(See also *Kernera*.)

CCC. Cotyledons incumbent, straight, convolute or transversely plicate.
D. The cotyledons transversely biplicate...28. HELIOPHILA.
DD. The cotyledons not transversely biplicate. .....
E. Petals pinnatified. .29. SCHIZOPETALON.
EE. Petals not pinnatified. .....
F. Stigmas erect, free or connate into a cone; sepals long and straight. ....
G. The stigmas bilamellate, lamellæ erect. .....30. HESPERIS.
GG. The stigmas bilamellate, lamellæ connivent or connate into a cone. .....31. MALCOMIA.
FF. Stigma simple, capitate, emargi-

nate or shortly 2-lobed; cotyledons straight. ..
GG. Silique stipitate. ..32. STANLEYA.
GG. Silique sessile. ....
II. Sepals equal. ....33. SMELOWSKIA.
III. Sepals unequal....34. ERYSIMUM.

13. CAPPARIDACEÆ.

A. Fruit capsular, 1-loculed: herbs. .....
B. Torus short, often produced into a posterior appendage. .....1. CLEOME.
BB. Torus long, produced into a gynophore which is elongated at the middle and bears the pistil to which the filaments are united. .....2. GYNANDROPSIS.
AA. Fruit berry-like or drupe-like. .....
B. Lvs. simple. .....3. CAPPARIS.
BB. Lvs. with 3 lfts. .....4. CRATÆVA.

14. RESEDACEÆ.

Petals 4–7, 2–many-cut: capsule 3-lobed at apex.....1. RESEDA.

15. CISTACEÆ.

A. Placentæ and valves 5, rarely 3: embryo circinate or spiral: fls. solitary or cymose, rarely racemose..14. CISTUS.
AA. Placentæ and valves 3: embryo biplicate, runcinate or circumflex: fls. commonly racemose. ....2. HELIANTHEMUM.

16. VIOLACEÆ.

A. Sepals subequal, produced at base: lower petal spurred or saccate. ....1. VIOLA.
AA. Sepals not produced at base.
B. Lower petal with a very large spur: seeds complanate. .....2. CORYNOSTYLIS.
BB. Lower petal merely gibbous: seeds obovoid-subglobose. .....3. SOLEA.

17. BIXACEÆ.

A. Fls. hermaphrodite: petals ample, convolute: anthers oblong. .....1. BIXA.
AA. Fls. polygamous: petals and sepals strongly imbricate, the former larger and very numerous: anthers linear. .....2. ONCOBA.
AAA. Fls. hermaphrodite, rarely polygamous or dioecious: petals 0. .....
B. Stamens numerous. .....3. AZARA.
BB. Stamens 5-10 .....
C. The sepals imbricate or minute. .....
D. Fr. a woody capsule.4. CARRIERIA.
DD. Fr. a berry. .....
E. Sepals 4–5: ovary 2–8-loculed: styles 2–8. .....5. FLACOURTIA.
EE. Sepals 4–6: placentæ 2–6: style entire, or 2–6-lobed or almost absent..6. XYLOSMA.
EEE. Sepals 5: placentæ and styles 5, (3–6) spreading. ...7. IDESIA.
CC. The sepals hardly imbricated. .....8. ABERIA.

18. PITTOSPORACEÆ.

A. Fruit indehiscent. .....
B. Filaments longer than anthers: petals more or less connivent from the base to beyond the middle. .....1. BILLARDIERA.
BB. Filaments shorter than anthers: petals spreading from the base. ...2. SOLLYA.
AA. Fruit a capsule which is loculicidally dehiscent. ..
B. Capsule thick-coriaceous: seeds numerous. .....
C. Seeds not winged, thick or slightly compressed. .....3. PITTOSPORUM.
CC. Seeds winged, flat, compressed, horizontal. ..4. HYMENOSPORUM.
BB. Capsule thinly coriaceous: seeds 1–2 in each locule, compressed, not winged, vertical. ..5. BURSARIA.

19. TREMANDRACEÆ.

A. Anthers 2-celled, or 4-celled in 2 series. .....1. TETRATHECA.
AA. Anthers 4-celled in 1 series.2. PLATYTHECA.

20. POLYGALACEÆ.

Sepals 2 very large, wing-shaped: anthers 8: capsule compressed, not horned. ..1. POLYGALA.

21. CARYOPHYLLACEÆ.

A. Sepals coalesced into a toothed or lobed calyx: petals and stamens hypogynous, being raised with the ovary on a gynophore, rarely sessile, petals with or without scale at the apex of the claw. .....
B. Hilum facial: embryo straight. .....
C. Calyx tubular, multistriate. .....1. DIANTHUS.
CC. Calyx top-shaped or long-tubular, 5- or 15-ribbed: plants and fls. smaller. .....2. TUNICA.
BB. Hilum lateral: embryo peripheral. .....
C. Calyx 10-nerved, rarely with many parallel-nerves. .....
D. Styles commonly 3: capsule shortly 6- or 3-valved. .....3. SILENE.
DD. Styles commonly 5 or 4: capsule shortly 10–5 or 8–4-valved.4. LYCHNIS.
CC. Calyx obscurely veined.5. SAPONARIA.
CCC. Calyx broadly or obscurely 5-nerved. ..6. GYPSOPHILA.
AA. Sepals free or only coalesced at the very base: petals and stamens hypogynous on a short torus or usually very shortly perigynous. .....
B. Stipules small, scarious..7. SPERGULA.
BB. Stipules 0. .....
C. Valves (or rather teeth) of the capsule twice as many as the styles. .....8. CERASTIUM.
CC. Valves of the capsule as many as the styles. .....
D. Petals 2-fid. styles commonly 3. .....9. STELLARIA.
DD. Petals entire: styles commonly 3. .....10. ARENARIA.
DDD. Petals entire or 0: styles as many as the sepals. .....11. SAGINA.

22. PORTULACACEÆ.

A. Ovary cohering below with the calyx tube. .....1. PORTULACA.
AA. Ovary free from the calyx..

B. Embryo arched; albumen scant. ..... 2. ANACAMPSEROS.
BB. Embryo more incurved or annular, including the albumen. .....
C. Sepals usually deciduous. ..... 3. TALINUM.
CC. Sepals persistent, at least usually in Calandrinia. .....
D. No. of sepals 5–8. . 4. LEWISIA.
DD. No. of sepals 2. ....
E. Shape of sepals roundish heart-shaped, scarious. . 5. SPRAGUEA.
EE. Shape of sepals ovate, herbaceous.
F. Stamens 3, rarely 5-6. MONTIA.
FF. Stamens definitely 5, 7. CLAYTONIA.
FFF. Stamens indefinitely 5–many .....8. CALANDRINIA.

23. TAMARISCACEÆ.

A. Petals free or hardly coalesced at the base: fls. racemose or spicate. .....1. TAMARIX.
AA. Petals coalesced into a tube: fls. thyrsoid-panicled. . .2. FOUQUIERA.

24. HYPERICACEÆ.

A. Fls. 4-merous. ..... 1. ASCYRUM.
AA. Fls. 5-merous. ..... 2. HYPERICUM.

25. GUTTIFERACEÆ.

A. Style very short or none: ovules solitary in each locule of the ovary. ....1. GARCINIA.
AA. Style elongated: ovules in the whole ovary 1, 2, or 4 .....
B. Ovary 1-locled: 1-ovuled. 2. CALOPHYLLUM.
BB. Ovary 2–4-locled, 4-ovuled. ..... 3. MAMMEA.

26. TERNSTRŒMIACEÆ.

A. Anthers basifixed. .....
B. Calyx of 5 sepals sub-connate at the base, at length fleshy and adhering to the ovary. . .1. VISNEA.
BB. Calyx inferior: sepals free. .....
C. Fls. rather large: petals coalesced at base: anthers glabrous: ovules 2–4 in each locule, pendulous from the apex. .....2. TERNSTRŒMIA.
CC. Fls. medium-sized: petals free or hardly coalesced: anthers pilose: ovules indefinite, in the middle of the locule. .....3. CLEYERA.
CCC. Fls. small, dioecious: petals coalesced at base: anthers glabrous: ovules indefinite in the middle of the locule. .....4. EURYA.
AA. Anthers versatile. .....
B. Peduncles with an indefinite no. of fls.: fr. rarely subdehiscent, usually pulpy inside. . .
C. Fls. 5-merous: sepals hardly imbricated: styles indefinite. . .5. ACTINIDIA.
CC. Fls. 4-merous: sepals strongly imbricated: styles simple. . . . .6. STACHYURUS.
BB. Peduncles 1-fld.; fr. a loculicidal capsule, ...
C. Radicles inferior. .....
D. Ovules ascending; seeds lens-shaped: embryo straight. . .7. STUARTIA.
DD. Ovules laterally affixed; seeds flat, winged on back; cotyledons flat and radicle inflexed. . .8. SCHIMA.
CC. Radicles superior. ...
D. Ovules indefinite; seeds winged above. .....9. GORDONIA.
DD. Ovules few in each locule; seeds not winged. .....10. CAMELLIA.

27. MALVACEÆ.

A. Fruit a capsule loculicidally dehiscent (in Adansonia indehiscent, and woody). .
B. Style branches as many as the locules of the ovary: staminal column laterally antheriferous the apex truncate or 5-toothed, or rarely another bearing. .....
C. Seeds usually kidney-shaped: stigmas or style branches finally spreading. .....
D. Bractlets 5–many, rarely 0, or reduced to teeth: style branches finally spreading. .....1. HIBISCUS.
DD. Bractlets 0 or 3: stigmas distinct, free, radiating. . .2. LAGUNARIA.
CC. Seeds obovoid or angled: style club-shaped at apex, undivided or with short erect branches. .....
D. Bractlets 3–5, small. 3. THESPESIA.
DD. Bractlets 3, large, cordate. .....4. GOSSYPIUM.
BB. Style entire or divided into very short branches as many as the locules of the ovary: staminal column various, but generally divided and antheriferous at the apex. .....
C. Staminal column separated above into numerous filaments. .
D. Capsule 5-valved, densely woolly within. .....5. BOMBAX.
DD. Capsule woody, not woolly within. ....
E. Calyx 5-cut. .....6. ADANSONIA.
EE. Calyx truncate. .....7. PACHIRA.
CC. Staminal column 5-cut or 5-toothed, the branches bearing 2–3 anthers. .....
D. Column outside below the middle annulately 5–10-lobed. .8. CHORISIA.
DD. Column not annulate. 9. ERIODENDRON.
AA. Fruit composed of carpels which separate at maturity. .....
B. Staminal column antherbearing outside truncate or 5-toothed at the apex: style branches 10. .....
C. Bractlets 5–8, herbaceous or setiform: carpels with or without 1–3 awns. .....10. PAVONIA.
CC. Bractlets indefinite, herbaceous or setiform: carpels fleshy outside, connate into a berry, later separating. . . .11. MALVAVISCUS.
CCC. Bractlets 4–6, large and colored: carpels naked, muticous. . . .12. GŒTHEA.
BB. Staminal column bearing anthers at or near the apex. .....

c. Carpels indefinite, crowded into a mass without order. .....
D. Bractlets 3. .....13. MALOPE.
DD. Bractlets 0. .....14. PALAUA.
cc. Carpels in a single whorl. .....
D. Ovules 2 or more. ....
E. Bractlets 4–6. .....15. KYDIA.
EE. Bractlets 0. .....16. ABUTILON.
EEE. Bractlets 3. .....17. SPHÆRALCEA.
DD. Ovules solitary. ....
E. The ovules ascending. .....
F. Styles longitudinally stigmatose inside. ...
G. Fls. diœcious. .18. NAPÆA. (see article *Sida*.)
GG. Fls. hermaphrodite. ...
H. Staminal column double; the outer of 5 clusters. .....19. SIDALCEA.
HH. Staminal column single...
I. Bractlets 3–9, connate at base. .....
J. Axis of fr. not surpassing carpels. ....20. ALTHÆA.
JJ. Axis of fr. surpassing carpels. .....21. LAVATERA.
II. Bractlets 0–3, distinct. ....
J. Carpels with transverse appendages inside under the beak. ...22. CALLIRHOE.
JJ. Carpels not appendaged. ..23. MALVA.
FF. Style branches tipped with small capitate or club-shaped stigmas. .....24. MALVASTRUM.
EE. The ovules pendulous. .....
F. Style branches longitudinally stigmatose inside. .....25. PLAGIANTHUS.
FF. Style branches truncate at apex or with small capitate stigmas. .....26. SIDA.

28. STERCULIACEÆ.

A. Petals concave or hooded at the base. .....
B. Anthers solitary between the staminodes. .....1. RULINGIA.
BB. Anthers 2 or more between the staminodes.
C. Fr. a membranous capsule. .....2. ABROMA.
cc. Fr. a woody capsule...3. GUAZAMA.
ccc. Fr. drupaceous. .....4. THEOBROMA.
AA. Petals flat. .....
B. The petals deciduous. ....
C. Anthers sessile; calyx club-shaped or bell-shaped. .....5. REEVESIA.
cc. Anthers stipitate; sepals at length free..6. PTEROSPERMUM.
BB. The petals persistent or marcescent. .....
C. Anthers 10 or 15, rarely 20. .....
D. Ovules 2 in each locule. .....7. DOMBEYA.
DD. Ovules indefinite. ...8. PENTAPETES.
cc. Anthers 5. .....9. MAHERNIA.
AAA. Petals 0. .....
B. Fls. hermaphrodite. .....10. FREMONTIA.
BB. Fls. unisexual or polygamous. .....
C. Anthers crowded without order; seeds without albumen ....11. STERCULIA.
cc. Anthers in a single ring; seeds albuminous. .....12. COLA.

29. TILIACEÆ.

A. Petals petal-like, usually glabrous and contracted at base, entire or rarely notched at apex, often convolute. .....
B. Calyx bell-shaped, 3–5-cut. .....1. BERRIA.
BB. Calyx composed of distinct sepals. .....
C. The petals pitted at the base inserted around the base of a more or less elevated torus which bears the stamens at its apex. ...2. GREWIA.
cc. The petals not pitted, inserted immediately around the stamens..
D. Fr. indehiscent globose, usually 1-seeded. .....3. TILIA.
DD. Fr. a capsule. .....
E. Capsule, loculicidally dehiscent...
F. The stamens all bear anthers....
G. Capsule globose, echinate. .....4. ENTELEA.
GG. Capsule pod-like, usually naked. .....5. CORCHORUS.
FF. The outer stamens have no anthers. .....6. SPARMANNIA.
EE. Capsule dehiscing at the apex. .....7. LUEHEA.
AA. Petals not petal-like, incised, 3-lobed or entire, usually pubescent or else level at base, never convolute. ...8 ARISTOTELIA.
B. Fr. a berry. .....
BB. Fr. a drupe. .....9. ELÆOCARPUS.

30. LINACEÆ.

A. Anther-bearing stamens as many as the petals. .....
B. Styles 5; lvs. entire; glands equal. .....1. LINUM.
BB. Styles 3–4: lvs. usually serrate; glands usually unequal or absent. ....2. REINWARDTIA.
AA. Anther-bearing stamens 2 or 3 times as many as the petals. .....3. ERYTHROXYLON.

31. MALPIGHIACEÆ.

A. Fr. a fleshy 3-stoned drupe.1. MALPIGHIA.
AA. Fr. a capsule composed of 3 dehiscent berries; fls. in terminal racemes. ...2. GALPHIMIA.
AAA. Fr. consists of 1–3 samaras; fls. in umbel-like corymbs. .....3. STIGMAPHYLLON.

32. GERANIACEÆ.

A. Flowers irregular, the posterior sepal spurred. ....
B. Petals hypogynous; capsule bursts suddenly and shoots out the seeds. .....1. IMPATIENS.
BB. Petals perigynous; fr. not elastically dehiscent....
C. Spur adnate to the pedicel; ovules in pairs; carpels beaked, dehiscing from the placentiferous axis .....2. PELARGONIUM.

cc. Spur free: ovules solitary: carpels not beaked, indehiscent, separating from the axis. ..... 3. TROPÆOLUM.
aa. Flowers regular or nearly so. .....
B. Sepals valvate. Glands present. ..... 4. LIMNANTHES.
bb. Sepals imbricate. .....
c. Glands alternate with petals. .....
D. Stamens 10, all fertile usually: tails of carpels usually not bearded inside. 5. GERANIUM.
dd. Stamens, 5 fertile, 5 reduced to scales: tails of carpels usually not bearded inside. ..... 6. ERODIUM.
cc. Glands 0. .....
D. Fr. a loculicidal capsule. ..... 7. OXALIS.
dd. Fr. an indehiscent berry. ..... 8. AVERRHOA.

33. OCHNACEÆ.

Ovary 3–10-loculed: locules 1-ovuled: seeds without albumen: stamens numerous: panicles lateral. .... 1. OCHNA.

34. RUTACEÆ.

A. Ovary entire or slightly 2–5-lobed: style terminal, entire at base: fr. drupe-like or berry-like, but leathery, usually indehiscent: carpels of the male fls. sometimes 4, and free. .....
B. Fls. hermaphrodite: petals and stamens free or connate: ovules 1, 2 or many: fr. usually with a cortex outside and pulpy within: seeds ex-albuminous. ...
c. Ovules numerous in each locule. .....
D. Stamens 12: ovary imperfectly 5–6-loculed: lvs. odd-pinnate. ..... 1. CITRUS.
dd. Stamens 30–60: ovary imperfectly 8-to-many loculed: lvs. with 3 lfts. .. 2. ÆGLE.
cc. Ovules solitary or twin in each locule. .....
D. Plant spiny: lvs. with 3 lfts.: calyx 3-lobed: stamens 6. 3. TRIPHASIA.
dd. Plant unarmed: lvs. pinnate: calyx 5-cut or 5-parted: stamens 10. ..... 4. MURRAYA.
BB. Fls. usually polygamo-dioecious: petals and stamens free: ovules 2 except in the first two genera: seeds usually albuminous. .....
D. Ovules solitary. .....
E. Petals 4–5, valvate: stamens 4–5: drupe 2–4-stoned. .. 5. SKIMMIA.
EE. Petals 5, valvate: stamens 5: ovary 5-lobed: stigma sessile. ..... 6. CASIMIROA.
DD. Ovules twin. .....
E. Petals 2–5, valvate or imbricate: stamens 2–5: fr. 4–7-loculed. ..... 7. TODDALIA.
EE. Petals 5–8, valvate: stamens 5–6: fr. a 5-stoned drupe. .. 8. PHELLODENDRON.
EEE. Petals 4–5, imbricate: stamens 4–5: fr. a 2–3-loculed samara. ..... 9. PTELEA.
aa. Ovary deeply 2–5-lobed, styles basilar or ventral or the stigmas connate: fr. capsular or 3–5-berried. .....
B. Ovules 2 or more in each locule. .....
c. Petals 4–5, equal: stamens 8–10, straight. 10. RUTA.
cc. Petals 5, unequal: stamens 10 declinate. .. 11. DICTAMNUS.
BB. Ovules 2 in each locule. .
c. Fls. irregular. ..... 12. RAVENIA.
cc. Fls. regular. .....
D. The fls. unisexual or polygamous. .....
E. Lvs. alternate. .....
F. Foliage pinnate: fls. polygamous. 13. XANTHOXYLUM.
FF. Foliage simple: fls. unisexual. .... 14. ORIXA.
EE. Lvs. opposite: fls. unisexual. ..... 15. EVODIA.
DD. The fls. hermaphrodite. .....
E. Albumen fleshy (unknown in Choisya). .....
F. Petals erect, long, connate or connivent, forming a cylindrical tube. ..... 16 CORREA.
FF. Petals free, spreading. .....
G. The petals imbricate. .....
H. Stamens 8: petals 4 lvs. opposite. ..... 17. BORONIA.
HH. Stamens 8–10: petals 4–5: lvs. alternate. 18. ERIOSTEMON.
HHH. Stamens 10: petals 5. lvs. opposite. ..... 19. CHOISYA.
GG. The petals valvate. ..... 20. PILOCARPUS.
EE. Albumen 0. .....
F. The capsule 5-loculed. ..... 21. CALODENDRUM.
FF. The ovary lobes 1–5 free. .....
G. Staminodes 0. 22. DIOSMA.
GG. Staminodes 5...
H. Style short: stigma capitate: fls. terminal. .. 23. ADENANDRA.
HH. Style long: stigma simple: fls. axillary. .... 24. BAROSMA.

35. ZYGOPHYLLACEÆ.

A. Ovary sessile: lvs. with 2 lfts. rarely 1 lft. ..... 1. ZYGOPHYLLUM.
AA. Ovary stalked: lvs. abruptly pinnate. ..... 2. GUAIACUM.

36. SIMARUBACEÆ.

A. Stamens 10, twice as many as petals. ..... 1. AILANTHUS.
AA. Stamens 4–5, as many as petals. ..... 2. PICRASMA.

37. MELIACEÆ.

A. Stamens free. ..... 1. CEDRELA.
AA. Stamens coalesced into a tube. .....
B. Locules of the ovary many-ovuled. ..... 2. SWIETENIA.

BB. Locules of the ovary 1–2 ovuled. . . . . .
c. Lvs. simple. . . . . 3. TURRÆA.
cc. Lvs. 3-foliolate or 1–3-pinnate. . . . . .
D. Anthers 10–12. . . . . 4. MELIA.
DD. Anthers 5. . . . . 5. AGLAIA.

38. BURSERACEÆ.

A. Calyx tube broadly urn-shaped, covered by the torus. . . . . 1. GARUGA.
AA. Calyx small, 4–5-parted. . . . 2. BURSERA.

39. OLACACEÆ.

Stamens twice as many as the petals, all fertile. . . . . 1. XIMENIA.

40. AQUIFOLIACEÆ.

A. Petals connate at base: ovary 4–5-loculed. . . . . 1. ILEX.
AA. Petals free, linear; ovary 3–5-loculed. . . . . 2. NEMOPANTHUS.

41. CYRILLACEÆ.

1. CYRILLA.

42. RHAMNACEÆ.

A. Calyx lobes persistent, the often star-shaped disc joining its tube to the entire surface of the ovary: fr. dry, 3-winged. . . . . 1. GOUANIA.
AA. Calyx lobes deciduous. . . . .
B. Disc lining the shallow calyx-tube, nearly or quite free from the ovary: fr. drupaceous, mostly fleshy and often edible, with a single 1–4-celled stone inclosing as many seeds, or 1-seeded by abortion: seed coats membranous. . . . . .
c. Petals 0; albumen copious, ruminate. . . 2. REYNOSIA.
cc. Petals 5. . . . . .
D. Fr. winged, dry, leathery; plants prickly; lvs. 3-nerved. . . . . 3. PALIURUS.
DD. Fr. a fleshy drupe; plants prickly; lvs. 3-nerved. . . . . 4. ZIZYPHUS.
DDD. Fr. a drupe with leathery sarcocarp: plants unarmed; lvs. penninerved. . . 5. BERCHEMIA.
BB. Disc lining the calyx tube, or both adherent to ovary; fr. drupaceous or becoming dry, inclosing 2–4 nutlets or cocci. . . . . .
c. Fr. a fleshy drupe free from calyx, containing 2–4, separate, nut-like stones. . . . 6. RHAMNUS.
cc. Fr. becoming nearly or quite dry, partly inferior separating into 3 nutlets; ovary adnate to disc at its base. . . . . 7. CEANOTHUS.
ccc. Fr. a capsule with membranous covering, inferior, separating into 3 cocci which are dehiscent inside. . . . 8. POMADERRIS.
cccc. Fr. indehiscent, pea-shaped, 3-celled, 3-seeded: ovary free. . . 9. HOVENIA.

43. CELASTRACEÆ.

A. Fruit indehiscent. . . . . 1. ELÆODENDRON.
AA. Fruit a dehiscent capsule.
B. Lvs. opposite. . . . . .
c. Ovules 1–2, in the axis of the locule. . . . . 2. EUONYMUS.
cc. Ovules 2 in the locules, erect. . . . . 3. PACHISTIMA.
BB. Lvs. alternate. . . . . .
c. Ovary confluent with the disc. . . . . .
DD. Locules generally 1 ovuled: plants unarmed: fls. solitary, clustered or cymose. . . . . 4. MAYTHENUS.
DD. Locules 2-ovuled plants often armed: fls. cymose. 5. GYMNOSPORIA.
cc. Ovary free. . . . . 6. CELASTRUS.

44. STACKHOUSIACEÆ.

Genus unique. . . . . 1. STACKHOUSIA.

45. VITACEÆ.

A. Plants climbing, mostly by adhesion of dilated and disc-shaped tips of the tendril-branches: no distinct disc or free nectariferous glands, but a nectariferous and wholly confluent thickening of the base of the ovary, or even this obsolete. . . . . 1. AMPELOPSIS.
AA. Plants climbing by the prehension and coiling of naked-tipped tendrils: nectariferous disc or glands surrounding the ovary or its base, and at least partly free from it. . . . .
B. Berries edible: petals cast off from the base while cohering by their tips: hypogynous disc of 5 nectariferous glands alternate with the stamens. . . . . 2. VITIS.
BB. Berries inedible: petals expanding; disc annular or cup shaped, encircling the base of the ovary and adherent to it below. . . . . 3. CISSUS.

46. LEEACEÆ.

1. LEEA.

47. SAPINDACEÆ.

A. Fls. irregular. . . . . .
B. Seeds albuminous: stamens inserted at the base of the disc inside: lvs. alternate, pinnate.
c. Calyx subsaccate the segments narrow very unequal at base: ovules in the locules 2–4. . . . . 1. MELIANTHUS.
cc. Calyx of 5 free, roundish sepals: ovules numerous in 2 series on the placentæ. . . . 2. GREYIA.
BB. Seeds not albuminous: stamens inserted at the base of the ovary inside the disc or unilateral: lvs. rarely opposite except in Aesculus. . . . . .
c. Lvs. opposite. . . . . 3. AESCULUS.
cc. Lvs. alternate. . . . . .
D. Ovules solitary in the locules (rarely 2 in Paullinia): plant climbing. . . . . .
E. Fr. bladdery, membranous, loculicidal. . . . . 4. CARDIOSPERMUM.
EE. Fr. a pear-shaped, septicidal capsule. 5. PAULLINIA.
DD. Ovules 2 or more in

the locules: plant erect. . . . . .
E. Sepals valvate; petals 3–4. . . . . 6 KOELREUTERIA.
EE. Sepals imbricate: petals 4–5. . . . . 7. UNGNADIA.
AA. Fls. regular or nearly so.
B. Lvs. rarely opposite; stamens inserted at the base of the ovary inside the disc unilateral. . . .
C. Ovules 2 or more in the locules. . . . . .
D. Disc produced into 5 horns: fr. a capsule. . . . . 8. XANTHOCERAS.
DD. Disc 4–5 lobed: fr. a drupe. . . . . 9. MELICOCCA.
(This genus repeated below.)
CC. Ovules solitary in the locules (sometimes solitary in Melicocca which is accounted for above and also below.) . . . . . .
D. Fr. capsular, dehiscent. . . . . 10 CUPANIA.
DD. Fr. indehiscent, not deeply lobed or divided into nutlets or cocci. . . . . 9. MELICOCCA.
DDD. Fr. indehiscent, deeply lobed or divided into 1–3 indehiscent cocci. . . . . .
E. Calyx of sepals broadly imbricated in 2 series; the 2 outer sepals smaller. . . . . 11. SAPINDUS.
EE. Calyx 4–5 toothed or 4–5 parted, the lobes slightly imbricate or subvalvate. . . . . .
F. Petals 0 or various; calyx small, cup-shaped . . . . . 12. NEPHELIUM.
FF. Petals 0 calyx subspherical 5 toothed. . . . . 13. STADMANIA.
BB. Lvs. opposite; stamens variously inserted (inside or outside) on the disc If that is complete: seeds not albuminous; (Compare BBB.
C. Petals 0; disc obsolete; lvs. pinnately 3–5-foliolate. . . . . 14. ACER Negundo.
(Often considered a separate genus.)
CC. Petals 0, or 4–5: disc annular: lvs. not compound. . . . . 15. ACER (Except A. Negundo.
BBB. Lvs. alternate, rarely subopposite: stamens inserted at the base of the disc outside or in the sinuses of the disc.
C. Petals 0: disc of male fls. 0. . . . . 16. DODONÆA.
CC. Petals 4: disc annular. 17. PTÆROXYLON.
BBBB. Leaves opposite; seeds albuminate: stamens inserted at base of disc outside. . . . . .
C. Ovary 2–3-parted at base. . . . . .
D. Capsule vesiculose. . . 18. STAPHYLEA.
DD. Follicles coriacious. 19. EUSCAPHIS.
CC. Ovary 3-lobed. . . . . 20. TURPINIA.

48. ANACARDIACEÆ.

A. Lvs. simple. . . . . .
B. Stamens 5; styles 3. . . . . 1. SEMECARPUS.
BB. Stamens 8–10 (all or some fertile); style eccentric; stigma a mere dot. . . . . 2. ANACARDIUM.
BBB. Stamens 1–5; style lateral, curved; stigma simple. . . . . 3. MANGIFERA.
AA. Lvs. pinnate or composed of 3 lfts. . . . . .
B. Ovary 1-celled. . . . . .
C. Ovules suspended at or near the apex of the locule. . . . . .
D Styles in the pistillate fls. short; in the staminate fls. 4–5. . . . . 4. TAPIRIA.
5. CYRTOCARPA.
DD Styles 3. . . . . 6. SCHINUS.
CC. Ovules suspended by a basilar funiculus. . . .
D. Petals 0. . . . . 7. PISTACIA.
DD. Petals 4–6. . . . . .
E. Stamens in a single whorl; petals imbricate in æstivation. . . . . 8. RHUS.
EE. Stamens in 2 whorls, the outer alternate with the petals; petals valvate in æstivation. . . . . 9. LITHRÆA.
BB. Ovary 3–5-celled. . . . . 10. SPONDIAS.
(Described under *Tropical Fruits.*)

49. CORIARIACEÆ.

Genus unique. . . . . 1 CORIARIA.

50. MORINGACEÆ.

Genus unique. . . . . 1. MORINGA.

51. DROSERACEÆ.

A. Stamens 4–8; styles 2–5; placentæ parietal. . . . . 1. DROSERA.
AA. Stamens about 15; style columnar; placentæ basal. 2. DIONÆA.

52. LEGUMINOSÆ.

SUMMARY OF SUBORDERS AND TRIBES. Ignoring exceptions and 6 tribes of which no examples are known to be cultivated in America.

A. Fls. regular, small: calyx gamosepalous or valvately parted: petals valvate, often connate, below the middle. . . . . .

SUBORDER I.—MIMOSEÆ.

B. Stamens numerous, indefinite. . . . . .
C. The stamens free. . . . 1. ACACIA TRIBE.
CC. The stamens monadelphous. . . . . 2. INGA TRIBE.
BB. Stamens fewer, definite. . .
C. Anthers usually appendaged with a stalked gland: stamens twice as many as the petals, rarely as many, fls generally 5-merous. . . . . 3. ADENANTHERA TRIBE.
CC. Anthers not glandular: stamens as many as the petals, rarely twice as many: fls. 4–5-merous, rarely 3 or 6-merous. . . . . 4. MIMOSA TRIBE.
AA. Fls. irregular and truly papilionaceous, i. e. like a sweet pea, the standard outside of the other petals and inclosing them in the bud: sepals more or less united above the disc into a tube or cup: radicles inflexed, accumbent or rarely very short and straight. (Compare AAA.) . . . . . .

SUBORDER II.—PAPILIONEÆ.

B. Lvs. simple, or else digitately compound. (Exceptions: A few members of the Trifolium Tribe are digitately compound and some of the Phaseolus Tribe are subdigitately compound. Some lvs. that appear to be simple have been reduced from several leaflets to one, generally leaving a gland, joint or other indication of the reduction.)
c. Stamens 10, free: shrubs, rarely herbs ..5. Podalyria Tribe.
cc. Stamens 10, monadelphous, rarely diadelphous: racemes terminal or opposite the leaves, or the fls. solitary or subfascicled at the axils ...6. Genista Tribe.
BB. Lvs. pinnate, rarely digitate in the Trifolium Tribe or subdigitate in the Phaseolus Tribe or the lvs. sometimes reduced to a single lft....
c. Stamens 10, free: lfts. 5 or more, sometimes reduced to one large lft., rarely 3. ..... 7. Sophora Tribe.
cc. Stamens monadelphous or diadelphous. .....
D. The pod jointed, rarely 1-jointed and 1-seeded by abortion. Otherwise like the Lotus, Galega and Phaseolus Tribes. An artificial division. ....8. Hedysarum Tribe.
DD. The pod not jointed.
E. Pod indehiscent, larger than calyx, membranous leathery, woody or drupaceous: lfts. 5 or more, rarely 3–1: trees or tall shrubs or climbers.9. Dalbergia Tribe.
EE. Pod dehiscent or if indehiscent usually of small size, generally 2-valved.
F. Fls. in heads or umbels, rarely solitary: lfts 3 or more, entire: alternate filaments usually dilated at the apex: herbs or subshrubs. ....10. Lotus Tribe.
FF. Fls. solitary or racemose, sometimes panicled or fascicled. ...
G. Plants typically climbing herbs, raising themselves by means of tendrils at the tips of the petioles. Sometimes there is a mere bristle: lft. often denticulate at apex. .....11. Vicia Tribe.
GG. Plants twining or erect, not climbing by tendrils. ....
H. Lfts. generally 3. .....
I. Plants mostly twining herbs. ....12. Phaseolus Tribe.
II. Plants mostly erect herbs. ...13. Trifolium Tribe.
HH. Lfts. mostly 5 or more. ..14. Galega Tribe.

AAA. Fls. more or less irregular, but not truly papilionaceous. When they seem to be so, the petal answering to the standard will be found within the other petals instead of outside as in AA.; radicle straight, very rarely slightly oblique. .....

SUBORDER III. CÆSALPINEÆ.

B. Calyx gamosepalous beyond the disc or valvately parted: lvs. simple and entire or 2-lobed, or rarely cut into 2 lfts.; stipe of ovary free or adnate to calyx tube. .....15. Bauhinia Tribe.
BB. Calyx usually parted to the very disc and the segments imbricate. ....
c. Stipe of ovary adnate to the disc bearing calyx-tube: lvs. mostly abruptly pinnate.16. Amherstia Tribe.
cc. Stipe of ovary free in the bottom of the calyx. .....
D. Anthers versatile: lvs. mostly bipinnate. .....17. Cæsalpinea Tribe.
DD. Anthers basifixed, erect but longitudinally dehiscent by 2 pores or short cracks. .....18. Cassia Tribe.

1. Acacia Tribe.

Sole genus. .....1. Acacia.

2. Inga Tribe.

A. Lvs. once pinnate. .....2. Inga.
AA. Lvs. mostly twice pinnate..
B. Shape of pods circinate, arched or variously twisted. .....
c. Pod usually 2-valved: seeds generally surrounded by a thin pulp. .....3 Pithecolobium.
cc. Pod indehiscent, usually septate between the seeds. .....4. Enterolobium.
BB. Shape of pods straight, or at most slightly sickle-shaped. .....
c. Valves separating from the persistent sutures. .....5. Lysiloma.
cc. Valves elastically dehiscent and revolute from apex to base..6. Calliandra.
ccc. Valves not elastic: pod often indehiscent....7. Albizzia.

3. Adenanthera Tribe.

A. Fls. short-pedicled. .....8. Adenanthera.
AA. Fls. sessile. .....
B. The pod indehiscent (presumably so in Stryphnodendron). ....
c. Pod straight, thick-compressed, transversely septate inside between the seeds. ....9. Stryphnodendron.
cc. Pod straight, falcate or variously twisted,

thick-compressed or subterete, usually septate inside between the seeds. ...10. PROSOPIS.
BB. The pods 2-valved See also BBB. .....
c. Pod straight or arched, flat: valves entire, continuous within: shrubs or trees. ....11. PIPTADENIA.
cc. Pod obliquely oblong, deflexed from the stipe: herbs or diffuse sub-shrubs, prostrate or floating. ...12. NEPTUNIA.
BBB. Pod flat, with thickened persistent continuous sutures, the valves transversely jointed between the sutures, the joints 1-seeded. .....13. ENTADA.

4. MIMOSA TRIBE.

A. Pods provided with a replum, *i. e.* a frame-like placenta, which remains after the valves have fallen away from it. .....
B. Valves wider than replum. .....14. MIMOSA.
BB. Valves narrower than the replum or hardly wider.15. SCHRANKIA.
AA. Pods 2-valved in the ordinary fashion. .....16. LEUCÆNA.

5. PODALYRIA TRIBE.

A. Keel petals free or slightly connate: foliage herbaceous. .....
BB. Pod linear or oblong-inflated. .....17. THERMOPSIS.
BB. Pod globose or ovoid, turgid or inflated. ....18. BAPTISIA.
AA. Keel petals connate on the back: foliage mostly leathery. .....
B. Ovules 4 or more. .....
c. Keel about as long as the wings. .....19. OXYLOBIUM.
cc. Keel much shorter than wings. .....20. CHORIZEMA.
BB. Ovules 2. .....
c. Pod indehiscent: calyx shortly 5-toothed. ...21. VIMINARIA.
cc. Pod 2-valved: calyx 5-fid. or bilabiate. ....22. PULTENÆA.

6. GENISTA TRIBE.

A. Stamens coalesced into a sheath which is split above the middle. .....
B. Seeds strophiolate. .....
c. Lvs. simple or reduced to mere scales. ....23. TEMPLETONIA.
cc. Lvs. pinnate: lfts. 3. .24. GOODIA.
BB. Seeds not strophiolate. ...25. CROTALARIA.
AA. Stamens coalesced into a closed tube. .....
B. Seeds not strophiolate. ...
c. Calyx lobes or lips much longer than the tube. .....26. LUPINUS.
cc. Calyx lobes or teeth shorter than the tube, rarely somewhat longer. .....
D. Lfts. 3. .....
E. Pod stalked. .....27. LABURNUM.
EE. Pod sessile .....
F. Claws of petals adnate to staminal tube. .....28. PETTERIA.
FF. Claws of petals free. .....
G. Shrubs unarmed: upper calyx lobes distinct. ....29. ADENOCARPUS.
GG. Shrubs usually spinescent: calyx short, truncate. .....30. CALYCOTOME.
DD. Lfts. rarely 3 or 1: shrubs with spiny or rush-like branches. .....
E. Shrub with rush-like branches. .....31. SPARTIUM.
EE. Shrubs spiny or unarmed: lfts. reduced to 1 or 0, rarely 3. .. ...32. GENISTA.
BB. Seeds strophiolate. .....
c. Calyx colored, 2-parted: the upper segment 2-toothed, lower 3-toothed: leafless shrubs, the branchlets and petioles transformed into spines. .....33. ULEX.
cc. Calyx with the 2 upper lobes or teeth connate or free, the 3 lower connate into a lower lip. .....34. CYTISUS.

7. SOPHORA TRIBE.

A. Flower with petals all nearly alike. .....35. CADIA.
AA. Flower distinctly papilionaceous. .....
B. Pod 2-valved. .....36. CASTANOSPERMUM.
BB. Pod indehiscent or at most tardily dehiscent to a slight extent. ....
c. Pod moniliform. .....37. SOPHORA.
cc. Pod not moniliform, linear. .....
D. Fls. yellow in axillary racemes. ...38. CALPURNIA.
DD. Fls. white, panicled..39. CLADRASTIS.

8. HEDYSARUM TRIBE.

A. Stamens all free among themselves. .....40. ADESMIA.
AA. Stamens all connate in a closed tube. .....41. ARACHIS.
AAA. Stamen nearest the standard free or connate with the others only at the base or at the middle. ..
B. Filaments all dilated above or only alternate ones. ..... 42. ORNITHOPUS.
c. Keel obtuse. .....
cc. Keel acute or beaked ..43. CORONILLA.
BB. Filaments normal. .....
c. Wings short or very short, rarely as long as the keel: lfts. not provided with minute stipules. .....
D. Pod flat or compressed. .....
E. Joints many, rarely 2: standard-stamen free. .....44. HEDYSARUM.
EE. Joints 2: standard-stamen connate with others at middle. .....45. ONOBRYCHIS.
DD. Pod thickish, subterete. .....46. ALHAGI.
cc. Wings as long as or longer than the keel: partial petioles of lfts. bear minute stipules (except in Lespedzza 0). .....
D. Pod indehiscent, rarely opening at the lower suture: joints flat. .....47. DESMODIUM.
DD. Pod of about 4 small, distinct, 1-seeded, smooth, veined joints included in

the calyx. .....48. URARIA.
DDD. Pod 1-seeded, indehiscent: no joints. ...49. LESPEDEZA.

9. DALBERGIA TRIBE.

A. Fruit drupaceous, globose or ovoid, indehiscent, the endocarp woody. .....50. ANDIRA.
AA. Fruit not drupaceous. .....
B. Lfts. mostly alternate. ..
c. Anthers versatile, the locules parallel, longitudinally dehiscent..51. TIPUANA.
cc. Anthers small, erect, didymous, the locules placed back to back: generally dehiscent at apex by a short crack. .....52. DALBERGIA.
BB. Lfts. opposite. .....
c. Pod longitudinally 4-winged. .....53. PISCIDIA.
cc. Pod with a narrow wing along the upper suture or both sutures. .....54. DERRIS.

10. LOTUS TRIBE.

A. Pod indehiscent or tardily 2-valved. .....55. ANTHYLLIS.
AA. Pod 2-valved. .....
B. Calyx lobes usually longer than tube: keel rostrate. .....56. LOTUS.
BB. Calyx teeth shorter than tube: keel obtuse. ....57. HOSACKIA.

11. VICIA TRIBE.

A. Stem woody: inflorescence subterminal: stamens 9, the standard-stamen absent. .....58. ABRUS.
AA. Stem herbaceous: fls. solitary or racemose in the axils: stamens 10.....
B. Wings adherent to the keel. .....59. LENS.
(See article *Lentil.*)
BB. Wings free or only slightly adherent. .....
c. Sheath of stamens oblique at the mouth: style slender, bearded or hairy only at the apex or all round the upper part. ....60. VICIA.
cc. Sheath of stamens equal at the mouth.
D. Calyx lobes leafy: style rigid, dilated above and the margins reflexed and joined together so that it becomes flattened laterally, bearded down the inner edge. .....61. PISUM.
DD. Calyx lobes not leafy: style flattened above on the back and front, bearded down one face. .....62. LATHYRUS.

12. PHASEOLUS TRIBE.

A. Style longitudinally bearded above on the inner side or rarely pilose only around the stigma: petals normal or the keel long-beaked or spiral: inflorescence nodose-racemose...
B. Calyx tube not longer than lobes. .....
c. Keel spiral. .....63. PHASEOLUS.
cc. Keel obtuse or arched, beaked. .....
D. Stigma strongly oblique or introrse. .64. VIGNA.
DD. Stigma subglobose on inner face: style flattened out at apex. .....65. PACHYRHIZUS.
DD. Stigma small, terminal: style filiform or subulate at apex.66. DOLICHOS.
BB. Calyx tube cylindrical longer than lobes. ....67. CLITORIA.
AA. Style not bearded .....
B. Standard stamen free only at the very base, thence connate with the rest into a closed tube: calyx mostly 4-lobed. .....
c. Calyx bell-shaped. ....
D. Pod broad, the upper suture thickened or 2-winged. .....68. DIOCLEA.
DD. Pod linear, narrow or flat. .....69. PUERARIA.
cc. Calyx bilabiate, the upper lip larger, entire or 2-lobed or 2-parted. .....70. CANAVALIA.
BB. Standard stamen free or connate only at the base. .....
c. Calyx 4-lobed. .....71. GALACTIA.
cc. Calyx not 4-lobed. ....
D. Inflorescence usually racemose, the rachis of the raceme jointed. .....
E. Standard much larger than the wings and keel. .....72. ERYTHRINA.
EE. Standard smaller than the keel. ..
F. Pod 2-valved. ..
G. Anthers of 2-kinds. .....73. MUCUNA.
GG. Anthers uniform..74. APIOS.
FF. Pod not dehiscent, except at the top. .....75. BUTEA.
DD. Inflorescence sometimes racemose but the rachis of the raceme not jointed.
E. Lvs. especially beneath with minute resinous dots: inflorescence racemose or subumbellate or the fls. solitary. .....
F. Ovules 2. .....76. FLEMINGIA.
FF. Ovules 4 or more.
G. Pod turgid: seeds strophiolate. ...77. FAGELIA.
GG. Pod compressed: seeds not strophiolate. .....78. CAJANUS.
EE. Lvs. without minute resinous dots: fls. clustered or racemose in the axils, solitary or twin along the rachis..
F. Fls. showy; standard large, flattened out; bracts persistent. .....79. CENTROSEMA.
FF. Fls. medium sized; standard, erect, complicate; sides often reflexed; bracts persistent80. AMPHICARPÆA.
FFF. Fls. small (showy in Kennedya); standard spreading or reflexed; bracts persistent or small and deciduous. .....
G. Seeds not strophiolate. .....81. GLYCINE.

GG. Seeds strophiolate. . . . . .
H. Fls. small; keel usually much smaller than wings, ... 82. HARDENBERGIA.
HH. Fls. showy; keel usually equalling or surpassing the wings, ... 83. KENNEDYA.

13. TRIFOLIUM TRIBE.

A. Standard-stamen connate with the others into a closed tube: keel beaked. 84. ONONIS.
AA. Standard-stamen free: keel obtuse or in Parochetus acutish. . . . . .
B. Lfts. digitate (rarely pinnate in Trifolium). . . .
C. Pod 2-valved; keel acutish; petals not adnate. . . . . 85. PAROCHETUS.
CC. Pod usually indehiscent; claws of all or the lower petals adnate to the staminal tube. . . . . 86. TRIFOLIUM.
BB. Lfts. 3, pinnate. . . . . .
C. Pod straight, sickle-shaped or arched, sometimes thick and beaked, sometimes linear, sometimes broad and flat, indehiscent or folliculately gaping or rarely 2-valved. . . . . 87. TRIGONELLA.
CC. Pod spirally falcate, circinate or cochleate. . . . . 88. MEDICAGO.
CCC. Pod small, subglobose or ovoid, thick, indehiscent or tardily 2-valved. . . . . 89. MELILOTUS.

14. GALEGA TRIBE.

A. Connective of the anthers appendaged with a small gland or mucro: ovules mostly indefinite, 1–2 in a few species: pod 2-valved. . . . . 90. INDIGOFERA.
AA. Connective not appendaged.
B. Ovules 1–2, rarely 3–4, (See also BB.) . . . . . .
C. Ovule 1 . . . . . 91. PSORALEA.
CC. Ovules 2, rarely 3–4. . . .
D. Stamens 10. . . . . 92. AMORPHA.
DD. Stamens 5 . . . . . 93. PETALOSTEMON.
BB. Ovules indefinite, (1–2 in a few species of Tephrosia). . . . . .
C. Inflorescence terminal or opposite the lvs., mostly racemose. (In Galega both axillary and terminal, in some Tephrosias axillary): pod 2-valved. . . . . .
D. Style longitudinally bearded on the inner side: calyx long-tubular: petals very long-clawed. . . . . 94. BARBIERIA.
DD. Style glabrous (or merely penicillate at the stigma in some Tephrosias). .
E. Standard-stamen connate with the rest from the base. 95. GALEGA.
EE. Standard-stamen free or connate with the others from the middle. .
F. The pod narrow or short with slender valves and nerviform or hardly thickened sutures. . . . . 96. TEPHROSIA.
FF. The pod thick, leathery or woody, ...
G. Pod usually tardily dehiscent: inflorescence mostly panicled. 97. MILLETIA.
GG. Pod easily dehiscent: inflorescence racemose. 98. WISTARIA.
CC. Inflorescence axillary, except where noted below. . . . . .
D. Pod flat, except where the seeds finally make it turgid. . . . 99. ROBINIA.
DD. Pod inflated, turgid or terete, longitudinally septate or undivided, rarely flat and when so always longitudinally septate. . . . . .
E. Styles variously bearded above. .
F. Petals acuminate. 100. CLIANTHUS.
FF. Petals not acuminate. . . . . .
G. Standard erect. . 101. SUTHERLANDIA.
GG. Standard spreading or reflexed. .
H. Stigma small. . . 102. SWAINSONA.
HH. Stigma prominent. . . . . 103. COLUTEA.
EE. Style not bearded. .
F. Lvs. even-pinnate: shrubs or trees. . . . . .
G. Pod stipitate, obovoid or oblong. 104. HALIMODENDRON.
GG. Pod linear, usually acute. . . . . 105. CARAGANA.
FF. Lvs. odd-pinnate or with a spiny petiole instead of an odd lft. . .
G. Anther cells confluent at apex. . . 106. GLYCYRRHIZA.
GG. Anthers uniform.
H. Petals not all narrow, the standard obovate or orbicular. . . . . 107. CALOPHACA.
HH. Petals narrow. .
I. Keel blunt. . . . 108. ASTRAGALUS.
II. Keel acute. . . . 109. OXYTROPIS.

15. BAUHINIA TRIBE.

A. Petals erect or spreading, only slightly unequal. . . . 110. BAUHINIA.
AA. Petals falsely pea-like, the standard inmost. . . . . 111. CERCIS.

16. AMHERSTIA TRIBE.

A. The petals absent: sepals 4. 112. SARACA.
AA. The petals present. . . . . .
B. Bractlets persistent, inclosing the bud. . . . . .
C. Petals 5, slightly unequal. . . . . 113. BROWNEA.
CC. Petals unequal, 1 very wide, 2 narrow, 2 minute and rudimentary. . . . . 114. AMHERSTIA.
BB. Bractlets small or deciduous. . . . . .
C. Lfts. 1 pair. . . . . 115. HYMENÆA.
CC. Lfts. 2 or more pairs. .
D. Petals 5; 3 perfect, 2 rudimentary. . . . . 116. TAMARINDUS.
DD. Petals 5, slightly unequal. . . . . 117. SCHOTIA.

17. CÆSALPINIA TRIBE.

A. Calyx lobes strongly imbricate; disc-bearing tube short; seed not albuminous. . . . . B. Pod indehiscent; stigma peltate. . . . . 118. PELTOPHORUM.
BB. Pod 2-valved; stigma not peltate. . . . . 119. CÆSALPINIA.
AA. Calyx tube long, or top-shaped or bell-shaped; segments short or narrow and open; seeds, where known albuminous. . . . . B. Pod turgid or subterete. . . . . 120. GYMNOCLADUS.
BB. Pod flattish. . . . . 121. GLEDITSCHIA.
AAA. Calyx segments valvate. . B. Segments 4, the upper ones connate; highest petal widest, lowest, narrow. . . . . 122. COLVILLEA.
BB. Segments 5; petals roundish, about equal. . . . . 123. POINCIANA.
AAAA. Calyx segments slightly imbricate or valvate; seeds albuminous. . . . . B. Ovary adnate to calyx tube. . . . . 124. SCHIZOLOBIUM.
BB. Ovary free in bottom of calyx. . . . . 125. PARKINSONIA.

18. CASSIA TRIBE.

A. Petals 5; fls. hermaphrodite. 126. CASSIA.
AA. Petals 0; fls. polygamous. . . 127. CERATONIA.

53. ROSACEÆ.

SUMMARY OF TRIBES. (Exceptions ignored for the sake of clearness).

A. Ovary superior; carpels when mature not included in the calyx tube. . . . . B. Calyx or calyx lobes usually deciduous, without bractlets; carpels 1; fr. drupaceous. . . . . C. Fls. often unsymmetrical; style basilar; ovules ascending; radicles inferior. . . . 1. CHRYSOBALANUS. TRIBE.
CC. Fls. symmetrical; style subterminal; ovules pendulous; radicles superior. . . . . 2. PRUNUS TRIBE.
BB. Calyx lobes usually persistent, with or without bractlets; carpels usually indefinite; . . . . C. Ovules 2 or more; calyx lobes without bractlets. . . . . D. Stamens 10 or more; carpels 1 or indefinite; ovules generally pendulous. . . 3. SPIRÆA TRIBE.
DD. Stamens 5, 10 or indefinite; carpels usually 5; ovules usually ascending. . . . 4. QUILLAJA TRIBE.
DDD. Stamens and carpels indefinite; ovules 2, pendulous. . . . . 5. RUBUS TRIBE.
CC. Ovule 1; calyx lobes usually accompanied by bractlets. . . . . 6. POTENTILLA TRIBE.
AA. Ovary inferior or included by the calyx tube; carpels when mature connate with the calyx tube into a composite fruit. . . . . B. Carpels or locules of the ovary 1–5, 2-ovuled; fr. pomaceous, containing 2–5 locules or stones. . . . . 7. APPLE TRIBE.
BB. Carpels 1-ovuled. . . . . C. Petals usually 5; carpels indefinite, calyx lobes without bractlets; akenes surrounded by the fleshy calyx tube; shrubs with odd-pinnate foliage. . . . . 8. ROSE TRIBE.
CC. Petals usually 0; carpels 1–3; calyx lobes often with bractlets; herbs or shrubs; foliage various. . . . . 9. POTERIUM TRIBE.

1. CHRYSOBALANUS TRIBE.

Anthers small, short, didymous; ovary 1-locled, inserted in the base of the calyx tube; stamens 15 or more. . . . . 1. CHRYSOBALANUS.

2. PRUNUS TRIBE.

A. Carpels 5. . . . . 2. NUTTALLIA.
AA. Carpel 1. . . . . 3. PRUNUS.

3. SPIRÆA TRIBE (by A. Rehder).

A. Carpels ripening into dehiscent follicles. . . . . B. Seeds wingless; fls. small. C. Pistils opposite to the petals or less than 5. D. Lvs. simple; shrubs. . E. Stipules large, caducous; staminate disc wanting; seeds shining, crustaceous. . . . . F. Follicles dehiscent along both sutures, often inflated, 1–5; fls. in terminal corymbs. . . . . 4. PHYSOCARPUS.
FF. Follicles dehiscent only along the ventral suture, 1–2, not inflated. G. Fls. in terminal panicles; style terminal; pistils, 2, rarely 1; follicles usually 5-seeded. 5. NEILLIA.
GG. Fls. in small terminal corymbs; style lateral; pistil 1; follicles 1- or rarely 2-seeded. . . . . 6. STEPHANANDRA.
EE. Stipules wanting; staminal disc usually present; seeds dull. . . . . 7 SPIRÆA.
DD. Lvs. 2–3 pinnate; fls. diœcious, in ample panicles composed of slender spikes; herbs. . . . . 8. ARUNCUS.
CC. Pistils opposite to the sepals, 5. . . . . D. Petals roundish, imbricate in the bud; carpels connate at the base; lvs. pinnate or bipinnate; shrubs. . . . . 9. SORBARIA.
DD. Petals strap-shaped, convolute in the bud; carpels distinct; lvs. ternate; herbs. . . . . 10. GILLENIA.
BB. Seeds with narrow wing; fls. over 1 in. across; fr. a 5-lobed and 5-celled capsule; lvs. stipulate, simple. . . . . 11. EXOCHORDA.
AA. Carpels ripening into indehiscent akenes or follicles. . . . . .

B. Pistils 2–5. calyx cup-shaped or flat. . . . . .
C. Foliage pinnate: follicles 5–15: filaments narrowed at the base: herbs. . . . .12. ULMARIA.
CC. Foliage simple: akenes 2–5: shrubs. . . . . .
D. Fls. very small in large terminal panicles: carpels 2-ovuled: akenes dry, villous. . . . . .13. SCHIZONOTUS.
DD. Fls. solitary or in corymbs. carpels 1-ovuled: akenes glabrous. . . . . .
E. Petals wanting: fls. in few-fld corymbs: akenes, 2–5 drupaceous. . . . . .14. NEVIUSA.
EE. Petals present: fls. solitary, large. . .
F. Lvs. alternate: fls. 5-merous, yellow, akenes drupaceous, yellow . . . . . .15. KERRIA.
FF. Lvs. opposite: fls. 4-merous, white: akenes dry, black. . . . . .16. RHODOTYPUS.
BB. Pistils one: calyx more or less tubular. . . . . .17. ADENOSTOMA.

4 QUILLAJA TRIBE.

A. Radicle superior. . . . . .18. EUCRYPHIA.
AA. Radicle inferior. . . . . .
B. Follicles spreading. . . . . .19. QUILLAJA.
BB. Follicles slipper-shaped. . .20. KAGENECKIA.

5. RUBUS TRIBE.

A. Drupelets pulpy. . . . . .21. RUBUS.
AA. Drupelets nearly dry, inclosed by calyx. . . . . .22. DALIBARDA.

6. POTENTILLA TRIBE.

A. Style not elongated after anthesis. . . . . .
B. Carpels solitary: shrubs. . .
C. Fls. corymbose: lvs. 3-pinnafisect. . . . . .23. CHAMÆBATIA.
CC. Fls. solitary: lvs. 3-fid.24. PURSHIA.
BB. Carpels 2 or indefinite: herbs, rarely subshrubs. . . . . .
C. Receptacle very pulpy in fruit. . . . . .25. FRAGARIA.
CC. Receptacle not fleshy, even in fruit. . . . . .
D. Pistils only 1–12. . .
E. Stamens 5: petals minute. . . . . .26. SIBBALDIA.
EE. Stamens numerous: petals conspicuous. . . . . .27. WALDSTEINIA.
DD. Pistils very numerous. . . . . .
E. Petals white or yellow, obtuse or emarginate. . . . .28. POTENTILLA.
EE. Petals purple, abruptly acuminate, much smaller than calyx. . .29. COMARUM.
AA. Style elongated after anthesis, often plumose or geniculate. . . . . .30. CERCOCARPUS.
B. Pistil 1. . . . . .
BB. Pistils indefinite. . . . . .
C. Lvs. simple: styles long and plumy. . . .31. DRYAS.
CC. Lvs. pinnatisect: styles moderately long, straight or geniculate, glabrous, pilose or villous. . . . . .32. GEUM.

7. APPLE TRIBE (by A. Rehder).

A. Carpels bony at maturity; fr. hence with 1–5 stones.
B. Pistils with 2 fertile ovules: lvs. entire or crenate. . . . . .
C. Lvs. entire: spineless shrubs: styles 2–5. .33. COTONEASTER.
CC. Lvs. crenate, persistent: usually spiny shrubs: styles 5. . . .34. PYRACANTHA.
BB. Pistils with only 1 fertile ovule: lvs. usually doubly serrate or lobed.
C. Ovules, 2, one fertile and one sterile: lvs. simple, often pinnately lobed. . . . . .
D. Carpels 5, wholly connate and covered at the top by the flesh of the fr.: fls. solitary, 2 in. across, lvs. entire or occasionally dentate. . . . . .35. MESPILUS.
DD. Carpels 1–5, more or less distinct at the ventral suture and free at the top: fls. 1 in. or less across, usually in corymbs: lvs. often lobed. . .36. CRATÆGUS.
CC. Ovule but one: stones 5: lvs. pinnate (in the cultivated species). . . . . .37. OSTEOMELES.
AA. Carpels with leathery or papery walls at maturity; fr. hence, 1–5-celled, each cell with 1 or 2, rarely many seeds. . . . . .
B. Fls. in compound corymbs. . . . . .
C. Styles 1–5, distinct or connate; carpels partly free. . . . . .
D. Fruit solid and pointed at the top; walls of cells leathery; lvs. deciduous, simple or pinnate. . . .38. SORBUS.
DD. Fruit hollow and rounded at the top, small 1 or 2-seeded; walls usually papery; styles usually 2: lvs. simple, deciduous or evergreen. . . . . .39. PHOTINIA.
CC. Styles 5, distinct; carpels wholly connate: fr. pear-shaped, rather large, yellow: lvs. evergreen. . . . . .40. ERIOBOTRYA.
BB. Fls. in umbels, racemes or solitary. . . . . .
C. Carpels many-seeded: fls. solitary or clustered. . . . . .41. CYDONIA.
CC. Carpels 1-2-seeded. . . .
D. Cells of the ovary as many as styles, each with 2 ovules. . . .
E. Ovary 2-celled: fr. 1–2-seeded, black: fls. in upright racemes sometimes panicled: lvs. evergreen. . .42. RAPHIOLEPIS.
EE. Ovary 3–5-celled: fls. in umbels: lvs. deciduous. . . . .43. PYRUS.
DD. Cells of the ovary twice as many as styles, each with 1 ovule. . . . . .
E. Styles usually 5: fls. in racemes: lvs. serrate, or crenate at the apex. . . .44. AMELANCHIER.

EE. Styles 2–3: fls. in few-fld. umbels: calyx tube cylindric: lvs. entire or denticulate, narrow. ..... 45. PERAPHYLLUM.

8. ROSE TRIBE.

Sole genus. ..... 46. ROSA.

9. POTERIUM TRIBE.

A. Calyx with 5–6 bractlets or 10–12-cut in 2 series or in Agrimonia with a setose limb, ...
B. Petals 0. ..... 47. ALCHEMILLA.
BB. Petals 4 or 5. ..... 48. AGRIMONIA.
AA. Calyx without bractlets: petals 0: lvs. pinnate. ..
B. Fls. axillary, solitary.... 49. MARGYRICARPUS.
BB. Fls. spicate or capitate. .
C. Calyx valvate: stamens 1–10, short: carpels 1–2. ..... 50. ACENA.
CC. Calyx imbricate. .....
D. Fls. usually hermaphrodite: carpel 1: stamens 4–12: fr. rarely rugose. .... 51. SANGUISORBA.
DD. Fls. polygamo-dioecious rarely hermaphrodite: carpels 2: stamens indefinite: fr. often rugose. .. 52. POTERIUM.

54. SAXIFRAGACEÆ.

SUMMARY OF TRIBES.

A. Plants are trees or shrubs..
B. Lvs. opposite. .....
C. The lvs. simple. ..... 1. HYDRANGEA TRIBE.
CC. The lvs. simple, or composed of 3–5 lfts. or odd-pinnate. .... 2. CUNONIA TRIBE.
BB. Lvs. alternate. .....
C. Stipules absent: lvs. often coriaceous or glandular-serrate: stamens usually isomerous with petals. ..... 3. ESCALLONIA TRIBE.
CC. Stipules absent or adnate to petiole at base: fls. generally racemose: ovary 1-locular, 2-merous: seeds immersed in pulp. ..... 4. RIBES TRIBE.
AA. Plants are herbs. .....
B. Lvs. bear pitchers. The anomalous genus. .....
BB. Lvs. do not bear pitchers.
C. Fls. 4-merous, ... 5. FRANCOA TRIBE.
CC. Fls. generally 5-merous. 6. SAXIFRAGE TRIBE.

1. HYDRANGEA TRIBE.

A. Ovary superior. ..... 1. CEPHALOTUS.
B. No. of petals 4: stamens 10: filaments 2-lobed: styles 3. ..... 2. FENDLERA.
BB. No. of petals 5 or 6. .....
C. Ovules solitary: stamens 4–12: styles 3–5. ..... 3. WHIPPLEA.
CC. Ovules 4: stamens 15: carpels 2, separate.. 4. LYONOTHAMNUS.
CCC. Ovules numerous. .....
D. Petals 5, convolute: stamens 10: styles 2–5. ..... 5. JAMESIA.
DD. Petals 5 or 6, imbricate: stamens numerous: style 1, with a 5–7-lobed stigma. 6. CARPENTERIA.
AA. Ovary inferior or semi-superior. .....
B. Stamens 8, 10 or 12. .....
C. Petals induplicate or imbricate: fr. capsular. ..... 7. DEUTZIA.
CC. Petals valvate. .....
D. Fr. a capsule. .....
E. Styles 4 or 5, free or connate at the base: petals 4 or 5 ..... 8. HYDRANGEA.
EE. Style 1, with a 4–5-lobed stigma: petals 5. ..... 9. SCHIZOPHRAGMA.
DD. Fr. a berry: petals 5 or 6: styles 3–5, club-shaped. ..... 10. DICHROA.
BB. Stamens numerous, indefinite. .....
C. Petals induplicate, 7–10: style 1. ..... 11. DECUMARIA.
CC. Petals imbricate: styles 1–5. ..... 12. PHILADELPHUS.
CCC. Petals valvate. .....
D. Styles 2: petals 4. ..13. PLATYCRATER.
DD. Styles 3: petals 5. ..14. CARDIANDRA.

2. CUNONIA TRIBE.

Fls. cymose: calyx valvate: stamens hypogynous, very long: styles divaricate.... 15. ACROPHYLLUM.

2. ESCALLONIA TRIBE.

A. Petals imbricate: style 1: ovary 2- or 3-loculed.... 16. ESCALLONIA.
AA. Petals valvate: styles divisible into 2: ovary 2-loculed. ..... 17. ITEA.

4. RIBES TRIBE.

Sole genus. ..... 18. RIBES.

5. FRANCOA TRIBE.

Sepals and petals equal. ..... 19. FRANCOA.

6. SAXIFRAGE TRIBE.

A. Ovary 1-loculed. .....
B. Placentæ basilar or nearly so. ..... 20. TIARELLA.
BB. Placentæ parietal opposite the stigmas. ..... 21. PARNASSIA.
BBB. Placentæ parietal, alternate with stigmas. ....
C. Stamens 3: petals 5, capillary. ..... 22. TOLMIEA.
CC. Stamens 5–10. .....
D. Capsule not beaked, superior: petals 5, 3-cut or pinnatifid. 23. MITELLA.
DD. Capsule 2-beaked. ...
E. No. of stamens 5: petals 5 or 0: capsule inferior. .... 24. HEUCHERA.
EE. No. of stamens 8 or 10: capsule semi-superior. .....
F. Petals 0: stamens 8 or 10: fls. solitary.... 25. CHRYSOSPLENIUM.
FF. Petals entire or lobed: stamens 10: fls. racemose. ..... 26. TELLIMA.
AA. Ovary 2- or 3-loculed, the placentæ in the axis of the fruit, rarely composed of distinct carpels. .....
B. Stamens 5. (See also BB.) .....
C. Carpels united at base, adnate to calyx tube. 27. SULLIVANTIA.
CC. Carpels united and wholly adnate to calyx tube. ..... 28. SUKSDORFIA.
CCC. Carpels 2, united at base, free from but included in the inflated calyx. ..... 29. BOLANDRA.
BB. Stamens 10, rarely 8, (sometimes 5 in Boykinia). .....

c Calyx lobes valvate. . . .
b. Petals 0. . . . . 30. ROBERGIESIA.
bb. Petals 5, deciduous: stamens 5 or 10 . . 31. BOYKINIA.
cc. Calyx lobes imbricate. . .
b. Styles erect; petals 5 or 0; stamens 8 or 10. . . . . 32. ASTILBE.
bb. Styles mostly recurved in fruit; petals 5. . . . . 33. SAXIFRAGA.

55. CRASSULACEÆ.

A. Stamens usually as many as the petals. . . . . .
B. Petals free or connate only at the base: floral parts in 5's. . . . . 1. CRASSULA.
BB. Petals usually connate to the middle or beyond. .
c. Calyx bell-shaped, as long as the corolla tube. . . . . 2. GRAMMANTHES.
cc. Calyx many times shorter than the corolla tube. . . . . 3. ROCHEA.
AA. Stamens usually twice as many as the petals. . . . .
B. Petals free or connate only at the very base. .
c. Fls. usually 4–5-merous 4 SEDUM.
cc. Fls. 6-merous or more. 5. SEMPERVIVUM.
BB. Petals usually connate to the middle or beyond.
c. Calyx large, inflated, shortly 4 fid. . . . . 6. BRYOPHYLLUM.
cc. Calyx 4-parted. . . . . 7 KALANCHOE.
ccc. Calyx 5-parted. . . . . 8. COTYLEDON.

56. HAMAMELIDACEÆ.

A. Ovary locules 1-ovuled. . . .
B. Petals 0. . . . . .
c. Lvs. evergreen: stamens 2–8, the connective elongated: ovary superior. . . . . 1. DISTYLIUM.
cc. Lvs. deciduous. . . . . 2. PARROTIA.
D. Stamens 5–7. . . . . 3. FOTHERGILLA.
BB. Petals as many as calyx lobes. . . . . .
c. Fls. borne in catkins, 5-merous. . . . . 4. CORYLOPSIS.
cc. Fls. not borne in catkins, 4-merous. . . . . 5. HAMAMELIS.
AA. Ovary locules 2– or more ovuled. . . . . .
B. Fls. unisexual. . . . . 6. LIQUIDAMBAR.
BB. Fls. hermaphrodite. . . . .
c. The fls. 5, in a head, surrounded by an involucre of which the outer bracts are small, the inner gradually larger. . . . 7. RHODOLEIA.
cc. The fls. 2 together with very short bracts at the base. . . . . 8. DISANTHUS.

57. BRUNIACEÆ.

Ovary 3-loculed: petals not connate into a tube. . . . . 1. ARDOVINIA. (See article *Diosma*.)

58. HALORAGACEÆ.

A. Stamens 1–2: calyx 3–4-lobed: ovary 1-loculed. . . . 1. GUNNERA.
AA. Stamens 2–8: calyx truncate or 4-toothed: ovary deeply 2 or 4-grooved. . . . . 2. MYRIOPHYLLUM.

59. RHIZOPHORACEÆ.

Style 1: embryo not albuminous; calyx 4-merous. . . . 1. RHIZOPHORA.

60. COMBRETACEÆ.

A. Petals 0; calyx tube not produced beyond ovary. . . . 1. TERMINALIA.
AA. Petals 5 (0 in a few species of Combretum). . . . . .
B. Calyx tube straight, constricted above ovary . .
c. Cotyledons convolute. . . 2. POIVREA.
cc. Cotyledons deeply furrowed or twisted and plaited. . . . . 3. COMBRETUM.
BB. Calyx tube produced to a great length beyond the ovary. . . . . 4. QUISQUALIS.

61. MYRTACEÆ.

A. Ovary 1-loculed . . . . . 1 THRYPTOMENE.
AA. Ovary 2– or more loculed.
B. Fr. a capsule which is loculicidally dehiscent at apex, rarely 1–2-seeded and subindehiscent. . . . . .
c. Anthers basifixed. . . . 2 CALOTHAMNUS.
cc. Anthers versatile. . . .
D. Individual fls. pedicelled . . . . . .
E. Stamens 5-adelphous. . . . . 3. TRISTANIA.
EE. Stamens free. . . . . .
F. Fls. in globose heads. . . . . 4. SYNCARPIA.
FF. Fls. in forking cymes. . . . . 5. METROSIDEROS.
DD. Individual fls. not pedicelled. . . . . .
E. Fls. solitary in the axils of the floral lvs. or bracts. . .
F. Stamens free, not larger than petals. . . . . 6. LEPTOSPERMUM.
FF. Stamens free, long-exserted. . . 7. CALLISTEMON.
FFF. Stamens in clusters. . . . . 8. MELALEUCA.
EE. Fls. in cymose or umbellate heads. .
F. Petals distinct. . .
FF. Petals wanting (or adnate to the calyx lid). . 9. ANGOPHORA.
BB. Fr. a berry or rarely an indehiscent drupe: lvs. opposite, punctate. . . .
c. Stamens straightish in the bud: seeds albuminous. . . . . 11. FEIJOA.
cc. Stamens inflexed or involute in the bud: seeds not albuminous. . . . . .
D. Calyx limb closed in bud, deeply divided in anthesis. . . . . 12. PSIDIUM.
DD. Calyx 4–5-lobed or parted in the bud, not cut deeper in anthesis. . . . . 13. PIMENTA.
E. Ovules pendulous. . .
EE. Ovules not pendulous. . . . . .
F. Embryo thick and fleshy. . . . . 14. EUGENIA.
FF. Embryo curved, circular or spiral.
G. Ovary 2–3, rarely 4-loculed; locules with indefinite no. of ovules. . . 15. MYRTUS.
GG. Ovary theoretically 1–3-loculed, but locules divided by spurious septa, the numerous locellæ 1-seeded. . . . . 16. RHODOMYRTUS.

BBB. Fr. woody or fleshy, indehiscent or opening at the top by a lid. .....
C. The fr. globose, woody, opening by a lid: calyx imbricate.17. BERTHOLLETIA.
CC. The fr. fleshy: calyx valvate. .....18. NAPOLEONA.

62. MELASTOMACEÆ.

SUMMARY OF TRIBES. (Excluding 5 tribes not represented in this work, and following Cogniaux in D. C. Monog. Phaner. vol. 7 (1891).

A. Fruit capsular, (rupturing regularly in Melastoma): stamens usually unequal..
B. Ovary and capsule 3–5-angled or winged, much dilated and hollowed out at apex. .....
C. Ovary cells as many as petals. .....1. SONERILA TRIBE.
CC. Ovary 3-loculed: petals 5, rarely 4. .....2. BERTOLONIA TRIBE.
BB. Ovary and capsule terete or angular, convex or conical at the top. ...
C. Connective rarely produced below the locules, usually with posterior spur or appendage. .....3. RHEXIA TRIBE.
CC. Connective usually elongated at the base, produced beyond the insertion of the filament into an appendage or wing on the anterior side.
D. Seeds shaped like a snail-shell. .....
E. Ovary generally adherent to calyx: calyx lobes usually alternating with long, stellate hairs. .....4. OSBECKIA TRIBE.
EE. Ovary generally free: no stellate hairs. .....5. TIBOUCHINA TRIBE.
DD. Seeds oblong or ovoid.6. MICROLICIA TRIBE.
AA. Fr. berry-like or leathery, rupturing irregularly: stamens generally equal...
B. Lvs. not striolate between the primary nerves. ...
C. Connective usually appendaged or spurred on the posterior side.7. DISSOCHÆTA TRIBE
CC. Connective rarely produced at the base, usually not appendaged. .....8. MICONIA TRIBE.
BB. Lvs. striolate between primary nerves with very numerous transverse nervelets. .....9. BLAKEA TRIBE.

1. SONERILA TRIBE.

A. Fls. 5-merous: stamens equal: connective with a posterior spur but no anterior appendage: ....1. GRAVESIA.
AA. Fls. mostly 3-merous: stamens unequal, those opposite petals smaller. ...2. SONERILA.
AAA. Fls. mostly 4-merous; stamens equal: connective not produced. .....3. PHYLLAGATHIS.

2. BERTOLONIA TRIBE.

A. The connective not appendaged on the anterior side. .....
B. Connective tuberculate on the posterior side at the base. .....4. BERTOLONIA.
BB. Connective with a short posterior spur and a long ascending appendage. .....5. SALPINGA.
AA. The connective with a spur on the anterior side and a tubercle on the posterior side. .....6. MONOLENA.

3. RHEXIA TRIBE.

Stamens equal or subequal: ovary glabrous. .....7. RHEXIA.

4. OSBECKIA TRIBE.

Stamens unequal: connective of the larger ones long-produced at base: fr. bacate: fls. not involucrate..8. MELASTOMA.

5. TIBOUCHINA TRIBE.

A. Stamens unequal; ovary 2–4-celled, usually glabrous: petals not acute: connective of larger stamens with a long, club-shaped, 2-fid. appendage..9. HEERIA.
AA. Stamens equal; ovary setose at apex: connective with 2 lobes or tubercles on the anterior side, and no posterior appendage. ....10. TIBOUCHINA.

6. MICROLICIA TRIBE.

Stamens unequal; anthers short, not beaked: calyx lobes shorter than tube....11. CENTRADENIA.

7. DISSOCHAETA TRIBE.

Stamens equal or nearly so: fls. mostly 4–5-merous....12. MEDINILLA.

8. MICONIA TRIBE.

A. Inflorescence terminal. ....
B. Lvs. provided with 2-lobed bladders at base. .....13. TOCOCA.
BB. Lvs. not provided with bladders: outer calyx lobes none or inconspicuous. .....14. MICONIA.
AA. Inflorescence lateral or axillary: petals obtuse: connective not produced at base. .....15. CLIDEMIA.

9. BLAKEA TRIBE.

The plants described as Amaraboya are now referred to the genus Blakea. .....16. AMARABOYA.

63. LYTHRACEÆ.

A. Ovary inferior. .....1. PUNICA.
AA. Ovary superior. .....
B. Calyx tubular, curved or gibbous at base. .....2. CUPHEA.
BB. Calyx straight. .....
C. Capsule and ovary all included by calyx tube. .....
D. Petals 5, rarely 4: stamens 8–10. ....3. DECODON.
DD. Petals 6: stamens mostly 6 or 12. ...4. LYTHRUM.
CC. Capsule not all included in calyx tube. ...
D. The calyx 4-parted: petals 4: stamens 8.5. LAWSONIA.
DD. The calyx 6-fid: petals 6: stamens numerous. .....6. LAGERSTRŒMIA.

64. ONAGRACEÆ.

A. Ovary 1–4-celled: cells 1-ovuled, rarely 2–4-ovuled: fr. nut-like, 1–4-celled, 1–4-seeded. .....

B. Fls. 2-merous; ovary 1–2-celled. ..... 1. CIRCEA.
BB. Fls. 4 merous; ovary 2-celled. ..... 2. TRAPA.
BBB. Fls. 3–4-merous; ovary 4-celled, rarely 3-celled. 3. GAURA.
AA. Ovary 2–6-celled, cells many –ovuled; fr. a capsule (in Fuchsia a berry). .....
B. Stamens 1 or 2. ..... 4. LOPEZIA.
BB. Stamens 4–8, rarely 3. ..
C. Seeds bearded. .....
D. Calyx broadened out above ovary into a funnel-shaped tube. 5. ZAUSCHNERIA.
DD. Calyx hardly produced beyond ovary. 6. EPILOBIUM.
CC. Seeds not bearded or winged. .....
D. Calyx usually long-produced beyond ovary (except in some Oenotheras) .
E. Stamens 4. ..... 7. EUCHARIDIUM.
EE. Stamens 8. .....
F. Fr. a capsule ... 8. ENOTHERA.
FF. Fr. a berry ..... 9. FUCHSIA.
DD. Calyx not or hardly produced beyond ovary. .....
E. Capsule loculicidal. 10. CLARKIA.
EE. Capsule septicidal..
F. Stamens 8-12. ... 11. JUSSIEUA.
FF. Stamens 3–6. ... 12. LUDWIGIA.

65. LOASACE.E.

A. Petals hooded. .....
B. Capsule 3–5 valved at apex, rarely twisted. .. 1. LOASA.
BB. Capsule longitudinally 5–10-valved, usually twisted spirally. ..... 2. BLUMENBACHIA.
AA. Petals not hooded. .....
B. Seeds very numerous, arranged in many series. 3. EUCNIDE.
BB. Seeds few or if numerous arranged in 2 series. 4. MENTZELIA.

66. PASSIFLORACE.E.

A. Fls. mostly unisexual, male fls. tubular, females 5-petaled; corona 0. ..... 1. CARICA.
AA. Fls. hermaphrodite; corona single or double. .....
B. Calyx tube long; petals and stamens 5. ..... 2. TACSONIA.
BB. Calyx tube short; petals 4–5, rarely 0; stamens 4–5. ..... 3. PASSIFLORA.

67. CUCURBITACE.E.

SUMMARY OF TRIBES.

A. Series I. Ovules horizontal. 1. CUCUMBER TRIBE.
AA. Series II. Ovules erect or ascending, rarely horizontal. .....
B. Fruit ruptures elastically. 2. CYCLANTHERA TRIBE.
BB. Fruit does not rupture elastically. ..... 3. ABOBRA TRIBE.
AAA. Series III. Ovules pendulous. ..... 4. SICYOS TRIBE.

1. CUCUMBER TRIBE.

A. Anther cells straight, rarely curved, not flexuous. ... 1. MELOTHRIA.
AA. Anther cells flexuous or conduplicate. .....
B. Corolla bell-shaped, 5-lobed to the middle or a little below. .....
C. Anthers free. ..... 2. SICANA.
CC. Anthers coherent. .....
D. Filaments connate. ... 3. COCCINIA.
DD. Filaments free. ..... 4. CUCURBITA.
BB. Corolla rotate and 5-petaled or bell-shaped and 5-parted to the base. .....
C. Petals fimbriate or tendril-bearing. .....
D. Seeds large, fibrous. 5. TELFAIREA.
DD. Seeds small, not fibrous. ..... 6. TRICHOSANTHES.
CC. Petals entire. .....
D. Calyx tube of male fls. long; anthers coherent in an oblong head, usually included. .....
E. Pistillodes 1–3, subulate or setiform. 7. GYMNOPETALUM.
EE. Pistillode absent or reduced to a gland. .....
F. Anthers coherent 8. PEPONIA.
FF. Anthers free. .... 9. LAGENARIA.
DD. Calyx tube of male fls. short; anthers free or slightly coherent, usually exserted. .....
E. Stamens inserted in the mouth of the calyx. .....
F. Scales in bottom of calyx 1. ..... 10. THLADIANTHA.
FF. Scales in bottom of calyx 2-3. ... 11. MOMORDICA.
EE. Stamens inserted in calyx tube. .....
F. Male fls. in racemes. .....
G. Fruit, dry, fibrous, dehiscent by lid at top .... 12. LUFFA.
GG. Fruit fleshy, not fibrous..
H. Female fls. solitary. ..... 13. ECBALLIUM.
HH. Female fls. racemose or clustered. 14. BRYONIA.
FF. Male fls. solitary or fascicled. ...
G. Calyx lobes somewhat leafy, serrate, reflexed. 15. BENINCASA.
GG. Calyx lobes awl-shaped, entire, erect. .....
H. Pollen minutely muricate; pistillode, none. ..... 16. BRYONOPSIS.
HH. Pollen smooth; pistillode reduced to a small gland..
I. Tendrils not branched; connective usually produced upwards beyond locule. ..... 17. CUCUMIS.
II. Tendrils 2–3-fid; connective not produced. ..... 18. CITRULLUS.

2. CYCLANTHERA TRIBE.

A. Fr. oblique, gibbous, rupturing elastically. ..... 19. CYCLANTHERA.
AA. Fr. not gibbous, opening by 1 or 2 pores at the top or by irregular rupture. ... 20. ECHINOCYSTIS. (Including *Megarrhiza*).

3. ABOBRA TRIBE

Anther cells flexuous: stamens free. ..... 21. ABOBRA.

4. SICYOS TRIBE.

Fls. 5-merous, monœcious; fr. fleshy. ..... 22. SECHIUM.

68. BEGONIACEÆ.

Ovary inferior: fr. rarely a berry, generally a capsule dehiscing below the perianth limb. ..... 1. BEGONIA.

69. CACTACEÆ.

For synopsis of genera see article "Cacti" also Lenchtenbergia and Nopalea.....

70. MESEMBRYANTHACEÆ OR FICOIDEÆ.

A. Petals numerous: capsule 5 or more valved. ..... 1. MESEMBRYANTHEMUM.
AA. Petals 0; drupe 3–8-stoned. 2. TETRAGONIA.

71. UMBELLIFERÆ.

SUMMARY OF TRIBES *(omitting two not in cultivation)*.

A. Umbels simple or irregularly compound, rarely regularly compound (Eryngium has fls. in heads): oil tubes absent. .....
B. Fr. laterally compressed or constricted on the commissure which is usually narrow. ..... 1. HYDROCOTYLE TRIBE.
BB. Fr. with a broad or subterete commissure or the commissure compressed on the back.... 2. SANICULA TRIBE.
AA. Umbels compound: oil tubes present. .....
B. The intervals thickened above the oil tubes or provided with second ary ridges. ..... 3. CAUCALIS TRIBE.
BB. The primary ridges only are conspicuous. .....
C. Fr. laterally compressed or constricted on the commissure. ..... 4. AMMINUM TRIBE.
CC. Fr. subterete in transverse section or dorsally compressed; commissure broad; lateral ridges either distinct or coalesced into a margin which is not dilated but perviform or suberose thickened. .... 5. SESELI TRIBE.
CCC. Fr. strongly compressed dorsally; lateral ridges dilated into winged-shaped or broadly tumid margin which is entire before dehiscence. ...6. PEUCEDANUM TRIBE.

1. HYDROCOTYLE TRIBE.

A. Stipules small, scarious. ... 1. HYDROCOTYLE.
AA. Stipules absent. ..... 2. TRACHYMENE.

2. SANICULA TRIBE.

A. Fls. in heads, all sessile.... 3. ERYNGIUM.
AA. Fls. in umbels, the males or all pedicelled: fr. densely bristly or tuberculate.... 4. SANICULA.

3. CAUCALIS TRIBE.

A. Fr. prickly or bristly. ..... 5. DAUCUS.
AA. Fr. glabrous: ridges obtuse, smooth or wrinkled. ....
B. Shape of fr. subglobose: involucre 0. ..... 6. CORIANDRUM.
BB. Shape of fr. narrowly oblong; involucre composed of slender bracts. 7. CUMINUM.

4. AMMINUM TRIBE.

A. Fr. Broadly ovate or didymous; seed deeply grooved or excavated on the face margins often involute. .....
B. Carpophore 0 or adnate to carpels. ..... 8. ERIGENIA.
BB. Carpophore undivided or shortly 2-fid. .....
C. Calyx teeth obsolete... 9. CONIUM.
CC. Calyx teeth conspicuous. ..... 10 MUSENIUM.
AA. Fr. ovate, didymous or oblong; seed flat or convex on the face or hardly concave: (Exceptions: seed deeply grooved in many species of Bupleurum, slightly concave in a few species of Carum and Pimpinella). .....
B. Petals broad, yellow, inflexed or induplicate at the obtuse apex. ..... 11. BUPLEURUM.
BB. Petals white or yellow, sometimes inflexed—acuminate at apex, sometimes flattish or concave with apex obtuse or acute. .....
C. Oil tubes solitary in the intervals. .....
D. Petals white, entire. 12. APIUM.
DD. Petals white or yellow, retuse, emarginate or 2-lobed. ...
E. Stylopodium conical. 13. CARUM.
EE. Stylopodium flat or wanting. ..... 14 ZIZIA.
CC. Oil tubes more than are in the intervals..
D. Carpophore 2-fid or 2-parted. ..... 15. PIMPINELLA.
DD. Carpophore obsolete or undivided. ..... 16 SIUM.
CCC. Oil tubes absent. ..... 17. ÆGOPODIUM.
AAA. Fr. oblong or linear, rarely ovate and never didymus: seeds grooved on the face. .....
B. Oil tubes more than one. 18. OSMORHIZA.
BB. Oil tubes solitary in the intervals or 0. .....
C. Fr. subrostrate: ridges much elevated, almost wing-shaped. ..19. MYRRHIS.
CC. Fr. long beaked: ridges not very prominent..20. SCANDIX.

5. SESELI TRIBE.

A. Fr. transversely subterete: primary ridges subequal, not winged. ..... 21. FŒNICULUM.
AA. Fr. dorsally compressed dorsal and intermediate ridges slightly prominent but not winged or only very narrowly winged, the lateral ridges expanded into distinct wings. ..
B. Oil tubes solitary. .....
C. Lateral wings thickish: bracts of involucre connate at base. ... 22. LEVISTICUM.
CC. Lateral wings membranous; bracts of involucel bristle-like or 0. 23. ANGELICA.
BB. Oil tubes more than one. 24. ARCHANGELICA.
AAA. Fr. dorsally compressed or subterete; all ridges or only the keel ridges more or less expanded into thickish wings; wings equal or the lateral ones wider. .....
B. Oil tubes more than one.
BB. Oil tubes solitary in the intervals. ..... 25. LIGUSTICUM.
C. Fls. yellow. ..... 26. THASPIUM.
CC. Fls. white or yellowish green. ..... 27. SELINUM.

6. PEUCEDANUM TRIBE.

A. Oil tubes more than one or obscure, rarely solitary: carpels hardly convex. . .28. FERULA.
AA. Oil tubes solitary, rarely in 2's or 3's. . . . . .
B. The oil tubes often shorter than the fr. rarely touching at base. . . . .29. HERACLEUM.
BB. The oil tubes touching at the base, rarely shorter than the fr. . . . . .30. PEUCEDANUM.

NOTE. Under *Peucedanum* in this work are mentioned Anethum, Lomatium, Pastinaca, Petroselinum Tiedemannia and Tommasinia, all of which are best considered separate genera. Some of these are distinguished by Coulter and Rose as follows:

C. Fr. not strongly flattened dorsally, usually more or less laterally flattened. . . .31. PETROSELINUM.
CC. Fr. strongly flattened dorsally, with lateral ribs more or less prominently winged.
D. Oil tubes solitary in the intervals. . . .
E. Stylopodium conical.32. OXYPOLIS.
EE. Stylopodium flat or wanting. . . . .33. PASTINACA.
DD. Oil tubes more than one in the intervals.34. LOMATIUM.

72. ARALIACEÆ.

A. Petals more or less imbricate, broadly affixed at base. . . . . .
B. Gynecium 2-merous: fr. transversely subterete..1 DELARBREA.
BB. Gynecium 2–5-merous: fr. angled when dry. . .2. ARALIA.
AA. Petals valvate. . . . . .
B. Albumen ruminate. . . . . .
C. Styles free or connate at base . . . . . .3. OREOPANAX.
CC. Styles connate in a cone or short column. . . . .4. HEDERA.
BB. Albumen equable. . . . . .
C. Gynecium 5-merous or more, rarely 3–4-merous: carpels as many as or more than the petals. . . . . .
D. Styles distinct from the base or a little above it. . . . . .
E. Fls. dioecious: petals of females continuous with calyx tube. . . . . .5. HELWINGIA.
EE. Fls. hermaphrodite or polygamous. . .6 POLYSCIAS.
DD. Styles coalesced at the base or all the way into an umbonate cone or column. . . . . .
E. Pedicel jointed under fl. . . . . .7. ELEUTHEROCOCCUS.
EE. Pedicel continuous with fl. . . . . .
F. Fls. 8–12-merous. . .8. TREVESIA.
FF. Fls. 5-merous. . . .9. DENDROPANAX.
CC. Gynecium 2-merous (rarely 1- 3- or 4-merous): carpels as many as or fewer than the petals: styles distinct at or above the base. .
D. Pedicels jointed under fl. . . . . .10.PANAX.
DD. Pedicels continuous with fl. . . . . .
E. Styles filiform distinct from base up: stigma small, terminal. . . . . .11. FATSIA.
EE. Styles very short, placed on a cone, or longer and connate beyond the middle, introrsely stigmatose. . . . . .12. ACANTHOPANAX.

73. CORNACEÆ.

A. Fls. hermaphrodite. . . . . .
B. Petals strap-shaped, valvate: anthers long, basifixed: style long. . .1. ALANGIUM.
BB. Petals short, valvate: anthers short, affixed on back: style short. . .2. CORNUS.
AA. Fls. unisexual. . . . . .
B. Lvs. opposite. . . . . .
C. Fls. paniculed: petals 4: ovule 1. . . . . .3. AUCUBA.
CC. Fls. in aments or spikes: petals 0: ovules 2. . . . . .4. GARRYA.
BB. Lvs. alternate. . . . . .
C. Stamens 4: petals in male fls. 4. . . . . .5. GRISELINIA.
CC. Stamens 4 or more: petals in male fls. 0, 4 or more. . . . . .6. NYSSA.

74. CAPRIFOLIACEÆ.

A. Corolla rotate or nearly so; limb regular: style short, deeply 2–5-cut. . . . . .
B. Lvs. pinnately cut. . . . .1. SAMBUCUS.
BB. Lvs. simple. . . . . .2. VIBURNUM.
AA. Corolla tubular or bell shaped; limb usually irregular: style long usually with capitate stigma.
B. Ovary 2–5-celled: all the cells 1-ovuled. . . . . .3. TRIOSTEUM.
BB. Ovary 3–4-celled: one or two cells 1-ovuled, the others with numerous ovules. . . . . .
C. Calyx limb cup-shaped, 4–5-toothed: berry 4-celled, 2-seeded. . . . .4. SYMPHORICARPOS.
CC. Calyx tube narrow, lobes long: fr. leathery, long, 3-celled, 1-seeded. . . . . .5. ABELIA.
CCC. Calyx lobes lanceolate: fr. leathery, subglobose, 3-celled, many-seeded. . . .6. LINNÆA.
BB. Ovary 2–5-celled: cells all many ovuled. . . . . .
C. Fr. a 2–3-celled, few-seeded berry. . . . . .7. LONICERA.
CC. Fr. a 2-celled, many-seeded capsule. . . . .8. DIERVILLA.

75. RUBIACEÆ.

(Ignoring exceptions and omitting eight tribes not within the scope of this work.) . . . . . .
A. No. of ovules in each locule indefinite. . . . . .
B. Fr. dry, capsular or 2–5-berried or nutlike. . . .
C. Fls. compacted or confluent into a spherical head. . . . . .1. NAUCLEA TRIBE.
CC. Fls. not disposed in a spherical head. . . . .
D. Seeds winged or appendaged, albuminous: capsule 2-celled. . . . . .2. CINCHONA TRIBE.
DD. Seeds not winged. . . .
E. Corolla valvate. . . .
F. Seeds albuminous: capsule 2-celled. . . . . .3. CONDAMINEA TRIBE.
FF. Seeds minute: fr. indehiscent, 2-

berried or capsular, 2–4 celled. . 4. HEDYOTIS TRIBE.
EE. Corolla imbricate or convolute: capsule 2-celled: seeds albuminous. 5. RONDELETIA TRIBE.
BB. Fl. fleshy, bursting irregularly or dehiscent at apex, or a drupe with 2 or more stones, the stones many-seeded . . . .
C. Corolla valvate: seeds numerous minute, angled. . . . . 6. MUSSÆNDA TRIBE.
CC. Corolla imbricate or convolute: seeds numerous, minute often angled. . . . . 7. HAMELIA TRIBE. .
CCC. Corolla strictly convolute: seeds numerous or few, large and compressed or smaller and angled. . . . . 8. GARDENIA TRIBE.
AA. No. of ovules in each locule 1. . . . . .
B. Radicles superior. . . . . .
C. Stamens inserted at base of corolla: corolla valvate or imbricate. . . . . 9. CHIOCOCCA TRIBE.
CC. Stamens inserted at throat of corolla. . . .
D. Corolla strictly convolute. . . . . 10. ALBERTA TRIBE.
DD. Corolla valvate. . . . 11. VANGUERIA TRIBE.
BB. Radicles inferior. . . . . .
C. Corolla strictly convolute. . . . . 12. IXORA TRIBE.
CC. Corolla valvate. . . . . .
D. Ovules affixed to septum, rarely basilar, generally amphitropous: trees and shrubs. . . . . 13. MORINDA TRIBE.
DD. Ovules affixed to septum, amphitropous or anatropous: herbs. . . . . 14. GALIUM TRIBE.
DDD. Ovules basilar, erect, anatropous. . . . . .
E. Stamens inserted on the throat of the corolla: fr. indehiscent: style entire or with short branches. . . . . 15. PSYCHOTRIA TRIBE.
EE. Stamens inserted on the throat, rarely at base of corolla: fr. capsular or 2-berried: style branches filiform. 16. PÆDERIA TRIBE.
EEE. Stamens inserted at base of corolla, rarely on throat: fr. berry-like or indehiscent: style entire or with long branches. . . 17. ANTHOSPERMA TRIBE.

1. NAUCLEA TRIBE.

Calyx tubes confluent; fr. a globose, fleshy syncarp; ovary 2-celled; ovules solitary, pendulous. . . . . 1. CEPHALANTHUS.

2. CINCHONA TRIBE.

A. Corolla valvate. . . . . .
B. Placentæ ascending from the base of the septum or erect. . . . . 2. MANETTIA.
BB. Placentæ adnate to the middle of the septum:
C. Capsule septicidal. . . . 3. CINCHONA.
CC. Capsule loculicidal. . . . 4. BOUVARDIA.
AA. Corolla imbricate; stamens inserted in the throat or tube. . . . . 5. LUCULIA.

3. CONDAMINEA TRIBE.

One calyx lobe dilated into an ample colored blade. . . . . 6. PINCKNEYA.

4. HEDYOTIS TRIBE.

A. Calyx lobes unequal; capsule loculicidal. . . . . 7. PENTAS.
AA. Calyx lobes equal; capsule loculicidal at the top . . . 8. HOUSTONIA.

5. RONDELETIA TRIBE.

Corolla imbricate, lobes equal or nearly so. . . . . 9. RONDELETIA.

6. MUSSÆNDA TRIBE.

Inflorescence terminal corymbose; ovary 1–2-celled; calyx lobes 5, one dilated and colored. . . . . 10. MUSSÆNDA.

7. HAMELIA TRIBE.

A. Corolla imbricate, 5-ribbed; berry 5-celled . . . . . 11. HAMELIA.
AA. Corolla imbricate, 4–5-lobed; berry 2–3-celled. . 12. HOFFMANNIA.

8. GARDENIA TRIBE.

A. Inflorescence usually terminal. . . . . .
B. Corolla tube short. . . . . 13. BURCHELLIA.
BB. Corolla tube long. . . . . .
C. Calyx 5-toothed. . . . . 14. POSOQUERIA.
CC. Calyx lobes large and leafy. . . . . 15. LEPTACTINIA.
AA. Inflorescence usually axillary. . . . . .
B. Style has a spindle or club-shaped stigma, entire or 2-toothed. . . . . .
C. Seed coat membranous.
D. Calyx limb various: ovary 2-celled. . . . 16. RANDIA.
DD. Calyx limb often tubular: ovary 1-celled. . . . . 17. GARDENIA.
CC. Seed coat fibrous or subfibrous. . . . . .
D. Corolla tube long and slender. . . . . 18. OXYANTHUS.
DD. Corolla tube short. . .
E. Calyx 5-parted. . . . 19. MITRIOSTIGMA.
EE. Calyx truncate or 5-toothed. . . . . 20. GENIPA.
BB. Style branches 2, distinct, (except sometimes in Kraussia.) . . . . . .
C. Throat of corolla bearded. . . . . 21. KRAUSSIA.
CC. Throat of corolla glabrous. . . . . 22. TRICALYSIA.

9. CHIOCOCCA TRIBE.

Corolla valvate; inflorescence axillary, racemose; anthers dorsifixed; stigma club-shaped. . . . . 23. CHIOCOCCA.

10. ALBERTA TRIBE.

Inflorescence terminal; the 2–4 calyx lobes dilated; anthers pilose on back. . . . . 24. ALBERTA.

11. VANGUERIA TRIBE.

A. Drupe 1–2-stoned. . . . . 25. PLECTRONIA.
AA. Drupe 3–6-stoned. . . . . 26. VANGUERIA.

12. IXORA TRIBE.

A. Fls. clustered in axils. . . . . 27. COFFEA.
AA. Fls. in 2–3-forking corymbs.
B. Style branches 2, short, rarely connate: lvs. leathery. . . . . 28. IXORA.
BB. Style very far exserted,

the slender spindle-shaped stigma usually long; lvs. usually membranous. .....29. PAVETTA.

13. MORINDA TRIBE.

A. Fls. confluent in heads, which are many-fld., solitary or umbellate. .....30. MORINDA.
AA. Fls. free: calyx limb 4–5-fid.: corolla villous at throat: stigma club-shaped, 2–4-lobed: drupe 1–4 stoned: inflorescence axillary. .....31. DAMNACANTHUS.

14. GALIUM TRIBE.

A. Corolla funnel-shaped or somewhat tubular. .....
B. Fls. 4-merous, with or without bracts but no bractlets: style-branches subequal. .....32. ASPERULA.
BB. Fls. 4–5-merous, bracted and with 2 bractlets: style branches unequal.33. CRUCIANELLA.
AA. Corolla rotate or rotate-campanulate. .....
B. Fls. 5-merous .....34. RUBIA.
BB. Fls. 4-merous. .....35. GALIUM.

15. PSYCHOTRIA TRIBE.

Inflorescence terminal; calyx usually 5-toothed: corolla 5-lobed, rarely 4-lobed, tube usually short. .....36. PSYCHOTRIA.

16. PLEDERIA TRIBE

Ovary 2-celled: stigma 2, capillary, twisted. .....37. PLEDERIA.

17. ANTHOSPERMA TRIBE.

A. Stamens inserted in throat: style branches 4 .....38. MITCHELLA.
AA. Stamens inserted at or near base of corolla .....
B. Fls. hemaphrodite: style shortly 2-cut: shrub. ...39. SERISSA.
BB. Fls. unisexual or hermaphrodite: style 2-parted to the base or near it: herbs. .....
c. Plants are creeping herbs. .....40 NERTERA.
cc. Plants are shrubs or small trees. .....41. COPROSMA.

76. VALERIANACEÆ.

A. Stamens 4. .....1. PATRINIA.
AA. Stamens 1, rarely 2: corolla tube spurred. .....2. CENTRANTHUS.
AAA. Stamens usually 3. .....
B. Calyx limb finally pappiform. .....3. VALERIANA.
BB. Calyx limb various but not pappiform. .....4. VALERIANELLA.

77. DIPSACACEÆ.

A. Stigma terminal, straight: fls. densely crowded in the axils of the floral lvs. forming whorls after the manner of the mint family. .....1. MORINA.
AA. Stigma oblique or lateral, rarely straightish: fls. in terminal heads. .....
B. Bracts of involucre generally herbaceous: chaff of receptacle rigidly awl-shaped acuminate or spinescent; corolla 4-fid. .....2. DIPSACUS.
BB. Bracts and chaff rigidly paleaceous, rarely subherbaceous; corolla 4-fid. .....3. CEPHALARIA.
BBB. Bracts leafy, in about 2 series: chaff short, or very narrow or abortive; corolla 4–5-cut. .4 SCABIOSA.

78. COMPOSITÆ (Summary of Tribes).

Series 1. TUBULIFLORÆ. Corollas tubular and regular in all the hermaphrodite flowers.

A. Heads composed entirely of disc flowers which are all perfect and never truly yellow. .....
B. Style branches awl-shaped, acute, minutely hairy, lvs generally alternate: anthers sagittate at base. ..... 1. VERNONIA TRIBE.
BB. Style branches subterete, obtuse, covered with minute papillæ: lvs. opposite or alternate: anthers subentire at base .....2. EUPATORIUM TRIBE.
AA. Heads with all perfect or some imperfect flowers with or without rays and often yellow. .....
B. Anthers tailed. .....
c. Style branches linear: heads with or without rays. .....3. INULA TRIBE.
cc. Style branches united or short: heads without rays. Typically with spiny or scarious appendaged, many-bracted involucre and fleshy receptacle. .....4. CYNARA TRIBE.
BB. Anthers not conspicuously tailed. .....
c. Style branches in disc fls. flattened out, and with a distinct though sometimes very short terminal appendage. .....5. ASTER TRIBE.
cc. Style branches not flattened out. .....

NOTE. It is impossible to make a key to separate the following tribes from one another. Some of the important characters are italicized:

Receptacle chaffy or rarely naked under the sterile disc fls.: style branches truncate or appendaged or the style of the sterile fls. undivided: *pappus* sometimes absent but generally of 2–4-*awns* which are slender or somewhat chaffy and with or without intermediate scales which are free or connate at base: *lvs. opposite*, rarely alternate.6. HELIANTHUS TRIBE
Receptacle naked: style branches truncate or appendaged: pappus usually chaffy, rarely of awns or bristles, or absent: *lvs. opposite or alternate: involucral bracts in 1 or 2 series*, rarely 3–4, *herbaceous or membranous. Herbage often resinous-dotted.* 7. HELENIUM TRIBE.
Receptacle chaffy or naked: style branches truncate: *pappus* when present *crown-shaped*, rarely of short chaff: lvs mostly alternate: *involucral bracts* in 2 or more series *dry or scarious at apex*.8. ANTHEMIS TRIBE.
Receptacle usually naked:

style branches truncate or appendaged: *pappus* usually of *bristles*; *lvs.* mostly alternate: *outer involucral bracts in one series, subequal, the outer ones small or wanting*, or rarely all imbricate in numerous series. .....9. SENECIO TRIBE.

Receptacle naked: style branches truncate or the style of the sterile fls undivided: *pappus absent or wool-like*: *lvs. usually alternate or radical*: involucral bracts in 1–2 series, subequal, *no outer*.10. CALENDULA TRIBE.

Receptacle naked, chaffy or alveolate: style branches rounded at apex, obtuse or rarely truncate or the style of the sterile fls. undivided: pappus absent, or chaffy or crown-shaped: *lvs. radical or alternate: involucral bracts* in an *indefinite* number of series, often scarious at apex or spinescent. ...11. ARCTOTIS TRIBE.

Series II. LABIATIFLORÆ.
Corollas of all or only of the hermaphrodite fls. bilabiate. .....12. MUTISIA TRIBE.

Series III. LIGULIFLORÆ.
Corollas all ligulate and flowers hermaphrodite. ....11. CICHORIUM TRIBE.

1. VERNONIA TRIBE.

A. Genus anomalous with enlarged palmately quasi-ligulate outer corollas. ....1. STOKESIA.
AA. Genus normal with tubular 5-lobed corollas. .....2. VERNONIA.

2. EUPATORIUM TRIBE.

A. Anthers truncate at apex, not appendaged: akenes 5-angled, secondary ribs not prominent. .....3. PIQUERIA.
AA. Anthers appendaged .....
B. Akenes 5-ribbed, no secondary ribs visible. .....
C. Pappus wholly of capillary bristles. .....
D. Involucral bracts 4. ..4. MIKANIA.
DD. Involucral bracts more than 4. ....5. EUPATORIUM. (see also *Conoclinium*.)
CC. Pappus chaffy, awned, blunt or crown-shaped. .....6. AGERATUM.
BB. Akenes 10-ribbed, (rarely 7–8-ribbed), secondary ribs conspicuous. .....
C. Involucral bracts not herbaceous, striate-nerved, conspicuously so when dry. .....7. BRICKELLIA.
CC. Involucral bracts somewhat herbaceous or partly colored, inconspicuously striate if at all. .....
D. The outer bracts successively shorter. ..8. LIATRIS.
DD. The bracts nearly all equal in length. ...9. TRILISA.

3. INULA TRIBE.

A. The fls. containing both stamens and pistil all sterile; heads monœcious or diœcious. .....
B. Pappus bristles united at the base in a ring. ....
C. Heads strictly diœcious: corymbose: rarely solitary. .....10. ANTENNARIA.
CC. Heads containing one or both sexes, monœcious or diœcious, crowded in a small cluster or cyme surrounded by a long conspicuous involucre. .....11. LEONTOPODIUM.
BB. Pappus bristles free. ....12. ANAPHALIS.
AA. The fls. containing both stamens and style usually fertile. .....
B. Heads composed only of disc fls., few fld in a head and the heads crowded into a head-like glomerule which has an involucre. ....13. MYRIOCEPHALUS.
BB. Heads composed of disc fls. only, but the involucral bracts often petal-like, sometimes scarious. .....
C. Pappus 0. .....14. HUMEA.
CC. Pappus crown-or cup shaped. .....15. AMMOBIUM.
CCC. Pappus bristly. .....
D. Akenes not beaked ..
E. Bristles often plumose at base. ...16. HELIPTERUM.
EE. Bristles smooth, scarious, barbed or plumose at apex. .....17. HELICHRYSUM.
DD. Akenes beaked. .....18. WAITZIA.
BBB. Heads composed of both rays and disc fls. .....
C. Style branches truncate. .....19. PODOLEPIS.
CC. Style branches linear, a little wider, rounded or obtuse at apex.
D. Involucral bracts not all alike, the outer usually herbaceous.20. BUPHTHALMUM.
DD. Involucral bracts all alike. .....21. INULA.

4. CYNARA TRIBE.

A. Heads 1-fld., aggregated into larger heads. .....22. ECHINOPS.
AA. Heads several-fld. .....
B. The heads separate. ....23. XERANTHEMUM.
BB. The heads aggregated. ...
C. Parts of the pappus in 1 series. .....24. CARLINA.
CC. Parts of the pappus in several series. ...
D. Akenes affixed by a straight or hardly oblique areola. ...
E. Filaments glabrous: pappus bristles falling off separately. .....25. ARCTIUM.
EE. Filaments papillose-pilose: pappus bristles inserted at the base of a ring which falls off with them. ...
F. Involucral bracts ending in a simple spine or short awn. ...26. CNICUS.
G. Receptacle setose. .....
GG. Receptacle hardly setose. .....27. ONOPORDON.
FF. Involucral bracts ending in a lanceolate or broad rigid appendage which is usually spinescent. ....28. CYNARA.
DD. Akenes affixed by an oblique or lateral areola. .....
E. Outer involucral bracts foliaceous, spiny-dentate. ...
F. Pappus in 2 series: outer of 10 awns, inner

of 10 slender bristles. .....29. CARBENIA.
FF. Pappy chaffy or 0. .....30. CARTHAMUS.
EE. Outer involucral bracts not foliaceous. ..31. CENTAUREA.

5. ASTER TRIBE.

A. Heads dioecious and composed wholly of disc fls.32. BACCHARIS.
AA. Heads not dioecious. .....
B. Color of fls. yellow. .....
C. Rays absent. .....33. BIGELOVIA.
CC. Rays present. .....
D. The pappus composed of long paleæ, which are sometimes reduced to a crown. .....34. GUTIERREZIA.
DD. The pappus not as in D .....
E. Pappus bristles few, (4–8). .....
F. Involucral bracts in 8 series, leathery, or scarious at apex. .....35. GRINDELIA.
FF. Involucral bracts in 2–3 series, scarious at margin. .....36. PENTACHÆTA.
EE. Pappus bristles copious, in 2–8 series, sometimes few in ray fls. ..
F. Bristles of 2 kinds, the inner series capillary, outer very short and setulose or squamellate. .....37. CHRYSOPSIS.
FF. Bristles mostly alike. .....
G. The bristles broad at base, aristate. .....38. XANTHISMA.
GG. The bristles capillary. ..
H. Heads usually many-fld.
I. Akens many-nerved. ..39. APLOPAPPUS.
II. Akenes few-nerved. ...40. HAZARDIA.
HH. Heads usually few-fld.
I. Bristles rudimentary, shorter than akene. ....41. BRACHYCHÆTA.
II. Bristles longer than akene. .....42. SOLIDAGO.
BB. Color of fls. not yellow...
C. The pappus 0, or forming a more or less conspicuous ring of short bristles or hairs. .....
D. Bracts dry or scarious at margin. ...43. BRACHYCOME.
DD. Bracts herbaceous. ..44. BELLIS.
CC. The pappus composed of numerous bristles in 1 or more series.
D. Involucre with outer bracts partly leafy, inner bracts membraneous or scarious. .....45. CALLISTEPHUS.
DD. Involucral bracts all nearly alike. ....
E. Bracts in about 2 series. .....
F. Akenes usually small. .....46. ERIGERON.
FF. Akenes larger longer: pappus more copious. ..47. VITTADINIA.
EE. Bracts usually in several series, sometimes 2 series in Aster and Felicia. .....
F. Akenes strongly compressed. ...
G. Bristles in 2 or more series. .....48. ASTER.
(See also *Calimeris and Linosyris.*)
GG. Bristles in 1 series. ....49. FELICIA.
FF. Akenes not compressed or slightly. .....
G. Plants are herbs. .....50. SERICOCARPUS.
GG. Plants are shrubs or subshrubs. .....51. OLEARIA.
CC. The pappus anomalous or absent from the rays. .....
D. Pappus bristles shortly plumose: style branches broad. .....52. CHARIEIS.
(Consult *Koulfussia.*)
DD. Pappus bristles in 1 series, unequal, rigid, thickened or dilated toward the base. .....53. TOWNSENDIA.
DDD. Pappus of the ray composed of very short paleæ: disc-pappus of copious slender bristles in 1–2 series. .....54. HETEROPAPPUS.
DDDD. Pappus bristles very short, usually accompanied by 2–4 awns not longer than the akene. ...55. BOLTONIA.

6. HELIANTHUS TRIBE.

Subtribe 1. MELAMPODIEÆ. Rays fertile: disc fls. sterile: akenes usually with coriaceous or thicker pericarp: style mostly entire: receptacle chaffy throughout: pappus none.

A. Involucre of the many-fld. heads broad: inner bracts concave, embracing and half inclosing the thick, turgid, obovoid akenes...56. POLYMNIA.
AA. Involucre broad, of plane or barely concave bracts: innermost subtending obcompressed akenes, but not inclosing nor embracing them. ...
B. Rays, or rather their ovaries and akenes, in more than one series. .57. SILPHIUM.
BB. Rays and akenes in a single series. .....
C. Heads nearly discoid, or rays short. .....58. PARTHENIUM.
CC. Heads conspicuously radiate, mostly of 5 fertile and rather numerous sterile fls..59. CHRYSOGONUM.

Subtribe 2. AMBROSIEÆ. Fertile fls. apetalous, or with corolla reduced to a tube or ring around base of 2-parted style: disc fls. staminate, with 4–5-lobed corolla; anthers slightly united: style abortive, hairy only at the somewhat enlarged and depressed summit. 60. IVA.

Subtribe 3. ZINNIEÆ. Rays fertile; the tube absent or very short, persistent on akene and at length papery: disc fls. fertile, subtended or embraced by chaffy bracts: lvs. opposite.

A. Receptacle flattish. .....61. SANVITALIA.
AA. Receptacle conical, cylindri-

cal or elongated. . . . . .
B. Akenes, at least inner ones, 1–3-awned. . . . . 62. ZINNIA.
BB. Akenes without pappus. . . 63. HELIOPSIS.

Subtribe 4. VERBESINEÆ. Rays fertile, or neutral becoming papery and persistent; disc fls. fertile; anthers often blackish; akenes various, but those of disc never obcompressed; pappus various.

A. Chaff of receptacle permanently investing akenes as an accessory covering. 64. SCLEROCARPUS.
AA. Chaff of receptacle concave or compliciate, loosely embracing or subtending the disc-akenes, mostly persistent. . . . . .
B. Rays sometimes absent. Certain species of . . . . 65. SPILANTHES.
BB. Rays usually present. . . .
C. Receptacle high, from conical to columnar or subulate, at least in fruit. . . . . .
D. The rays, if present, fertile. . . . . 65. SPILANTHES.
DD. The rays sterile. . . .
E. Color of rays rose or rose purple. . 66. ECHINACEA.
EE. Color of rays yellow or partly brown-purple, (sometimes wholly so). .
F. Akenes 4-angled, prismatic. . . . . 67. RUDBECKIA.
FF. Akenes short and broad, compressed . . . . 68. LEPACHYS.
CC. Receptacle low, flat to convex, rarely becoming conical. . . . .
D. Akenes not winged nor very flat, when flattened not margined nor sharp-edged. . . . . .
E. Rays fertile. . . . 69. BALSAMORRHIZA.
EE. Rays sterile. . . . . .
F. Akenes pubescent. 70. VIGUIERA.
FF. Akenes glabrous. . 71. HELIANTHUS.
DD. Akenes of the ray or margin often triquetrous, of the disc either flat-compressed and margined or thin-edged, or if turgid some of them winged. . . . . .
E. Rays neutral. . . . . .
F. Pappus none, or an awn or its rudiment answering to each margin of the wingless akene. . . . . 72. ENCELIA.
FF. Pappus of delicate squamellæ between the 2 chaffy teeth or awns which surmount the 2 acute margins of the akene. . 73. HELIANTHELLA.
FFF. Pappus of 2 slender-subulate naked awns, at length divergent, sometimes with 2 or 3 intermediate awns. 74. ACTINOMERIS.
EE. Rays fertile, rarely neutral in Verbesina. . . . . .
F. Pappus of ∝ distinct squamellæ. . . . . 75. PASCALIA.
FF. Pappus of dilated awns or 2 awn-like paleæ on the angles of the akene, with 2 small intermediate squamellæ on each side. . . . . 76. PODACHLENIUM.
FFF. Pappus of 2 awns, sometimes 1–3 or 0, and no intermediate squamellæ. . . 77. VERBESINA.

Subtribe 5. COREOPSIDEÆ. Rays fertile or neutral; disc fls. fertile; receptacle chaffy; chaff flat or hardly concave; akenes more or less dorsally compressed, often 2-awned.

A. Involucral bracts distinct, the outer herbaceous, inner somewhat like paleæ. 78. GUIZOTIA.
AA. Involucre double; inner bracts membranous, subequal, connate at base or often higher; outer bracts few and small or minute.
B. Plants are all climbers with fertile rays, akenes much enlarging and sterile disc fls. with undivided style. . . . . 79. HIDALGOA.
B. Plants not climbing: rays usually sterile. . . . . .
C. Style branches with long hairy appendages. . . . . 80. DAHLIA.
CC. Style branches truncate, penicillate or with short appendages. . . . . .
D. Rays always neutral: akenes not beaked, rarely contracted at apex; pappus of 2 short awns, or hairy, or absent, never retrorsely barbed. . . 81. COREOPSIS.
DD. Rays fertile, neutral or wanting; pappus awns when present retrorsely barbed. . .
E. Bracts of inner involucre united into a cup. . . . . 82. THELESPERMA.
EE. Bracts of involucre distinct, or united only at the common base. . . . . .
F. Akenes beaked, slender: rays purple or rose, in one species yellow; white vars. in cult. awns mostly deciduous. . . . 83. COSMOS.
FF. Akenes not beaked: rays yellow or white. . . . . .
G. Pappus of 2–5 awns, retrorsely hispid, mostly persistent. . . 84. BIDENS.
GG. Pappus various: tube of disc fls. with a ring near the top. . . . . 85. LEPTOSYNE.

Subtribe 6. GALINSOGEÆ. Heads rayless and homogamous; (in Marshallia). Pappus of ∝ distinct paleæ. . . . . 86. MARSHALLIA.

Subtribe 7. MADIEÆ. Rays fertile, each subtended by an involucral bract which partly or competely incloses its akene; disc fls. with both stamens and styles, but some or all sterile. Glandular, viscid and heavy scented herbs.
A. Akenes laterally compressed. 87. MADIA.
AA. Akenes not laterally compressed. . . . . 88. LAYIA.

7. Helenium Tribe.

A. Involucral bracts united nearly throughout into an oblong cup or tube....89. Tagetes.
(See also *Lasthenia.*)
AA. Involucral bracts hardly at all imbricated; when broad nearly equal or in 1 series. .....
B. Receptacle mostly high-conical, and acute, beset after the akenes have fallen by projecting points (as if pedicels on which they were inserted). .....
C. The involucre a single series of bracts connate by their edges into a 5-15-toothed green cup. .....90. Lasthenia.
CC. The involucre of loose, distinct bracts. ...91. Bæria.
(Including *Actinolepis coronaria.*)
BB. Receptacle flat or convex, rarely obtusely conical: akenes from linear to obpyramidal, rarely 5-angled. See also BBB. .....
C. Herbage mostly woolly: involucral bracts erect not membranous. .....92. Eriophyllum.
CC. Herbage usually not woolly. .....
D. Disc fls. deeply 5-cleft: involucral bracts mostly appressed. .....93. Polypteris.
DD. Disc fls. with long and narrow throat and 5 short lobes or teeth. .....
E. Akenes merely pubescent. .....94. Chænactis.
EE. Akenes villous. ....95. Hulsea.
BBB. Receptacle from convex to oblong: akenes short, obpyramidal or top-shaped, 5-10-ribbed or angled, mostly silky hairy: disc fls. all fertile. .....
C. The receptacle destitute of awn-like fimbrillæ among the fls. 4
D. Involucre erect or nearly so. .....96. Actinella.
DD. Involucre spreading or soon reflexed....97. Helenium.
CC. The receptacle beset with bristle-like or awl-shaped or rarely dentiform fimbrillæ among the fls. .....98. Gaillardia.

8. Anthemis Tribe.

A. Receptacle chaffy. .....
B. Heads usually discoid. ...
C. Corolla with a hood-like appendage at base. .....99. Santolina.
CC. Corolla without such appendage. .....100. Lonas.
BB. Heads usually radiate. ..
C. Akene compressed, with 2 narrow margins. ..101. Achillea.
CC. Akenes 4-5-cornered or ∞-ribbed. .....
D. Heads peduncled at tips of branches...102. Anthemis.
DD. Heads sessile in forks, surrounded by 5-6 dissected floral lvs. .....103. Cladanthus.
AA. Receptacle naked or alveolate fimbrilliferous. .....
B. Involucral bracts in many series. .....
C. Rays present. .....104. Chrysanthemum.
(Consult also *Pyrethrum.*)
CC. Rays absent. .....105. Tanacetum.
BB. Involucral bracts in 1 or 2 or few series. .....
C. Rays present. .....106. Matricaria.
CC. Rays absent or inconspicuous. .....
D Involucre top-shaped.107. Cenia.
DD. Involucre ovoid or broadly bell-shaped. .....108. Artemisia.

9. Senecio Tribe.

A. Involucral bracts in 1 series and connate at the base or beyond the middle in a cup: no outer bracts: style branches of the fertile hermaphrodite fls. truncate at apex, usually penicillate. .....
B. Style undivided: disc fls. sterile. .....109. Othonna.
BB. Style bifid: disc fls. all or some fertile. .....110. Gamolepis.
AA. Involucral bracts 1 or 2 series, not connate in a cup but free, at least finally. .....
B. Style branches of hermaphrodite fertile fls. roundish obtuse or at least not truncate and wholly without appendage or hariness at summit. .....
C. Heads composed entirely of hermaphrodite and fertile fls. homogamous, discoid. ...111. Cacaliopsis.
CC. Heads submonœcious or subdiœcious, the fls. containing both stamens and pistils, sterile. .....
D. Fls. solitary, yellow..112. Tussilago.
DD. Fls. racemose or corymbose, white or purplish. .....113. Petasites.
BB. Style branches (of hermaphrodite fls.) either truncate or capitellate at summit, which is either penicillate, hairy or naked and not rarely bears a short conical or flattened appendage.
C. Bracts of involucre herbaceous, acuminate. .....114. Arnica.
D. Receptacle flat. ...
DD. Receptacle hemispherical. .....115. Doronicum.
CC. Bracts of involucre narrow, strict, usually ribbed or keeled.
D. Apex of style usually truncate and penicillate. .....
E. Involucral bracts numerous. .....
F. Akenes subterete.116. Senecio.
FF. Akenes dorsally compressed. ..117. Cineraria.
EE. Involucral bracts few, 4-5: heads homogamous. ...118. Tetradymia.
DD. Apex of style with long, subulate hairy appendages: heads homogamous.119. Gynura.
DDD. Apex of style with appendages short and obtuse or long and acutish: heads homogamous. ....120. Emilia.

10. CALENDULA TRIBE.

A. Akenes of the rays thick, hard and bony; those of the disc usually all empty. ....121. OSTEOSPERMUM.
AA. Akenes straight, those of the rays usually tricetrons; disc-akenes often flattish or 2-winged. ....122. DIMORPHOTHECA.
AAA. Akenes incurved, heteromorphous. ....123. CALENDULA.

11. ARCTOTIS TRIBE.

A. Involucral bracts free, the inner ones broadly scarious, at least at the apex.
B. Herbs glabrous or pubescent: receptacle chaffy. ....124. URSINIA.
BB. Herbs tomentose; receptacle naked or alveolate. ....
C. Akenes usually villous, crowned by hyaline palea which are often convolute. ....125. ARCTOTIS.
CC. Akenes glabrous, with or without a crown of minute paleolæ. ..126. VENIDIUM.
AA. Involucral bracts grown together at the base. ....
B. Lvs. not spinescent: alveoli short. ....127. GAZANIA.
BB. Lvs. spinose-dentate: alveoli including akenes. 128. BERKHEYA.

(Consult *Stobæa*.)

12. MUTISIA TRIBE.

129. CHAPTALIA.

13. CICHORIUM TRIBE.

A. Pappus none, or of 2–3 long-bristles which soon fall away. ....130. SCOLYMUS.
AA. Pappus paleaceous or partly so, or aristiform, or plumose. ....
B. Involucre of equal bracts and no short calyculate ones at base. ....
C. Akenes long beaked. ..131. TRAGOPOGON.
CC. Akenes truncate. ....
BB. Involucre either calyculate or imbricate, i. e. principal bracts equal and some short ones at base, or less unequal bracts in 2 or more series. ....
C. Akenes (at least inner ones) tapering into a beak. ....133. HYPOCHŒRIS.
CC. Akenes usually short, with summit truncate or only a trifle contracted below apex. ....134. CATANANCHE.
D. Receptacle chaffy. ..
DD. Receptacle not chaffy. 135. CICHORIUM.
E. Fls. normally blue. .136. SCORZONERA.
EE. Fls. yellow. ....
AAA. Pappus of capillary bristles, scabrous, rarely barbellulate, never plumose nor paleaceous-dilated; receptacle naked (except in 1 species of Troximon). ....
B. Akenes flattened: pappus of copious, fine soft, capillary bristles. ....137. LACTUCA.
BB. Akenes not flattened: pappus persistent or bristles tardily falling (except 1 or 2 species of Crepis). ....
C. Beak distinct and slender (except in 1 or 2 species of Troximon). ....
D. The akenes 10-ribbed or 10-nerved, not muricate. ....138. TROXIMON.
DD. The akenes 4–5-ribbed or angled, muricate 139. TARAXACUM.
CC. Beak none, or akene merely narrow at apex. ....
D. Fls. whitish or cream-color to violet or rose red. ....140. PRENANTHES.
DD. Fls. mostly yellow, sometimes orange-red or white. ....
E. Pappus of rather rigid, scabrous, fragile bristles which are usually rather dirty or neutral colored. 141. HIERACIUM.
EE. Pappus of copious white and usually soft capillary bristles. ....142. CREPIS.

79. LOBELIACEÆ.

A. Corolla open down to the base on one side. ....1. LOBELIA.
AA. Corolla with a closed tube.
B. Stamens in a tube free from the corolla. ....2. DOWNINGIA.
BB. Stamens more or less adnate to the corolla up to near the throat, then monadelphous and free or farther adnate on one side only. ....3. PALMERELLA.
BBB. Stamens affixed at top of corolla tube or above the middle: capsule 2-valved at apex. ....4. ISOTOMA.
BBBB. Stamens affixed at base of corolla tube. ....
C. Fr. an indehiscent berry. ....5. CENTROPOGON.
CC. Fr. a capsule, 2-valved at apex. ....6. SIPHOCAMPYLUS.

80. CAMPANULACEÆ.

NOTE. CENTROPOGON and ISOTOMA usually placed in this family are best referred to Lobeliaceæ.

A. Fr. an indehiscent, fleshy berry. ....1. CANABINA.
AA. Fr. a capsule. ....
B. Capsule dehiscing loculicidally by apical valves.
C. Corolla 3-parted nearly to base. ....2. JASIONE.
CC. Corolla broadly bell-shaped, 5-lobed. ....3. PLATYCODON.
BB. Capsule closed at apex, dehiscing laterally between the ribs by small lids or small solitary valves. ....
C. Corolla 5-cut-lobed, or -parted. ....
D. Ovary linear or narrowly oblong. ....4. SPECULARIA.
DD. Ovary hemispherical or top shaped. ...
E. Anthers connate in a tube. ....5. SYMPHYANDRA.
EE. Anthers not connate in a tube. ....
F. Style girt at base by an epigynous fleshy disc which is cup-shaped or tubular. ....6. ADENOPHORA.
FF. Style without such disc. ....
G. Corolla 5-parted to the base, lobes narrow, either long-

coboring above or rotate-spreading. . . . . 7. PHYTEUMA.
GG. Corolla 5-cut, shortly or to the middle, rarely farther, bell-shaped, tubular, funnel-shaped or subrotate. . . 8. CAMPANULA.
CC Corolla narrowly tubular, shortly 3-cut at apex. . . . . 9. TRACHELIUM.
CCC. Corolla rarely 5-cut.
D. No. of lobes 5–9, usually 7: fls. bell-shaped. . . . . 10. OSTROWSKIA.
DD. No. of lobes 8–10, lobes narrow and spreading. . . . . 11. MICHAUXIA.

81. ERICACEÆ. (Including VACCINIACEÆ.)

(Synopsis of subfamilies and tribes.)

A. Calyx adnate to ovary: fr. a berry or drupe. . . . . .

Subfamily 1. VACINIEÆ. Calyx tube adnate to the ovary (or to the greater part of it), which in fruit is not a capsule but a berry or drupe crowned with the calyx-teeth: corolla always gamopetalous, and disc epigynous: anthers erect, introrse: pollen-grains compound, of 4 united grains. Shrubs or subshrubs with alternate leaves. . . . . .

AA. Calyx free from ovary: fr. a capsule, except in tribe 1 of sub-family 2. . . . . .
B. Pollen-grains compound, (except in Clethra). . . .
C. Corolla usually gamopetalous: disc generally annular or 8–10-lobed . . . . . .

Subfamily 2. ERICINEÆ. Corolla gamopetalous, rarely polypetalous or nearly so: anthers upright introrse. Shrubs or small trees.

Tribe 1. ARBUTEÆ. Fruit fleshy, a berry or drupe.

Tribe 2. ANDROMEDEÆ. Fruit a loculicidal capsule, chiefly 5-celled: corolla deciduous.

Tribe 3. ERICEÆ. Fruit a capsule, with loculicidal or sometimes septicidal dehiscent and 4 or 5 cells: corolla marcescent-persistent.

Tribe 4. RHODODENDREÆ. Fruit a septicidal capsule: corolla deciduous.

CC. Corolla polypetalous, (see also Rhododendreæ): disc obsolete or obscure. . . . . .

Subfamily 3. PYROLINEÆ. Anthers erect and extrorse in the bud, with apex often pointed, emarginate or 2-horned at base, where each cell opens by a pore, in anthesis mostly introrsely resupinate on the filament so that the really basal pores become apical and the point or apex basal.

Tribe 1. CLETHREÆ. Ovary of the 5-merous flower 3-celled: pollen-grains simple, shrubs or trees.

Tribe 2. PYROLEÆ. Ovary cells 5 or 4, as many as sepals or petals: pollen-grains compound: herbs or nearly so.

BB. Pollen-grains simple.

Subfamily 4. MONOTROPEÆ. Herbaceous root-parasites or saprophytes, scaly, destitute of all green herbage.

Subfamily 1. VACCINIEÆ.

A. Filaments connate. . . . . 1. MACLEANIA.
AA. Filaments usually free. . . .
B. The ovary wholly inferior.
C. Ovary 10-celled, 10-ovuled. . . . . 2. GAYLUSSACIA.
CC. Ovary 4–5-celled, or by false partitions from the back of these cells 8–10-celled, ovules numerous. . . 3. VACCINIUM.
BB. The ovary at first 1-3-4-2 superior. . . . . 4. CHIOGENES.

Subfamily 2. ERICINEÆ.

Tribe 1. ARBUTEÆ.

A. The anthers have a pair of awns on the back . . . . . .
B. Ovary cell many ovuled. . 5. ARBUTUS.
BB. Ovary cells 1-ovuled. . . . 6. ARCTOSTAPHYLOS.
AA. The anthers blunt on back. . 7. PERNETTYA.

Tribe 2. ANDROMEDEÆ.

A. Anther cells opening through their whole length, not appendaged: stigma 5-lobed, the lobes adnate to a surrounding ring or cup. 8. EPIGÆA.
AA. Anthers opening only at the top: stigma usually entire. . . . . .
B. Calyx becoming fleshy in fruit forming a berry and inclosing the small capsule. . . . . 9. GAULTHERIA.
BB. Calyx unchanged and dry under the capsule. . . .
C. Sepals or calyx lobes valvate or open in the bud, never overlapping. . . . . .
D. Anthers destitute of appendages or awns. . . . . 10. LYONIA.
DD. Anthers short and obtuse, with 2 pores topped by slender, ascending awns: corolla urn-shaped. 11. ANDROMEDA.
DDD. Anthers lanceolate, produced into 2 small tubes, each surmounted by a pair of slender, ascending awns: corolla bell-shaped. . 12. ZENOBIA.
DDDD. Anthers with 2 spreading or deflexed awns or teeth, on the back, of the filament or at its junction with the anther. . . . . 13. PIERIS.
CC. Sepals or calyx lobes imbricated, at least in the early bud. . . .
D. Lvs. heath-like, small, thick or needle like, mostly overlapping: anthers fixed near apex . . . . 14. CASSIOPE.
DD. Lvs. not heath-like, usually larger, flat, broad and leathery.
E. Corolla cylindraceous to conical-urceolate: anthers fixed near base. . .
F. Seeds imbricated in 2 rows. . . . 15. CHAMÆDAPHNE.
FF. Seeds pendulous or in all directions. . . . . 16. LEUCOTHOË.
FFF. Seeds all ascending or erect. . 17. OXYDENDRUM.
EE. Corolla bell-shaped or urn-shaped. . . 18. ENKIANTHUS.

Tribe 3. ERICEÆ.

A. Anthers 2-awned on back at base. ..... 19. CALLUNA.
AA. Anthers 2-parted, blunt or awned, usually cristate or lamellate at base. .. 20. ERICA.
AAA. Anthers blunt on back, not cristate. ..... 21. BRUCKENTHALIA.

Tribe 4. RHODODENDREÆ.

A. Seed coat lax, produced at both ends. .....
B. Corolla polypetalous or nearly so. ..... 22. LEDUM.
BB. Corolla gamopetalous. ...
C. Stamens usually 5; style more or less exserted. ..... 23. AZALEA.
CC. Stamens usually 10; style rarely exserted. 24. RHODODENRON.
AA. Seed coat firm and coriaceous. .....
B. Corolla polypetalous or nearly so. .....
C. Inflorescence terminal..
D. Fls. corymbose; petals 5–6. ..... 25. LEIOPHYLLUM.
DD. Fls. racemose; petals 3–5. ..... 26. ELLIOTTIA.
CC. Inflorescence axillary; fls. solitary. ..... 27. CLADOTHAMNUS.
BB. Corolla gamopetalous. ...
C. Stamens 10. .....
D. Fls. corymbose. ....28. KALMIA.
DD. Fls. solitary. .....29. RHODOTHAMNUS.
CC. Stamens 8. .....30. DABŒCIA.
CCC. Stamens 4–6 in the first case, 5 in the next..
D. Anthers open by apical pore. .....31. BRYANTHUS.
DD. Anthers open from apex nearly to base.32. LOISELEURIA.

Subfamily 3. PYROLINEÆ.

Tribe 1. CLETHREÆ.
33. CLETHRA.
Tribe 2. PYROLEÆ.

A. Style very short, obconical; stems leafy. .....34. CHIMAPHILA.
AA. Style mostly elongated; scape naked, or leafy only at base. .....
B. Fls. solitary. .....35. MONESES.
BB. Fls. racemose. .....36. PYROLA.

Subfamily 4. MONOTROPEÆ.

Anthers introrse from the first; corolla bell-shaped, rather fleshy. .....37. SARCODES.

82. EPACRIDACEÆ.

Style inserted in the intruded vertex of the ovary; stamens epipetalous; anthers 1-celled; corolla lobes quinconciately imbricate; bracts numerous, passing into sepals. .....1. EPACRIS.

83. DIAPENSIACEÆ.

A. Corolla persistent; staminodes 0. .....1. PYXIDANTHERA.
AA. Corolla deciduous; staminodes 5. .....
B. Staminodes small, scale like separate, corolla lobes crenate. .....2. SHORTIA.
BB. Staminodes long, linear separate; corolla lobes fimbriate. .....3. SCHIZOCODON.
BBB. Staminodes spatulate, connate with stamens; corolla segments entire.4. GALAX.

84. PLUMBAGINACEÆ.

A. Calyx limb usually spreading, scarious and colored..
B. Lvs. usually needle-like; styles distinct at angles of ovary; stigmas subcapitate. .....1. ACANTHOLIMON.
BB. Lvs. flat; styles as above; stigmas capitate, oblong or linear; inflorescence cymose or dense or scape 1-few-fld. ...2. STATICE.
BBB. Lvs. flat or linear—subulate; styles shortly subconnate at vertex of ovary; stigmas linear; scape 1-headed. .....3. ARMERIA.
AA. Calyx lobes or teeth erect with merely scarious sinuses. .....
B. Stamens free; calyx glandular. .....4. PLUMBAGO.
BB. Stamens adnate to middle of corolla; calyx not glandular. .....5. CERATOSTIGMA.

85. PRIMULACEÆ.

A. Corolla lobes imbricated in quincunx fashion. .....
B. Ovules anatrophous; umbilicus basal. .....1. HOTTONIA.
BB. Ovules semi-anatropous; umbilicus ventral. ....
C. Capsule dehisces by a lid at top. .....2. SOLDANELLA.
CC. Capsule dehisces by valves. .....
D. Corolla lobes bent back. .....3. DODECATHEON.
DD. Corolla lobes spreading or erectish. ...
E. Stamens affixed to base of corolla; anthers long acuminate. .....4. CORTUSA.
EE. Stamens affixed to corolla tube; anthers obtuse. ...
F. Corolla tube usually longer than calyx. ....
G. Capsule many-seeded. .. ...5. PRIMULA.
GG. Capsule 1–2-seeded. .....6. DOUGLASIA.
FF. Corolla tube as long as calyx or shorter; capsule few-or many-seeded. .7. ANDROSACE.
AA. Corolla lobes convolute in the bud; ovules semi-anatropous; umbilicus ventral. .....
B. Capsule circumscissile....8. ANAGALLIS.
BB. Capsule longitudinally dehiscent by valves.
C. Lobes of corolla bent back. .....9. CYCLAMEN.
CC. Lobes of corolla not bent back .....
D. Testa of seed with a firm epidermis. ...
E. Staminodes none. ..10. LYSIMACHIA.
EE. Staminodes 5, each corolla-lobe curved round its stamen. .....11. STEIRONEMA.
EEE. Staminodes 5, toothlike. .....12. NAUMBERGIA.
DD. Testa of seed with a lax epidermis. ....13. TRIENTALIS.

86. MYRSINACEÆ.

A. Staminodes 5; corolla gamopetalous. .....
B. Corolla cylindrical, short-

ly 5-lobed: fr. many seeded. .....1. THEOPHRASTA.
BB. Corolla rotate-campanulate, deeply 5-cut: fr. few-seeded .....2. JACQUINIA.
AA. Staminodes 0: corolla gamopetalous or polypetalous: fr. 1-seeded. ...
B. Corolla imbricated: fls. fascicled, lateral or axillary. .....3. MYRSINE.
BB. Corolla convolute: panicles terminal or terminal and axillary. .....4 ARDISIA.

87. SAPOTACE.E.

A. Corolla lobes, salyx segments, stamens and staminodes (when present,) isomerous. .....
B. Staminodes 0: seeds usually albuminous: fls. 5-merous, rarely 6-7-merous. .....1 CHRYSOPHYLLUM.
BB. Staminodes small usually affixed higher than stamens, sometimes few or 0: seeds not albuminous: fls. 4–5-merous. ..2. LUCUMA.
BBB. Staminodes alternate with stamens, rarely affixed higher: seeds albuminous. .....3. SIDEROXYLON.
AA. Corolla lobes and calyx segments isomerous: stamens twice as many or more. .....4. ISONANDRA.
AAA. Corolla lobes usually 2 or 3 times as many as calyx segments. .....
B. Calyx segments 1 series.5. BUMELIA.
BB. Calyx segments 2 series..6. MIMUSOPS.

88. STYRACACE.E.

A Stamens numerous, in several series. .....1. SYMPLOCOS.
AA. Stamens 10, in 1 series.....
B. Fr. becoming 1 celled: seed mostly solitary filling the cell. .....2. STYRAX.
BB. Fr. 1–4-celled, pointed with the persistent base of the style: seeds single in each cell, imperfectly filling the cell. .....
C. Inflorescence paniculed drooping, subterminal: fls. 5-merous. ..3. PTEROSTYRAX.
CC. Inflorescence often lateral: fls. often 5-merous. .....4. HALESIA.

89. EBENACE.E.

A. The fls. usually hermaphrodite: stamens in 1 series. .....1. ROYENA.
AA. The fls. dioecious. .....
B. Fls. usually 3-merous: stamens 3– .....2. MABA.
BB. Fls. usually 4–5-merous: stamens 4–8, usually in 2 series: styles or style branches 1–4..3. DIOSPYROS.

90. OLEACE.E.

(Summary of Tribes)

1. JASMINE TRIBE. Fruit didymous or septicidally divisible into two: corolla lobes strongly imbricate: ovules laterally affixed near base: seeds erect, not albuminous: radicle inferior.

2. LILAC TRIBE. Fruit terete or compressed parallel to the septum, loculicidally dehiscent: ovules pendulous from apex of cells: seeds winged, pendulous: radicle superior.

3. ASH TRIBE. Fruit entire, dry, indehiscent, winged, a samara, compressed contrary to the septum: ovules twin, pendulous from apex of cell: seeds pendulous, albuminous; radicle superior.

4. OLIVE TRIBE. Fruit fleshy and indehiscent, a drupe or rarely a berry, not lobed: ovules twin, laterary affixed near apex: seeds solitary, suspended or pendulous, albuminous: radicle superior.

1. JASMINE TRIBE.

Fr. fleshy, indehiscent, didymous or by abortion simple. .....1. JASMINUM.

2. LILAC TRIBE.

A. Corolla lobes imbricate. ...
B. Ovules 3–4 in a cell: seeds albuminous: corolla lobes shorter than tube. .....2. SCHREBERA.
BB. Ovules 4–10 in a cell: seeds albuminous: lobes many times longer than tube. .....3. FORSYTHIA.
AA. Corolla lobes induplicate-valvate: tube long or short: ovules 2 in a cell: seeds albuminous. .....4. SYRINGA.

3. ASH TRIBE.

A. Lvs. usually pinnate: fr. elongate, with a terminal wing, generally 1-seeded by abortion. .....5. FRAXINUS.
AA. Lvs. undivided: fr. ovate or orbiculate surrounded by a wing, usually 2–celled and 2-seeded. ....6. FONTANESIA.

4. OLIVE TRIBE.

A. Corolla of nearly distinct petals which are long and linear. .....7. CHIONANTHUS.
AA. Corolla lobes imbricate, broad and obtuse. .....
B. Endocarp of drupe thinly crustaceous. .....8. PHILLYREA.
BB. Endocarp of drupe hard and somewhat woody..9. OSMANTHUS.
AAA. Corolla lobes in duplicate-valvate. .....
B. Fr. a drupe; endocarp hard, thick or thin: inflorescence axillary rarely terminal. .....10. OLEA.
BB. Fr. a berry hardly drupaceous; endocarp membranous or thinly coriaceous: panicles terminal. .....11. LIGUSTRUM.

91. LOGANIACE.E

A. Style 2-fid. branches linear, 2-fid. .....1. GELSEMIUM.
AA. Style simple. .....
B. Corolla lobes valvate. ...2. SPIGELIA.
BB. Corolla lobes imbricate...
C. Anthers exserted. .....3. CHILIANTHUS.
CC. Anthers included. .....4. BUDDLEIA.

92. GENTIANACE.E.

A. Lvs. alternate or radical, (Menyanthes Tribe). ....
B. Fr. indehiscent. .....1. LIMNANTHEMUM.
BB. Fr. dehiscent. .....
C. Capsule usually 4-valved at apex. .....2. VILLARSIA.
CC. Capsule irregularly sub-2-valved at apex. ...3. MENYANTHES.
AA. Lvs. opposite (sometimes the lower ones alternate in Swertia Tribe). .....
B. Ovary perfectly 2-celled; placentæ solitary in each cell, often thick,

adnate to septum: liberated by dehiscence of capsule. . . . . 4. EXACUM.

BB. Ovary 1-celled: placentiferous margins of carpels more or less intruded within or even touching but not connate in the middle of the cell, spuriously 2-celled. (*Chironia* Tribe). . . . . .
C. Style often deciduous: anthers usually erect.
D. Anthers spirally twisted finally. . . .5. ERYTHRÆA.
DD. Anthers finally recurved at apex. . . .6. SABBATIA.
CC. Style usually persistent: anthers versatile, finally recurved.7. LISIANTHUS.

BBB. Ovary 1-celled: margins of carpels rarely intruded: ovules and seeds affixed at each side of the suture in 1 series or more or less extended over the parietal surface: placentæ adnate very thin. (*Swertia Tribe*). . . . . .
C. Corolla has 1–2 pits at base of each lobe. . .
D. Style short or scarcely any. . . . . .8. SWEETIA.
DD. Style subulate. . . . .9. FRASERA.
CC. Corolla has no such pits. . . . . .10. GENTIANA.

93. ASCLEPIADACEÆ. (SUMMARY OF TRIBES CONCERNED.)

A. Pollen granular loosely aggregated in 2 masses in each anther cell. . . . . .

(Subfamily 1. PERIPLOCEÆ.)

Tribe 1. PERIPLOCEÆ. Character of subfamily.

AA. Pollen waxy, the masses solitary in each anther cell. (Subfamily 2. Eusclepiadeæ). . . . . .

Tribe 2. CYNANCHEÆ. Anthers tipped by a membrane, which is inflexed or sometimes erect, and usually hyaline, rarely opaque or petal-like: pollen masses suspended, attached in pairs (one in each adjacent cell of different anthers) to the corpuscle or gland.

Tribe 3. MAESDENIEÆ. Anthers usually tipped by an inflexed or suberect membrane which is hyaline, rarely opaque: pollinia solitary in each cell, erect or very small.

Tribe 4. CEROPEGIEÆ. Anthers obtuse at apex, not appendaged or rarely the connective produced: pollinia solitary in the cells, erect.

Tribe 5. STAPELIEÆ. Anthers like those of the Ceropegieæ or more incumbent above the top of the stigma or subimmersed. Stems thick and fleshy, leafless or with a few lvs. at top.

Tribe 1. PERIPLOCEÆ.

A. Scales of corona distant from staminal tube. . . . .
B. Corolla tube short: scales linear or club-shaped. . .1. CRYPTOLEPIS.
BB. Corolla large, funnel-shaped: scales acuminate or 2-fid. . . . . .2. CRYPTOSTEGIA.
AA. Scales of corona close to stamens. . . . . .
B. Corolla lobes valvate. . . .3. CHLOROCODON.
BB. Corolla lobes imbricate. . .4. PERIPLOCA.

Tribe 2. CYNANCHEÆ.

A. The outer or single crown either simple and composed of 5 scales or ring-shaped, adnate to the corolla and not the staminal tube or rarely adherent to both. . . . . .
B. Stigma depressed . . . . .5. MACROSCEPIS.
BB. Stigma umbonate at apex or 2-beaked. . . . . .6. ARAUJIA.
(Consult *Physianthus*.)

AA. The crown of 5 scales affixed to base of corolla and staminal tube: caudicles of pollinia appendaged with an erect fuscous tooth. . . . . .7. OXYPETALUM.

AAA. The crown of 5 scales which are distinct, affixed or adnate to the staminal tube or the back of the anthers. . .
B. Scales concave or hooded, with a ligula inside. . .8. ASCLEPIAS.
BB. Scales (5 outer ones) carinate–complicate at base of staminal tube; the 5 scales at the apex of the long staminal tube, short, obtuse, spreading, alternate with anthers. . . . . .9. PODOSTIGMA.

AAAA. The outer or single crown affixed to the staminal tube, ring or cup-shaped, entire, lobed or parted. .
B. Corona villous inside. . . .10. MORRENIA.
BB. Corona with 5 scales or ligulæ inside . . . . . 11. CYNANCHUM.
BBB. Corona naked inside. . . . .12. VINCETOXICUM.
BBBB. Corona of 5 short processes opposite anthers and 10 ligulæ alternate with anthers in pairs. .13. ROTHROCKIA.

Tribe 3. MAESDENIEÆ.

A. Corolla lobes strictly valvate. . . . . .14. HOYA.
AA. Corolla lobes usually overlapping dextrorsely. . . . .
B. Fls. not pure white, urn- or salver-shaped: small or medium-sized. . . . .15. MAESDENIA.
BB. Fls. white salver–or funnel-shaped, large. . . . .16. STEPHANOTIS.

Tribe 4. CEROPEGIEÆ.

Corona double, affixed to staminal tube. . . . . .17. CEROPEGIA.

Tribe 5. STAPELIEÆ.

Corona double, outer spreading, inner of 5 scales. . . .18. STAPELIA.

94. APOCYNACEÆ.

A. Anther cells not appendaged at base. . . . . .
B. Ovary entire (*Carissa Tribe*): fls. 5-merous. . .
C. Fr. a 2-valved capsule; ovary 1-celled. . . . .1. ALLAMANDA.
CC. Fr. a berry, indehiscent: ovary 2-celled, cells 1–4 ovuled. . . .
D. Ovules laterally affixed; cymes terminal, few fld: spines axillary. . . . . .2. CARISSA
DD. Ovules erect from base: cymes axillary dense: spines 0. . . . . .3. ACOKANTHERA.
BB. Ovary with carpels distinct under style. (*Plumeria Tribe*). . . . . .
C. Calyx with several glands inside or a ring of hairs. . . . . .
D. Carpels 2-ovuled. . . .4. THEVETIA.

DD. Carpels many-ovuled.5. TABERNÆMONTANA.
CC. Calyx without glands inside. . . . . .
D. Carpels 2-ovuled. . . .6. RAUWOLFIA.
DD. Carpels 6-many-ovuled. . . . . .
E. Ovules in 2 series. . .
F. Disc 0. . . . . .
G. Seeds truncate. . .7. AMSONIA.
GG. Seeds winged. . 8. GONIOMA.
FF. Disc of 2 scales . .9. VINCA.
EE. Ovules in many series. . . . . .
F. Stamens near base of tube. . . . . .10. PLUMERIA.
FF. Stamens above middle of tube. 11. ALSTONIA.
AA. Anther cells produced at base. (*Echites Tribe.*) . .
B. The cone of anthers exserted at apex. . . . . .12. PRESTONIA.
BB. The anthers included . . .
C. Lvs. usually in whorls of 3. . . . . .13. NERIUM.
CC. Lvs. opposite. . . . . .
D. Corolla bell-shaped, with 5 squamellæ alternating with stamens. . . . . .14. APOCYNUM.
DD. Corolla salver-shaped or funnel-shaped: the throat without scales. . . . . .
E. Disc of 2 scales. . . 15. DIPLADENIA.
EE. Disc many toothed or crenulate. . . 16. ODONTADENIA.
EEE. Disc of 5 lobes or scales, often truncate in Trachelospermum. . . . . .
F. Fls. salver-shaped.
G. Inflor. lax corymbose cymes.17. TRACHELOSPERMUM.
GG. Inflor. racemose: rarely shortly dichotomous. .18. ECHITES.
FF. Fls. funnel-shaped
G. In cymes. . . .19. BEAUMONTIA.
GG. In racemes. . . .20. MANDEVILLA.

95. POLEMONIACE.E.

A. Capsule 3-valved, deeply loculicidal: herbs or subshrubs. . . . . .
B. Stamens unequally affixed to corolla tube; not declinate. . . . . .1. PHLOX.
BB. Stamens equally affixed to tube or throat. . . . . .
C. Stamens not declinate. .2. GILIA.
CC. Stamens declinate. . . .
D. Filaments pilose-appendaged at base. .3. POLEMONIUM.
DD. Filaments not appendaged. . . . .4. LŒSELIA.
AA. Capsule 3-valved, deeply septicidal; tall climbers.6. CONÆA.
AAA. Capsule 3-valved, deeply loculicidal at apex: trees or shrubs. . . . . .5. CANTUA.

96. HYDROPHYLLACE.E.

A. Styles 2, distinct from base; corolla lobes imbricate. . .1. WIGANDIA.
AA. Styles 2-cut, rarely undivided. . . . . .
B. Corolla lobes usually convolute. . . . . .
C. Stamens exserted. . . .2. HYDROPHYLLUM.
CC. Stamens included. . . .3. NEMOPHILA.
BB. Corolla lobes imbricated. .
C. Fls. marcescent, bell-shaped. . . . . .4. EMMENANTHE.
CC. Fls. deciduous. . . . . .
D. The peduncles 1-fl. .5. HESPEROCHIRON.
DD. The fls. cymose or in 1-sided racemes. . .6. PHACELIA.

97. BORAGINACE.E.

(SUMMARY OF TRIBES.)

A. Ovary undivided (or only laterally 4-lobed) and surmounted by the style. . .
B. Style twice bifid: stigmas not annular: cotyledons plaited or corrugated. .1. CORDIA TRIBE.
BB. Style once bifid or 2-parted (the divisions sometimes coalescent to the top): stigmas more or less capitate: cotyledons plane. . . . . .2. EHRETIA TRIBE.
BBB. Style entire, sometimes wanting: stigma shield- or ring-shaped, forming a complete ring surmounted usually by a tip or appendage which is entire or 2-lobed and varies from hemispherical to subulate. . . . . .3. HELIOTROPE TRIBE.
AA. Ovary 4-parted (rarely 2-parted) from above into one-celled, one-ovuled divisions surrounding the base of the undivided (rarely 2-lobed) style: stigma not annular. . . . .4. BORAGE TRIBE.

1. CORDIA TRIBE.

Calyx tubular or bell shaped, merely toothed or lobed. .1. CORDIA.

2. EHRETIA TRIBE.

Calyx 5-parted: style 2-fid. . .2. EHRETIA.

3. HELIOTROPE TRIBE.

A. Plants sarmentose or twining. . . . . .3. TOURNEFORTIA.
AA. Plants are herbs or subshrubs. . . . . .4. HELIOTROPIUM.

4. BORAGE TRIBE.

Subtribe 1. Nutlets with a flat scar on the inner face which is usually broad, rarely linear, and affixed to a gynobase (which may be flat, convex, conical or ovoid, rarely columnar), the apices not or hardly prominent beyond the scar.

A. The nutlets divergent or divaricate (either radiately or in pairs), extended outward or backward much beyond the insertion (which is by a roundish or oblong scar); gynobase little elevated or broadly conical. . . . . .
B. Stamens included. . . . . .
C. Nutlets covered with small cups or cavities. . . . . .5 OMPHALODES.
CC. Nutlets covered with small warts or barbed bristles. . . . . .6. CYNOGLOSSUM.
BB. Stamens exserted. . . . . .
C. Corolla tube longer than spreading lobes. . . .7. LINDELOFIA.
CC. Corolla tubular, lobes short, erect or somewhat spreading. . . .8. SOLENANTHUS.
AA. Nutlets adnate by the inner face or keel to an elevated conical or columnar gynobase, forming a more or less globose or pyramidal fruit. . . . . .9. MYOSOTIDIUM.

Subtribe 2. Nutlets with a scar on the inner face which is flat, (rarely concave), narrow, linear or short, affixed to an elevated gynobase which is conical, oblong or columnar, the apices erect, free, more or less prominent around the style.

A. Nutlets affixed by a short areola below the middle of the gynobase, which is conical or strongly convex. ..... 10. ERITRICHIUM.
AA. Nutlets affixed above the middle or almost at the apex of the gynobase, which is narrowly conical or columnar. ..... 11. KRYNITZKIA.

Subtribe 3. Nutlets placed on a flattish, rarely shortly conical, gynobase, scar excavated or often girt by a ring.

A. Throat of corolla has 5 scales inside. .....
B. Filaments appendaged with a scale. ..... 12. BORAGO.
BB. Filaments not appendaged.
c. Corolla lobes very short and suberect. ..... 13. SYMPHYTUM.
cc. Corolla lobes spreading. 14 ANCHUSA
AA. Throat naked or pilose. .... 15. PULMONARIA.

Subtribe 4. Nutlets erect or incurved, placed on flat or slightly convex (rarely shortly conical) gynobase, the basilar scar flat, either small at the inner angle or oblique.

A. Racemes without bracts (rarely a few bracts at base); anthers obtuse at apex. .....
B. Throat of corolla scaly... 16. MYOSOTIS.
BB. Throat almost naked. .... 17. MERTENSIA.
AA. Racemes bracted. .....
B. Anthers obtuse at apex or hardly mucronate. .....
c. Lobes of corolla erect... 18. ONOSMODIUM.
cc. Lobes of corolla spreading. .....
D. Corolla tube cylindrical; throat naked or 5-gibbous and subsquamate. .... 19. LITHOSPERMUM.
DD. Corolla tube slender; throat naked. .... 20. ARNEBIA.
DD. Corolla tubular or salver-form; throat naked: lobes usually unequal. ..... 21. ECHIUM.
BB. Anthers linear, often acuminate, arrow-shaped at base. .....
c. Nutlets distinct. ..... 22. ONOSMA.
cc. Nutlets connate in pairs. ..... 23. CERINTHE.

98. CONVOLVULACEÆ.

A. Corolla lobes small, imbricate: plants parasitic, leafless; stems thread-like, not green. ..... 1. CUSCUTA.
AA. Corolla plicate or induplicate in æstivation. ....
B. Ovary normally entire, with 2 carpels and 2-ovuled; rarely 3 carpels or 1, rarely 1-ovuled. .....
c. Fr. berry-like or harder, indehiscent: style undivided. .....
D. The ovary 4-celled, 4-ovuled. ..... 2. ARGYREIA.
DD. The ovary 2-celled, 4-ovuled. ..... 3. LETTSOMIA.
cc. Fr. a 2–4-valved capsule with a thin or hard pericarp, or indehiscent with a thin pericarp; styles 2 and distinct or the style entire or divided. .....
D. Stigma thick, globose or didymous: ovary 2– 3– or 4-celled. .4. IPOMŒA.
DD. Stigma 0; capitate: ovary 2-celled. ....5 BREWERIA.
DDD. Stigmas 2, linear, filiform or thickish 6. CONVOLVULUS. (Except Calystegia section. See also *Rhodorhiza*). ...
DDDD. Stigmas 2, flat, ovate or oblong. ..... 7. JACQUEMONTIA. (Also Calystegia section of Convolvulus). .....
BB. Ovary with 5 or more lobes: fr. lobes, or nutlets 1–6-seeded. ..... 8. NOLANA.

99. SOLANACEÆ.

A. Stamens unequal, didynamous, the fifth (and sometimes also one of the pairs) smaller, abortive or missing. .....
B. No. of perfect stamens usually 5 .....
c. Stamens affixed at middle of tube or lower. 1. PETUNIA.
cc. Stamens affixed at apex of tube. ..... 2. NIEREMBERGIA.
BB. No. of perfect stamens usually 4 or 2. .....
c. Corolla tube cylindrical; limb oblique; perfect stamens 2. ..... 3. SCHIZANTHUS.
cc. Corolla obliquely funnel-shaped; perfect stamens 4, didynamous. 4. SALPIGLOSSIS.
ccc. Corolla tube cylindrical, straight; anthers of the 2 short stamens dimidiate, of the 2 longer ones 2-celled. 5. BROWALLIA.
cccc. Corolla tube twisted; anthers as in Browallia. ..... 6. STREPTOSOLEN.
ccccc. Corolla tube long, not twisted, slightly widened at apex; 4 perfect anthers with confluent cells. ..... 7. BRUNFELSIA.
AA. Stamens all perfect, not didynamous, normally 5 ..
B. Seeds little, if at all, flattened .....
c. Fr. a few-seeded berry. 8. CESTRUM.
cc. Fr. a many-seeded capsule. .....
D. Corolla with a narrow tube and short, spreading lobes. ..9. FABIANA.
DD. Corolla funnel or salver-shaped, limb equal or oblique... 10. NICOTIANA.
BB. Seeds flattened. .....
c. Fr. a capsule. .....
D. Corolla lobes plicate. 11. DATURA.
DD. Corolla lobes imbricate. .....12. HYOSCYAMUS.
cc. Fr. berry like, or at least indehiscent. ...
D. Limb of corolla subequally plicate or divided into valvate or induplicate lobes. .....
E. Anthers longer than filament, connivent or connate in a cylinder or cone, acuminate at apex or dehiscent by 2 apical pores. .....
F. Connective variously thickened on back. .....13. CYPHOMANDRA.
FF. Connective slender or obsolete. ...
G. Lvs. pinnatisect: anthers acuminate, hollow at tip, dehiscing by a longitudinal crack. .....14. LYCOPERSICUM.
GG. Lvs. polymor-

phous: anthers opening by an apical pore which is sometimes continued into a longitudinal crack. ....15. SOLANUM.
EE. Anthers free, with parallel cells, and dehiscing by a longitudinal crack. ....16. SALPICHROA.
F. Stamens affixed above middle of tube. ....
FF. Stamens affixed near base of tube. ....
G. Corolla nearly rotate or broadly bell-shaped. ..
H. Fruiting calyx hardly enlarged ..17. CAPSICUM.
HH. Fruiting calyx inflated or bladdery.
I. Calyx cut shortly or to middle 18. PHYSALIS.
II. Calyx parted to base. ..19. NICANDRA.
GG. Corolla tubular or narrowly funnel-shaped 20. IOCHROMA.
DD. Limb of corolla more or less imbricate, flat and distinct or connected by induplicate sinuses..
E. The lobes imbricated from the base not plicate. ....
F. Calyx 3-5-toothed or lobed. ..21. LYCIUM.
FF. Calyx leafy, 5-fid. ....22. ATROPA.
EE. The sinuses of the corolla induplicate between the lobes.
F. Calyx long and tubular. ....23. SOLANDRA.
FF. Calyx leafy, 5-fid., increasing in fr.24 MANDRAGORA.

100. SCROPHULARIACEÆ.

Series 1. PSEUDOSOLANEÆ. Lvs. all alternate; inflorescence simple centripetal; corolla hardly if at all bilabiate; the two posterior lobes external in the bud.

A. Corolla tube short, somewhat bell-shaped, American species. ....1. LEUCOPHYLLUM TRIBE.
AA. Corolla subrotate. Old World species. ....2. VERBASCUM TRIBE.

Series 2. ANTIRRHINIDEÆ. Lvs. prevailingly opposite at least the lower; inflorescence when simple centripetal, when compound partially centrifugal, i. e. the peduncle cymosely few-several-fld.; posterior lip or lobes of corolla generally external in the bud.

A. Tube of corolla scarcely any, or if present bilabiate. ....
B. Lobes concave or slipper-shaped, entire; inflorescence compound. ....3. CALCEOLARIA TRIBE.
BB. Lobes fossulate, saccate or slipper-shaped; inflorescence centripetal, uniform. .. ... 4. HEMIMERIS TRIBE.
AA. Tube of corolla developed..
B. Corolla tube often gibbous, saccate or spurred; inflorescence centripetal, uniform; capsule opens by pores. ...5. ANTIRRHINUM TRIBE.
BB. Corolla tube not saccate or spurred. ....
C. Inflorescence compound, rarely sub-simple; capsule valvately dehiscent or berry-like and indehiscent. ...6. CHELONE TRIBE.
CC. Inflorescence centripetal, uniform ....
D. Anthers 1-celled ...7. MANULEA TRIBE.
DD. Anthers 2-celled. ....8. GRATIOLA TRIBE.

Series 3. RHINANTHIDEÆ. Lvs. various; inflorescence usually centripetal or compound; corolla lobes variously imbricated, the anterior or lateral ones usually exterior.

A. Anther cells contiguous at apex and usually confluent; plants not parasitic. ....9. DIGITALIS TRIBE.
AA. Anther cells everywhere distinct. plants often parasitic. ....
B. Corolla lobes all flat, usually spreading, the 2 posterior ones usually interior. ....10 GERARDIA TRIBE.
BB. Corolla with posterior lip erect, concave or galeate, interior in the bud; anterior lip often spreading. ....11 EUPHRASIA TRIBE.

1. LEUCOPHYLLUM TRIBE.

Corolla lobes 5, subequal, spreading. ....1. LEUCOPHYLLUM.

2. VERBASCUM TRIBE.

A. Stamens 5 ....2. VERBASCUM.
AA. Stamens 4 ....3. CELSIA.

3. CALCEOLARIA TRIBE.

Sole genus. ....4. CALCEOLARIA.

4. HEMIMERIS TRIBE.

A. Corolla more or less rotate, resupinate, the grooves inconspicuous or obsolete. ..5. ALONSOA.
AA. Corolla spread out flat, swollen or saccate under anterior lip. ....6. ANGELONIA.
AAA. Corolla tube short, with a spur or sac on the anterior side. ....7. NEMESIA.

5. ANTIRRHINUM TRIBE.

A. Throat has a prominent palate. ....
B. Corolla spurred. ....8. LINARIA.
BB. Corolla saccate or gibbous at base. ....9. ANTIRRHINUM.
AA. Throat has no palate ....
B. Capsule opens by 2 apical pores which are sometimes confluent. ....10. ANARRHINUM.
BB. Capsule opens by transverse holes or irregularly. ....
C. Calyx ample, membranous. ....11. RHODOCHITON.
CC. Calyx smaller, herbaceous. ....12. MAURANDIA.

6. CHELONE TRIBE.

A. Staminode often elongated..
B. Capsule loculicidally de-

hiscent. . . . . 13. TETRANEMA.
BB. Capsule septicidally dehiscent. . . . . .
C. Fls. bilabiate. . . . . .
D. Anterior lip with middle lobe folded upon itself and inclosing the stamens. . . .14 COLLINSIA.
DD. Anterior lip of 3 flat, spreading lobes. . .
E. Seeds winged. . . . . 15. CHELONE.
EE. Seeds not winged. . 16. PENTSTEMON.
CC. Fls. with all the lobes flat, spreading and subequal. . . . . 17. RUSSELIA.
AA. Staminode usually in the form of a scale at apex of corolla tube . . . . . 18. SCROPHULARIA.
AAA. Staminode small, minute or 0 . . . . . .
B. Stamens usually exserted.
C. Calyx 5-parted: capsule tardily dehiscent . . . 19. PHYGELIUS.
CC. Calyx cup-shaped: berry indehiscent. . . . . 20. HALLERIA.
BB. Stamens included: calyx 5-cut. . . . . .
C. Fr. an indehiscent berry. . . . . 21. TEEDIA.
CC. Fr. a loculicidal capsule. . . . . 22. PAULOWNIA.

7. MANULEA TRIBE.

A. Calyx bilabiate or 2-parted. . 23. ZALUZIANSKYA.
AA. Calyx 5-parted. . . . . 24. CHÆNOSTOMA.

8. GRATIOLA TRIBE.

A. Perfect stamens 2. . . . . 25. GRATIOLA.
AA. Perfect stamens 4. . . . . .
B. Stamens all affixed inside corolla tube. . . . . 26. MIMULUS.
BB. Stamens partly inside corolla tube, partly in throat, 2 affixed in each place. . . . . 27. TORENIA.

9. DIGITALIS TRIBE.

A. Capsule opens by loculicidal valves. . . . . 28. SIBTHORPIA.
AA. Capsule opens by septicidal valves. . . . . .
B. Lvs. alternate. . . . . .
C. Corolla declinate, tube swollen, or bell-shaped: posterior lip spreading. . . . . 29. DIGITALIS.
CC. Corolla tube slender, spreading. . . . . 30. ERINUS.
BB. Lvs. opposite. . . . . 31. OCRISIA.
AAA. Capsule 4-valved or septicidally 2-valved. . . . . .
B. Lvs. all alternate or radical. . . . . 32. SYNTHYRIS.
BB. Lvs. (at least lower ones) opposite. . . . . 33. VERONICA.

10. GERARDIA TRIBE.

Calyx lobes shorter than tube. 34. GERARDIA.

11. EUPHRASIA TRIBE.

A. The anther cells equal. . . . 35. PEDICULARIS.
AA. The outer anther cell fixed by the middle; inner one pendulous or deficient. . . .
B. Calyx laterally compressed, split on anterior side or both. . . . 36. CASTILLEIA.
BB. Calyx 4-cut. . . . . 37. ORTHOCARPUS.

101. LENTIBULARIACEÆ.

A. Posterior lip of corolla erect: calyx 2-parted or deeply 2-lobed. . . . . 1. UTRICULARIA.
AA. Posterior lip of corolla spreading: calyx 4-5-parted. . . . . 2. PINGUICULA.

102. BIGNONIACEÆ.

A. Fr. indehiscent. . . . . 1. CRESCENTIA.
AA. Fr. dehiscent. . . . . .
B. Seeds affixed to middle of valve. . . . . .
C. Calyx ample, membranous, colored ovary 1 celled. . . . . 2. ECCREMOCARPUS.
CC. Calyx small: ovary 2-celled. . . . . 3. JACARANDA.
BB. Seeds affixed to septum.
C. Valves open parallel with septum. . . . . .
D. The seeds in 1 series or irregularly arranged in about 2 series. . . . . .
E. Capsule long and narrow: valves flat, undivided. . 4. BIGNONIA.
EE. Capsule oblong or elongate; valves leathery or hard, usually rugose. . . 5. ADENOCALYMNA.
EEE. Capsule broadly ovate or orbicular smooth outside. . 6. ANEMOPÆGMA.
DD. The seeds in 2 or more series. . . . . .
E. Valves usually thick or markedly convex. . . . . 7. PITHECOCTENIUM.
EE. Valves flat and coriaceous. . . . . 8 OROXYLON.
CC. Valves open at right angles to septum. . . .
D. Wing of seed split into long hairs. . . .
E. Plants herbaceous. .
EE. Plants woody. . . . 9. AMPHICOME.
F. Perfect stamens 2 . . . . . 10. CATALPA.
FF. Perfect stamens 4. . . . . 11. CHILOPSIS.
DD. Wing of seed undivided. . . . . .
E. Lvs. simple or digitately compound. . 12. TABEBUIA.
EE. Lvs. pinnately compound, rarely simple. . . . . .
F. Capsule dehiscing follicularly on one side: lvs. alternate, pinnate. . . . . 13. INCARVILLEA.
FF. Capsule not as in F. . . . . .
G. Calyx teeth 5, equal. . . . . 14. TECOMA.
GG. Calyx cut or lobed irregularly or truncate. . . . . .
H. Capsule 5-8-ribbed. . . . 15. HETEROPHRAGMA.
HH. Capsule not ribbed. . . . 16. STEREOSPERMUM.

103. GESNERACEÆ.

A. Ovary more or less inferior: fr. capsular. . . . . .
B. Disc 0. . . . . 1. NIPHÆA.
BB. Disc annular. . . . . .
C. Fls. smallish, pallid or white. . . . . 2. DICYETA.
CC. Fls. largish, variously colored. . . . . .
D. Corolla tube broadly swollen or bell-shaped: calyx lobes usually membranous or leafy. . . . . 3. GLOXINIA.
(Of botanists, not of florists.)
DD. Corolla tube cylindrical or broadened above: calyx lobes

narrow or short...
E. Fls. axillary. .....4. ACHIMENES. (Consult also *Schceva.*)
EE. Fls. alternate in a terminal, leafless raceme. .....5. NÆGELIA.
BBB. Disc glandular or the glands rarely connected by an obscure ring: glands distinct, usually 5 and equal, posterior glands large, the other 3 smaller or wanting..
C. Capsule inferior to the middle or higher. ...
D. Anther cells confluent at apex. .....6. SINNINGIA. (Gloxinia of Florists.)
DD. Anther cells distinct..7. ISOLOMA.
CC. Capsule shortly immersed at base, almost superior. .....8. GESNERIA.
AA. Ovary wholly superior: fr. capsular or baccate, unknown in Conandron and Saintpaulia. .....
B. Anther cells parallel and distinct. .....
C. Disc with a large posterior gland, the others small or wanting. .....
D. Filaments free among themselves. .....9. EPISCEA.
DD. Filaments connate into a sheath which is split on the posterior side. .....
E. Calyx segments broad and colored, entire, dentate cristate. .....10. ALLOPLECTUS.
EE. Calyx segments acute, entire or incised-dentate. ...11. COLUMNEA.
CC. Disc annular, elevated, almost cup-shaped...
D. Perfect stamens 2. ..12. AGALMYLA.
DD. Perfect stamens 4. ..13. ÆSCHYNANTHUS.
BB. Anther cells divaricate or diverging, rarely subparallel. .....
C. Disc 0. .....
D. Anthers free. .....14. RAMONDA.
DD. Anthers cohering in a tube extending beyond the cells. ...15. CONANDRON.
CC. Disc a ring (rarely dimidiate in Chirita).
E. Lvs. opposite. .....
F. Stamens 4. .....16. BESLERIA.
FF. Stamens 2. .....17. CHIRITA.
EE. Lvs. radical (rarely opposite in Streptocarpus). .....
F. Stamens 4. .....18. HABERLÆA.
FF. Stamens 2. .....
G. Corolla tube long. .....19. STREPTOCARPUS.
GG. Corolla tube short. .....20. SAINTPAULIA.

104. PEDALIACEÆ.

A. Fls. in terminal racemes; anther cells divaricate; connective small, not glandular. .....
B. Corolla tubes swollen above the short base. ..1. MARTYNIA.
BB. Corolla tube very long, slender and cylindrical with a bell-shaped throat. .....2. CRANIOLARIA.
AA. Fls. axillary; anthers dorsifixed, cells parallel or divergent at base; connective often crowned by a gland. .....
B. Capsule truncate at apex, the angles awned or horned. .....3. CERATOTHECA.
BB. Capsule obtuse or acuminate, unarmed. .....4. SESAMUM.

105. ACANTHACEÆ.

A. Corolla lobes convolute, or rarely the interior inmost. .....
B. Filaments connate in pairs at the base. .....
C. Capsule subterete. ....1. RUELLIA.
CC. Capsule compressed parallel to the septum. .....2. DÆDALACANTHUS.
BB. Filaments equidistant or subconnate at the base in pairs: calyx lobes obtuse. .....3. SANCHEZIA.
BBB. Filaments crowded or connate at the base on the posterior wall of the tube, or 2 posterior filaments affixed a little higher. .....
C. Calyx ample, membranous or colored. .....4. WHITFIELDIA.
CC. Calyx segments linear, not colored. .....5. STROBILANTHES.
AA. Corolla expanded into a single obovate lip. .....
B. Calyx of normal texture; posterior segment 3-nerved. .....6. BLEPHARIS.
BB. Calyx usually cartilaginous; posterior segment 3–5-nerved. .....7. ACANTHUS.
AAA. Corolla limb subequal or bilabiate, the 2 posterior lobes or the posterior lip inner, or in Barleria strongly imbricate. ....
B. Corolla of 5 flat lobes, not bilabiate. .....
C. Stameos 4. .....
D. The corolla lobes variously imbricated, lateral ones usually outer. .....
E. Anthers all 2-celled..8. BARLERIA.
EE. Anthers all 1-celled.9. CROSSANDRA.
DD. The anterior corolla lobe outside, posterior one inside...
E. Anthers all 1-celled.10. STENANDRIUM.
EE. Anthers all 2-celled (in Chamæranthemum, the posterior anthers sometimes 1-celled). .....
F. Tube swollen into a long or broad throat. .....11. ASYSTASIA.
FF. Tube long slender, scarcely swollen at apex.12. CHAMÆRANTHEMUM.
CC. Stamens 2. .....
D. Ovules in each cell 2.13. ERANTHEMUM.
DD. Ovules in each cell 3–8. .....
BB. Corolla bilabiate or subequally 4-cut. .....
C. Ovules in each cell 3 or more. .....14. PHLOGACANTHUS.
CC. Ovules in each cell 2..
D. Fls. with 2 or 4 bracts longer than calyx. .....15. PERISTROPHE.
DD. Fls. without such bracts. .....
E. Stamens 4, anthers all 1-celled. .....16. APHELANDRA.
EE. Stamens 2, anthers 2-celled. .....
F. Anther cells unlike, one larger or affixed higher. (In Jacobinia cells often subequal). ....
G. The lower an-

ther cell usually spurred. . 17. JUSTICIA.
GG. The anther cells not spurred, sometimes equally mucronate at base. . . . . .
H. Corolla with short tube and ample lips. . . . . 18. ADHATODA.
HH. Corolla tube usually long and narrow. . . . 19. JACOBINIA.
FF. Anther cells equal. . . . . .
G. Staminodes at base of filaments small. .
H. Corolla tube swollen above; posterior lip incurved, anterior spreading, 3-cut. . . . . 20. GRAPTOPHYLLUM.
HH. Corolla tube elongated: limb subbilabiate, 4-lobed. . . . . 21. THYRSACANTHUS.
GG. Staminodes 0. . .
H. Veins of lvs. white or colored. . . . 22. FITTONIA.
HH. Veins of lvs. green. . . . .
I. Calyx segments linear or bristle-like. 23. SCHAUERIA.
II. Calyx small, lobes acute or acuminate. . . . . 24. ANISACANTHUS.

106. MYOPORACEÆ.

Corolla more or less bell-shaped, rarely funnel-shaped, with a subregular limb; ovary 2- or more-celled; cells 1-ovuled, rarely 2-celled and 2-ovuled. . . . . 1. MYOPORUM.

107. GLOBULARIACEÆ. (or SELAGINACEÆ.)

Calyx 5-cut; the 2 posterior lobes of the corolla narrow or connate or deficient. . . . 1. GLOBULARIA.

108. VERBENACEÆ.

A. Inflorescence centripetal. . .
B. Ovary 1-celled and 1-ovuled; ovule orthotropous. . . . . 1. PHRYMA.
BB. Ovary or at least the fruit with 2 or 4, (or even 8) cells or nutlets; ovules anatropous. . . . . .
C. Fls. sessile in the spike.
D. Nutlets 2 or by abortion 1, 1-seeded. . .
E. Fr. a juicy berry. . . 2. LANTANA.
EE. Fr. dry, in Lippia drupaceous; in the next oblong or linear. . . . . .
F. Calyx 2–4 cut or toothed. . . . . 3. LIPPIA.
FF. Calyx 5-toothed. . . 4. STACHYTARPHETA.
DD. Nutlets or cells of fr. 4, or by abortion fewer, 1-seeded. . . 5. VERBENA.
CC. Fls. pedicelled, racemose, paniculed or axillary. . . . . .
D. Nutlets 1-seeded. . . .
E. No. of nutlets 4 . . . 6. AMASONIA.
EE. No. of nutlets of cells of fr. 2. . . 7. PETREA.
DD. Nutlets 2-seeded, in pyrenes 2–5, 2-locellate. . . . . 8. DURANTA.
AA. Inflorescence centrifugal. . . .
B. Fr. drupe-like, entire or 4-lobed, exocarp usually pulpy or fleshy, the endocarp entire or 4-celled, separating into 4 nutlets. . . . . .
C. Corolla regular; stamens as many as petals. . . . . 9. CALLICARPA.
CC. Corolla limb oblique with anterior lobe produced, or sub-bilabiate; stamens 4 didynamous or arched under posterior lobes.
D. Drupe with 1 nutlet, 4-celled. . . . . .
E. Tube swollen above; stamens shorter than corolla. . . 10. GMELINA.
EE. Tube short; stamens usually exserted. . 11. VITEX.
DD. Drupe 4-parted or by abortion reduced to a single segment. . 12. OXERA.
DDD. Drupe with 4 nutlets, 4 grooved or semi-4-fld. . . . . 13. CLERODENDRON.
BB. Fr. dry, subcapsular, exocarp with 4 valves involute at the margin from the base up, which carry off the nutlets and leave no central column. . . . . 14. CARYOPTERIS.

109. LABIATÆ.

(Summary of Tribes and Subtribes, ignoring exceptions.)

A. The nutlets fleshy or drupe-like, affixed to a small basal or oblong introrsely oblique areola: ovary 4-lobed. . . . . 1. PRASIA TRIBE.
AA. The nutlets dry or hard. . . .
B. Ovary shortly, rarely deeply, 4-lobed; nutlets wrinkled or netted, affixed to an obliquely introrse or lateral, usually large, areola. . . . . .
C. Seeds where known albuminous: corolla with an ample throat and broad lobes. . . . 2. PROSTANTHERA TRIBE.
CC. Seeds not albuminous; corolla various. . . . . 3. AJUGA TRIBE.
BB. Ovary 4-parted to the base: nutlets affixed to a small basal or slightly oblique areola. . . . . .
C. Stamens declinate; perfect ones 4, rarely 2; anthers 1-celled by confluence. . . . . 4. OCIMUM TRIBE.
D. *Subtribe* 1. *Eucleæ.* Areola basal: stamens usually exserted: anterior corolla lobe usually unlike the others. . . . . .
DD. *Subtribe* 2 *Lavandulaceæ.* Areola extrorsely oblique: stamens included: corolla lobes equal or the anterior lobe with the lateral ones forming the anterior lip. . . . . .
CC. Stamens ascending, or

in the Stachys tribe sometimes included. (Consult also ccc.)
D. Perfect stamens 2; anther cells linear, separate, solitary or confluent. .....5. MONARDA TRIBE.
DD. Perfect stamens 4, rarely 2 in the Nepeta tribe. .....
E. Calyx usually 15-nerved: posterior stamens longer than the anterior 6. NEPETA TRIBE.
EE. Calyx 5- or 10-nerved; posterior stamens shorter than anterior: posterior lip of corolla erect, usually concave or forniciate, anterior spreading 3-cut. .7. STACHYS TRIBE.
F. *Subtribe* 1. *Scutellarieæ*. Calyx bilabiate or at length 2-parted, the mouth closed after anthesis. .....
FF. Calyx not bilabiate. .....
G. *Subtribe* 2. *Melitteæ*. Corolla tube long exserted: calyx broad, of 5 short teeth or 3–4 broad lobes. .....
GG. Corolla tube included or slightly exserted, rarely long exserted: calyx tubular or bell-shaped 5–10-toothed.
H. *Subtribe* 3. *Mayeæ*. Stamens included. ....
HH. Subtribe 4. *Lamieæ*. Stamens exserted. ....
CCC. Stamens straight, diverging or ascending; perfect ones 4 or 2: calyx 5, 10, or 13-nerved, rarely 15-nerved; corolla lobes usually flat. .....8. SATUREIA TRIBE.
D. *Subtribe* 1. *Pogostemoneæ*. Anthers 1-celled, subglobose: stamens distinct, straight .....
DD. Anthers 2-celled, at least the younger ones. .....
E. *Subtribe* 2. *Menthoideæ*. Calyx usually 5- or 10-nerved: stamens distant or divaricate. .....
EE. *Subtribe* 3. *Melissoideæ*. Calyx usually 13-nerved: stamens ascending, at least at the base. .....

1. PHASIA TRIBE.

Not in cultivation. . . .

2. PROSTANTHERA TRIBE.

A. Calyx bilabiate, lips entire or anterior emarginate. . .1. PROSTANTHERA.
AA. Calyx equal, 5-toothed. . . . . .2. WESTRINGIA.

3. AJUGA TRIBE.

A. Corolla tube slender, lobes 5, subequal, spreading. . .3. TRICHOSTEMA.
AA. Corolla tube short, quasi 1-lipped, the posterior lobes and small lateral ones declinate at the contracted base of the very large anterior lobe, or rarely erect.4. TEUCRIUM.
AAA. Corolla tube short or exserted, the posterior lip short, erect, 2-cut, anterior much longer and its middle lobe largest. . .5. AJUGA.

4. OCIMUM TRIBE.

A. *Subtribe* 1. *Ocimoideæ*. . . .
B. Anterior lobe hardly longer than the others, often narrower, declinate, flat or slightly concave. . . . . .6. OCIMUM.
BB. Anterior lobe of corolla longer than others, concave or boat-shaped. . . .
C. Filaments connate at the base in a tube. . .7. COLEUS.
CC. Filaments free. . . . . .8. PLECTRANTHUS.
AA. *Subtribe* 2. *Lavandulæ*. Sole genus. . . . . .9. LAVANDULA.

5. MONARDA TRIBE.

A. Calyx tubular. . . . . .10. MONARDA.
AA. Calyx bilabiate. . . . . .
B. Connective continuous with filament and not indicated unless by a slender reflexed tooth. .11. ROSMARINUS.
BB. Connective articulated to the filament but not produced or very shortly acuminate. . . . . .12. AUDIBERTIA.
BBB. Connective transverse on the short and mostly horizontal filament, its descending or porrect portion continued beyond the articulation and either dilated or bearing an abortive rudiment of the second anther cell. . . . . .13. SALVIA.

6. NEPETA TRIBE.

A. Calyx bilabiate or with the posterior tooth much wider than the others. . . . . .14. DRACOCEPHALUM.
AA. Calyx tubular, mouth straight or oblique. . . . . .
B. Stamens erect or divergent: anther cells parallel or at length divergent. . . . . .15. LOPHANTHUS.
BB. Stamens ascending or straightish: anther cells parallel. . . . . .16. CEDRONELLA.
BBB. Stamens ascending and parallel or in a few species rather lax and distant; anther cells divergent or divaricate. . .17. NEPETA.

7. STACHYS TRIBE.

Subtribe 1. SCUTELLARIEÆ.

A. The calyx lips entire. . . . .18. SCUTELLARIA.
AA. The posterior calyx lip 3-toothed, anterior 2-fid. . .19. BRUNELLA.

Subtribe 2. MELITTEÆ.

Anther cells parallel: calyx subequally 5-toothed. . . . .20. PHYSOSTEGIA.

Subtribe 3. MARRUBIEÆ.

Calyx 5–10-toothed; corolla tube included; anther cells at length confluent. .....21. MARRUBIUM.

Subtribe 4. LAMIEÆ.

A. The posterior lip of corolla often short or flat, glabrous or pubescent. .....22. COLEUS.
AA. The posterior lip concave or fornicate, rarely flattish, usually villous. .....
B. Teeth of calyx 8–10 in Leonotis, 5–13 in Moluccella. .....
C. Calyx very broad at apex. .....23. MOLUCCELLA.
CC. Calyx long tubular. ..24. LEONOTIS.
BB. Teeth of calyx 5. .....
C. Stamens often cast to one side after anthesis. .....25. STACHYS.
CC. Stamens often hairy on the back of the anthers. .....26. LAMIUM.
CCC. Stamens often have the posterior filaments appendaged at the base. .....27. PHLOMIS.

8. SATUREIA TRIBE.

Subtribe 1. POGOSTEMONEÆ.

Calyx 5-toothed; corolla 4 cut; anterior lobes usually wider spreading. .....28. POGOSTEMON.

Subtribe 2. MENTHOIDEÆ.

A. Whorls spicate or racemose, not axillary. .....
B. Calyx equal, erect, often elongated in fr.; whorls many-fld. .....29. ELSHOLTZIA.
BB. Calyx subequal in anthesis but declinate and bilabiate in fr.; whorls 2-fld. .....
C. Nutlets smooth. .....30. COLLINSONIA.
CC. Nutlets netted-veined. ..31. PERILLA.
AA. Whorls axillary (or in a few species of Mentha, crowded) in a dense terminal spike).
B. Perfect stamens 4. .....32. MENTHA.
BB. Perfect stamens 2. .....33. CUNILA.
AAA. Whorls in dense heads surrounded by involucral bracts. .....
B. Corolla sub-bilabiate; whorls densely many-fld. .....
C. Lobes of corolla ovate; heads often corymbose-panicled. .....34. PYCNANTHEMUM.
CC. Lobes of corolla oblong or linear; heads globose, solitary. .....35. MONARDELLA.
BB. Corolla bilabiate; whorls 2-fld., rarely more; heads solitary, crowded or corymbose panicled. 36. ORIGANUM.
AAAA. Whorls few-fld., axillary or the upper ones spicate; calyx throat closed by villous hairs. 37. THYMUS.
AAAAA. Whorls axillary or the highest spicate; calyx open-bell-shaped, equal. .....
B. Calyx 10-nerved; stamens ascending. .....38. SATUREIA.
BB. Calyx 15-nerved; stamens divergent. .....39. HYSSOPUS.

Subtribe 3. MELISSEÆ.

A. Posterior lip of corolla concave, sickle-shaped or galeate. .....40. ACANTHOMINTHA.
AA. Posterior lip of corolla flattish or slightly concave.
B. Calyx distinctly 2-lipped.
C. Corolla tube straight or slightly curved. ...41. CALAMINTHA.
CC. Corolla tube below the middle recurved ascending. .....42. MELISSA.
BB. Calyx equal or sub-bilabiate. .....
C. Perfect stamens 4. ...43. MICROMERIA.
CC. Perfect stamens 2. ....44. HEDEOMA.

110. PLANTAGINACEÆ.

Ovary 2-celled or spuriously 4-celled. .....1. PLANTAGO.

111. NYCTAGINACEÆ.

A. Fls. involucrate. .....
B. Stigma with a small head; anthers didynamous. .....1. MIRABILIS.
BB. Stigma linear; anthers not didynamous .....2. ABRONIA.
AA. Fls. not involucrate; bracts large, colored. .....3. BOUGAINVILLÆA.

112. ILLECEBRACEÆ.

A. Segments of involucrate perianth hooded near apex and mucronate on back..1. PARONYCHIA.
AA. Segments of hardly involucrate perianth not hooded, and blunt. .....2. HERNIARIA.

113. AMARANTACEÆ.

A. Anthers 2-celled. .....
B. Ovary 2-ovuled. .....1. CELOSIA.
BB. Ovary 1-ovuled. .....
C. Ovule erect, with a short funiculus. ....2. AMARANTUS.
CC. Ovule suspended from the apex of an elongated funiculus..
D. Perianth segments scarious at apex, connate at base. ..3. TRICHINIUM.
DD. Perianth segments hyaline, membranous or somewhat papery, lanate. ...4. ÆRVA.
AA. Anthers 1-celled .....
B. Fls. minute in glomerules or little spiked along the sparse branches of the panicle. .....5. IRESINE.
BB. Fls. in heads or spikes rarely panicled. .....
C. Stigmas 2. .....
D. Perianth segments free or connate at base. .....6. GOMPHRENA.
DD. Perianth tube 5-cut, cristate or winged in fr. .....7. FROELICHIA.
CC. Stigma simple. .....
D. Staminal tube short or long, with 5 anther-bearing awl-shaped laciniæ and 5 antherless laciniæ interposed. ..8. TELANTHERA.
DD. Staminal tubes with no antherless laciniæ interposed. ..9. PFAFFIA.

114. CHENOPODIACEÆ.

A. Fls. with 4 bractlets, 2 of which are adnate to the perianth at the base or higher. .....
B. Embryo spiral; filaments straight in the bud. ...1. BASELLA.
BB. Embryo semi-annular; filaments recurved at apex or lower in the bud. .....2. BOUSSINGAULTIA.

AA. Fls. with bractlets not adnate to perianth. .....
B. Embryo spiral: albumen scant or 0. .....3. SALSOLA.
BB. Embryo ring-shaped or horseshoe-shaped: albumen copious. .....
(Salicornia has conduplicate embryo and no albumen)...
C. Stem and branches articulated: fls. immersed in caves in the superposed joints. .....4. SALICORNIA.
CC. Stem not articulated...
D. Perianths heteromorphous: staminate without bracts, 3–5-lobed or parted; pistillate usually with 2 bractlets accrescent in fr. free or connate into a sack, and no perianth. .....
E. Pistillate fls. without perianth 3–4-toothed. .....5. SPINACIA.
EE. Pistillate fls. with ample bracts which enlarge in fr.; periatnh 0. .6. ATRIPLEX.
DD. Perianths homomorphous i. e. not of two different forms in the same plant.
E. Fls. hermaphrodite and feminine, solitary or glomerate: seed horizontal: embryo annular: albumen scant .....7. KOCHIA.
EE. Fls. glomerate, hermaphrodite or unisexual: seed erect, inverse or horizontal; embryo annual or horseshoe-shaped..
F. Perianth tube surrounded by a wing: stamens 5: seed horizontal, bony. .....8. CYCLOLOMA.
FF. Perianth 5-parted usually unchanged in fr.: stamens 1–5 seed erect or horizontal, bony or leathery. .....9 CHENOPODIUM.
FFF. Perianth 5-lobed hardened at the base in fruit: seed horizontal, leathery. .....10. BETA.

115. PHYTOLACCACEÆ.

A. Ovary superior. .....
B. Carpel 1. .....1. RIVINA.
BB. Carpels 2–∞ .....2. PHYTOLACCA.
AA. Ovary semi-inferior: fr. inferior. .....3. AGDESTIS.

116. POLYGONACEÆ.

A. The fls. fascicled in the axils or at the nodes of inflorescence. (In the first 3 genera sometimes along the rachis of inflorescence). .....
B. Albumen 3–6-lobed with longitudinal grooves and usually ruminate..
C. Fruiting perianth fleshy or berry-like at the base or everywhere, the nut included or exserted at the apex. .....1. MUEHLENBECKIA.
CC. Fruiting perianth with fleshy or berry-like tube, including the nut and often adnate to it, crowned by the unchanged conniveni or marcescent limb...2. COCCOLOBA.
CCC. Fruiting perianth enlarged, membranous or scarious, colored, outer segments larger and broadly cordate, inner ones oblong. ..3. ANTIGONON.
BB. Albumen equable, entire..
C. Perianth 5-merous, rarely 4-merous: styles usually filiform and stigmas usually capitate. ....
D. Pistil 2-3-merous: stamens usually 6–8: shrubs, often spinescent. .....4. ATRAPHAXIS.
DD. Pistil 3-merous: stamens 8 or fewer. .....
E. Nut entirely or nearly covered by the fruiting perianth. .....5. POLYGONUM.
EE. Nut much longer than the fruiting perianth. .....6. FAGOPYRUM.
CC. Perianth 6-merous, rarely 4-merous. ...
D. Stamens 9, rarely 6: fruiting perianth unchanged: nut 3-winged .....7. RHEUM.
DD. Stamens 6, rarely 9: inner segments of fruiting perianth much enlarged, erect and including the 3-angled nut. .....8. RUMEX.
AA. The inflorescence dichotomously or umbellately branched, the floral lvs. or bracts connate below the branches into one 3-cut bract or free and 3–∞ in number. .....9. ERIOGONUM.

117. NEPENTHACEÆ.

Sole genus. .....1. NEPENTHES.

118. ARISTOLOCHIACEÆ.

A. Perianth persistent, 3-lobed above ovary, regular stamens 12 surrounding the style in 2 series; anthers free. .....1. ASARUM.
AA. Perianth deciduous, irregular, polymorphous: anthers 6–∞ adnate in 1 series to a stylar column.2. ARISTOLOCHIA.

119. PIPERACEÆ.

A. Ovary of 3 or 4 carpels, 2–8-ovuled. .....1. SAURURUS.
AA. Ovary 1-celled, 1-ovuled. ..
B. Stamens 2–6, anther cells usually distinct: stigmas 3–4, rarely 2 or 5.2. PIPER.
BB. Stamens 2, anther cells confluent into one 2-valved anther: stigma terminal or lateral, penicillate or undivided..3. PEPEROMIA.

120. CHLORANTHACEÆ.

Fls. falsely hermaphrodite, the staminate with 1-3 anthers. .....1. CHLORANTHUS.

121. MYRISTICACEÆ.

Sole genus. .....1. MYRISTICA.

122. MONIMIACEÆ.

Perianth lobes 10–12: stamens numerous; filaments glandular at base; anther-cells dehiscing in a 2-valved fashion by a longitudinal crack. .....1. PEUMUS.

123. LAURACEÆ.

A. Anthers 2-locellate, valves laterally dehiscent or quickly deciduous. .....1. HERNANDIA.
AA. Anthers extrorsely locellate, valves dehiscent upwards. .....
B. The whole perianth persisting under the fruit, appressed or slightly spreading; perianth sometimes deciduous from the base. .....2. PERSEA.
BB. The perianth segments at length transversely cut, leaving the fruiting tube bell-shaped or expanded and 6 toothed. .....3. CINNAMOMUM.
BBB. The perianth segments deciduous from the base, leaving the fruiting tube flattened out or disc-shaped and entire or truncate. .....4. CAMPHORA.
AAA. Anthers introrsely locellate; valves dehiscing upwards. .....
B. Fls. in a short, lax raceme, accompanied by small and narrow bracts. .....5. SASSAFRAS.
BB. Fls. umbellate, capitate or rarely solitary; umbels or heads before anthesis included in a 4–6-bracted involucre...
C. Locellæ of anther 4...6. UMBELLULARIA.
CC. Locellæ 2. .....
D. Stamens usually 9: fls. dioecious. .....7. BENZOIN.
DD. Stamens usually 12–20: fls. polygamous. .....8. LAURUS.

124. THYMELEACEÆ.

A. Stamens fewer than the corolla lobes. .....1. PIMELEA.
AA. Stamens twice as many as corolla lobes. .....
B. Disc 0 or a very short ring. .....
C. Perianth tube cylindrical; limb spreading;2. DAPHNE.
CC. Perianth much swollen above, obliquely truncate, limb not spreading. .....3. DIRCA.
BB. Disc more or less lobed or oblique. .....
C. Fls. 5-merous; disc cup-shaped. .....4. DAIS.
CC. Fls. 4-merous. .....
D. The disc annular; lobes very short...5. EDGEWORTHIA.
DD. The disc 4 cut or 2-cut. .....6. WIKSTRŒMIA.

125. PROTEACEÆ.

Series 1. Fr. an indehiscent nut or drupe: fls. usually solitary with a bract under each one.

A. Fls. dioecious by abortion: regular. .....1. LEUCADENDRON.
AA. Fls. hermaphrodite irregular. .....2. PROTEA.

Series 2. Fr. follicular, capsular or rarely dehiscent and subdraceous: fls. usually in pairs along the rachis with only one bract for each pair.

A. Ovules 2: collateral. .....
B. Fls. racemose or fascicled, involucre none or inconspicuous: bracts deciduous. .....
C. The ovules pendulous orthotropous. .....
D. Fr. scarcely or tardily dehiscent: pericarp thick, fleshy or hard: seeds with thick, often unequal cotyledons. .....
E. Perianth limb recurved. .....3. GEVUINA.
EE. Perianth straight...4. MACADAMIA.
DD. Fr. follicular or obliquely 2-valved: seeds compressed: margined or wing. 5. ROUPALA.
CC. The ovules laterally affixed or ascending. ..
D. Seeds with or without a narrow wing.6. GREVILLEA.
DD. Seeds samara-like, wing oblong, terminal. .....7. HAKEA.
BB. Fls. in dense spikes or cones. .....8. BANKSIA.
AA. Ovules 4 or more. .....
B. Fls. umbellate: seeds winged below. .....9. STENOCARPUS.
BB. Fls. in dense racemes: seeds samara-like, with an oblong terminal wing. .....10. TELOPEA.

126. ELÆAGNACEÆ.

A. Lvs. alternate: stamens 4.
B. Fls. hermaphrodite. .....1. ELÆAGNUS.
BB. Fls. unisexual, usually dioecious. .....2. HIPPOPHAË.
AA. Lvs. opposite: stamens 8...3. SHEPHERDIA.

127. LORANTHACEÆ.

Anthers erect, 2-celled at apex, longitudinally dehiscent. .....1. PHORADENDRON.

128. PLATANACEÆ.

Sole genus. .....1. PLATANUS.

129. URTICACEÆ.

A. Ovule erect, orthotropous..1. NETTLE TRIBE.
AA. Ovule pendulous. .....
B. Anthers reversed in the bud, with inflexed filaments: fls. unisexual...2. MULBERRY TRIBE.
BB. Anthers erect from the beginning. .....
C. Fls. unisexual, the males or those of either sex numerous on a fleshy receptacle, rarely racemose. ....3. BREAD FRUIT TRIBE.
CC. Fls. not borne upon a fleshy receptacle.
D. Fr. a small akene: fls. dioecious, males panicled, females sessile. .....4. INDIAN HEMP TRIBE.

DD. Fr. drupaceous, globose or bladdery, with a hard endocarp: embryo curved; cotyledons variously plicate or involute. .....5. CHINESE NETTLE TREE TRIBE.

DDD. Fr. not drupaceous, compressed, oblique at apex, dry or thinly fleshy, often winged or appendaged; embryo straight, cotyledons flat or longitudinally complicate. .....6. ELM TRIBE.

1. NETTLE TRIBE OR URTICEÆ.

A. Hairs stinging. .....
B. Akene straight. .....1. URTICA.
BB. Akene oblique. .....2. URERA.
AA. Hairs harmless. .....
B. Female perianth 3-parted.3. PILEA.
BB. Female perianth 4–5-parted. ....4. PELLIONIA.
BBB. Female perianth tubular..5. BEHMERIA.

2. MULBERRY TRIBE OR MOREÆ.

A. The male fls. spicate, racemose or capitate; female globose, capitate. .....
B. Female perianth dentate.6. BROUSSONETIA.
BB. Female perianth deeply 4-fid. ....7. TOXYLON.
AA. The fls. of either sex spicate; spikes short and dense or long and lax. ..8. MORUS.
AAA. The fls. crowded on a fleshy receptacle. .....9. DORSTENIA.

3. BREAD FRUIT TRIBE OR ARTOCARPEÆ.

A. The receptacle fleshy, globose or ovoid, clearly inclosing the numerous fls., but with a small mouth which is bracteate introrsely; the mouth is closed in fruit. ....10. FICUS.
AA. The receptacle androgynous, male fls. numerous, females solitary in the center of the receptacle..11. BROSIMUM.
AAA. The receptacle unisexual, with an involucre of numerous bracts overlapping in series.....12. ANTIARIS.
AAA. The flower clusters unisexual, with or without 3–4 bracts at the base, in heads, spikes, rarely in racemes or the female 1-fid. .....
B. Stamens 4. .....13. CUDRANIA.
BB. Stamen 1. .....14. ARTOCARPUS.

4. INDIAN HEMP TRIBE OR CANNABINEÆ.

A. Stem climbing: lvs. opposite: embryo spirally involute. .....15. HUMULUS.
AA. Stem not climbing: lvs. alternate or the lowest opposite: embryo curved. ..16. CANNABIS.

5. CHINESE NETTLE TREE TRIBE OR CELTIDEÆ.

A. Cotyledons very broad. ....
B. Style excentric: male perianth shortly lobed.17. ZELKOVA.
BB. Style central: male perianth segments imbricate. .....18. CELTIS.

AA. Cotyledons narrow: embryo involute. .....19. APHANANTHE.

6. ELM TRIBE OR ULMEÆ.

A. Fr. stalked, surrounded by a broad wing. ....20. ULMUS.
AA. Fr. not winged, everywhere somewhat fleshy and muricate. .....21. PLANERA.

130. JUGLANDACEÆ.

A. The fls. of either sex in erect spikes, imbricate-bractate. .....1. PLATYCARYA.
AA. The staminate fls. in pendulous catkins: pistillate fls. spicate or subsolitary.
B. In germinating cotyledons are borne above ground and remain green. ....2. PTEROCARYA.
BB. In germinating cotyledons remain inside the nut. .....
C. Husk at length splitting into segments: nut smooth or angled. ....3. HICORIA.
CC. Husk indehiscent: nut wrinkled or sculptured. .....4. JUGLANS.

131. MYRICACEÆ.

A. Lvs. serrate or entire, not stipulate: ovary subtended by 2–4 bractlets..1. MYRICA.
AA. Lvs. pinnatifid stipulate: ovary subtended by 8 linear, persistent bractlets. .....2. COMPTONIA.

132. CASUARINACEÆ.

Sole genus. ..... 1. CASUARINA.

133. EUPHORBIACEÆ.

(Summary of Tribes, ignoring exceptions and omitting two tribes not in cultivation).

NOTE. Opinions differ as to the rank of Buxus and allied genera, some botanists giving them a separate family, *Buraceæ*. They are here treated as a tribe of the Euphorbiaceæ.

A. Fls. simulating a single hermaphrodite flower, but composed of a calyx-like involucre, including numerous 1-anthered staminate fls. and a single central pistillate fl.: true perianths very small or wanting. .....1. EUPHORBIA TRIBE.
AA. Fls. distinct. .....
B. Raphe of ovules dorsal: embryo various: stamens opposite sepals or ∞ . .....2. BUXUS TRIBE.
BB. Raphe ventral: embryo with cotyledons much broader than radicles..
C. Ovules twin: all stamens or outer ones opposite sepals. ....3. PHYLLANTHUS TRIBE.
CC. Ovules solitary: all stamens or outer ones alternate with sepals.4. CROTON TRIBE.

1. EUPHORBIA TRIBE.

A. Involucre irregular, oblique, declinate or urn-shaped, increased by a posterior appendage, glandular inside. .....1. PEDILANTHUS.
AA. Involucre regular or nearly so. .....

B. Glands distinct, alternate with lobes of calyx like involucre. ..... 2. EUPHORBIA.
BB. Glands connate in a cup or entire disc encircling the lobes of the deeply 5-cut involucre. . 3. SYNADENIUM.

2. BUXUS TRIBE.

A. Stamens ♂ : no rudiment of ovary in staminate fls. 4. SIMMONDSIA.
AA. Stamens as many as the sepals and opposite them: rudiment of ovary in staminate fls. present. The following genera are fundamentally separated on inflorescence characters but the leaf characters are briefer and easier. .....
B. Lvs. alternate, entire. . . 5. SARCOCOCCA.
BB. Lvs. alternate, usually coarsely toothed. ..... 6 PACHYSANDRA.
BBB. Lvs. opposite. ..... 7. BUXUS

3. PHYLLANTHUS TRIBE.

A. Fls. petaliferous, the staminate ones glomerate at axils or nodes, pistillate often solitary. ..... 8. CLEISTANTHUS.
(Consult *Lebidicropsis*.)

AA. Fls. very rarely petaliferous.
B. Staminate fls. glomerate at axils or nodes, rarely subcymose: pistillate fls. often solitary. ....
C. Styles or style branches erect or recurved, slender or dilated only at apex. . .
D. Stamens opposite sepals usually 5: rudiment of ovary present in staminate fl. ..... 9. SECURINEGA.
DD. Stamens 2–6: rudiment of ovary absent from the center of the staminate fl. ..... 10. PHYLLANTHUS.
CC. Styles much dilated: spreading. .....
D. Stamens few in the center of the fl. . . 11. PETRANJIVA.
DD. Stamens ∞, affixed around a broad, concave central disc. ..... 12. HEMICYCLIA.
BB. Staminate fls. in racemes or spikes, which are catkin-like or slender and simple or paniculately branched. .....
C. Stamens 5–15, crowded in center of fl. . . . . 13. DAPHNIPHYLLUM.
CC. Stamens 2–5 around the rudiment of ovary. ..... 14. ANTIDESMA.

4. CROTON TRIBE.

(Summary of the subtribes, omitting one, and ignoring exceptions).

A. *Subtribe* 1. *Jatrophæ*. Inflorescence composed of cymose panicles, 2–3-chotomous, rarely reduced to a terminal fascicle, androgynous with a central pistillate flower, or unisexual. .....
AA. Inflorescence usually composed of racemes or spikes. .....
B. Staminate fls. usually petaliferous. .....
C. *Subtribe* 2. *Euerotinæ*. Racemes or spikes terminal: filaments inflexed at the apex in the bud, the anthers reversed, but at length usually erect. .....
CC. *Subtribe* 3. *Cheiseæphoræ*. Racemes, spikes, (or rarely the racemiform panicles) axillary, rarely terminal or panicled at tips of branches: anthers erect even in the bud .....
BB. Staminate fls. devoid of petals .....
C. *Subtribe* 4. *Hippomanoræ*. Calyx of staminate fls. small and open even before anthesis, sometimes minute or wanting; otherwise as in Acalypheæ or Plukenetieæ. .....
CC. Calyx not as in C. .....
D. *Subtribe* 5. *Adrianeæ*. Racemes or spikes terminal, simple: styles distinct or hardly connate at base. . .
DD. Racemes or spikes axillary or paniculed at tips of branches. .....
E. *Subtribe* 6. *Acalypheæ*. Styles usually distinct. . . .
EE. *Subtribe* 7 *Plukenetieæ*. Style usually continuous with the ovary, columnar, shortly or very shortly lobed at apex. . . .

Subtribe 1. JATROPHEÆ.

A. Staminate fls. without petals. .....15. HEVEA.
AA. Staminate fls. with petals, or rarely with a petaloid calyx. .....
B. Calyx imbricate. .....16. JATROPHA.
BB. Calyx valvately ruptured. 17. ALEURITES.

Subtribe 2. ERYTROTONEÆ.

Sepals equal or rarely unequal, valvate or slightly imbricate. .....18. CROTON.

Subtribe 3. CHROZOPHOREÆ.

Calyx small, oppressed, free petals small, free. .....19. CODIÆUM.

Subtribe 4. HIPPOMANEÆ.

A. Stamens ∞. .....20. HOMALANTHUS.
AA. Stamens 1–2. .....21. STILLINGIA.

Subtribe 5. ADRIANEÆ.

Staminate calyx often colored. 22. MANIHOT.

Subtribe 6. ACALYPHEÆ.

A. The anther cells usually stalked, at length flexuous, dehiscent at apex . . 23. ACALYPHA.
AA. The anther cells oblong, everywhere or above the middle adnate, parallel or divergent. .....24. MALLOTUS.
AAA. The anther cells subglobose: stamens very numerous, the filaments branching repeatedly. . . .25. RICINUS.

Subtribe 7. PLUKENETIEÆ.

Stamens usually 20–30, affixed to a convex or columnar torus. .....26. DALECHAMPIA.

134. CUPULIFERÆ.

A. Ovary 2-celled; cells 1-ovuled: staminate fls. in pendulous catkins. .....
B. Staminate fls. with 4 perianth segments, or by abortion fewer. (*Birch Tribe*). .....
c. Stamens 2. .....1. BETULA.
cc. Stamens 4. .....2. ALNUS.
BB. Staminate fls. with no perianth. (Hazel Tribe). .....
c. Nut large, inclosed by a leafy involucre; staminate fls with 2 bractlets: pistillate fls. 2–4, capitate. ...3. CORYLUS.
cc. Nut small, subtended by or inclosed in a large bractlet; staminate fls. with no bractlets: pistillate catkins spike like....
D. Fruiting bractlet flat, 3-cleft and incised. .....4. CARPINUS.
DD. Fruiting bractlet bladder-like, closed, membranous .....5. OSTRYA.
AA. Ovary 3-celled (rarely 2-4- or 6-celled); cells 2-ovuled: staminate inflorescence various. (Oak Tribe). .....
B. Ovary of pistillate fls. 6-celled: spikes of either sex erect and strict: fruiting involucre or burr densely covered with strong pickers. ..6. CASTANEA.
BB. Ovary of pistillate fls. 3-celled, rarely 4 or 5-celled in some species of Quercus. .....
c. The staminate fls. 1–3 in a cluster; lvs. usually small. .....7. NOTHOFAGUS.
cc. The staminate fls. in loose, roundish heads: lvs. generally large. .....8. FAGUS.
ccc. The staminate catkins pendulous, or the spikes of either sex erect and strict. ....
D. Involucre of numerous scales forming a cup in fruit and subtending the acorn. .....9. QUERCUS.
DD. Involucre in fruit armed with clusters of prickles or tubercles, wholly including the fruit, perfectly closed or at length split irregularly. .....10. CASTANOPSIS.

135. SALICACEÆ.

A. Lvs. usually narrow: catkins usually erect and dense: disc composed of 1 or 2 glands which are distinct or barely connate at base. .....1. SALIX.
AA. Lvs. usually broad: catkins, at least the staminate ones, lax and pendulous: disc cyathiform often oblique or cup-shaped, entire or lobed. .....2. POPULUS.

136. EMPETRACEÆ.

A. Fls. axillary, solitary; stamens 3: pistil 6–9 merous. .....1. EMPETRUM.
AA. Fls. axillary in 2's or 3's.: stamens 2: pistil 2-merous. .....2. CERATIOLA.

(Summary of Tribes)

Leafless shrubs with jointed branches and scales opposite the nodes connate into a little sheath. .....1. EPHEDRA.

138. CONIFERÆ.

Summary of Tribes.

A. Ovules erect, at least during anthesis. .....
B. Ovule bearing blade adnate to the bract, usually increasing much: ovules under the fertile scales 2–6 or ∞, rarely 1.
c. Scales of the pistillate ament in 2 ∞ series opposite in each series, or in whorls of 3, rarely 4: lvs. of the fertile branches opposite or in whorls of 3. .....1. CYPRESS TRIBE.
cc. Scales of pistillate ament spirally crowded: lvs. spirally affixed, spreading in several directions, or in two directions.2. BALD CYPRESS TRIBE.
BB. Ovule-bearing blade free from the bract: ovule under the fertile scales solitary: scales of the pistillate ament imbricate, all except the terminal one empty or many fertile. .....3. YEW TRIBE.
AA. Ovules reversed even during anthesis. .....
B. Ovule-bearing blade adnate to the bract, or in the Podocarpus tribe sometimes adnate to the ovule. .....
c. Ovule affixed to the apex of the scale or ovule-bearing blade: scales of the pistillate aments often fleshy, spirally crowded: ovule solitary. .....4. PODOCARPUS TRIBE.
cc. Ovules affixed at or below the middle of the scale: scales of the pistillate aments spirally overlapping in many series: seeds with or without a lateral wing, but never a spurious samara-like wing. .....5. ARAUCARIA TRIBE.
BB. Ovule-bearing blade free from the bract or adnate only at base: ovules affixed near base of scale: scales of pistillate aments double: seed usually samara-like with a spurious wing formed from the inner stratum of the scales. .....6. FIR TRIBE.

1. CYPRESS TRIBE.

A. Fr. fleshy, indehiscent, a berry or drupe, with 2–6 fertile scales. .....1. JUNIPERUS.

AA. Fr. a cone. . . . . .
B. Cone scales all fertile. . .
C. Scales of the larger branches usually alternate or irregularly opposite. . . . . 2. WIDDRINGTONIA.
CC. Scales of the branches usually in whorls of 3 or 4. . . . . 3. CALLITRIS.
BB. Cone scales partly fertile, partly empty. . . . . .
C. No. of seeds under each fertile scale ∞, usually numerous narrowly 2 winged, maturing the second year. . . . . 4. CUPRESSUS.
CC. No. of seeds under each fertile scale 2–5. . . .
D. Seeds samara like, winged above, 2 under each fertile scale. . . . . 5. LIBOCEDRUS.
DD. Seeds winged everywhere or not at all. . . . . .
E. Fertile scales usually 4 or 6, rarely 8. . . . . .
F. No. of seeds 4 or 5. . . . . 6. THUYOPSIS.
FF. No. of seeds 2 or 3. . . . . .
G. Mature cones globose, hard, with scales thickened or dilated at apex: seeds broadly or rarely narrowly 2-winged. . . . 7. CHAMÆCYPARIS.
GG. Mature cones various. . . .
H. Seeds rather narrowly 2-winged: otherwise as in Thuya, sub genus Enthuya. . . 8. THUYA, *Subgenus Macrothuya.*
HH. Seeds not winged: young cones globose and somewhat fleshy; mature cones suboyoid with hard scales. . . . 9. THUYA, *subgenus Biota.*
EE. Fertile scales 2: mature cones ovoid–oblong nodding, the scales hardly thickened. . . . . 10. THUYA, *subgenus Euthuya.*

2. BALD CYPRESS TRIBE.

A. Ovules 3–6, usually 5 in Sequoia. . . . . .
B. Ovule-bearing blade digitately 5-cut at apex. . . . 11. CRYPTOMERIA.
BB. Ovule-bearing blade entire at margin. . . . . 12. SEQUOIA.
AA. Ovules 2. . . . . .
B. Seeds drupe-like, large, long-exserted from cone scales. . . . . 13. CEPHALOTAXUS.
BB. Seeds included by the cone scales which are woody at apex. . . . . 14. TAXODIUM.

3. YEW TRIBE.

A. Ovule-bearing blade at first ring-shaped: then cup-shaped and fleshy, finally berry-like, including the seed but not adnate to it, open at top: anthers umbrella-shaped after flowering, the cells connate in a circle. . . . . 15. TAXUS.
AA. Ovule-bearing blade at first cup-shaped, later including the ovary, finally strongly adnate to the seed: anther cells connate in a semi-circle. . . . 16. TORREYA.

AAA. Ovule-bearing blade long-stalked, shortly 2– ∞ –cut at apex, the lobes dilated into a ring or short cup adnate to the seed: anther cells 2, pendulous. 17. GINKGO.

4. PODOCARPUS TRIBE.

Scales of pistillate aments few, adnate to peduncle and with it usually fleshy. . . . . 18. PODOCARPUS.

5. ARAUCARIA TRIBE.

A. Ovule-bearing blade finally much increased and hardened, making the greater part of the woody cone. . . 19. SCIADOPITYS.
AA. Ovule-bearing blade thin terminated at the apex by a hardly prominent line or apical point. . . . . .
B. Ovules 3: ovule-bearing blade much shorter than the scale. . . . . .
C. Anther cells 2–4: seeds surrounded by a narrow wing. . . . . 20. CUNNINGHAMIA.
CC. Anther cells 5– ∞: seeds with a broad wing on one or all sides. . . . . 21. AGATHIS.
BB. Ovule 1: ovule-bearing blade hardly shorter than scale: anther cells 6– ∞: seed everywhere or nowhere winged. . . . 22. ARAUCARIA.

6. FIR TRIBE.

A. Foliage deciduous. . . . . .
B. Male fls. solitary in a leafless scaly bud; connective not produced beyond anther cells or scarcely prominent: cones reflexed: scales persistent. . . . . 23. LARIX.
BB. Male fls. clustered, pendulous; cone scales deciduous. . . . . 24. PSEUDOLARIX.
AA. Foliage evergreen. . . . . .
B. Connective of anthers usually produced into a scale-like appendage.
C. Male fls. subspicate at base of new shoots: cone scales persistent. 25. PINUS.
CC. Male fls. solitary in the cluster of lvs. which terminate short branchlets: cone scales finally deciduous. . . . . 26. CEDRUS.
CCC. Male fls. solitary in the axils; cones reflexed: scales persistent. . . . 27. PICEA.
BB. Connective of anthers umbonate beyond the cells or hardly prominent: male fls. solitary in axils. . . . . .
C. Cones reflexed; scales persistent. . . . . .
D. Subtending bract conspicuous. . . . . 28. PSEUDOTSUGA.
DD. Subtending bract small. . . . . 29. TSUGA.

cc. Cones erect; scales deciduous with seeds. .30. ABIES.

139. CYCADACEÆ.

A. Leaf segments circinately involute in vernation: female cones proliferous after anthesis; scales elongate, the margins bearing 2–many ovules. ..1. CYCAS.
AA. Leaf segments straight in vernation: female cones deciduous after anthesis; scales peltate. .. ..
B. Cone scales superposed in vertical series .....
C. Shield of the scales transversely 2 horned at apex .....2. CERATOZAMIA.
CC. Shield of the scales truncate, not horned at apex. .....3. ZAMIA.
BB. Cone scales overlapping in alternating series. .....
C. Leaf segments ribbed and nerved; nerves spreading on either side of midrib, very numerous, simple or forked. .....4. STANGERIA.
CC. Leaf segments with parallel, longitudinal nerves. .....
D. Shield of cone scales flat, erect, ovate-cordate. .....5. DIOON.
DD. Shield thickened, ascending, usually prolonged into an erect, acuminate blade. .....6. MACROZAMIA.
DD. Shield thickened, truncate, decurved at apex. .....7. ENCEPHALARTOS.

140. HYDROCHARIDACEÆ.

A. Stem elongated, submerged, everywhere leafy: lvs. short: spathes small, sessile in axils: placentæ little prominent in ovary.1. ELODEA.
AA. Stem very short, sometimes emitting creeping or floating stolons: lvs crowded, immersed, sessile, elongated: spathes pedunculate: placentæ hardly prominent. .....2. VALLISNERIA.
AAA. Stem very short: lvs. crowded some sessile and submerged, others (except in Stratiotes) long-stalked, with a floating blade: spathes pedunculed: placentæ of 2 lamellæ, strongly intruded, dividing the ovary more or less perfectly into 6 cells. .....
B. Styles 3: stamens 3–9. 3. LIMNOBIUM.
BB. Styles 6, 2-fid. .....
C. Stamens with 6, 2-fid. filaments, of which 3 have 2 anthers and 3 have 1 anther. ...4. HYDROCHARIS.
CC. Stamens 11–15. .....5. STRATIOTES.

141. ORCHIDACEÆ.

(Summary of subfamilies.)

(By Heinrich Hasselbring.)
Mostly following Pfitzer in Engler and Prantl: Die Natürlichen Pflanzenfamilien. .....
Fertile anthers 2, rarely 3: stigmas 3. .....SUBFAMILY 1. DIANDRÆ.
Fertile anther 1: stigmas 2 mostly confluent. .....,SUBFAMILY 2. MONANDRÆ.

(Summary of Tribes.)

SUBFAMILY I. DIANDRÆ.

Sole tribe. .....1. CYPRIPEDIUM TRIBE.

SUBFAMILY II. MONANDRÆ.

A. Pollinia with appendages (caudicles) at the base: filaments broad: anthers persistent. .....2. OPHRYS TRIBE.
AA. Pollinia with appendages at the apex or without appendages; filaments narrow and delicate in consequence of which the anthers are easily deciduous. .....
B. Inflorescence terminal, ending the growth of the flowering shoot. ...
C. Leaf-arrangement convolute. .....
D. Blade and sheath of the lvs. continuous: anthers withering, persistent; pollenmasses mostly granular. .....3. NEOTTIA TRIBE.
DD. Blade of the leaves distinctly differentiated from the sheath and separating from the latter along a well-marked line: anthers mostly deciduous; pollinia waxy, rarely granular. .....
E. Stems slender, or with all the internodes equally thickened: fls. mostly spurred: pollinia 8. .....4. THUNIA TRIBE.
EE. Stems with a single thickened internode (pseudobulb): fls. rarely spurred: pollinia 4. .....5. CŒLOGYNE TRIBE.
CC. Leaf arrangement conduplicate. .....
D. Sepals smaller than or equalling the petals, the latter and the labellum the more conspicuous. .....
E. Lvs. not jointed at base of blade: foot of the column wanting or forming a short spur with the labellum: pollinia 4, without appendages. .....6. LIPARIS TRIBE.
EE. Lvs. mostly jointed: column with a distinct foot: pollinia 2 or 4, provided with short stipes. .....7. POLYSTACHYA TRIBE.
EEE. Lvs. jointed, mostly fleshy or leathery: fls. large with the labellum larger than the sepals: pollinia 4, 6 or 8, provided with caudicles. ..8. LÆLIA TRIBE.
EEEE. Lvs. jointed, longitudinally folded in the bud: pollinia without appendages: fls. large. .....9. SOBRALIA TRIBE.

DD. Sepals larger than the petals, often concealing the latter. .....10. PLEUROTHALLIS TRIBE.

BB. Inflorescence lateral or on special lateral branches, not terminating the growth of the main shoot. .....
C. Leaf-arrangement convolute. .....
D. Stems slender; internodes not enlarged or all equally thickened. .....
E. Labellum enveloping the column, or united with it, without a hypochil. .....11. PHAJUS TRIBE.
EE. Labellum membranous, jointed to the column, or spurred. .....12. CYRTOPODIUM TRIBE.
EEE. Labellum often with a distinct hypochil, united with the base of the column but not jointed. .....13. CATASETUM TRIBE.
DD. Stems pseudobulbous, a single internode thickened into a pseudobulb. .
E. Floral axis arising below the new leafy shoot. .....
F. Labellum membranous jointed at the foot of the column, mostly with longitudinal ridges. .....14. LYCASTE TRIBE.
FF. Labellum fleshy, firmly united with the base of the column. .15. GONGORA TRIBE.
EE. Floral axis arising above the new leafy shoot: labellum mostly with transverse ridges. .16. ZYGOPETALUM TRIBE.
CC. Leaf-arrangement conduplicate. .....
D. Growth determinate, sympodial. .....
E. Labellum moveably joined to the column. .....
F. Stems typically slender with all the internodes similar; inflorescence arising from the summit of the internodes. .....17. DENDROBIUM TRIBE.
FF. Stems with pseudobulbs consisting of a single internode: inflorescence below the pseudobulb, either above or below the leafy shoot of the same order, pollinia mostly without appendages. ...18. BULBOPHYLLUM TRIBE.
FFF. Stems mostly with pseudobulbs consisting of one internode: inflorescence arising below the leafy shoot of the same order: pollinia provided with stipes.19. MAXILLARIA TRIBE.
FFFF. Stems typically without pseudobulbs: inflorescence arising above the leafy shoot of the same order: pollinia provided with distinct stipes. . .....20. HUNTLEYA TRIBE.
EE. Labellum somewhat moveable: pollinia with transverse candicles and broad stipes: lvs. strap-shaped. ...21. CYMBIDIUM TRIBE.
EEE. Labellum firmly joined with the foot of the column, bearing longitudinal ridges, crests, etc.: pollinia with distinct stipes. ...22. ONCIDIUM TRIBE.
DD. Growth indeterminate, monopodial..23. SARCANTHUS TRIBE.

(Summary of GENERA.)

1. CYPRIPEDIUM. TRIBE.

A. Ovary 1-celled. .....1. CYPRIPEDIUM.
AA. Ovary 3-celled. .....2. SELENIPEDIUM.

2. OPHRYS TRIBE.

A. Anthers erect: column absent or very short. .....
B. Stigmas sessile. (*Serapiadeæ*. .....
C. Viscid glands of the pollinia inclosed in separate pouches: labellum convex, hairy. .....3. OPHRYS.
CC. Viscid glands enclosed in a common pouch.
D. Labellum spurred....4. ORCHIS.
DD. Labellum not spurred. .....5. SERAPIAS.
BB. Stigmas more or less elevated on stalks. (*Habenarieæ*) .....
C. The stigmas short, broad: labellum somewhat adnate to the column, spurred. 6. CYNORCHIS.
CC. The stigmas slender or cylindrical: labellum free, long-spurred. . .7. HABENARIA.
AA. Anthers deflexed: column evident, long or short. (*Satyrieæ*) viscid glands of the pollinia separate. . .8. DISA.

3. NEOTTIA TRIBE.

A. Anthers usually much exceeding the rostellum: removal of the viscid glands not leaving a well defined furrow in the rostellum. .....
B. Labellum without a hypochil, not spurred. ....
C. Flowering stems without lvs.: leafy stems generally appearing later. (*Pogonieæ*.).
D. Column clavate: labellum free, not spurred. .....9. POGONIA.
DD. Column linear, dilated: labellum adherent to its base, with 2 very short spurs. .....10. ARETHUSA.
CC. Flowering stems, in the

cultivated species bearing lvs. Some species are leafless saprophytes: (*Vanilleæ*) fr. a fleshy pod: labellum united with the column. .....11. VANILLA.

BB. Labellum with a distinct hypochil often spurred. (*Cephalantheræ.*) ....

C. Hypochilium concave, labellum with a distinct mentum, included. .....12. CEPHALANTHERA.

CC. Labellum without a mentum, exserted. ..13. EPIPACTIS.

AA. Anthers equalling the rostellum; removal of the viscid glands leaves a well defined furrow in the rostellum. .....

B. Pollinia waxy or powdery not divided into many small masses. .....

C. Labellum reflexed. (*Spiranthoæ.*) .....

D. The dorsal sepal and petals galeate, but not united: inflorescence spiral. ...14. SPIRANTHES.

DD. The sepals and petals spreading: lvs. opposite. .....15. LISTERA.

CC. Labellum erect (*Cranichideæ*): lateral sepals not forming a mentum: labellum and petals inserted on the prolonged column. .....16. PONTHIEVA.

BB. Pollinia divided into many small masses. (*Physureæ.*) .....

C. Labellum spurred or saccate. .....

D. Claw of the labellum concave above the spur, constricted, limb spreading or recurved. ...17. PHYSURUS.

DD. Claw of the labellum long, fimbriate on the margin, limb 2-lobed. .....18. ANŒCTOCHILUS.

CC. Labellum not spurred or saccate or at least the short sac not projecting beyond the sepals. ....

D. Column short, straight: fls. opening symmetrically.

E. Labellum unlike the petals, sessile or adnate, concave not papillose within, often hairy. .....19. GOODYERA.

EE. Labellum unlike the petals, clawed ventricose, often papillose within; claw entire: stigma 1. .....20. DOSSINIA.

DD. Column short, twisted: fls. opening asymmetrically, dorsal sepal plane or nearly so. .....

E. Column with 2 perpendicular appendages in front.21. MACODES.

EE. Column without appendages. .....22. HÆMARIA.

4. THUNIA TRIBE.

A. Stems leafy, not thickened: labellum mostly spurred.23. THUNIA.

AA. Stems short, slender, 2-lvd.; lateral sepals forming a mentum with the column.24. TRICHOSMA.

5. CŒLOGYNE TRIBE.

A. Column slender, base of the labellum not ventricose.

B. Lvs. evergreen, and pseudobulbs perennial. .25. CŒLOGYNE.

BB. Lvs. and pseudobulbs annual. .....26. PLEIONE.

AA. Column short, 1-winged: labellum ventricose at the base. ....27. PHOLIDOTA.

AAA. Column rather short, 2-winged: labellum plane at the base. .....28. PLATYCLINIS.

6. LIPARIS TRIBE.

A. Leafy plants. .....

B. Labellum not saccate.....

C. Anthers erect, deciduous; locules dehiscing above. .....29. MICROSTYLIS.

CC. Anthers inclined, deciduous. .....30. LIPARIS.

BB. Labellum saccate. .....31. CALYPSO.

AA. Leafless saprophytes. .....32. CORALLORHIZA.

7. POLYSTACHYA TRIBE.

A. Labellum spurred. .....

B. Plants 1-lvd. .....33. TIPULARIA.

BB. Plants leafy; lvs. jointed at the base. .....34. GALEANDRA.

AA. Labellum not spurred: tubers wanting: lateral sepals decurrent on the foot of the column. .....

B. Column short. .....35. POLYSTACHYA.

BB. Column long. .....36. ANSELLIA.

8. LÆLIA TRIBE.

A. The lateral sepals forming a mentum with the foot of the column, or the base of the labellum slightly saccate. .....

B. Labellum free from the column, sigmoid. .....37. ISOCHILUS.

BB. Labellum free, not sigmoid: pollinia 8: pseudobulbs present. ..38. CŒLIA.

BBB. Labellum, united to the column, forming a short tube or basin. .....

C. Young shoots formed near the summit of the old pseudobulb. .39. HEXISEA.

CC. Young shoots from the the base of the old pseudobulbs: stem 1-lvd. .....

D. Fls. numerous in a spike. .....40. ARPOPHYLLUM.

DD. Fls. few in a short raceme. .....41. HARTWEGIA.

AA. The foot of the column wanting: labellum enveloping the column, or adnate. .....

B. Pollinia 4. .....

C. Labellum more or less adnate to the column, blade spreading. ....42. EPIDENDRUM. (See also 43. BROUGHTONIA.)

CC. Labellum free; disc with 2 hollow horns.

CCC. Labellum free, mostly enveloping the column, without horns.44. DIACRIUM. 45. CATTLEYA.

BB. Pollinia 8. .....

C. Stigma in a hollow in the front of the column. .....

D. The labellum gradually expanding from the base. .....

E. Sepals and petals plane: labellum enveloping the column. .....46. LÆLIA.

EE. Sepals and petals more or less

wavy: labellum spreading. . . . . 47. SCHOMBURGKIA.
DD. The base of the labellum rolled around the column, expanding suddenly into a broad blade. . . . . 48. BRASSAVOLA. (See also 49. TETRAMICRA).
CC. Stigmas on subpetaloid expansions of the column. . . . . 50. SOPHRONITIS. (See also 51. EPIPHRONITIS.
BBB. Pollinia 6. . . . . 52. LEPTOTES.
BBBB. Pollinia mostly abnormal. 53. LELIO-CATTLEYA.

9. SOBRALIA TRIBE.

A. Stems slender, leafy: fls. few, large. . . . . 54. SOBRALIA.
AA. Stems 1–2-lvd. . . . . 55. CALOPOGON.

10. PLEUROTHALLIS TRIBE.

A. The sepals all united into a tube or shallow basin, apices produced into tails. . . . . 56. MASDEVALLIA.
AA. The lateral sepals united into a boat-shaped limb. . 57. SCAPHOSEPALUM.
AAA. The lateral sepals free, or united into a flat or slightly concave blade. . .
B. Dorsal sepal and petals caudate-clavate. . . . . 58. RESTREPIA.
BB. Dorsal sepal and petals without clavate tails: petals narrow. . . . . 59. PLEUROTHALLIS.

11. PHAIUS TRIBE.

A. Lvs. not articulated. . . . . .
B. Labellum free, surrounding the column. . . . . 60. PHAIUS.
BB. Labellum adnate with spreading limb. . . . . 61. CALANTHE.
AA. Lvs. articulated. . . . . .
B. Sepals and petals spreading. . . . . .
C. Fls. spurred: labellum not united with the column but enveloping the latter. . . . . 62. LIMATODES.
CC. Fls. not at all or slightly spurred. . . .
D. Mentum evident: pollinia 8: pseudobulbs spindle-shaped, leafy all the way up. . . . . 63. CHRYSIS.
DD. Mentum absent. . . . . .
E. Pollinia 8. . . . . .
F. Middle lobe of the labellum of uniform width. . . . 64. BLETIA.
FF. Middle lobe of the labellum clawed. . . . . 65. SPATHOGLOTTIS.
EE. Pollinia 4. . . . . 66. APLECTRUM.
BB. Sepals and petals connivent, urceolate. . . . . 67. ACANTHEPHIPPIUM.

12. CYRTOPODIUM TRIBE.

NOTE. Eulophiella (68) belongs near Cyrtopodium, "differing in habit and in the absence of a mentum, the perianth being hemispherical and nearly rounded at the base."

A. Labellum spurred or saccate, long and broad, with a plane middle lobe. . . . . .
B. Sepals narrower than the petals. . . . . 69. LISSOCHILUS.
BB. Sepals and petals similar. 70. EULOPHIA.
AA. Labellum not spurred nor saccate: column without appendages. . . . . .
B. Lateral sepals inserted on the ovary: labellum inserted on the foot of the column. . . . . 71. CYRTOPODIUM.
BB. Lateral sepals decurrent on the foot of the column forming a mentum. 72. WARREA.

13. CATASETUM TRIBE.

A. Fls. all alike perfect: column twisted. . . . . 73. MORMODES.
AA. Fls. in 2 or 3 forms: column not twisted. . . . . .
B. Column thick, straight. . . 74. CATASETUM.
BB. Column slender, curved. . 75. CYCNOCHES.

14. LYCASTE TRIBE.

A. Pollinia on a common stipe.
B. Fls. subspherical. . . . . 76. ANGULOA.
BB. Fls. with spreading segments. . . . . .
C. Scape 1-fld.: labellum spreading or recurved; stipes long narrow. . . . . 77. LYCASTE.
CC. Scape few-fld.: labellum erect: stipes long and narrow. . . . . 78. PAPHINIA.
CCC. Scape many-fld.: stipe short; petals decurrent on the foot of the column. . . . . 79. BATEMANNIA.
AA. Pollinia on separate stipes. 80. BIFRENARIA. (*See also Lycaste*).

15. GONGORA TRIBE.

A. Anther decumbent: labellum deflexed. . . . . .
B. Segments connivent, similar. . . . . .
C. Dorsal sepal free; hypochil strongly constricted at the base. . 81. LACÆNA.
CC. Dorsal sepal free; hypochil broadly united with the column. . . .
D. Epichil movably joined to the hypochil. . . . . 82. PERISTERIA.
DD. Epichil firmly united with the hypochil. .
BB. Segments spreading or reflexed. . . . . 83. ACINETA.
C. The lateral sepals much larger than the dorsal one and the petals. . . . . 84. CORYANTHES.
CC. The sepals and petals similar. . . . . .
D. Hypochil excavated: epichil flat. . . . . .
F. Pollinia 4, with a distinct stipe. . 85. AGANISIA.
FF. Pollinia 2, with a distinct stipe. . 86. STANHOPEA.
DD. Hypochil not excavated, possessing narrow, fleshy pleuridia: column short. . . . . 87. HOULLETIA.
AA. Anther decumbent, labellum erect: lateral sepals free. 88. GONGORA.

16. ZYGOPETALUM TRIBE.

A. Labellum with a narrow claw: sepals and petals broad, connivent. . . . . 89. COLAX. (See *Zygopetalum*).
AA. Labellum not distinctly clawed. . . . . .
B. Disc with a semicircular crest. . . . . 90. ZYGOPETALUM.
BB. Disc with few parallel lamellæ. . . . . 91. ERIOPSIS.

17. DENDROBIUM TRIBE.

A. Lateral lobes of the labellum free; pollinia 4: lvs. flat. 92. DENDROBIUM.

18. Bulbophyllum Tribe.

A. Lateral sepals united above; labellum plane or convex; anthers opening downwards. .....93. Cirrhopetalum.
AA. Lateral sepals free or nearly so; labellum and anthers as in the foregoing. .....94. Bulbophyllum.

19. Maxillaria Tribe.

A. Lvs. plane; fls. not spurred, sepals spreading from the base, labellum sessile, movable. .....95. Maxillaria.
AA. Lvs. long, whip like; fls. as in Maxillaria. .....96. Scuticaria.

20. Huntleya Tribe.

A. Pseudobulbs evident. .....97. Promenæa.
AA. Pseudobulbs obsolete or wanting. .....
B. Column not boat-shaped..
C. The crest of the labellum fleshy, not fimbriate. .....
D. Labellum undivided..
E. Column keeled beneath the stigma.98. Keffersteinia. (See *Zygopetalum*).
EE. Column not keeled..99. Chondroeyncha.
DD. Labellum 2–3-lobed..
E. Crest forming a plate free in front; labellum subsessile. .....100. Warscewiczella
E. Crest large, fleshy, semicircular: labellum clawed....101. Pescatoria.
CC. The crest of the labellum fimbriate. .....102. Huntleya. (See *Zygopetalum*).
BB. Column boat shaped.....103. Bollea. (See *Zygopetalum*).

21. Cymbidium Tribe.

A. Pollinia separate on 2 outgrowths of the stipe; fls. not evidently spurred; labellum free on the margin; leafy. .....104. Grammatophyllum.
AA. Pollinia on a common stipe, not on special outgrowths; fls. not spurred .....
B. Lvs. sheathing the pseudobulbs or short stems. ..
C. Stems scarcely pseudobulbous; pollinia pear-shaped on a subquadrate stipe. .....105. Cyperorchis.
CC. Stems somewhat pseudobulbous; pollinia rounded on a transversely broadened stipe. .....106. Cymbidium.
BB. Lvs. at the top of the pseudobulbs, sheaths not clothing the latter; lateral sepals free. ....107. Grammangis.

22. Oncidium Tribe.

A. Fls. spurred; anther incumbent. (*Ionopsideæ.*) ....
B. Labellum spurred; sepals not spurred or saccate.
C. Lateral sepals free, segments spreading. ...108. Trichocentrum.
CC. Lateral sepals united; labellum with an open spur or a fleshy solid protuberance...109. Rodriguezia.
BB. Labellum not spurred, long-clawed; lateral sepals united and saccate at the base. .....110. Ionopsis.
BBB. Labellum with a 2-parted spur inclosed in the long slender spur of the sepals; lvs. flat. .....111. Comparettia.
AA. Fls. not spurred; anthers incumbent. .....
B. Segments connivent; labellum erect, free. (*Adeæ.*) .....
C. Labellum narrow, undivided; sepals free; lvs. plane. .....112. Ada.
CC. Labellum folded, lateral sepals united. .....113. Mesospinidium. (Not in cultivation.)
BB. Segments spreading; labellum adnate to the base of the column, limb enveloping the latter. (Trichopilieæ.)..114. Trichopilia.
BBB. Segments spreading; labellum spreading from the middle of the column. (Aspasieæ.) ...
C. Middle lobe of the labellum large and broad or the labellum undivided. .....115. Aspasia.
CC. Middle lobe of the labellum narrow, ...116. Cochlioda. (See also *Mesospinidium*).
BBBB. Segments spreading; labellum nearly free and spreading (Odontoglosseæ), stigma at the top of the column; rostellum scarcely or not at all beaked: pseudobulbs scarcely concealed by the plane lvs.
C. The base of the labellum parallel with the column, blade expanded. .....117. Odontoglossum.
CC. The labellum spreading from the base, scarcely clawed. .....
D. Labellum resembling the dorsal sepal: lateral sepals entirely united. .....118. Palumbina.
DD. Labellum differing from the dorsal sepal: lateral sepals free or partially united. .....
E. Sepals and petals long and narrow.119. Brassia.
EE. Sepals and petals broad. .....
F. Labellum large, undivided or sagittate at the base. .....120. Miltonia.
FF. Labellum variously formed, 3-lobed, disc ornamented with fleshy tubercles.121. Oncidium.

23. Sarcanthus Tribe.

A. Labellum moveably joined to the column.....
B. Middle lobe tongue-shaped or labellum entire. ....122. Renanthera.
BB. Middle lobe shaped like a conch shell. .....123. Esmeralda. (See *Vanda*).
AA. Labellum firmly united the foot of the column; not spurred. .....
B. Terminal lobe of the labellum vertically flattened.124. Vandopsis.
BB. Labellum not vertically flattened. .....
C. Lvs. terete. .....125. Luisia.
CC. Lvs. plane. .....126. Phalænopsis.
AAA. Labellum firmly united with the foot of the column; but spurred....
B. Lateral sepals inserted on ovary: foot of the column absent. .....
C. Pollinia on a common stipe. .....

D. Spur divided by a longitudinal plate within. . . . . 127. SARCANTHUS.
DD. Spur with a horizontal plate at the mouth. . . . . 128. CLEISOSTOMA.
DDD. Spur without any special growth within or at the mouth; pollinia 2 only, or 4 united into 2 masses. . . . . .
E. Stipe a filament; column without appendages. . . . .
F. Labellum reflexed. raceme dense. . 129. SACCOLABIUM.
FF. Labellum erect: fls. fragile. . . . 130. ACAMPE.
EE. Stipe broad, not prolonged between the pollinia.
F. Spur short, broad. 131. VANDA.
FF. Spur long, slender. . . . . 132. ANGRŒCUM.
CC. Pollinia on 2 separate stipes; stipes papillose; plants leafless. . 133. DENDROPHYLAX.
BB. Lateral sepals decurrent on the foot of the column: spur projecting beyond the mentum: stems leafy. . . . . .
C. Spur curved toward the labellum: column short. . . . . 134. AËRIDES.
CC. Spur straight or recurved: labellum 3-lobed; rostellum long-beaked. . . . . 135. RHYNCHOSTYLIS.

142. DIOSCOREACEÆ.

A. Seeds samara-like, winged above. . . . . 1. TESTUDINARIA.
AA. Seeds winged below, or all round, rarely not at all. 2. DIOSCOREA.

143. TACCACEÆ.

Fr. an indehiscent berry. . . . 1. TACCA.

144. IRIDACEÆ.

A. Fls. never more than one to a spathe, spicate, not fugitive. . . . . .
B. Style branches simple, not bifid. . . . . .
C. Stamens equilateral: perianth regular. . . .
D. The style short; branches long. . . . .
E. Rootstock not bulbous: roots in dense tufts, fibrous, some fleshy. 1. SCHIZOSTYLIS.
EE. Rootstock bulbous. . 2. HESPERANTHA.
DD. The style longer: branches shorter. . .
E. The spathe valves oblong, green or brownish upwards. . . . . 3. GEISSORHIZA.
EE. The outer spathe valve short, emarginate, membranous or papery. . . 4. IXIA.
CC. Stamens unilateral and arched. . . . . .
D. Foliage very hairy and plaited. . . . . 5. BABIANA.
DD. Foliage not hairy and plaited. . . . . .
E. Perianth limb irregular. . . . . .
F. Tube funnel-shaped: spathe valves, lanceolate. . . . . 6. GLADIOLUS.
FF. Tube cylindrical in lower half: suddenly dilated at the middle: spathe valves oblong—lanceolate. . . . 7. ANTHOLYZA.
EE. Perianth limb subregular. . . . . .
F. Fls. small: no tube: segments very acuminate. 8. MELASPHÆRULA.
FF. Fls. larger: tube present: segments more or less oblong. . . .
G. Spathe valves large, green, lanceolate. . . . 9. ACIDANTHERA.
GG. Spathe valves small, oblong. . . . . .
H. Capsule inflated, globose. . . . . 10. CROCOSMIA.
HH. Capsule small, oblong. . . . 11. TRITONIA.
GGG. Spathe valves scarious and deeply lacerated. . . . . 12. SPARAXIS.
BB. Style branches bifid: stamens unilateral. . . . . .
C. Tube broadly funnel-shaped, with stamens inserted below the throat. . . . . 13. FREESIA.
CC. Tube slender with stamens inserted at the throat. . . . . 14. LAPEYROUSIA.
CCC. Tube broadly funnel-shaped above the middle where the stamens are inserted. . . 15. WATSONIA.
AA. Fls. usually more than one to a spathe, stalked, often fugitive and opening one after another. . . . . .
B. Style branches opposite stamens and outer perianth segments. . . . . .
C. Stigmas transverse; style branches have crests that overtop anthers. . . . . .
D. Inner perianth segments not convolute . . . . . .
E. Ovary 1-celled, with 3 parietal placentæ; root-stock digitate. . . . . 16. HERMODACTYLUS.
EE. Ovary 3-celled. . . . . .
F. Perianth tube usually present: filaments free; root-stock usually a rhizome, sometimes a bulb. . . . . 17. IRIS.
FF. Perianth without a tube; filaments monadelphous: root-stock usually a tunicated corm. 18. MORÆA.
DD. Inner perianth segments convolute. . .
E. Style crests petaloid: lvs. in 2-ranked rosette, not plaited: peduncle flattened: rootstock not bulbous. . . . . 19. MARICA.
EE. Style crests large spur-like or flattened: lvs. superposed, plaited; stems terete; rootstock bulbous. 20. CYPELLA.
(See also *Phalocallis*).
CC. Stigmas terminal: style branches do not over-

top anthers. .....
D. Perianth without any tube: inner segments small, not convolute: style branches bifid at tip. .....21. HERBERTIA.
DD. Perianth segments connivent in a cup, without any spreading blade. .....22. HYDROTÆNIA.
DDD. Perianth segments connivent in a cup, then spreading, at least the outer ones.
E. Style branches with 2 petal-like stigmatose crests. ...23. HOMERIA.
EE. Style branches bifid.
F. Ditto penicillate, i. e. shaped like an artist's brush, a dense tuft of hairs...24. FERRARIA.
FF. Ditto not penicillate. .....
G. Inner segments very small; outer with a large, reflexed blade. .....25. RIGIDELLA.
GG. Inner and outer segments dissimilar, various. .....26. TIGRIDIA.
BB. Style branches alternate with anthers. .....
C. Rootstock not a bulb or corm. .....
D. Spathes essentially 1-fld. .....
E. Peduncle short, hidden; perianth with a long tube and ascending segments. .....27. CROCUS.
EE. Peduncle long: perianth segments much longer than the short tube. ..28. ROMULEA.
DD. Spathes usually with more than one flower. .....29. NEMASTYLIS.
CC. Rootstock not a bulb or corm; spathes usually more than 1-fld. ....
D. Perianth segments unequal. .....
E. Inner segments shorter, connivent: upper stamen imperfect. ..30. DIPLARRHENA.
EE. Inner segments obovate-cuneate; outer oblong, usually shorter: stamens all perfect. .31. LIBERTIA.
DD. Perianth segments subequal. .....
E. Style branches flattened and emarginate at apex: inflorescence a lax corymb. .....32. BELAMCANDA.
EE. Style branches subulate. ....
F. Pedicels short: clusters panicled. .....33. ORTHOSANTHUS.
FF. Pedicels long: clusters terminal, single or fascicled. .....34. SISYRINCHIUM.

145. AMARYLLIDACEÆ.

(Key to Tribes.)

A. Styles often columnar and shorter than the erect stigmas. .....1. HYPOXIS TRIBE.
AA. Styles long and thread-like.
B. Stamens usually 18, sometimes 6: stem woody, often branching: lvs. crowded at apex of branches: peduncles 1-fld.: solitary or few inside clusters of lvs. ...2. VELLOZIA TRIBE.
BB. Stamens 6. .....
C. Flowering stems leafy: rootstock none (bulbous in Ixiolirion), with fibrous roots, inflorescence a simple or compound umbel. ...3. ALSTRŒMERIA TRIBE.
CC. Flowering stems not truly leafy. .....
D. Inflorescence usually more or less umbellate: rootstock a tunicated bulb: lvs. all from the root..4. AMARYLLIS TRIBE.
DD. Inflorescence racemose, spicate or panicled: rootstock various: lvs. usually crowded in a dense basal rosette, rigid or fleshy, often spiny at the margin. .....5. AGAVE TRIBE.

Subfamily 1. HYPOXIS TRIBE.

A. Ovary often produced into a long slender beak simulating a perianth tube: fr. succulent, indehiscent.1. CURCULIGO.
AA. Ovary not beaked: fr. a capsule usually circumscissile at apex. .....2. HYPOXIS.

Subfamily 2. VELLOZIA TRIBE.

Perianth tube continuous with ovary. .....3. BARBACENIA.

Subfamily 3. ALSTRŒMERIA TRIBE.

A. Rootstock bulbous: perianth segments subequal..4. IXIOLIRION.
AA. Rootstock none: 3 outer perianth segments different from 3 inner. .....
B. Inner segments unequal: stem erect. .....5. ALSTRŒMERIA.
BB. Inner segments equal: stem sarmentose. .....6. BOMAREA.

Subfamily 4. AMARYLLUS TRIBE.

Subtribe 1. CORONATÆ. Flower furnished with a crown between the perianth and stamens, which is not to be confused with a staminal cup formed by the growing together of filaments. 7. NARCISSUS.

Subtribe 2. AMARYLLEÆ GENUINEÆ. Corona none and filaments not united into a staminal cup.

A. Anthers erect; filaments inserted at or near the base of anthers. .....
B. Stamens epigynous: filaments short. .....
C. The perianth segments all alike. .....8. LEUCOJUM.
CC. The inner segments different, permanently connivent. .....9. GALANTHUS.
BB. Stamens perigynous. ....
C. Fls. solitary. .....10. COOPERIA.
CC. Fls. umbellate. .....11. CHLIDANTHUS.
AA. Anthers dorsifixed, versatile.
B. Ovules many, superposed: testa black. .....
C. Fls. solitary: spathe tubular in the lower half. .....
D. The fl. gaping, horizontal, bright red, 3 lower segments convolute. .....12. SPREKELIA.
DD. The fls. regular, erect or suberect. .....
E. Seeds globose: fls. yellow: peduncle short or long. ....13. STERNBERGIA.

EE. Seeds flat: peduncle long. ..... 14. ZEPHYRANTHES.
CC. Fls. umbellate; spathe 2–4-valved, and pedicels subtended by filiform bracteoles. ...
D. Perianth tube short or almost 0, rarely long in Hippeastrum. .....
E. Peduncle solid: seeds few in a cell. ..... 15. LYCORIS.
EE. Peduncle hollow...
F. Fl. often furnished with minute scales or a distinct neck at the throat: seeds many in a cell. ..... 16. HIPPEASTRUM.
FF. Fl. with a sort of corona, which is funnel-shaped, and deeply cut, the divisions emarginate. ... 17. PLACEA.
DD. Perianth tube long...
E. Tube broadly funnel-shaped, pulvinate at throat... 18. VALLOTA.
EE. Tube 2–3 times longer than segments, naked at throat. ..... 19. CYRTANTHUS.
BB. Ovules 2, basal, collateral; testa pale. ..... 20. GRIFFINIA.
BBB. Ovules 2 or few, collateral or fascicled from the center of the placenta.
C. Fr. baccate. .....
D. Ovules several: bulb imperfect. ..... 21. CLIVIA.
DD. Ovules 2: bulb large, tunicated. ..... 22. HÆMANTHUS.
CC. Fr. capsular ..... 23. BUPHANE.
BBBB. Ovules few or many, superposed: seeds few, green, turgid. .....
C. Fr. indehiscent or bursting irregularly. .....
D. Perianth tube long.. 24. CRINUM.
DD. Perianth tube short...
E. Segments broad..... 25. AMARYLLIS.
EE. Segments narrow... 26. AMMOCHARIS.
CC. Fr. a 3-valved capsule..
D. Capsule top-shaped, acutely angled .... 27. BRUNSVIGIA.
DD. Capsule globose, obtusely angled. ..... 28. NERINE.

Subtribe 3. PANCRATIEÆ. Corona none but stamens appendaged toward base and often united into a distinct cup.

A. Ovules superposed, many or few .....
B. Lvs. broad, petioled. ....
C. Perianth white. .....
D. Ovary globose. .....
E. Filaments quadrate, with a large tooth on each side of the anthers. ..... 29. CALLIPHRŒBIA.
EE. Filaments quadrate, united in a distinct cup. ..... 30. EUCHARIS.
DD. Ovary 3-lobed. Hybrid. ..... 31. URCEOCHARIS.
CC. Perianth colored. .....
D. The perianth tube cylindrical, suddenly dilated. ..... 32. URCEOLINA.
DD. The perianth subcylindrical, segments long or short. .... 33. PHÆDRANASSA.
BB. Lvs. linear or ligulate, sessile. .....
C. Perianth colored, subcylindrical; tube long; filaments united in an entire or toothed cup. .... 34. STENOMESSON.
CC. Perianth white; tube funnel-shaped: staminal cup large. .... 35. PANCRATIUM.
AA. Ovules collateral, basal, 2–6. ..... 36. HYMENOCALLIS.
AAA. Ovules medial, 2–3. .....
B. Perianth funnel-shaped: segments narrow. .... 37. VAGARIA.
BB. Perianth with a slender tube and broad segments. ..... 38. EURYCLES.

Subfamily 5. AGAVE TRIBE.

A. Lvs. thick, fleshy, usually spiny at edge and point..
B. Perianth funnel-shaped: filaments normal. ... 39. AGAVE.
BB. Perianth rotate: filaments strumose at base. ..... 40. FURCRÆA.
AA. Lvs. comparatively thin, not spiny at edge or point...
B. Segments short. .....
C. Fls. white, in a lax, simple spike: tube long, curved, subcylindrical. ..... 41. POLIANTHES.
CC. Fls. greenish-brown, in a lax raceme: tube abruptly curved and dilated at middle. ..42. PROCHNYANTHES.
CCC. Fls. red or white, laxly spicate or racemose: tube curved, subcylindrical. ..... 43. BEAUCA.
BB. Segments long: tube scarcely any. .....
C. Fls. greenish red, in a simple or panicled raceme: segments oblanceolate. ..... 44. BESCHORNERIA.
CC. Fls. bright red, in a capitulum or thyrsoid panicle; segments narrow, falcate. .... 45. DORYANTHES.

146. SCITAMINACEÆ.

(Summary of Tribes.)

A. Perfect stamens 5. ..... 1. BANANA TRIBE.
AA. Perfect stamens 1. .....
B. Anther 2-celled. ..... 2. GINGER TRIBE.
BB. Anther 1-celled. .....
C. Ovary cells 1-ovuled. ..3 MARANTA TRIBE.
CC. Ovary cells ∞ -ovuled..4. CANNA TRIBE.

1. BANANA TRIBE.

A. Calyx tubular, later split—spathaceous. ..... 1. MUSA.
AA. Calyx of free sepals (lateral ones sometimes adnate to corolla in Heliconia)...
B. Fr. a capsule, loculicidally 3-valved. .....
C. The outer petal short, broad and concave, lateral petals long and narrow, one laterally connate, the other with long lateral appendage. ....2. STRELITZIA.
CC. The petals long, narrow, free, not appendaged, outer one shorter than lateral ones. .....3. RAVENALA.
BB. Fr. indehiscent or separating into berries. .....4. HELICONIA.

2. GINGER TRIBE.

A. Ovary 1-celled, with 3 parietal placentæ. .....5. GLOBBA.
AA. Ovary perfectly 3-celled, or at least 3-celled long beyond the middle; placentæ axile. .....
B. Lateral staminodes ample and petal-like. .....
C. Connective not appendaged at the base.

D. Filament short: bracts 1-fld. .....6. KÆMPFERIA.
DD. Filament long: bracts 1– ∞ -fl.....7. HEDYCHIUM.
CC. Connective appendaged at the base. .....
D. Spur 2-fd.; lateral staminodes narrowed at base ....8. ROSCOEA.
DD. Spurs 2. lateral staminodes connate with the petaloid filament. .....9. CURCUMA.
BB. Lateral staminodes small, tooth-like or 0, rarely longer, narrow and adnate to labellum.
C. Filament short or very short. .....
D. Inflorescence cone-like. .....
E. Anther cells divergent at apex: connective less dilated, either short or produced beyond cells into an entire or 3-lobed crest. .....10. AMOMUM.
EE. Anther cells contiguous; connective produced beyond the cells into a long, linear appendage. .....11. ZINGIBER.
DD. Inflorescence not cone-like. .....
E. Connective not produced beyond cells: anther cells contiguous to apex. .....12. ELETTARIA.
EE. Connective produced beyond cells into a long lanceolate, concave, appendage .....13. BURBRIDGEA.
CC. Filament elongated, (in Costus petal-like.) ...
D. Inflorescence cone-like. .....14. COSTUS.
DD. Inflorescence not cone-like. .....15. ALPINIA.

3. MARANTA TRIBE.

A. Ovary 1-celled after a fashion, the other cells being minute and empty. .....
B. Bracts narrow, convolute, inclosing the rachis. ..16. MARANTA.
BB. Bracts and bractlets usually colored, spreading, long persistent. .....17. STROMANTHE.
BBB. Bracts spreading, deciduous. .....18. THALIA.
AA. Ovary usually 3-celled and 3-ovuled. .....
B. Corolla tube usually short.19. PHRYNIUM
BB. Corolla tube usually slender and longer. ...20. CALATHEA.

4. CANNA TRIBE.

Calyx of free sepals: embryo central straight: sole genus.21. CANNA.

147. BROMELIACEÆ.

(Following Mez in DC. Monog. Phaner. vol. 9).

A. Fr. a berry, indehiscent: ovary inferior: seeds not winged or plumed. .....
B. Pollen grains entire, not provided with pores or a longitudinal membranous fold. .....
C. Calyx without a tube or cup. .....1. BROMELIA. (See also *Karatas*).
CC. Calyx with a tube or cup. .....2. CRYPTANTHUS.
BB. Pollen grains furnished with pores. .....
C. Inflorescence immersed in a central bowl of lvs. and surrounded by an involucre formed from the reduced inmost leaves and usually colored. 3. NIDULARIUM.
CC. Inflorescence not surrounded by a distinct involucre: stem or scape tall. .....
D. Petals furnished with 2 ligules inside. .....
E. Berries connate among themselves and also to the bracts and axis. .....4. ANANAS.
EE. Berries free. .....5. ÆCHMEA. (See also *Echinostachys*.)
DD. Petals not provided with ligules inside.
E. Fls. very flat and crowded into dense cones. ....6. HOHENBERGIA.
EE. Fls. more or less loosely spicate on the branches of the inflorescence. .7. STREPTOCALYX.
BBB. Pollen grains furnished with a longitudinal membranous groove. ..8. BILLBERGIA.
AA. Fr. a capsule, dehiscent:...
B. Seed winged, or appendaged: pollen grooved...
C. Ovary semi-superior. ..9. PITCAIRNIA.
CC. Ovary superior. .....
D. Fls. of 2 forms and diœcious. .....10. HECHTIA.
DD. Fls. all the same form. .....
E. Petals free to the very base. .....11. PUYA.
EE. Petals coalesced toward the base. ..12. DYCKIA.
BB. Seed with a long, plumose appendage: ovary superior. .....
C. Petals free. .....
D. The petals ligulate inside. .....13. VRIESIA.
DD. The petals not lignate inside. .....14. TILLANDSIA.
CC. Petals connate intimately conglutinate. .....15. GUZMANNIA. (See also *Massangea*.)

148. HÆMODORACEÆ.

A. Cells of ovary 2-ovuled: perianth marcescent, persisting in fruit. .....
B. Perianth tube long and slender: filaments normal. .....1. SANSEVIERIA.
BB. Perianth more or less erect or spreading above the ovary: filaments shorter than the linear anthers: style longish. .....2. OPHIOPOGON.
BBB. Perianth spreading from base of ovary: filaments about as long as the oblong anthers. .....3. LIRIOPE.
AA. Cells of ovary ∞ -ovuled..
B. Perianth at length deciduous in a circumscissile fashion around or above the ovary. .....4. TECOPHILÆA.
BB. Perianth persistent. .....
C. Fls. plump or woolly...5. ANIGOZANTHUS.
CC. Fls. mealy or scaly. 6. ALETRIS.

149. LILIACEÆ.

Summary of Tribes, omitting two and ignoring exceptions.

Series I. Anthers introrsely dehiscent; fruit usually berry-like; plant not bulbous, usually scaly at the base of the stem and leafy above, sometimes with a scaly scape.

- A. Stigma not broadly peltate.
  - B. Ovules orthotropous or hemianatropous; "foliage" abnormal, in the Smilax tribe 3–5-nerved but with netted veinlets; in the Asparagus tribe leaf-shaped or needle-like "phylloclades" are present..
    - C. Anthers abnormal, the inner valve of each cell being so narrow that the open anther seems to be 1-celled; stem sarmentose or scandent. ..... 1. Smilax Tribe.
    - CC. Anthers normally 2-celled; or cells confluent at apex; stem branched or scandent. 2. Asparagus Tribe.
  - BB. Ovules anatropous, rarely hemianatropous in the Luzuriaga tribe. .....
    - C. Stem shrubby and branched, or scandent. ..... 3. Luzuriaga Tribe.
    - CC. Stem herbaceous, unbranched or sparingly branched; leafy above. ..... 4. Solomon's Seal Tribe.
    - CCC. Stemless herbs with lvs. clustered on the rhizome and often inclosed (together with the lateral leafless scape) by sheathing scales at the base.... 5. Lily of the Valley Tribe.
- AA. Stigma usually very broadly peltate; lvs. on the rhizome few, ample; scape very short and 1-fld. or bearing a dense spike at apex. ..... 6. Aspidistra Tribe.

Series II. Anthers introrsely dehiscent; fr. loculicidally dehiscent, rarely indehiscent or berry-like; lvs. on a rhizome, or densely crowded at the apex of a caudex, or forming a bulb at the base of the scape.

- A. Antners with a pit on the back into which the filament intrudes. .....
  - B. Lvs. linear or membranous, crowded on a short rhizone; perianth cylindrical, funnel-shaped or bell-shaped. ..... 7. Lemon Lily or Hemerocallis Tribe.
  - BB. Lvs. usually thick, fleshy or rigid, sometimes spiny; rhizome hard, often extended above ground into a woody caudex; perianth segments connivent or connate into a tube or sometimes with spreading tips. ..... 8. Aloe Tribe.
- AA. Anthers not pitted, (sometimes slightly pitted in the Asphodel Tribe); lvs. not thick, and fleshy as in a century plant. .....
  - B. Rootstock, if any, rhizomatous; rhizome usually short, often very short in Asphodel tribe, sometimes produced into a woody caudex in Dracæna tribe: See also BB. .....
    - C. Perianth shaped like a bell or cylinder, rarely a funnel, the segments usually distinct; inflorescence often panicled. ..... 9. Dracæna Tribe.
    - CC. Perianth segments usually distinct and spreading; inflorescence sparingly branched if at all. .. 10. Asphodel Tribe.
  - BB. Rootstock bulbous as a rule; in the Onion tribe sometimes a corm and rarely a very short rhizome; bulb usually tunicated, but in the Tulip tribe often scaly.
    - C. Stemless plants with the inflorescence terminal on a leafy scape. .....
      - D. Inflorescence an umbel with an involucre of at least 2 bracts. ..... 11. Onion Tribe.
      - DD. Inflorescence a raceme, or rarely a spike. ..... 12. Squill Tribe.
    - CC. Stem leafy, or at least with 1 leaf; lvs few or in a lax raceme... 13. Tulip Tribe.

Series III. Anthers usually introrsely affixed but extrorsely dehiscent (the whole Colchicum tribe exceptional); fr. usually a septicidal capsule, rarely loculicidal or in the Medeola tribe an indehiscent berry.

- A. Fr. a berry; plant not bulbous; lvs. few, subradical or whorled on the stem... 14. Medeola or Cucumber-root Tribe.
- AA. Fr. a capsule, rarely in the Bellwort tribe, a berry...
  - B. Anthers introrsely dehiscent; the only tribe in Series III, with a corm-ous root stock. ..... 15. Colchicum or Autumn crocus Tribe.
  - BB. Anthers extrorsely dehiscent, rarely otherwise in the Narthecium Tribe; plants not bulbous except sometimes in False Hellebore Tribe. .....
    - C. Stem-lvs. smaller than the radical lvs. (which are either crowded or petiolate) sometimes very small or 0; capsule septicidal or loculicidal.. 16. Narthecium Tribe.
    - CC. Stem leafy, herbaceous or high climbing; lvs. alternate, sessile or clasping, without sheath. ..... 17. Bellwort or Uvularia Tribe.
    - CCC. Stem usually tall, leafy or hardly so beyond the radical lvs.; plants not bulbous or bulbous; anthers with confluent cells, roundish-peltate after dehiscence. ..... 18. False Hellebore or Veratrum Tribe.

1. Smilax Tribe.

- A. Perianth 6-parted. .....1. Smilax.
- AA. Perianth undivided, mouth minutely toothed. .....2. Heterosmilax.

2. Asparagus Tribe.

- A. Filaments connate into a little urn, with the anthers sessile at the mouth

of the urn. . . . . .
B. Anthers 3: fls. clustered on the middle of the face of the phyllocladc. 3. RUSCUS.
BB. Anthers 6: fls. clustered on the margins, rarely on at the middle. . . . . 4. SEMELE.
AA. Filaments free. . . . . 5. ASPARAGUS.

3. LUZURIAGA TRIBE.

A. Fls. large or rather large, solitary or few; perianth segments erect; ovary 1-celled with 3 parietal placentæ. . . . . .
B. Lvs. 3-5-nerved; perianth segments of about equal length. . . . . 6 LAPAGERIA.
BB. Lvs. 1-nerved; outer perianth segments much smaller than inner. . . 7. PHILESIA.
AA. Fls. smallish, clustered at axils; perianth segments spreading; ovary 3-celled; lvs. with 2 slender nerves. . . . . 8. EUSTREPHUS.

4. SOLOMON'S SEAL TRIBE.

A. Fls. 1-2 in the axils, rarely more, usually nodding.
B. Perianth tube cylindrical; lobes short; style undivided, with a small stigma. . . . . 9. POLYGONATUM.
BB. Perianth tube 0; segments spreading above or from the base; style shortly or more deeply 3-fid. . . . . 10. STREPTOPUS.
AA. Fls. in a terminal raceme or panicle. . . . . .
B. Floral parts in 3's. . . . . 11. SMILACINA.
BB. Floral parts in 2's. . . . . 12. MAINTHEMUM.

5. LILY OF THE VALLEY TRIBE.

A. Fls. racemose, nodding; perianth subglobose; lobes shorter than tube. . . . . 13. CONVALLARIA.
AA. Fls. spicate, far apart; perianth tube cylindrical; lobes recurved-spreading. 14. REINECKIA.

6. ASPIDISTRA TRIBE.

A. Fls. 4-merous; stigma very large, roundish-peltate; undivided. . . . . 15. ASPIDISTRA.
AA. Fls. 3-merous; stigma broadly peltate, 3-lobed. . 16. ROHDEA.

7. LEMON LILY HEMEROCALLIS TRIBE.

A. Fls. erect; stamens affixed at apex of tube; lvs. long and narrow. . . . . .
B. Perianth funnel-shaped, the cylindrical tube shorter than the lobes; panicles few-fld. . . . . 17. HEMEROCALLIS.
BB. Perianth with subincurved segments loosely connivent above the top-shaped tube; panicles much branched. . . 18. PHORMIUM.
AA. Fls. pendulous. . . . . .
B. Stamens affixed at middle of tube; lvs. long and narrow; perianth tube swollen above, lobes short. . . . . 19. BLANDFORDIA.
BB. Stamens often hypogynous. . . . . .
C. Lvs. petioled, usually broad; fls. racemose; perianth funnel-shaped, tube short or long. . . . . 20. FUNKIA.
CC. Lvs. long and narrow; fls. spicate; perianth a long narrow tube with short lobes. . . . . 21. KNIPHOFIA.

8. ALOE TRIBE.

A. Perianth segments strongly connate into a tube which is swollen at the base, segments free at apex; stamens included in tube. . . . . 22. GASTERIA.
AA. Perianth segments coherent or connivent to the very apex in a tube, or barely spreading at the very apex; stamens usually exserted. . . . . 23. ALOE.
AAA. Perianth segments coherent or connivent, stellate-spreading at apex; stamens a little shorter than perianth. . . . . 24. APICRA.
AAAA. Perianth usually incurved, the segments cohering or connivent, at the apex recurved and spreading somewhat as if 2-lipped; stamens not exceeding perianth. . . . . 25. HAWORTHIA.
AAAAA. Perianth of Aloe, but stamens a little shorter than the perianth. . . . . 26. LOMATOPHYLLUM.

9. DRACÆNA TRIBE.

A. Ovary 1-celled; cells 3-ovuled. . . . . 27. DASYLIRION.
AA. Ovary 3-celled. . . . . .
B. Cells 1-ovuled. . . . . 28. DRACÆNA.
BB. Cells 2-ovuled. . . . . 29. NOLINA.
BBB. Cells ∞-ovuled. . . . . .
C. Fls. racemose. . . . . 30. HESPEROCALLIS.
CC. Fls. panicled. . . . . .
D. Anthers small, sessile on a club-shaped filament; perianth subglobose or bell-shaped; segments hardly connate at base. . . . . 31. YUCCA.
DD. Anthers dorsifixed on normal or flattened filaments; perianth cylindrical or narrowly bell-shaped, with a short tube. . 32. CORDYLINE.

10. ASPHODEL TRIBE.

(Summary of Subtribes.)

A. Anthers dorsifixed, versatile.
B. Subtribe 1. *Eunsphodeleæ*. Plant not bulbous: lvs. crowded at base of stem; cauline lvs. smaller, when present. . . . . .
BB. Subtribe 2. *Chlorogaleæ*. Plant bulbous: lvs. few. . . . . .
AA. Anthers erect, affixed at or near the base. . . . . .
B. Subtribe 3. *Bowieæ*. Lvs. few, from a thick tuber or fleshy bulb, quickly vanishing before or at anthesis. . . . . .
BB. Lvs. numerous, crowded at base of stem, or sometimes in subtribe 5 arranged along stem. . .
C. Subtribe 4. *Antherieeæ*. Lvs. not 2-ranked. . . . . .
CC. Subtribe 5. *Dianelleæ*. Lvs. 2-ranked. . . . . .

Subtribe 1. *Euasphodeleæ.*

A. Ovules 2 in a cell. . . . . .
B. Stem or scape leafless . . .
c. Anthers pitted where the filament is introduced; fls. yellow...33. ASPHODELUS.
cc. Anthers not pitted. . . .34. BULBINELLA. (Consult *Chrysobactron.*)
BB. Stem more or less leafy: fls. usually white. . . . .35. ASPHODELINE.
AA. Ovules ∞ in a cell. . . . . .
B. Anthers pitted: filaments glabrous. . . . . .36. PARADISEA.
BB. Anthers not pitted: filaments long bearded. . .37. BULBINE.

Subtribe 2. *Chlorogaleæ.*

A. Perianth segments 3-nerved.38. CHLOROGALUM.
AA. Perianth segments 1-nerved.39. HASTINGSIA.

Subtribe 3. *Bowieæ*

Lvs. linear, vanishing before anthesis; bulb tuber-like...40. BOWIEA.

Subtribe 4. *Anthericeæ.*

A. Inflorescence clustered down among the radical lvs. on a very short stem. . . . .41. LEUCOCRINUM.
AA. Inflorescence on a scape, simple or with few branches, racemose or spicate. . . . . .
B. Stamens finally as long as the perianth or longer: raceme long, simple and dense. . . .42. EREMURUS.
BB. Stamens shorter than perianth. . . . . .
c. Capsule with hardly prominent angles. . .43. ANTHERICUM.
cc. Capsule 3-cornered or 3-winged. . . . . .44. CHLOROPHYTUM.

Subtribe 5. *Dianelleæ.*

Filaments fleshy or thickened at apex or middle. . . . . .45. DIANELLA.

11. ONION TRIBE.

A. Rootstock a short rhizome with clusters of root fibers. . . . . .46. AGAPANTHUS.
AA. Rootstock a tunicated bulb or corm. . . . . .
B. Perianth salver-shaped or urn-shaped. . . . . .
c. Stamens 6: perianth tube cylindrical. . . .
D. Tube often crowned at throat with 3–6 scales: stamens included inside the tube in 2 series. . .47. TRISTAGMA.
DD. Tube constricted at the mouth by a scarcely noticeable ring: stamens exserted at mouth of tube; filaments very short. . . . . .48. MILLA.
cc. Stamens 3, affixed at throat. . . . . .
D. Perianth tube subglobose, constricted at mouth: stamens alternate with a like number of staminodes. . . . . .49. STROPHOLIRION.
DD. Perianth tube broadly cylindrical, shortly 6-sacate at base: stamens with a like number of staminodes connate into a spurious corona behind the anthers. . . . . .50. BREVOORTIA.
BB. Perianth funnel shaped or bell-shaped; lobes as long as the tube or longer. . . . . .
c. Filaments connate into a tube: stamens 6, affixed to throat . . .
D. Tube about as long as lobes. . . . . .51. ANDROSTEPHIUM.
DD. Tube much shorter than lobes. . . . . .52. BESSERA.
cc. Filaments free, normal or very short: perfect stamens 6 or 3, affixed to throat or tube. . . . . .
D. Pedicels articulated at apex. . . . . .53. BRODIÆA.
DD. Pedicels not articulated at apex. . . .54. TRITELEIA.
BBB. Perianth wheel shaped or bell-shaped; segments connate at the base in to a ring or cup. . . . . .
c. Rootstock a fibrous-tunicated corm. . . . . .
D. Filaments dilated at base into truncate scales surrounding ovary. . . . . .55. BLOOMERIA.
DD. Filaments slightly dilated below the middle. . . . . .56. MUILLA.
cc. Rootstock a tunicated bulb. . . . . .
D. Alliaceous odor absent; perianth segments connate at base or to the middle. . . . . .57. NOTHOSCORDUM.
DD. Alliaceous odor nearly if not quite always present; perianth segments distinct or barely united at base in a ring. . . . . .58. ALLIUM.

12. SQUILL TRIBE.

A. Perianth segments distinct, or united only at the very base. . . . . .
B. Seeds strongly compressed: ovules numerous. . . . . .
c. The outer segments of the persistent perianth spreading, the inner a little shorter, erect, connivent at apex and variously crested. . . . . .59. ALBUCA.
cc. The segments of the deciduous perianth subequal, connivent into a bell, or spreading. . . . . .60. URGINEA.
BB. Seeds obovoid or globose, not flattened or angled: ovules 2–∞ in a cell.
c. Inflorescence a long dense raceme, bearded at the apex by empty bracts which may be herbaceous or colored. . . . . .61. EUCOMIS.
cc. Inflorescence not as in c. . . . . .
D. Perianth segments 1-nerved. . . . . .62. SCILLA.
DD. Perianth segments 3 – ∞ -nerved. . . . . 63. CAMASSIA.
DDD. Perianth segments obscurely nerved...64. ORNITHOGALUM.
AA. Perianth segments united into a tube or bell. . . . . .
B. Ovules ∞, usually numerous. . . . . .
c. Seeds strongly compressed or angled. . .
D. The outer lobes spreading; inner

ones erect and shorter. .. ..65. DIPCADI.
DD. The lobes all spreading and subequal, or the inner ones a little wider. .....66. GALTONIA.
CC. Seeds oboyoid or globose. .....67. LACHENALIA.
BB. Ovules 2–6 in a cell, rarely more; seeds not flattened or angled. .....
C. Lobes very short, tooth-like, much shorter than tube. .....
D. Perianth cylindrical68. VELTHEIMIA.
DD. Perianth urn-shaped, constricted at throat. .....69. MUSCARI.
CC. Lobes considerably longer than the bell-shaped tube; fls. few, in a lax raceme. ...
D. Filaments erect, not connate, all or only alternate ones dilated and petal-like. .....70. CHIONODOXA.
DD. Filaments connate into a sort of cup which is produced beyond the anthers into a cone. ....71. PUSCHKINIA.
CCC. Lobes shorter than the tube or about as long, sometimes a trifle longer; filaments normal or dilated at base. ....72. HYACINTHUS.

13. TULIP TRIBE.

A. Capsule septicidally dehiscent or 3-parted: fls. erect or pendulous; outer perianth segments usually narrower or smaller; inner ones pitted. .....73. CALOCHORTUS. (Consult also *Cyclobothra.*)
AA. Capsule loculicidally dehiscent. .....
B. Anthers dorsifixed, versatile: fls. nodding or pendulous, rarely erect; claw of segments usually furnished with a nectariferous groove. ..74. LILIUM.
BB. Anthers basifixed, erect; filament usually introduced. .....
C. Fls. usually erect: perianth bell-shaped or somewhat funnel-shaped; segments often spotted near the base, not pitted.75. TULIPA.
CC. Fls. nodding or pendulous. .....
D. Perianth bell-shaped; segments usually furnished with a pit or nectar-bearing spot above the base. ...76. FRITILLARIA.
DD. Perianth segments narrow, recurved or reflected from the middle or almost from the base. ....77. ERYTHRONIUM.

14. MEDEOLA OR CUCUMBER-ROOT TRIBE.

A. Foliage at base of stem: lvs. few, stalked or contracted into a sheath: fls. in a long-pedunculed umbel, rarely solitary. ....78. CLINTONIA.
AA. Foliage whorled at top of stem. .....
B. Lvs. 3; fl. solitary, 3-merous. .....79. TRILLIUM.
BB. Lvs. 4–∞; fl. solitary, 4–∞-merous. .....80. PARIS.
AAA. Foliage whorled at middle of stem, with 3 smaller leaves at the top surrounding the umbel. ...81. MEDEOLA.

15. COLCHICUM OR AUTUMN-CROCUS TRIBE.

A. Perianth tube entire: styles 3, distinct from the base.82. COLCHICUM.
AA. Perianth segments with distinct claws, connivent into a tube. .....
B. Styles 3, distinct from base. .....83. MERENDERA.
BB. Style entire inside the tube, 3-fid at apex. ...84. BULBOCODIUM.

16. NARTHECIUM TRIBE.

A. Capsule loculicidally dehiscent. .....
B. Style undivided. .....85. NARTHECIUM.
BB. Styles 3. .....86. XEROPHYLLUM.
AA. Capsule septicidally dehiscent or parted. .....
B. Fls. few at apex of scape; style undivided.87. HELONIOPSIS.
BB. Fls. in a dense raceme; styles 3, very short. ..88. HELONIAS.

17. BELLWORT OR UVULARIA TRIBE.

A. Fr. an indehiscent berry. ..89. DISPORUM.
AA. Fr. a septicidal capsule. ..90. TRICYRTIS.
AAA. Fr. (where known) a loculicidal capsule. .....
B. Fls. terminal pendulous.
C. Lvs. perfoliate: seeds covered by a thin white aril. .....91. UVULARIA.
CC. Lvs. sessile: seeds have a swollen, spongy, brown ridge. .....92. OAKESIA.
BB. Fls. axillary, or long-pedicelled in the axils.
C. Plants are climbers. ..
D. Perianth segments spreading, usually wavy or crisped. ..93. GLORIOSA.
DD. Perianth segments distinct, suberect, more or less connivent and bell-shaped. .....94. LITTONIA.
CC. Plants not climbers: perianth urn-shaped; lobes very short. ...95. SANDERSONIA.

18. FALSE-HELLEBORE OR VERATRUM TRIBE.

A. Seeds membranous-winged nearly all the way round; stems leafy. .....
B. Lvs. narrow or long-stalked, perianth segments distinctly clawed. .....96. MELANTHIUM.
BB. Lvs. usually broad, plaited, veiny, contracted into a sheath, not distinctly stalked: perianth segments a trifle contracted at the base.97. VERATRUM.
AA. Seeds narrow, angled, hardly winged: lvs. radical or crowded at base of stem, linear or rarely sublanceolate. .....
B. Stamens much shorter than perianth: perianth more or less bell-shaped. .....98. STENANTHIUM.
BB. Stamens a little shorter than perianth: perianth flattened out. .....99. ZYGADENUS.

150. PONTEDERIACEÆ.

A. Ovary by abortion 1-celled, 1-ovuled. .....1. PONTEDERIA.
AA. Ovary 3-celled, many-ovuled.2. EICHHORNIA.

151. COMMELINACEÆ.

A. Fls. with 3 perfect stamens, and 3 or fewer staminodes. .....
B. Anther cells parallel and contiguous. .....
C. Ovary 3-celled; 2 anterior cells 1-2-ovuled; posterior 1-ovuled, empty or wanting. .....1. COMMELINA.
CC. Ovary 2-3-celled; cells usually 2- ∞ -ovuled.2. ANEILEMA.
BB. Anthers with variously petaloid connective cells spirally twisted into numerous gyres. ..3. COCHLIOSTEMA.
AA. Fls. with 6 stamens, rarely 5, all perfect: no staminodes. .....
B. Anther cells dehiscing by a terminal pore. .....4. DICHORISANDRA.
BB. Anthers otherwise dehiscent. .....
C. Connective transversely or divaricately 2-lobed. .....5. ZEBRINA.
CC. Connective not 2-lobed as in C. .....
D. Ovary cells 2-5-ovuled. .....
E. Cymes fasciculeformed, with the very short rachis contracted into a receptacle, sessile inside the base of the complicate floral lvs. or variously paniculate..6. TRADESCANTIA.
EE. Cyme terminal, pedunculate with 2-3 longish branches secund frd. from base. .....7. TINANTIA.
DD. Ovary cells 1-ovuled.8. RHŒO.

152. JUNACEÆ.

A. Anthers dorsifixed, versatile.1. XANTHORHŒA.
AA. Anthers basifixed, erect.....
B. Ovary 1-celled, or more or less perfectly 3-celled; placentæ or cells ∞-ovuled. .....2. JUNCUS.
BB. Ovary 3-celled; cells 2- or few-ovuled. .....3. PRIONIUM.

153. PALMACEÆ.

SUMMARY OF TRIBES.

A. Leaf-segments infolded in vernation: spadices interfoliaceous. .....
B. Fls. dioecious. .....
C. Lvs. pinnatisect, segments acuminate: spathe solitary: ovary of 3 distinct carpels, only one maturing: seed deeply grooved ventrally umbilicate, embryo dorsal. .....1. PHŒNIX TRIBE.
CC. Lvs. plaited in a fan-shaped fashion, roundish, semi-orbicular or wedge-shaped, split: spathes numerous: ovary entire or 3-lobed, 3-celled, with erect ovules: seeds with a mere dot of a hilum, raphe ventral. .....2. CORYPHA TRIBE.
BB. Fls. usually hermaphrodite: lvs. much like those of Corypha Tribe: spathes numerous: ovary entire, 3-lobed, at ascending ovules: seeds with diffused hilum. .....3. BORASSUS TRIBE.
AA. Leaf segments folded back in vernation. .....
B. Seeds adherent to the endocarp, hilum diffused, embryo opposite pore: spadices interfoliaceous: fls. usually monœcious in the same spadix, the lower ones in 3's with the middle one pistillate. .....4. COCOS TRIBE.
BB. Seed umbilicate. .....
C. Raphe dorsal, embryo ventral: spadices terminal or axillary: fls. polygamo-monœcious. .....5. LEPIDOCARYA TRIBE.
CC. Raphe ventral; embryo dorsal. .....6. ARECA TRIBE.

1. PHŒNIX TRIBE.

Sole genus. .....1. PHŒNIX.

2. CORYPHA TRIBE.

A. Style or stigma basilar in fruit: albumen equable...
B. Style short: embryo terminal: palms fruit once and die. .....2. CORYPHA.
BB. Style elongated. .....
C. Embryo dorsal. .....3. SABAL.
CC. Embryo sub-basilar. ...4. WASHINGTONIA.
AA. Style or stigma terminal in fruit. .....
B. Perianth of imbricate petals or corolla segments.
C. Fls. polygamo-dioecious: carpels free: stigmas sessile, distinct: embryo dorsal. .....
D. Albumen ruminate...5. CHAMÆROPS.
DD. Albumen equable. ...6. RHAPIDOPHYLLUM.
CC. Fls. hermaphrodite: carpels distinct; styles long, distinct.
D. Filaments free. ....7. ACANTHORHIZA.
DD. Filaments connate into a tube. .....8. TRITHRINAX.
BB. Perianth of valvate petals or corolla lobes: see also BBB. .....
C. Fls. dioecious: corolla 3-toothed: anthers extrorsely dehiscent.9. RHAPIS.
CC. Fls. polygamo-monœcious: carpels distinct: stigmas distinct, sessile: albumen equable, ventrally grooved: embryo dorsal. .....10. TRACHYCARPUS.
CCC. Fls. hermaphrodite. ....
D. Embryo dorsal: albumen equable: carpels slightly cohering or in Livistona sometimes distinct.
E. Spadix branches not sheathed: style short, 3-cornered. .....11. BRAHEA.
EE. Spadix rachis sheathed: carpels 3-cornered: style single, thread-like 12. LICUALA.
EEE. Spadix branches naked or lower ones bracted: carpels globose: styles short, distinct or cohering.13. LIVISTONA.
DD. Embryo, sub-basilar; rachis of spadix sheathed. .....
E. Albumen ruminate: carpels 3, distinct at base: style

single, short, 3-grooved. ..... 14. COPERNICIA.
EE. Albumen equable.
F. Corolla tube persistent: segments deciduous: ovary 3-cornered or 3-lobed narrowed into a style. ...
FF. Corolla otherwise. 15. PRITCHARDIA.
G. Carpels free at base: style single, slender elongated. ..... 16. SERENEA.
GG. Carpels slightly cohering: style single, short, 3-grooved. ..... 17. ERYTHEA.
BBB. Perianth minute 6-fid. or obsolete. ..... 18. THRINAX.

3. BORASSUS TRIBE.

A. Stamens 6. .....
B. Fls. numerous in the cavities of the spadix. ... 19. BORASSUS.
BB. Fls. solitary in the cavities. ..... 20. HYPHÆNE.
AA. Stamens numerous. .....
B. Fls. numerous in cavities. 21. LODOICEA.
BB. Fls. solitary in cavities. . 22. LATANIA.

4. COCOS TRIBE.

A. Palms armed with prickles: fr. 1-seeded; endocarp 3-porous at or above the middle. .....
B. Pistillate fls. with petals united for a considerable distance: staminate fls smaller: endocarp bony. .....
C. Staminate fls. not immersed in spadix: leaf-segments acuminate. ..... 23. BACTRIS.
CC. Staminate fls. immersed in cavities of spadix: leaf segments praemorse. ..... 24. ASTROCARYUM.
BB. Pistillate fls. with petals connate only at base. ..
C. Staminate fls. immersed; anthers large, inserted: leaf segments acuminate. . 25. ACROCOMIA.
CC. Staminate fls. immersed; anthers included: leaf segments wedge-shaped, praemorse. ..... 26. MARTINEZIA.
AA. Palms unarmed. .....
B. Endocarp 3-porous above middle: fr. 1–3-seeded. 27. ELAEIS.
BB. Endocarp bony and even in Jubæa, 3–6-porous towards base: fr. 1–∞-seeded. .....
C. Spadix simple. ..... 28. DIPLOTHEMIUM.
CC. Spadix simply branched.
D. No. of stamens 6: fr. 1-seeded (in Scheelea sometimes 2–3-seeded. .....
E. Petals minute, much smaller than exserted stamens of staminate fls. ... 29. MAXIMILIANA.
EE. Petals lanceolate: stamens included. 30. COCOS.

[NOTE.—Latest researches point toward the American nativity of the Cocoanut. Cook, in Bull.—Div. of Bot., U. S. Dept. Agric.]

EEE. Petals shaped like a long club, or cylindrical: stamens shorter. .... 31. SCHEELEA.
DD. No. of stamens 10–24 or more: petals of staminate fls. lanceolate: stamens included; anther cells connate. .....
E. Fr. 2–6 seeded. .... 32. ATTALEA.
EE. Fr. 1-seeded; the endocarp 3-porous at the middle or a little lower. ..... 33. JUBÆA.

5. LEPIDOCARYA TRIBE.

A. Lvs. fan-shaped; ovary perfectly 3-celled. ... ... 34. MAURITIA.
AA. Lvs. equally pinnatisect, ovary imperfectly 3-celled: spadices axillary.
B. Palms fruit once and die. 35. PLECTOCOMIA.
BB. Palms fruit more than once; usually climbers.
C. Spathes solitary, deciduous: leaf segments rhombic; nerves fan-shaped. ..36. CERATOLOBUS.
CC. Spathes numerous, persistent. leaf segments acuminate; nerves parallel. ....
D. Spadices contracted: spathes cymbiform, beaked, long,–persistent, the 2 lower ones forming an involucre for the others. ..... 37. DÆMONOROPS.
DD. Spadices diffused, or if contracted the spathes are flat and persistent only during anthesis. ..... 38. CALAMUS.

6. ARECA TRIBE.

(Key to Subtribes.)

A. Petals of the pistillate fls. valvate throughout nearly their whole length: spadices interfoliaceous; spathes 2 or more: ovary entire, 3-celled. ..... 1. *Caryotideæ.*
AA. Petals of the pistillate fls. overlapping or valvate only at apex, very rarely valvate throughout. ....
B. Spadices infrafoliaceous..
C. Stigmas terminal in fruit: ovary entire, 1-celled. .....
D. Staminate fls. unsymmetrical: sepals usually small and not imbricate. .... 2. *Euarecæ.*
DD. Staminate fls. symmetrical: sepals usually roundish and widely overlapping. ..... 3. *Ptychospermeæ.*
CC. Stigmas usually excentric or lateral in ovary entire or 3-lobed: leaf-segments acuminate. .....
D. Spathes 2: ovary entire. ..... 4. *Oncospermeæ.*
DD. Spathes numerous: leaf segments wedge-shaped. ....
E. Ovary entire: younger spadices horn-shaped. ....5. *Iriarteæ.*
EE. Ovary deeply 3-lobed, with large stigmas: spadices club-shaped. ....6. *Wettinieæ.*
BB. Spadices nearly always interfoliaceous. .....
C. Stigmas terminal in fr., rarely basal. .....
D. Ovary 1-celled: spadix simple, with

monœcious fls. immersed in cavities.7. *Linospadicœæ*.
DD. Ovary 3-celled, imperfectly so in subtribe S. .....
E. Fruit globose: spadix paniculately branched, the fls. diœcious and pedicelled. .....8 *Ceroxyleæ*.
EE. Fruit elongated: spadix subdigitately branched, the fls. monœcious and not immersed. .....9. *Malortieæ*.
CC. Stigmas lateral or basal in fruit, rarely terminal; ovary entire. ..
D. Fls. not immersed in cavities. .....
E. Spathes 2: all the fls. or the lower ones in 3's.: ovary 1–3-celled..10. *Iguanureæ*.
EE. Spathes numerous; ovary 3-celled; spadices inter-and infrafoliaceous: fls. usually diœcious, without bracts or bractlets; perianth rather fleshy or leathery. .....11. *Chamædoreæ*.
DD. Fls. immersed in cavities, monœcious or dioecious, compressed; perianth glumaceous; style often elongated, terminal or lateral.12 *Geonomeæ*.

Subtribe 1. *Carpotideæ*.

A. Lvs. bipinnatisect: albumen ruminate; staminate fls. with 3 sepals and stamens. .....39. CARYOTA.
AA. Lvs. pinnatisect: albumen equable. .....
B. Stamens 6; calyx of staminate fls. tubular, truncate. .....40. WALLICHIA.
BB. Stamens ∞ .....
C. Calyx of staminate fls. cup-shaped, 3-lobed .41. DIDYMOSPERMA.
CC. Calyx of staminate fls. of 3 sepals. .....42. ARENGA.

Subtribe 2. *Euarecœæ*.

A. Ovule basal, erect. .....
B. Albumen ruminate. .....
C. Stamens 3 or 6: staminate fls. minute, numerous, solitary or in pairs, on branches of spadix; pistillate fls. much larger, solitary toward base of branches. .....43. ARECA.
CC. Stamens numerous: fls. in 3's, the middle one pistillate, arranged in 2, 4 or 6 ranks. ....44. PINANGA.
BB. Albumen equable: stamens 6: fls. in 3's, the middle one pistillate, arranged in 4 ranks. ..45. KENTIA.
AA. Ovule parietal, more or less pendulous. .....
B. Fls. arranged in 4 ranks on branches of spadix.46. HYDRIASTELE.
BB. Fls. arranged spirally on branches of spadix. (All "sepals" mentioned under BB. refer to sepals of staminate fls., except where otherwise stated.) .....
C. Pistillate fls. much larger than staminate: sepals papery, connate at base. ....47. VEITCHIA.
CC. Pistillate fls. not larger than staminate. .....
D. Length of sepals far surpassing petals: sepals narrow. ....48. NENGA.
DD Length of sepals not exceeding petals. ..
E. The sepals overlapping. .....
F. Sepals triangular-orbicular; stamens numerous; filaments short. .....49. KENTIOPSIS.
FF. Sepals small, keeled: stamens 9–24; filaments inflexed at apex. .....50. ARCHONTOPHŒNIX.
EE. The sepals do not overlap. .....
F. Filaments inflexed at apex. .....
G. Sepals awl-shaped or lanceolate; stamens 6–12: pistillate fls. with short petals valvate at apex. ....51. RHOPALOSTYLIS.
GG. Sepals small, acute: stamens 6: pistillate fls. with petals a little longer than the sepals. .....52. DICTYOSPERMA.
FF. Filaments normal; sepals narrowly lanceolate; stamens 9–12; pistillate fls. with petals like the sepals.53. HEDYSCEPE.

Subtribe 3. *Ptychospermeæ*.

A. Albumen ruminate. .....54. PTYCHOSPERMA.
AA. Albumen equable. .....
B. Leaf-segments obliquely premorse: stamens numerous. .....55. DRYMOPHLŒUS.
BB. Leaf-segments narrowed at apex, or in Cyrtostachys entire or sometimes obliquely 2-toothed. .....
C. Stamens 6–15: pericarp slightly fibrous, smooth inside. ....56. CYRTOSTACHYS.
CC. Stamens 6: pericarp thick, granular, fibrous inside. .....57. CYPHOPHŒNIX.

Subtribe 4. *Oncospermeæ*.

A. Staminate fls. symmetrical; sepals broad and much overlapping: stigmas in fruit excentric or lateral, or in Cyphosperma subterminal. .....
B. Perianth of pistillate fls. eolarged after anthesis.
C. Pericarp grumose and fibrous. .....58. CLINOSTIGMA.
CC. Pericarp thin, leathery or bony. .....59. CYPHOSPERMA.
BB. Perianth not changed after anthesis. .....60. MICROKENTIA.
AA. Staminate fls. unsymmetrical; sepals small or narrow, not imbricate or only slightly so: stigmas lateral in fruit or basal. .....
B. Petals of pistillate fls.

connate at base, valvate above. .....61. OREODOXA.
BB. Petals free. .....
C. Anthers erect. .....62. ONCOSPERMA.
CC. Anthers versatile. ....
D. Fr. globose: palms unarmed .....63. EUTERPE.
DD. Fr. minute: palms spiny. .....64. ACANTHOPHŒNIX.

Subtribe 5. *Iriarteæ.*

Stamens 9–15: stigmas terminal or nearly so in fr.: leaf-segments turned in every direction. .....65. IRIARTEA.

Subtribe 6. *Wettenieæ.*

No representatives known to be cult. in America.

Subtribe 7. *Linospadiceæ.*

A. Anthers basifixed, erect. ...
B. Stamens 6, 10, or 12: pistillate fls. have ∞ staminodes: leaf-segments premorse. .....66. BACULARIA.
BB. Stamens very numerous, pistillate fls. have no staminodes. leaf segments acuminate. ....67. HOWEA.
AA. Anthers dorsifixed, versatile; staminodes in pistillate fls. 6–9: leaf-segments acuminate. .....68. LINOSPADIX.

Subtribe 8. *Ceroxyleæ.*

Stamens 9–15: fr. with basal stigmas. .....69. CERONYLON.

Subtribe 9. *Malorticæ.*

Not cult. in America.

Subtribe 10. *Iguanureæ.*

A. Stigmas excentric or or lateral in fruit. .....70. HETEROSPATHE.
AA. Stigmas basal or nearly so in fruit. .....
B. Stamens 15–20: ovary 1-celled: palm armed. ..71. STEVENSONIA.
BB. Stamens 6, with didymous anthers. .....
C. Ovary 1-celled: palm armed. .....72. VERSCHAFFELTIA.
CC. Ovary 3-celled: palm unarmed. .....73. DYPSIS.

Subtribe 11. *Chamædoreæ.*

A. Fls. dioecious or monœcious in different spadices, spirally arranged. .....74. CHAMÆDOREA.
AA. Fls. monœcious in the same spadix. .....
B. The fls. arranged in elongated heaps or clusters.75. HYOPHORBE.
BB. The fls. sparse, solitary or in pairs. .....76. ROSCHERIA.

Subtribe 12. *Geonomeæ.*

A. Anthers arrow-shaped. ....77. CALYPTROGYNE.
AA. Anthers with long separate, pendulous cells. .....78. GEONOMA.

IMPERFECTLY KNOWN GENERA OF PALMS.

79. BALAKA is a member of the Areca Tribe and probably belongs between Ptychosperma and Drymophlœus, differing from those genera as indicated in the article *Balaka*.

80. BISMARCKIA is a member of the Borassus Tribe.

81. CHRYSALIDOCARPUS is a well known member of the Areca Tribe of doubtful affinity.

82. ENORRHIZA is a member of the Areca Tribe, subtribe Euarecee.

83. PHYTELEPHAS is a well-known member of the Areca Tribe but of doubtful affinity.

84. PSEUDOPHŒNIX is a member of the Areca Tribe which probably belongs in the subtribe Chamædoreæ, near Hyophorbe.

85. PTYCHORAPHIS is a member of the Areca Tribe which probably comes after Ptychosperma.

86. RANEVIA is known only in the juvenile state and is conjectured to be near to Hyophorbe.

154. LEMNACEÆ.

Floating plants with roots: fls. inserted on marginal cracks of the frond: stamens 1–2; anthers 2-celled.1. LEMNA.

155. PANDANACEÆ.

No staminodes in pistillate fls.; ovules solitary in carpels. .....1. PANDANUS.

156. CYCLANTHACEÆ.

A. Plants with watery juice....1. CARLUDOVICA.
AA. Plants with milky juice....2. CYCLANTHUS.

157. TYPHACEÆ.

Fr. dry, at length split on one side. .....1. TYPHA.

158. ARACEÆ OR AROIDEÆ.

[NOTE.—The arrangement of Engler in Monog. Phaner. Vol. 2, is more natural, but like most natural arrangements of large groups it is more difficult for the use of students who are in search of differences rather than likenesses. Moreover the Englerian system of the Araceæ is largely based upon histological characters, which are of no use to most horticulturists.]

A. Perianth 0, (except female fls. of Peltandra). .....
B. Fls. monœcious (in Arisæma sometimes dioecious) .....
C. Spadix appendaged (except in Protea). ....
D. The male and female inflorescences contiguous with no neutral organs between: ovules anatropous or semi anatropous. .....1. AMORPHOPHALLUS.
DD. The upper fls. males, lower ones females: ovules orthotropous. .....
E. The spadix free from the spathe or adnate at the base. .....
F. Male fls. sparse: lvs. and fls. appear together. .
G. Tube of spathe with connate margins: male fls. with stamens; anthers horseshoe-shaped.2. ARISARUM.
GG. Tube of spathe convolute: fls. usually dioecious: males with 2–5 stamens.3 ARISÆMA.
FF. Male fls. dense: lvs. often appear before fls.
G. Tube of spathe with connate margins. ...
H. Ovule solitary: lvs. entire. ....4. BIARUM.

HH. Ovules 2–4: lvs. pedatisect. .....5. SAUROMATUM.
GG. Tube of spathe convolute. ..
H. Ovules 2 parietal, in 2 series. ..6. ARUM.
HH. Ovules few, inserted at base and apex of cell.
I. Male and female fls. remote: appendix of spadix hairy. ....7. HELICODICEROS.
II. Male and female fls. contiguous. .....8. DRACUNCULUS.
EE. The spadix not appendaged, adnate to spathe on back: aquatic plant. .....9. PISTIA.
EEE. The tube of spathe closed at mouth by dilation of spadix or else divided into 2 cells...
F. Tube closed at throat. .....10. PINELLIA.
FF. Tube 2 celled. ....11. AMBROSINIA.
CC. Spadix not appendaged (rarely with a naked appendage or endowed with neutral organs: upper fls. males, lower ones females. .....
D. Stamens connate in a prismatic or peltate body. .....
E. Plants are climbing shrubs. .....
F. Ovaries distinct, 2–10-celled. ...12. PHILODENDRON.
FF. Ovaries coherent, 1–2-celled. ...13. SYNGONIUM.
EE. Plants are herbs, not climbing. ...
F. The ovules orthotropous or nearly so; micropyle superior. .....
G. Ovules numerous in 2 series on 3–5 parietal placentæ. .....14. COLOCASIA.
GG. Ovules few, basal. .....15. ALOCASIA.
GGG. Ovules, 1 or few suburparietal: distinguished by ovary immersed in a carp and embryo not albuminous. ..16. PELTANDRA.
FF. The ovules anatropous or semi-anatropous; micropyle inferior. .....
G. Ovaries distinct or slightly coherent. ...17. CALADIUM.
GG. Ovaries distinct below, above thick, dilated and grown together. .....18. XANTHOSOMA.
GGG. Ovary 2–5-celled. .....19. DIEFFENBACHIA.
DD. Stamens distinct. ...
E. Fr. not included by tube of spathe; the whole spathe deciduous, marcescent. .....
F. Ovule affixed to to intruded placentæ: lvs. ovate. .....20. AGLAONEMA.
FF. Ovule affixed near top of cell: lvs. broadly arrow-shaped. .....21. NEPHTHYTIS.
EE. Fr. included by accrescent tube of spathe: blade of spathe marcescent, deciduous. ..22. RICHARDIA.
EEE. Fr. included by spathe; blade of of which is persistent. .....23. HOMALOMENA.
EEEE. Fr. girt by the top-shaped tube of spathe, which has a circumscissile, deciduous blade...24. SCHISMATOGLOTTIS.
BB. Fls. hermaphrodite. ....
C. Plants marsh herbs. ..25. CALLA.
CC. Plants are scandent shrubs. .....
D. Ovules 2 in a cell, affixed to base of septum. .....26. MONSTERA.
DD. Ovules solitary, basal 27. SCINDAPSUS.
DDD. Ovules numerous. ...28. RHAPHIDOPHORA.
AA. Perianth of 4–8 distinct segments: fls. all hermaphrodite. .....
B. Spadix flowering below: spathe long, often twisted, long persistent.29. CYRTOSPERMA.
BB. Spadix flowering above. ..
C. Spathe sheathing the very long pedunculiform stipe of the spadix, with blade incomplete or 0. .....
D. Ovary 1-celled; ovules solitary, semi-anatropous. ..30. ORONTIUM.
DD. Ovary 2-celled; ovules 1–2 in a cell, orthotropous. .....31. LYSICHITUM.
CC. Spathe provided with scale-like appendages in the tube, long persistent, ovules semi-anatropous or campylotropous. .....32. SPATHYEMA.
CCC. Spathe leafy, accrescent, persistent, quite flattened out: ovules anatropous. .....33. SPATHIPHYLLUM.
CCCC. Spathe open, recurved or reflexed, accrescent, persistent: ovules various. ...34. ANTHURIUM.
CCCCC. Spathe accrescent, persistent or obsolete: ovules anatropous. ..35. POTHOS.
CCCCCC. Spathe obsolete or obscure: ovules orthotropous. .....36. ACORUS.

159. ALISMACEÆ.

A. Ovules solitary, basal, or many affixed to the inner angle of the carpel; mature carpels indehiscent.
B. Carpels inserted on a small receptacle. .....1. ALISMA.
BB. Carpels densely crowded in many series on a large oblong or globose receptacle. .....2. SAGITTARIA.
AA. Ovules numerous, inserted on reticulately branched parietal placentæ: mature carpels dehiscent by ventral suture. .....

B. Petals marcescent; stamens 9; carpels 6. . . . 3. BUTOMUS.
BB. Petals deciduous; stamens numerous; carpels 15–20. . . . . 4. LIMNOCHARIS.

160. NAIADACEÆ.

A. Fls. hermaphrodite, spicate.
B. Perianth 0; stamens 6 or more, hypogynous; carpels 3– ∞ -ovuled, dehiscent at maturity. . . 1. APONOGETON. (See also 2. *Ouvirandra*).
BB. Perianth segments 4; stamens 2 or 4, inserted at base of perianth; carpels 1-ovuled, indehiscent. . . . . 3. POTAMOGETON.
AA. Fls. unisexual, axillary; perianth 0; stamens 1; carpels 1-ovuled. . . . . 4. ZANNICHELLIA.

161. CYPERACEÆ.

A. The fls. strictly unisexual; in female spikelets 1-fld., spicate, enclosed by a single bladder-like glume, or the glume is split and includes the fl.; male spikelets 2– ∞ -fld., terminal, or continuous with the apex of the female spike, rarely at the base of the female spike. . . . 1. CAREX.
AA. The fertile fls. hermaphrodite or rarely subfemale with antherless filaments.
B. With several of the lower glumes empty. . . . . 2. MAPANIA.
BB. With only one of the lower glumes empty. . .
c. Glumes 2-ranked. . . . .
D. Hypogynous setæ 0, 3. 3. CYPERUS.
DD. Hypogynous setæ 8. 4. DULICHIUM.
cc. Glumes many ranked, overlapping. . . . . .
D. Hypogynous setæ 3–8, or 0. . . . . .
E. Style persistent, thickened and bulb-like at base. 5. ELEOCHARIS.
EE. Style not or hardly thickened at base. . . . . 6. SCIRPUS.
DD. Hypogynous setæ 6 or many, very long excrescent after anthesis, becoming wavy or cottony. . . 7. ERIOPHORUM.

162. GRAMINEÆ.

(Following Hackel's "True Grasses," translated by Scribner and Southworth, 1890.)

SYNOPSIS OF TRIBES.

A. Spikelets 1-fld., rarely 2-fld., lower flower when present imperfect, falling from the pedicel entire or together with certain joints of the rachis at maturity. Rachilla not produced beyond the fls. Internodes between the different glumes or fls. not measurable. . . . . .
B. Hilum punctiform, spikelets not flattened laterally, but usually somewhat dorsally compressed or else perfectly round. . . . . .
c. Flowering glumes and palea (the latter often wanting) hyaline. Empty glumes thick, membranaceous to coriaceous or cartilaginous, the lowest the largest, with its edges embracing the others. Spikelets generally in racemes or spikes whose articulate axes break up at maturity. . . . . .
D. The male and female spikelets in separate inflorescences or on different parts of the same inflorescence. . . . . 1. INDIAN CORN TRIBE OR MAYDEÆ.
DD. The spikelets either all hermaphrodite or male and hermaphrodite and so arranged in the same inflorescence that a male stands near an hermaphrodite. 2. SORGHUM TRIBE OR ANDROPOGONEÆ.
cc. Flowering glume and palea membranaceous; empty glumes herbaceous, chartaceous or coriaceous, the first generally the largest; spikelets falling off singly or in groups from the continuous rachis. . . 3. ZOYSIA TRIBE OR ZOYSIEÆ.
ccc. Flowering glume and palea membranaceous, empty glumes herbaceous or chartaceous; the first empty glume smaller or narrower than the following ones. Spikelets falling off singly from the ultimate branches of the panicle. . . . . 4. TRISTEGINEÆ.
cccc. Flowering glume and palea cartilaginous, coriaceous or chartaceous. Empty glume more delicate, usually herbaceous, the first usually smaller. Spikelets falling off singly from the ultimate branches of the panicle or continuous (rarely articulate) rachis of a spike. . . . . 5. PANICUM TRIBE OR PANICEÆ.
BB. Hilum linear, spikelets laterally compressed. . . 6. RICE TRIBE OR ORYZEÆ.
AA. Spikelets 1– ∞ -fld., the 1-fld. frequently with the rachilla produced beyond the fls., rachilla generally articulated above the empty glumes, so that these remain after the fall of the fruiting glumes. When 2–many-fld. there are always distinct internodes between the fls. . .
B. Culm herbaceous, annual; leaf blade not articulated with the sheath.
c. Spikelets upon distinct (sometimes very short) pedicels, in panicles, spike-like panicles, or racemes (without notches in the main axis). . . . .
D. Spikelets 1-fld. . . . .
E. Empty glumes 4, palea 1-nerved. . . 7. PHALARIS TRIBE OR PHALARIDEÆ.
EE. Empty glumes 2 (rarely 0), palea 2-nerved. . . . . 8. AGROSTIS TRIBE OR AGROSTIDEÆ.

DD. Spikelets 2–x -fld ...
E. Flowering glume generally shorter than the empty ones; usually with a bent awn on the back rarely awned from the point or awnless. When not awned there are 2 nearly opposite florets, and the rachilla is not produced beyond them. ...9. Oat Tribe or Avenæ.

EE. Flowering glume generally longer than the empty ones, unawned or with a straight awn from the point (seldom below). .....10. Fescue Tribe or Festuceæ.

CC. Spikelets crowded in 2 close rows, forming a 1-sided spike or raceme with a continuous axis. .....11. Chloris Tribe or Chlorideæ.

CCC. Spikelets in 2 (rarely more) opposite rows forming an equilateral spike (very rarely unilateral). .....12. Barley Tribe or Hordeæ.

BB. Culm woody, at least at the base, leaf-blade often with a short, slender petiole articulated with the sheath from which it finally separates. .....13. Bamboo Tribe or Bambuseæ.

1. Indian Corn Tribe or Maydeæ.

A. Male spikes numerous in terminal panicles, female spikes in the axils of lvs. subtended by large membranaceous bracts. .....
B. Female spikes of each leaf-axil grown together into a continuous, compound, much thickened axis (the "ear"). ....1 Zea.
BB. Female spikes of each leaf-axil free, articulated. .....2. Euchlæna. (See also *Teosinte*.)

AA. Male spikes solitary at the ends of branchlets, female below, 1–2, each reduced to a single spikelet which is entirely inclosed by the ovate or spherical, ivory-like sheath of the subtending bract. .....3. Coix.

AAA. Male and female spikelets in the same spike (at least in the lateral ones), the lowest empty glume of the female spikelets indurated. .....4. Tripsacum.

2. Sorghum Tribe or Andropogoneæ.

A. Spikelets homogamous, hermaphrodite .....
B. Axis of racemes continuous .....5. Miscanthus.
BB. Axis of racemes articulate.
C. Spikelets awned. .....6. Erianthus.
CC. Spikelets unawned. ...7. Saccharum.

AA. Spikelets heterogamous, the sessile hermaphrodite, the pedicillate male. .....8. Andropogon. (See also 9. *Chrysopogon*).

3. Zoysia Tribe or Zoysieæ.

Not cult. in America.

4. Tristegineæ.

Not cult. in America.

5. Panicum Tribe or Paniceæ.

A. The spikelets forming very short spikes which are sunken into cavities of the one-sided, broad axis.10. Stenotaphrum.

AA. The spikelets neither sunken in an excavation in the rachis nor subtended by a large leaf-sheath. .....
B. Spikelets without any special covering of bristles or spines (sterile branches). .....
C. First and second empty glumes without a distinct callus, awnless.11. Panicum.
CC. First empty glume very small and awnless, the second apparently distant from the first on account of a conical or pedicel-like callus, and like the third flowering glume of the male floret) more or less awned between the cleft apex. .....12. Trichlæna.
CCC. First and second empty glumes awned. .....13. Oplismenus.

BB. Spikelets single or in pairs, subtended by an involucre consisting of from one to many bristles or spines (sterile branches) which are sometimes grown together. .....14. Setaria.
C. Involucral bristles falling off with the spikelets at maturity (cultivated forms excepted). .....
D. Bristles numerous, rigid, thickened at base, frequently grown together. ...15. Cenchrus.
DD. Bristles usually numerous, apparently whorled, delicate, not thickened at base, often plumose.16. Pennisetum.

6. Rice Tribe or Oryzeæ.

A. Spikelets unisexual; plants monœcious. .....17. Zizania.
AA. Spikelets all hermaphrodite.18. Oryza.

7. Phalaris Tribe or Phalarideæ.

A. Third and fourth glumes empty, reduced to small scales, awnless. .....19. Phalaris.
AA. Third and fourth glumes empty, small awned upon the back. .....20. Anthoxanthum.
AAA. Third and fourth glumes, or at least the third, with a male fl. almost equaling the first and second, awnless or short-awned. .....21. Hierochloë.

8. Agrostis Tribe or Agrostideæ.

A. Flowering glume indurated at maturity (at least firmer in texture than the empty glumes) and very closely enveloping the fruit. .....
B. Awned. .....

c. Lodicules usually 3: fl. glume and palea finally very hard. . . . . .
D. Fl. glume narrow; awn twisted, stout, persistent. . . . . 22. STIPA.
DD. Fl. glume broad; awn slender, falling after anthesis. . . . . 23. ORYZOPSIS.
cc. Lodicules 2 (anterior); awns slender, sometimes reduced to a mere point: palea simply membranaceous: spikelets small. 24. MUEHLENBERGIA.
BB. Awnless. . . . . 25. MILIUM.
AA. Flowering glume usually hyaline or membranaceous at maturity, at least more delicate than the empty glumes: grain loosely or not at all inclosed. . . . . .
B. Stigmas subplumose (their very short hairs springing from all sides) projecting from apex of nearly closed glumes. 26. PHLEUM.
BB. Stigmas distinctly plumose (branchlets 2-ranked) projecting from the sides of the spikelets, rarely remaining inclosed within them. .
c. Palea 1-nerved, with one keel: stamen 1. . 27. CINNA.
cc. Palea 2-nerved, rarely wanting: stamens 3.
D. The fl.-glume with a delicate awn inserted below the point and many times longer than the glume. . . . . 28. APERA.
DD. The fl.-glume not as in D. . . . . .
E. Callus, or prolongation of rachilla, having a tuft of hairs at least a third as long as the fl.-glume. . . . .
F. Fl.-glume and palea thin—membranaceous. 29. CALAMAGROSTIS.
FF. Fl.-glume and palea chartraceous: panicle spike-like. . . . 30. AMMOPHILA.
FFF. Fl.-glume and palea chartraceous: panicles expanded. . . . 31. CALAMOVILFA.
EE. Callus naked or with a few very short hairs. . . . . 32. AGROSTIS.

9. OAT TRIBE OR AVENEÆ.

A. Spikelets readily deciduous as a whole. . . . . 33. HOLCUS.
AA. Spikelets with fruiting glumes deciduous, but the empty glumes not deciduous. . . . . .
B. No. of fls. in a spikelet strictly 2; rachilla not produced. . . . . 34. AIRA.
BB. No. of fls. in a spikelet 2-∞: rachilla produced beyond upper fl. . . . . .
c. Grain free, unfurrowed. 35. DESCHAMPSIA.
cc. Grain furrowed, usually adherent to glumes. . 36. AVENA.

10. FESCUE TRIBE OR FESTUCEÆ.

A. Rachilla or fl.-glume (at least of the fertile fl.) with long hairs which envelop the latter. Tall reed-like grasses. . . . . .
B. Plant dioecious, female spikelets hairy, male spikelets naked. . . . . .
c. Culms perennial; lvs. rather evenly distributed over the culm. . 37. GYNERIUM.
cc. Culms biennial: lvs. mainly crowded at the base. . . . . 38. CORTADERIA.
BB. Plant hermaphrodite (very rarely dioecious), all the spikelets hairy. .
c. Hairy on fl. glumes, not on rachilla. . . . . 39. ARUNDO.
cc. Hairy on rachilla, not on fl.-glumes. . . . . 40. PHRAGMITES.
AA. Rachilla and fl.-glume naked or hairy; hairs much shorter than the glumes: stigmas plumose. . . . . .
B. Spikelets of 2 forms, the fertile 1–3 fld., surrounded by the sterile, consisting of many glumes. . . . . .
c. Fertile spikelets 1 fld.; sterile spikelet with obtuse glumes. . . . 41. LAMARCKIA.
cc. Fertile spikelets 2–3-fld.: sterile spikelet with awned or pointed glumes. . . . . 42. CYNOSURUS.
BB. Spikelets all alike. . . . . .
c. Fl.-glumes 1–3-nerved, all with hermaphrodite fls. or the uppermost only with a male fl., or empty. . .
D. Panicle-branches spirally arranged. . . . .
E. The spikelets loosely 2–4-fld. . . . . 43. MOLINIA.
EE. The spikelets densely many-fld. . . . 44. ERAGROSTIS.
DD. Panicle-branches (primary ones) 2-ranked, usually branched again at the base. . . . . .
E. Second empty glume much broader and somewhat longer than the fl.-glumes. . . . . 45. EATONIA.
EE. Second empty glumes not broader nor longer than the fl.-glumes. . . . . 46. KŒLERIA.
cc. Fl.-glumes 5-many-nerved; each containing an hermaphrodite fl. or the upper with only a male fl. or empty. . . . . .
D. Empty glumes 3 6 at the base of each spikelet. . . . . 47. UNIOLA.
DD. Empty glumes 2. . . . .
E. Plants strictly dioecious: spikelets almost sessile. . . 48. DISTICHLIS.
EE. Plants hermaphrodite (rarely dioecious and then loosely paniculate). . . . . .
F. Base of fl.-glumes cordate. . . . . 49. BRIZA.
FF. Base of fl.-glumes not cordate. . .
G. Spikelets closely imbricate, arranged in a linear, dense, false spike. . 50. DEMAZERIA.
GG. Spikelets in small fascicles which are united into a glomerate or interrupted panicle. . . . . 51. DACTYLIS.

H. Stigmas 2 plainly arising below the apex (lateral) on the anterior portion of the ovary; empty glumes awnless. ..52. BROMUS.
HH. Stigmas 2, inserted at or near apex of ovary. ....53. PANICULARIA.
I. Lateral nerves of floral glumes nearly parallel, not converging.
II. Lateral nerves of the fl.-glumes arched, converging above toward the midvein. ...
J. Fl.-glumes strongly keeled on back. .....54. POA.
JJ. Fl.-glumes rounded on the back, at least below. .....55. FESTUCA.

11. CHLORIS TRIBE OR CHLORIDEÆ.

A. Each spikelet with 1 hermaphrodite fl. .....
B. With no sterile glumes or male fls., and only rarely a short projection above the hermaphrodite fl. .....
C. The spikelets falling off from the rachis entire.56. SPARTINA.
CC. The empty glumes not deciduous. .....57. CYNODON.
(Consult *Capriola*).
BB. With one to several empty glumes above the hermaphrodite fl. these are often small or awn-like, rarely with a male fl. in their axils. .....
C. Fl.-glumes of hermaphrodite fl. with one awn, or awnless.....58. CHLORIS.
CC. Fl.-glume of hermaphrodite with 3 awns.....59. TRICHLORIS.
AA. Each spikelet with 2-3 hermaphrodite fls. .....
B. Spikes with terminal spikelets. .....60. ELEUSINE.
BB. Spikes without terminal spikelets; the rachis drawn out to a point and projecting beyond them. .....61. DACTYLOCTENIUM.

12. BARLEY TRIBE OR HORDEÆ.

A. Spikelets solitary at the notches of the rachis....62. LOLIUM.
AA. Spikelets transverse, i. e., the sides turned toward the hollowed surface of the rachis. .....
B. Fl.-glumes with a distinct callus which is limited by a furrow at the base; falling, off at maturity, each with a single grain which is grown to the palea.....63. AGROPYRUM.
BB. Fl.-glumes without a callus, persistent at maturity; grain free.....
C. Empty glumes subulate, 1-nerved. .....64. SECALE.
CC. Empty glumes, ovate, 3–many-keeled. .....65. TRITICUM.
(Including *Cryptopyrum*).
AAA. Spikelets 2-6 at each joint of the rachis. .....
B. Stamens 3 in each fl.....
C. The spikelets 1-fld. or with a rudiment only of a second.....66. HORDEUM.
CC. The spikelets 2-many-fld. .....
D. Empty glumes a little smaller than the fl.-glumes. .....67. ELYMUS.
DD. Empty glumes very small or 0. .....68. ASPERELLA.

13. BAMBOO TRIBE OR BAMBUSEÆ.

A. Stamens 3; palea 2-keeled: fr. a true caryopsis.....
B. The spikelets with no subtending leaf. .....69. ARUNDINARIA.
BB. The 1-2 spikelets surrounded by a large leaf at their base. .....70. PHYLLOSTACHYS.
AA. Stamens 6. .....
B. Fr. a true caryopsis with a delicate pericarp....
C. Palea of the uppermost fl. 2-keeled.....71. BAMBUSA.
CC. Palea of the uppermost fl. not keeled.....72. THYRSOSTACHYS.
BB. Fr. a nut (with a thick, free pericarp). .....73. DENDROCALAMUS.

Division 2. FLOWERLESS PLANTS OR CRYTOGAMS; those which produce spores instead of flowers and seeds. By L. M. UNDERWOOD.

[NOTE.—The key to the ferns and fern-like plants is arranged on a slightly different basis, but its use is very simple. Commencing with the paragraphs numbered on the left two or three alternatives are given with which the unknown plant in hand is to be compared. If for example we have in hand a fern common in cultivation with the sporangia arranged in a marginal line and covered by a delicate membrane formed of the edge of the leaf we would trace it in this way. In the paragraph numbered 1 our plant being "fern like with expanded foliage leaves" would be sought under 2 (the reference number at the right). Under 2 (at the left) the plant having (like all true ferns) uniform spores would be referred to 3. Under 3 it would agree with the second so we would pass to 5 (left). Under 5 it would agree with the second so we would go on to 6. From 6 we go to 7 as the plant is a terrestrial one. Under 7 we would have to use our lens and we could see the normal form of the sporangia to be like that in article Fern in Cyclopedia Fig. 807, so we would take the third option and be referred to the proper family POLYPODIACEÆ. We then pass down to family X and commence the same way at 1 (left side). The plant having an indusium, *i. e.* the membranous covering to the sporangia, we are referred to 14. Passing down the left hand side until we reach 14 we find that the sori are at least twice as long as wide (and in this case a good deal more), we pass on to 15 in which the first statement regarding "an indusium formed of the reflexed margin of the leaf" fits our plant and we attain the tribe *Pteridee* with the further reference to 16. At 16 the first paragraph would seem to be contradictory but there are some *Pteridee* that exceptionally have no indusium, so we have included them in the tribe. The plant agrees with the second statement so we go to 19.

Under this (with the use of the lens again) we will find that our plant agrees with the third option and we are referred to 25. At 25 the plant in hand agrees with the second option there being "no inner indusium present." Under 26 the "larger pinnate

leaves ' of the plant will bring us to the genus *Pteris*. We then turn to the Cyclopedia under *Pteris* and there we find a key on the same plan in use for the seed plants by means of which we can trace the plant in hand to its proper species. In the key the groups of the true fern (*Polypodiaceæ*) are separated by a head line into tribes so that by considering each section by itself we can find what plants are related to each other and thus gain some idea of the natural arrangement and affinities of ferns for each other. There are still some defects in the system for we have not yet attained a completely natural system of classification.]

BRYOPHYTA.

Spore-producing plants consisting of soft cellular tissues without fibrovascular bundles. Sexual organs present in the form of antheridia and archegones. From the fertilization of the egg-cell a sporophyte arises consisting normally of a capsule which contains the asexually formed spores, and a stalk or seta.

I. RICCIACEÆ. Plant body a simple thallus: capsules imbedded in the thallus: spores not mixed with elaters. Contains three genera of which the largest is ..... I. RICCIA.

II. MARCHANTIACEÆ. Plant body a thalloid shoot with a more or less differentiated axis of growth: capsules pendent from the under surface of a special receptacle borne at the end of a modified erect branch of the thalloid shoot. Contains numerous genera of which the following are most common.

Antheridial disc stellate on an upright branch: vegetative propagation by means of gemmæ ..... I. MARCHANTIA.

Antheridial disc oval, sessile on the thalloid shoot: no gemmæ. ..... II. CONOCEPHALUM.

III. SPHAGNACEÆ. Leafy stemmed plants growing in masses in bogs. Leaf-cells complex, of two sorts, hyroscopic: Capsules nearly sessile formed on the apex of a stalk (pseudo-podium) that appears like a seta. Contains the single genus. ..... I. SPHAGNUM.

PTERIDOPHYTA.

Spore-producing plants containing a well marked fibro-vascular system, and manifesting two distinct phases in their life history: (1) A *sporophyte* differentiated into stem and leaves and producing spores, and (2) A *gamctophyte* developed from the germination of the spore in the form of a thallus (*prothallium*) and producing sexual organs (archegonia) containing the egg and antheridia from which the sperms (antheroids) are produced. From the fertilized egg the sporophyte arises.

SYNOPSIS OF FAMILIES.

1. Fern-like plants with normal expanded foliage-leaves ..... 2.
   Moss like plants with subulate or scale-like leaves. ..... 11.
   Rush-like plants with jointed stems and rudimentary leaves ..... XV. EQUISETACEÆ.
2. Spores uniform, minute ..... 3.
   Spores of two sorts; large macrospores and minute microspores ..... 10.
3. Sporangia rising from tissues beneath the epidermis (*eusporangiate*) either in spikes or panicles or grouped in boat-shaped synangia ..... 4.
   Sporangia borne on the back or margin of a leaf or rarely in panicles ..... 5.
4. Sporangia borne in spikes or panicles. ..... IV. OPHIOGLOSSACEÆ.
   Sporangia borne in boat-shaped synangia on the under surface of the leaf. ..... V. MARATTIACEÆ.
5. Sporangia sessile, borne on a thread-like receptacle formed of a continuation of the veins: texture filmy ..... VI. HYMENOPHYLLACEÆ.
   Sporangia borne on the back or margin of the leaf, or rarely in panicles ..... 6.
6. Plants terrestrial ..... 7.
   Plants aquatic, with floating sterile leaves and pod-like sporophylls: sporangia sessile with broad ring or none . . IX. CERATOPTERIDACEÆ.
7. Ring of sporangia obsolete; sporangia in panicles ..... VII. OSMUNDACEÆ.
   Ring of sporangia apical: sporangia ovate, sessile ..... VIII. SCHIZÆACEÆ.
   Ring of sporangia vertical. ..... 8.
8. Sporangia mostly long-stalked: lvs. pinnate or palmate. ..... X. POLYPODIACEÆ.
   Sporangia mostly sessile or very short-stalked. . 9.
9. Sporangia in sori of 2–8: radiating in a single plane; branching dichotomous. . . . XI. GLEICHENIACEÆ.
   Sporangia numerous in the globose sori; mostly arborescent. ..... XII. CYATHEACEÆ.
10. Plants floating: microspores and macrospores in separate sporocarps . . . . . XIII. SALVINIACEÆ.
    Plants rooting in mud: microspores and macrospores in the same sporocarp. XIV MARSILEACEÆ.
11. Spores uniform, minute. . . . . XVI. LYCOPODIACEÆ.
    Spores of two sorts, larger macrospores and minute microspores. . . . XVII. SELAGINELLACEÆ.

The above families constitute six orders: the Ophioglossaceæ and Marattiaceæ each form a distinct order; the families VI–XII constitute the FILICALES; families XIII and XIV constitute the SALVINIALES; the Equisetaceæ ferm an order and the last two families together with the PSILOTACEÆ form th. order of LYCOPODIALES. [The ISOETACEÆ form the order of ISOETALES.]

IV. OPHIOGLOSSACEÆ. Sporangia originating from the interior tissues of the leaf, devoid of a ring, variously spiked or panicled, opening by a transverse slit into two equal valves: spores sulphur yellow: Prothallium devoid of chlorophyll, subterranean. Contains 6 genera.

Sporangia coherent in 2 ranks forming spikes: veins anastomosing. ..... i. OPHIOGLOSSUM.
Sporangia free in compound spikes or panicles: veins free: lvs. mostly compound. . ii. BOTRYCHIUM.

V. MARATTIACEÆ. Sporangia arranged in circular or boat-shaped receptacles (synangia) which are attached to the under surface of the leaf. Coarse plants with mostly thick compound lvs. prothallium green. Contains 5 genera.

1. Sori in two ranked lines along the veins not united to each other. ..... i. ANGIOPTERIS.
   Sori united in synangia. ..... 2.

2. Synangia oval, opening by a fissure. . ii. MARATTIA.
   Sporangia elongate, each compartment opening by a terminal pore ..... iii. DANÆA.

VI. HYMENOPHYLLACEÆ. Sporangia sessile on a thread-like receptacle which is surrounded at the base by a cup-shaped or 2-valved involucre, lenticular, provided with a more or less horizontal ring and opening transversely. Foliage normally filmy and translucent. Contains about 8 or 9 genera.

Involucre 2-valved ..... i. HYMENOPHYLLUM.
Involucre tubular or funnel-shaped. ii. TRICHOMANES.

VII. OSMUNDACEÆ. Sporangia with a rudimentary ring, opening longitudinally, either borne in panicles or loosely attached to the under surface of the leaf. The family contains 3 genera.

1. Sporangia borne in panicles formed either on certain pinnæ or on entire leaves. . . . i. OSMUNDA.
   Sporangia borne on the under surface of foliage. 2.

2. Coarse ferns with broad segments. . . . . ii. TODEA.
   Finely cut membranous ferns. . . . . iii. LEPTOPTERIS.

VIII. SCHIZÆACEÆ. Sporangia with a rudimentary form, sessile, with an apical ring and opening longitudinally, either attached singly on the under surface of a leaf or arranged in panicles. Contains about 10 genera.

1. Sporangia borne on the under side of normal or altered leaves ..... 2.
   Sporangia borne in panicles formed on the elongate lowermost pinnæ. ..... i. ANEMIA.*

2. Stems twining: lfts. palmate or pinnate: sporangia borne singly under scales. ..... ii. LYGODIUM.
   Stems not twining. ..... 3.

3. Sporangia in sori on the under surface. iii. MOHRIA.
   Sporangia in 2 ranks forming sedge-like spikes. ..... iv. SCHIZÆA.

IX. CERATOPTERIDACEÆ. Sporangia irregularly scattered, sessile, provided with a broad ring or devoid of one altogether: lvs dimorphous, the sterile floating, foliaceous, the sporophylls pod-like, erect,

* The free-veined species of the genus should be separated in the genus. ..... v. ORNITHOPTERIS.

Habit aquatic. Contains a single genus and species. ..... i. CERATOPTERIS.

X. POLYPODIACEÆ. Sporangia borne on the back or margin of the lvs. in lines or rounded masses (sori) or rarely scattered over the entire surface, oval, stalked, provided with a vertical elastic ring, breaking open transversely at maturity. Sori naked or covered when young with a membranous indusium. Prothallium green, usually monœcious. The family includes a hundred or more genera and four-fifths of the known species of ferns.

SYNOPSIS OF THE TRIBES AND GENERA.

1. Indusium wanting or rudimentary (rarely developed in *Monogramma*) ..... 2.
Indusium present (exceptionally wanting in *Phegopteris*, *Gymnogramma*, *Meniscium* and *Notholäna*) ..... 14.

2. Sporangia scattered in a stratum over the under surface of the leaves: coarse ferns (Tribe *Acrostichea*) ..... 3.
Sporangia collected in rounds or linear sori..... 5.

Tribe Acrostichæ.

3. Sporangia localized in definite areas of the lvs. lvs. dimorphous, the sterile basal ones shield-like. ..... i. PLATYCERIUM.
Sporangia covering entire lvs. or entire pinnæ..4.

4. Veins free: lvs. simple..... ii. ELAPHOGLOSSUM.*

Veins anastomosing: lvs. simple or pinnate..... ..... iii. ACROSTICHUM.

5. Leaves not jointed to the root-stock: sporangia linear or elongate following the veins (Tribe *Vittaricæ*) ..... 6.
Leaves not jointed to the root-stock; sori round. ..... [PHEGOPTERIS].
Leaves jointed to the root-stock: sori mostly roundish (Tribe *Polypodicæ*)..... 10.

Tribe Vittaricæ.

6. Sori forming one or more continuous lines parallel to the midrib..... 8.
Sori on lateral veins forming more or less interrupted lines ..... 7.

7. Leaves simple: veins reticulated..iv. ANTROPHYUM.
Leaves palmately or pinnately compound..... ..... [GYMNOGRAMMA.]

8. Leaves simple, linear..... 9.
Leaves compound: sori forming a marginal line ..... [NOTHOLÆNA].

9. Sori single, on or near the midrib, sometimes covered with an indusium..... v. MONOGRAMMA.
Sori in grooves on either side of midrib..... ..... vi. VITTARIA.

Tribe Polypodicæ.

10. Leaves distinctly dimorphous, compound, the sterile basal ones oak-like: plants large..... ..... vii. DRYNARIA.
Leaves dimorphous, simple: plants very small... ..... viii. DRYMOGLOSSUM.
Leaves uniform..... 11.

11. Leaves covered underneath with stellate hairs. ..... ix. NIPHOBOLUS.
Leaves smooth or scaly, not stellate hairy....12.

12. Veins free..... x. POLYPODIUM.
Veins anastomosing ..... 13.

13. Corresponding veinlets from principal veins uniting and bearing a sorus at the end..... ..... xi. GONIOPHLEBIUM.
Areolæ bearing 2 or more free veinlets extending outward, which bear a single sorus..... ..... xii. PHLEBODIUM.
Areolæ containing free veinlets irregularly directed ..... xiii. PHYMATODES.

* The simple free-veined species hitherto united with Acrostichum are best kept distinct.

14. Sori oblong or linear at least twice as long as broad ..... 15.
Sori roundish or at least less than twice as long as broad 24

15. Sori marginal, covered with an indusium formed of the reflexed edge of the leaf (naked in *Notholäna*) or naked and distributed along the veins (*Gymnogramma*, etc.). Tribe *Pteridea*). ..... 16.
Sori dorsal covered with a flap-like indusium (Tribe *Asplenieæ*) ..... 27.

Tribe Pteridea.

16. Sori dorsal, extending to all the veins, naked..17.
Sori marginal, nominally covered with edge of leaf ..... 19.

17. Veins copiously anastomosing..... 18.
Veins free or only casually uniting..... ..... xiv. GYMNOGRAMMA.

18. Leaves large pinnate..... xv. DICTYOGRAMMA.
Leaves smaller, palmate..... xvi. HEMIONITIS.

19. Sori at the ends of veins unconnected at their apices ..... 20.
Sori inserted beneath the marginal indusium; stalks black or blackish..... xvii. ADIANTUM.
Sori rising in a continuous line-like receptacle which joins the ends of the veins..... 25.

20. Leaves dimorphous..... 21.
Leaves uniform, smooth, on dark colored stalks. ..... 22.
Leaves uniform, hairy, scaly or powdery..... 23.

21. Sori at the ends of veins only..... ..... xviii. CRYPTOGRAMMA.
Sori scattered the length of the veins..... ..... xix. ONYCHIUM.

22. Leaves pinnate; veins free..... xx. PELLÆA.
Leaves palmate; veins usually anastomosing.... ..... xxi. DORYOPTERIS.

23. Margins scarcely recurved ..... xxii. NOTHOLÆNA.
Margins recurved to form a distinct indusium..24.

24. Indusia more or less continuous around the segment ..... xxiii. CHEILANTHES.
Indusia in the form of more or less distant marginal lobes ..... xxiv. HYPOLEPIS.

25. With an inner membranous indusium..... ..... xxv. PTERIDIUM.
No inner indusium present..... 26.

26. Leaves small, radiate-dichotomous..... ..... xxvi. ACTINOPTERIS.
Leaves small, palmate: stalk black..... ..... xxvii. CASSEBEERA.
Leaves larger pinnate..... xxviii. PTERIS.

Tribe Asplenieæ.

27. Sori parallel to the midrib..... 28.
Sori partly parallel and partly oblique to the midrib: veins anastomosing. .... xxix. CAMPTOSORUS.
Sori oblique to the midrib..... 31.

28. Sterile leaves with free veins: sori continuous. 29.
Sterile leaves with anastomosing veins: sori interrupted ..... 30.

29. Leaves dimorphous: the laminæ of the sporophylls scarcely extending beyond the sori..... ..... xxx. LOMARIA
Leaves uniform: the laminæ of the sporophylls extending beyond the sori....xxxi. BLECHNUM.

30. Sori sunken in the lvs. in a single row near the midrib. ..... xxxii. WOODWARDIA.
Sori superficial in one or more rows .... xxxiii. DOODIA.

31. Veins free..... 32.
Veins united at the margins: sori linear-elongate ..... xxxiv. THAMNOPTERIS.
Veins of lower (inner) series uniting: indusium extending both sides of vein. xxxv. CALLIPTERIS.

32. Sori double extending to both sides of vein..... .....xxxvi. Diplazium.
Sori single on the veins.....33.

33. Indusia opening toward each other in pairs..... .....xxxvi. Phyllitis.
Indusia all opening toward the end of pinnæ or segments .....xxxvii. Asplenium.

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34. Indusia superior attached by a central stalk or by a sinus (naked in *Phegopteris* and *Meniscium*), normally dorsal: lvs. not jointed to the root-stock (Tribe *Dryopteridæ*) .....35.
Indusia extrorse or cup-shaped, normally marginal: lvs. jointed to the root-stock in most genera (Tribe *Davallieæ*) .....42.
Indusia inferior attached under the sorus and opening laterally or by splitting radially into lobes (Tribe *Woodsieæ*) .....49.

Tribe Dryopteridæ.

35. Indusium present.....36.
Indusium wanting.....40.

36. Veins free .....37.
Veins anastomosing.....39.

37. Indusia on the ends of veins which project beyond the margin of the leaf..xxxviii. Deparia.
Indusia dorsal.....38.

38. Indusium cordate or reniform attached by the sinus .....xxxix. Dryopteris.
Indusium orbicular, peltate, attached by a central stalk .....xl. Polystichum.
Indusium oval, fixed to a central elongate receptacle .....xli. Didymochlena.

39. Indusium cordate or reniform, attached by the sinus .....xlii. Sagenia *
Indusin peltate, attached by a centrun stalk: veins forming small areolæ..xliii. Cyrtomium.

40. Veins free.....xliv. Phegopteris.
Veins anastomosing.....41.

41. Main veins joined by arches which bear the curved sori .....xlv. Meniscium.
Sori round, attached dorsally..xlvi. Goniopteris.

Tribe Davallieæ.

42. Indusium attached at base only.....43.
Indusium attached at both base and sides....45.

43. Pinnæ jointed to the rachis: lvs. simply pinnate: indusium circular or reniform..... .....xlvii. Nephrolepis.
Pinnæ not jointed to the rachis: lvs. joined to the root-stock .....44.

44. Indusium thick, coriaceous .....xlviii. Humata.
Indusium membranous .....xlix. Leucostegia.

45. Leaves jointed to the scaly root-stocks.....46.
Leaves not jointed to the root-stocks.....47.

46. Indusium tubular .....l. Davallia.
Indusium broader than long, forming a boat-shaped cavity on the edge of the segment..... .....li. Loxoscaphe.

47. Indusia near the end of unmodified leaf-lobes..48.
Indusium united with the modified leaf-lobe to form a complete cup.....lii. Dennstedtia.

48. Sorus formed on receptacles containing vascular tissues .....liii. Microlepia.
Sorus not formed on a special receptacle..... .....liv. Stenoloma.

* This genus is now merged with *Tectaria.*

Tribe Woodsieæ.

49. Leaves uniform, plane; veins free.....50.
Leaves dimorphous, the sporophylls closely rolled together .....50.

50. Leaves in crowns: veins free....lv. Matteuccia.
Leaves scattered: veins anastomosing..... .....lvi. Onoclea.

51. Indusium underneath the sorus, breaking up into stellate lobes.....lvii. Woodsia.
Indusium extrorse, opening laterally with a hood-like lobe.....lviii. Cystopteris.

XI. Gleicheniaceæ. Sporangia sessile or very short-stalked, more or less wedge shaped, grouped in small flattish groups of 2–8, with a transverse ring, opening vertically. Branching normally dichotomous. Contains 4 genera, a single one in cultivation..... .....i. Gletchenia.

XII. Cyatheaceæ. Mostly tree ferns with erect caudex crowned by a cluster of leaves: sporangia sessile or short-stalked, cuneate-oval, with a complete or nearly complete ring, opening transversely. Contains 7 or more genera.

1. Sori borne on the apex of veins: indusium extrorse, formed of a more or less modified marginal tooth and an inner lid-like scale (*Tribe Dicksonieæ*): 2.
Sori borne dorsally on the veins or at a fork: Indusium inferior or wholly wanting. (*Tribe Cyatheæ*) .....3.

2. Tooth of spore-bearing segment scarcely modified, about the size of the inner scale..i. Dicksonia.
Tooth of spore-bearing segment strongly modified, coriaceous like the inner scale and usually larger. .....ii. Cibotium.

3. Indusium present, inferior.....4.
Indusium wanting.....iii. Alsophila.

4. Indusium at first enclosing the globular sorus, remaining cup-shaped or irregularly splitting at maturity. .....iv. Cyathea.
Indusium membranous, semicircular, more fully enclosing the sorus.....v. Hemitelia.

XIII. Salviniaceæ. Floating plants with a more or less elongated axis and 2-ranked lvs.: Spores borne within sporocarps of two sorts; one bearing macrospores, and the other bearing microspores. Contains 2 genera.

Leaves minute, numerous closely imbricated: sporocarps of 2 kinds, the larger globose, the smaller ovoid .....i. Azolla.

Leaves larger, fewer distinct; sporocarps uniform, globose .....ii. Salvinia.

XIV. Marsileaceæ. Perennial plants growing in mud, sporangia borne in sporocarps which are stalked and containing both macrospores and microspores. Contains 3 genera; only one in cultivation. .....i. Marsilea.

XV. Equisetaceæ. Rush-like plants consisting of a mostly hollow jointed stem with sheath-like leaves at the joints, spores produced in sporangia under shield-like disks which are grouped together in spikes at the end of the stems. Prothallium green, variously lobed. Consists of a single genus. .....i. Equisetum.

XVI. Lycopodiaceæ. Moss-like terrestrial or epiphytic plants with small lanceolate or subulate leaves in 2–4 or more ranks: Sporangia 1–3 celled, solitary in the axils of lvs.: Spores of one sort, minute. Prothallium mostly subterranean. Contains 2 genera, only one in cultivation .....i. Lycopodium.

XVII. Selaginellaceæ. Moss-like terrestrial plants with subulate or oval scale-like leaves in 4 or more ranks. Sporangia in the axils of the leaves of two sorts. Macrosporangia containing four microspores and microsporangia containing numerous minute microspores. Consists of a single genus..... .....i. Selaginella.

INDEX OF FAMILIES AND GENERA.

The numbers refer not to pages but to families and genera.

It is hoped that the above arrangement will be found more convenient than reference to pages; it will also have the advantage of indicating in a rough way simply by number the place of a given genus or family in the vegetable kingdom.

The 162 families of flowering plants are described and distinguished on pages 3 to 9; the 17 families of flowerless plants on pages 77 and 78.

The 2255 genera are *distinguished* from one another on pages 10 to 76 and 78 to 80. They are *described* in the body of the work in alphabetical order.

For example "ROSACEÆ, 53," means that the rose family is number 53. The reader will find this family distinguished from all other families on page 5, and he will find all the genera of the rose family distinguished from one another on pages 23, 24 and 25.

ROSA 53 : 46 means that Rose is genus 46 of family 53. It is on page 24.

N.

O.

ABÈLIA (after Dr. Clarke Abel, d. 1826). *Caprifoliàceæ*. Small shrubs: lvs. opposite, small, petioled and mostly dentate: fls. tubular, unequally 5-lobed, in axillary, 1–3-fld. cymes, sometimes forming terminal panicles: fr. a dry, leathery berry. E. Asia, Himalayas and Mexico. Free-flowering low shrubs for cool greenhouse or outdoor cultivation. The Japanese and Chinese species are the hardiest, but in the north require some protection during the winter. The Mexican species are hardy only south. If potted, a sandy compost of peat and loam will suit them; in the open they grow best in sandy soil in a sunny position. Prop. by greenwood cuttings in summer or by layers in spring.

Chinénsis, R. Br. (*A. rupéstris*, Lindl.). Lvs. ovate, rounded at the base, serrate, hairy on the midrib beneath and sometimes with scattered hairs above, deciduous: fls. in terminal panicles, white, ½in. long; sepals 5; stamens exserted. Summer. China. B.R. 32: 8. Gn. 27, p. 424.

floribúnda, Decaisne. Shrub, 4 ft.: lvs. persistent, oval, crenate-serrate, ciliate: peduncles axillary, 1–3-fld.; corolla rosy purple, 2 in. long; sepals 5. Summer. Mex. B.M. 4316. F.S. 2: 5. R.B. 23: 157.

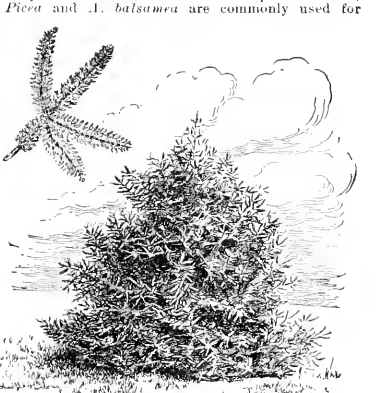
grandiflòra, Hort. (*A. Chinénsis* × *uniflòra*, *A. rupéstris*, Hort., not Lindl. *A. rupéstris*, var. *grandiflòra*, André. *A. uniflòra*, Hort., not Turcz.). Lvs. ovate, rounded or attenuate at the base, serrate, shining above, nearly glabrous, half-evergreen: fls. in terminal panicles, white flushed pink, over ¾in. long; sepals 2–5; stamens not exserted. Of garden origin. Gt. 41: 1366.—One of the hardiest and most free-flowering Abelias; it flowers continuously from June to Nov.

A. biflòra, Turcz. Lvs. ovate-lanceolate, hairy, coarsely serrate, deciduous: fls. white; sepals 4. Manchuria, N. China.—*A. serràta*, Sieb. & Zucc. Allied to A. biflora. Sepals 2. Japan. S.Z. 1: 34.—*A. spathulàta*, Sieb. & Zucc. Allied to A. biflora. Lvs. ovate: fls. over 1 in. long, white tinged yellow in throat; sepals 5. Japan. S.Z. 1: 34. B.M. 6601.—*A. triflòra*, R. Br. Lvs. persistent, lanceolate, nearly entire, hairy: fls. white, tinged with pink; sep. 5, linear, long, hairy. Himal. P.F.G. 3: 91. R.H. 1870: 511.—*A. uniflòra*, R. Br. (A. serrata, Nichols., not S. & Z.). Lvs. persistent, ovate-lanceolate: fls. rosy white with yellow in throat: sepals 2. China. B.M. 4694 Gn. 27, p. 425. ALFRED REHDER.

ABÈRIA (Mt. Aber). *Bixinèæ*. The Kei Apple of the Cape of Good Hope; a spiny plant grown S. for hedges, but killed in Fla. by freeze of 1893; is considered promising for S. Calif. and S. Fla. as a fruit plant. Int. 1891. Fresh fruit used as pickles.

Caffra, Hook. f. & Harv. Thorny, glabrous: lvs. obovate, obtuse, cuneate at base, entire: fls. diœcious, apetalous. G.C. III. 18: 737.

ABIES (derivation doubtful). *Coniferæ*. FIR. Tall, pyramidal trees: lvs. lanceolate or oblanceolate, entire, sessile, persistent for many years; on young plants and lower sterile branches flattened, usually deep green and lustrous above and silvery white below from the presence of many rows of stomata, rounded and variously notched at the apex, appearing 2-ranked by a twist at their base; on upper fertile branches crowded, more or less erect, often incurved or falcate, thickened or quadrangular, obtuse or acute: fls. axillary, appearing in early spring from buds formed the previous summer on branchlets of the year, surrounded by involucres of the enlarged scales of the flower-buds: staminate fls. pendent on branches above the middle of the tree; pistillate fls. globular, ovoid or oblong, erect on the topmost branches: fr. an erect, ovoid or oblong cylindrical cone, its scales longer or shorter than their bracts, separating at maturity from the stout, persistent axis. Northern and mountainous regions of the northern hemisphere, often gregarious. Twenty-three species are distinguished; greatest segregation on the Cascade Mountains of Oregon, in the countries adjacent to the Mediterranean, and in Japan. All the species produce soft, perishable wood, sometimes manufactured into lumber, and balsamic exudations contained in the prominent resin vesicles in the bark characteristic of the genus. Handsome in cultivation, but usually of short-lived beauty. Moist, well-drained soil. Prop. by sowing and by grafts. Seeds are usually kept dry over winter and planted in frames or seed-beds in spring. Young plants usually need shade. Most species can be grafted with comparative ease; *A. Picea* and *A. balsamea* are commonly used for stocks. Many species which have been referred to Abies are now included in Picea. S. S. 12. Heinrich Mayr, Monographie der Abietineen des Japanischen Reiches. Gn. 11, pp. 280, 281. See *Conifers*.



1. Spanish Fir.—Abies Pinsapo.

The following species, in the American trade, are here described, the synonyms being in italics: amabilis, Nos. 4, 8; Apollinis, 12; balsamea, 6; *brachyphylla*, 11; Cephalonica, 12; Cilicica, 3; concolor, 9; Fraseri, 7; *Gordoniana*, 8; grandis, 8; homolepis, 11; Hudsonia, 6; *Lowiana*, 9; magnifica, 15; *nephrolepis*, 10; nobilis, 14; Nordmanniana, 2; *Parsonsiana*, 9; pectinata, 1; Picea, 1; *Pichta*, 5; Pinsapo, 13; Shastensis, 15; Sibirica, 5; Veitchii, 10. See supplementary list, p. 3, for other cultivated species.

A. *Enabies. Leaves flat, grooved on the upper surface, only occasionally stomatiferous above on upper fertile branches.*

B. *Leaf blunt.*

C. *Foliage essentially green,—the leaves green above and whitish only beneath.*

D. *Cones usually upwards of 4 in. long.*

1. **Picea**, Lindl. (*A. pectinàta*, DC.). SILVER FIR. Fig. 2, *c*. Tree 100–200 ft.: trunk 6–8 ft. in diam.: lvs. flat, distichously spreading, dark green and lustrous above, silvery white below: cones slender, cylindrical, light green to dark purple, 5–6 in. long; bracts slightly longer than their scales. Mountains of central and southern Europe, often gregarious.—Wood esteemed and much used; yields Strasburg turpentine. Dwarf forms, with erect and pendulous and with much abbreviated branches, are common in gardens.

2. **Nordmanniàna,** Spach. Fig. 2, *e*. Tree 100–150 ft.; trunk 4–6 ft. in diam.: lvs. flat, crowded, dark green and very lustrous above, silvery white below; cones oblong-cylindrical or ellipsoidal, dark orange-brown, 4–6 in. long; bracts as long as or slightly longer than their scales. Mountains south and southeast of the Black Sea, and western spurs of the Caucasus. B.M. 6992. Gng. 6:51.—Very hardy; one of the most desirable firs in northern states.

3. **Cilícica,** Carrière. Tree 45–60 ft.; trunk 2–3 ft. in diam.: lvs. narrow, flat, dark green above, silvery white below; cones stout, cylindrical, orange-brown, 5–6 in. long; bracts rather shorter than their scales. At high elevations on the Anti-Taurus of Asia Minor, and on the Lebanon. A.G. 16:255. Gng. 4:113.—Begins to grow early in the spring and is often injured by late frosts; hardy and desirable in the northern states.

4. **amábilis,** Forb. WHITE FIR. Tree 100–150 ft.: trunk 4–6 ft. in diam.: lvs. crowded, dark green and very lustrous above, silvery white below, occasionally stomatiferous on the upper surface; cones oblong, dark purple, 3½–6 in. long; bracts much shorter than their scales. Cascade Mountains of Washington and Oregon, and Coast Ranges from Vancouver Island to Oregon.—One of the handsomest of the genus, often forming groves at high elevations; in cultivation grows slowly, and is not very satisfactory.

DD. *Cones usually under 4 in. long.*

5. **Sibírica,** Ledeb. (*A. Pichta*, Forbes). Tree 60–100 ft.: trunk 2–4 ft. in diam.: lvs. crowded, dark yellow-green: cones cylindrical, slender, brownish yellow, 2½–3 in. long; bracts much shorter than their scales. Northern and eastern Russia to Kamtschatka and Mongolia, gregarious on the Altai Mountains.—Very hardy, the early growth often injured by late frosts; in cult. soon becomes thin and loose in habit.

6. **balsámea,** Mill. BALSAM FIR. Fig. 2, *b*. Tree 50–80 ft.: trunk 17–30 in. in diam.: lvs. dark green and lustrous above, pale below, rounded or obtusely short-pointed and occasionally emarginate, acute or acuminate on fertile branches: cones oblong, cylindrical, purple, 2½–4 in long; bracts shorter or rarely slightly longer than their scales. Eastern North America from Labrador and the valley of the Athabasca to Iowa and the mountains of Virginia. S. S. 12:610. G.C. III. 17:423, 425, 431.—Wood occasionally used for lumber; Canadian Balsam, or Balm of Fir, is obtained from bark; in cult. loses its beauty early.

2. Abies or Fir.

a. A. grandis; *b*. A. balsamea; *c*. A. Picea; *d*. A. concolor; *e*. A. Nordmanniana; *f*. A. magnifica.

Var. **Hudsónia,** Engelm. (*A. Hudsónica*, Hort.), is a dwarf form.

7. **Fráseri,** Poir. SHE BALSAM. Tree 30–50 or even 70 ft.; trunk reaching 2½ ft. in diam.: lvs. flat, obtusely short-pointed, twisted at the base so as to appear to be crowded on the upper side of the branches, dark green and lustrous: cones oblong-ovate or nearly oval, rounded at the slightly narrower apex, 2½ in. long and 1 in. thick, the scales dark purple, twice as wide as long and at maturity nearly half covered by pale reflexed bracts or points. Mountains of Va., Tenn., and N. C. S. S. 12:609.—Too much like the balsam fir to be prized as an ornamental tree. Trees sold under this name are nearly always forms of *A. balsamea*.

8. **grándis,** Lindl. (*A. amábilis*, Murr., not Forbes. *A. Gordoniàna*, Carr.). Fig. 2, *a*. Tree 200–300 ft., becoming 4 ft. in diam.: lvs. thin and flexible, deeply grooved, very dark green above and silvery white beneath: cones cylindrical, 2–4 in. long, rounded or retuse at the apex, the broad scales somewhat squarrose and irregularly serrate and furnished with a short point. Coast of northern California to Vancouver Island and to the western slopes of the Rocky Mountains of Montana. S.S. 12:612. Gn. 38, p. 291. R.H. 1894, p. 274.—Occasional specimens are seen in parks and choice grounds, but it rarely thrives in eastern states.

cc. *Foliage pale blue or glaucous.*

9. **cóncolor,** Lindl. & Gord. (*A. Lowiàna*, A. Murr. *A. Parsonsiàna*, Hort.). WHITE FIR. Fig. 2, *d*. Tree 100–250 ft.: trunk 4–6 ft. in diam.: lvs. elongated, stomatiferous on the upper surface, on fertile branches often falcate and thickened and keeled above: cones oblong, gray-green, dark purple or bright canary-yellow, 3–5 in. long; bracts shorter than their scales. Western North America from southern Oregon to Lower California and to Utah, southern Colorado, New Mex., Ariz. and Sonora. S.S. 12:613. G.C. III. 8:748, 749.—Of all fir trees best withstands heat and drought; very hardy, grows rapidly, and the most desirable of the genus in the eastern states.

BB. *Leaf pointed, especially on main shoots, and usually rigid.*

10. **Veitchii,** Lindl. (*A. nephrólepis*, Maxim.). Tree 80–100 ft.: trunk 3–4 ft. in diam.: branchlets slender, pubescent: lvs. crowded, dark green and lustrous above, silvery white below: cones cylindrical, slender, dark purple, 2–2½ in. long; bracts shorter than their scales. Mt. Fuji-san, Japan; gregarious and forming great forests, coast of Manchuria.—Very hardy in the northern states, and in a young state one of the most beautiful of fir trees.

11. **homólepis,** Sieb. & Zucc. (*A. brachyphýlla*, Maxim.). Tree 80–100 ft.: trunk 6 ft. in diam: upper branches long and vigorous, ultimately forming a broad round-topped head: lvs. elongated, sharp-pointed, dark green and very lustrous above, silvery white below; cones cylindrical, stout, dark purple, 3–3½ in. long; bracts much shorter than their scales. Mountains of central Japan, singly or in small groves. B.M. 7114.—Very hardy, and in its young state one of the most desirable of the fir trees for the northern states.

12. **Cephalónica,** Loud. Tree 60–70 ft.: trunk 2–4 ft. in diam.: lvs. broad, rigid, sharp-pointed, standing out from the branches at right angles: cones cylindrical, slender, pointed, gray-brown, 5–6 in. long; bracts longer or rarely shorter than their scales. Mt. Enos, on the Island of Cephalonia. Gng. 6:49.—Hardy as far N. as southern New York.

Var. **Apóllinis,** Boiss. (*A. Apóllinis*, Link.), with narrow and blunter leaves, is remarkable in its power to produce vigorous shoots from adventitious buds. Mountains of Greece and Roumelia, often gregarious: more hardy than the type in the northern states.

13. **Pinsàpo,** Boiss. SPANISH FIR. Fig. 1. Tree 70–80 ft.: trunk 4–6 ft. in diam.: lvs. short, broad, rigid, sharp-pointed, bright green, spreading from all sides of the stiff branchlets: cones cylindrical, slender, gray-brown, 5½–6 in. long; bracts shorter than their scales. Mountains of central and southern Spain, often gregarious. G.C. III. 21: 407.—Not very hardy north of the Middle states.

AA. *Nobiles. Leaves blue-green, often glaucous, stomatiferous on both surfaces, flat or 4-sided on sterile branches; 4-sided, acute, incurved and crowded on fertile branches.*

14. **nóbilis,** Lindl. RED FIR. Tree 150–250 ft.: trunk 6–8 ft. in diam.: lvs. on lower branches grooved above, rounded and emarginate at the apex: cones oblong-cylindrical, purplish or olive-brown, 4–6 in. long; bracts much longer, thin and covering the scales, strongly reflexed, pale green. Cascade and Coast Mountains of Washington and Oregon, often gregarious. S.S. 12: 617. G.C. III. 20: 275.—There is a var. *glauca* in the trade.

15. **magnífica,** A. Murr. RED FIR. Fig. 2, *f.* Tree 200–250 ft.: trunk 6–10 ft. in diam.: lvs. quadrangular, bluntly pointed on sterile and acute on fertile branches: cones oblong-cylindrical, purplish brown, 6–9 in. long; bracts much shorter than the scales. Sierra Nevada of California; gregarious and forming great forests. S.S. 12: 618. Gn. 37, p. 591.—Wood occasionally manufactured into lumber. Less hardy in the eastern states than *A. nobilis*.

Var. **Shasténsis,** Lemm., of southern Oregon and northern California, cones somewhat smaller, with bracts as long as or longer than the scales. S.S. 620.

A. Albertiana, Murr.=Tsuga heterophylla.—*A. Baborensis,* Let. Lvs. dark, silvery below, very numerous, ½–1 in. long: cones 4 or 5 together, reaching 7 or 8 in. long and 1 in. diam. N. Africa. R.H. 1866, p. 106.—*A. bifida,* Sieb & Zucc.=A. firma.—*A. bracteata,* Hook. & Arn. =A. venusta.—*A. Canadénsis,* Michx. = Tsuga Canadensis.—*A. firma,* Sieb. & Zucc.=A. Mome, Sieb. Lvs. thick and rigid, 1 in. long: cones cylindrical often 6 in. long, with keeled scales. Japan. Promising for S.—*A. Hookeriana,* Murr.=Tsuga Mertensiana.—*A. lasiocárpa* Nutt. Lvs. blue-green and glaucous: cones 3 in. long, with very broad spineless scales. Western U.S. 6 mg 4: 373. S.S. 12: 611.—*A. macrocárpa,* Vasey=Pseudotsuga macrocarpa.—*A. Mariesii,* Mast. Small tree with crowded branches and short, dark foliage which is pale below; cones large, dark purple. N. Japan.—*A. Mertensiana,* Lindl.=Tsuga heterophylla.—*A. Numidica,* DeLannoy =A. Baborensis.—*A. Pindrow,* Spach., is a form of A. Webbiana, but has longer leaves and smaller cones. Himalayas.—*A. Reginæ Amaliæ*=A. Cephalonica, var. Appolinis.—*A. religiósa,* Lindl. Long, slender, drooping branches: lvs. silvery below: cones 5 in. long. Mex. B.M. 6753.—*A. Sachalinénsis,* Mast. Tall tree, with pale bark, white buds, and long, slender, dark green lvs: cones 3 in. long. E. Asia.—*A. subalpina,* Engelm.=lasiocarpa.—*A. venústa,* Koch. Lvs. acuminate, dark yellow, green above and silvery below: cones 4 in. long, with long, slender bracts. California. S.S. 12: 615, 616. B.M. 4740.—*A. Webbiana,* Lindl. Lvs. 1–2½ in. long, flat, silvery below: cones cylindrical, 6 or 7 in. long. Himalayas. See Picea for *A. Ajanensis, alba, Alcockiana, Engelmanni, excelsa, Gregoriana, miniata, Marinda, nigra, obovata, orientalis, pendula, polita, pungens, Schrenkiana, Smithiana.* See, also, Pseudotsuga and Tsuga.

C. S. SARGENT.

ABÒBRA (Brazilian name). *Cucurbitàceæ.* Greenhouse climber, cult. for its numerous small, showy fruits: grows rapidly, and may be planted out in summer. The tuberous roots are stored like dahlias. Prop. by seeds or rarely by soft cuttings.

viridiflòra, Naudin. Height 10–15 ft.: lvs. much divided: fls. small, pale green, fragrant: fr. a scarlet gourd. Brazil. R.H. 1862: 111.

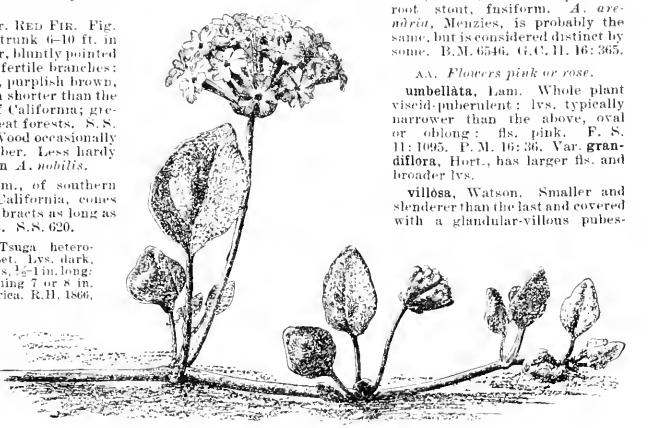
ABÒMA (from *a*, not, and *broma*, food). *Sterculiàceæ.* Greenhouse evergreen trees. Prop. by seeds or by cuttings in spring from half-ripened wood under glass.

A. angusta, Linn. f. Lower lvs. cordate, 3–5-lobed, upper lvs. ovate-lanceolate. Trop. As. B.R. 518.—*A. fastuósa,* R.Br. Lower lvs. cordate, 5-lobed; upper lvs. ovate: fls. dark purple. Trop. As., Austral.

ABRONIA (from *abros*, delicate, referring to involucre). *Nyctagináceæ.* Trailing plants, with fragrant verbena-like flowers suitable for baskets and rockeries; commonly treated as hardy annuals. Mostly tender perennials from Calif. Height 6–18 in. For early and continuous summer bloom, seeds may be sown in pots of sandy soil the previous autumn and wintered in a frame. Peel off the husk before sowing seed. Cf. Sereno Watson, Bot. Calif. 2: 3–5.

A. *Flowers yellow.*

latifolia, Esch. Fig. 3. Plant very viscid-pubescent: lvs. thick, broadly ovate or reniform, obtuse, on distinct petioles: root stout, fusiform. *A. arenária,* Menzies, is probably the same, but is considered distinct by some. B.M. 6546. G.C. II. 16: 365.



3. Abronia latifolia (× ⅓).

AA. *Flowers pink or rose.*

umbellàta, Lam. Whole plant viscid-puberulent: lvs. typically narrower than the above, oval or oblong: fls. pink. F.S. 11: 1095. P.M. 16: 36. Var. **grandiflòra,** Hort., has larger fls. and broader lvs.

villòsa, Watson. Smaller and slenderer than the last and covered with a glandular-villous pubescence: lvs. rarely 1 in. long: fls. 5–15 in a cluster, rose. Not common in cult. Int. 1891.

AAA. *Flowers white.*

mellífera, Dougl. Stouter than *A. umbellata:* involucre larger, scarious: lvs. longer and narrower. B.M. 2879. Int. 1891.

frágrans, Nutt. Lvs. larger than in *A. umbellata,* broader at the base and more tapering: fls. night-blooming. B.M. 5544.

A. pulchella, Nicholson. Fls. pinkish rose.—*A. rósea,* Hartweg.=umbellata?

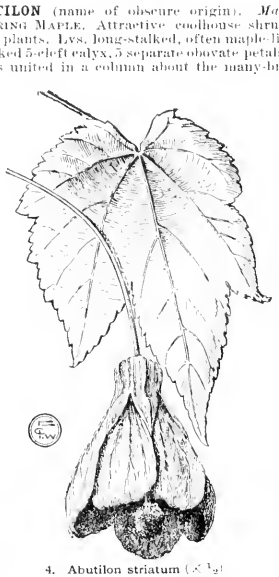
W. M.

ABRUS (from *abros*, soft, referring to leaves). *Leguminòsæ.* Deciduous greenhouse climber, or used S. outdoors for screens. Roots have virtues of licorice. Needs strong heat for indoor culture. Prop. by seeds or by cuttings under glass in sand.

precatórius, Linn. CRAB'S-EYE VINE. WEATHER-PLANT. Height 10–12 ft.: leaflets oblong, in numerous pairs: fls. varying from rose to white: seeds bright scarlet, with a black spot, used by Buddhists for rosaries, and in India as standards of weight. Tropics.—The absurd claims made for its weather-prophesying properties are exposed by Oliver in Kew Bull. Jan. 1890.

ABÚTA (native name). *Menispermàceæ.* Greenhouse evergreen climber. Prop. by cuttings under glass with bottom heat.—*A. ruféscens,* Aubl. Lvs. ovate: fls. dark purple within. S. Am. Unimportant.

ABÜTILON (name of obscure origin). *Malvàceæ*. Flowering Maple. Attractive coolhouse shrubs and window plants. Lvs. long-stalked, often maple-like: fls. with naked 5-cleft calyx, 5 separate obovate petals, many stamens united in a column about the many-branched



4. Abutilon striatum (× 1/2).

style. Of very easy culture in conditions which are suitable for geraniums or fuchsias. Usually grown in pots, but sometimes bedded out in summer. Dwarf and compact varieties suitable for bedding are becoming popular. The tall varieties are adaptable to growing on rafters or pillars. *A. striatum* and *A. Thompsoni* are the commonest type forms. Prop. by greenwood cuttings at any season, preferably in late winter or early spring; also freely by seeds. Many horticultural varieties, some of them no doubt hybrids, are in common cultivation. Following are well known: Arthur Belsham, red, shaded gold. Boule de Neige, pure white, very free. Eclipse, foliage marbled green and yellow: fls. of fair size; sepals scarlet; petals orange-buff: suited for baskets and vases: a form of *A. megapotamicum* (another Eclipse is known). Erecta, pink orange-veined erect fls. Golden Bell, deep yellow, free-flowering. Golden Fleece, pure yellow, free-flowering. Mary Miller, deep rose pendulous fls. Mrs. John Laing, purplish rose. Rosæflora, pinkish rose. Royal Scarlet, rich, shining scarlet. Santana, deep red. Savitzii, dwarf, with white-edged foliage; useful for bedding. Snow Storm, semi-dwarf, pure white. Souvenir de Bonn, lvs. large, deep green, not mottled, but edged with a broad white margin: distinct and striking: a useful bedding plant. Splendens, bright red.

A. *Leaves prominently lobed, mostly maple-like or vine-like.*

B. *Corolla widely open or spreading.*

Dàrwini, Hook. f. Strong pubescent shrub 3–5 ft.: lvs. velvety pubescent beneath, thickish, 5–9-ribbed, the lower ones lobed to the middle, the upper ones shallow-3-lobed: fls. 1–3 at a place, orange with blood-red veins, Brazil. B.M. 5917.—Blooms in both winter and summer. Much hybridized with other species. *A. grandiflòrum* and *A. compàctum* are garden forms; also *A. floribùndum*, Hort., R.H. 1881: 350.

BB. *Corolla mostly longer and contracted at the mouth.*

striàtum, Dicks. Fig. 4. Glabrous throughout: lvs. thin, deeply 5-lobed, the lobes long-pointed, rather closely serrate, sometimes small-spotted: fls. rather small and slender, hanging on peduncles 4–6 in. long, red or orange, with brown-red veins, the stamens scarcely or not at all exserted. Brazil. B.M. 3840. P.M. 7: 53.—One of the hardiest species, blooming continuously.

Thompsoni, Hort. Fig. 5. Graceful but strong-growing plant: lvs. vine-like, mostly 3-lobed, the middle lobe long-pointed, thin and usually glabrous, mottled with green and yellowish blotches: fls. medium size, yellow or orange with red veins, the column of stamens conspicuously exserted in the single forms. R.H. 1885: 324. G.W. 7: 133.—Blooms in summer and winter. An offshoot of *A. striatum*, or a hybrid with that species. In the double-fld. form, the fls. are open-spreading. Clons often convey the variegation to the stock. Common and valuable.

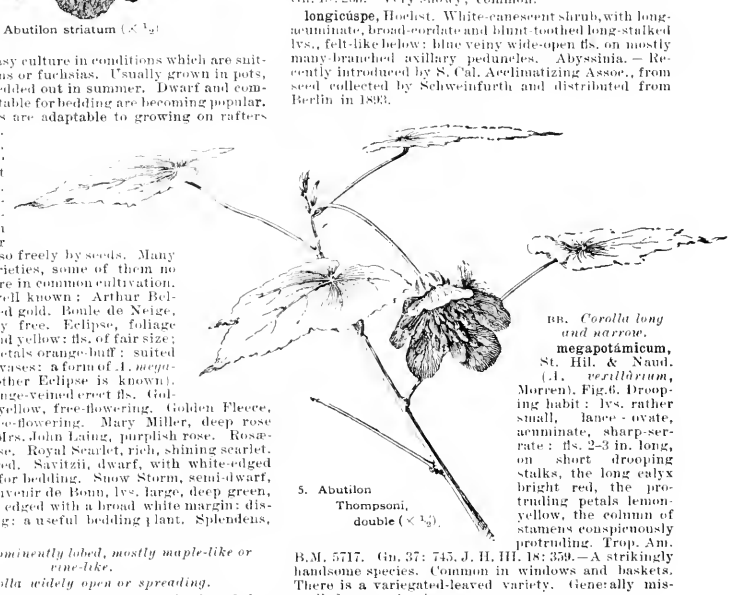
venòsum, Lemaire. Very strong grower: lvs. large, deeply palmate-lobed and strongly toothed: fls. large, 3 in. long, on peduncles 10–12 in. long. Mex. B.M. 4463. —A showy species.

AA. *Leaves not lobed, cordate, but prominently toothed, sometimes angled.*

B. *Corolla wide-spreading.*

insigne, Planchon. (*A. igneum*, Hort.). Lvs. medium size, crenate-dentate, acuminate, villous pubescent underneath: fls. large, flaring-mouthed, white with very heavy and rich veining and markings of purple and red, on slender hanging peduncles. New Granada. B.M. 4840. Gn. 18: 263.—Very showy; common.

longicúspe, Hochst. White-canescent shrub, with long-acuminate, broad-cordate and blunt-toothed long-stalked lvs., felt-like below: blue veiny wide-open fls. on mostly many-branched axillary peduncles. Abyssinia.—Recently introduced by S. Cal. Acclimatizing Assoc., from seed collected by Schweinfurth and distributed from Berlin in 1893.



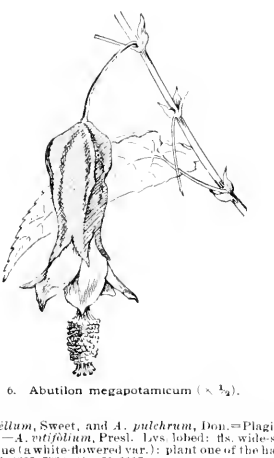
5. Abutilon Thompsoni, double (× 1/2).

BB. *Corolla long and narrow.*

megapotámicum, St. Hil. & Naud. (*A. vexillàrium*, Morren). Fig. 6. Drooping habit: lvs. rather small, lance-ovate, acuminate, sharp-serrate: fls. 2–3 in. long, on short drooping stalks, the long calyx bright red, the protruding petals lemon-yellow, the column of stamens conspicuously protruding. Trop. Am. B.M. 5717. Gn. 37: 745. J. H. III. 18: 359.—A strikingly handsome species. Common in windows and baskets. There is a variegated-leaved variety. Generally misspelled *mesapotamicum*.

A. arbòreum, Sweet. Lvs. cordate, tomentose: fls. pale yellow.

Peru. — *A. Bedfordiánum*, St Hil. Lvs. lobed; fls yellow with red; very tall. Brazil. — *A. globulárium*, Don. Fls. large, cream colored. Mauritius. — *A. integerrimum*, Hooker & Jackson, Index Kewensis = Sida integerrima, Hook. B.M. 6360. Lvs. entire, cordate, tomentose below; fls. large, yellow, flaring. New Granada. — *A. pæoniæflorum* Walpers. Fls. rather small, pink. Brazil.



6. Abutilon megapotamicum (× ⅓).

— *A. pulchéllum*, Sweet, and *A. pulchrum*, Don. = Plagianthus pulchellus. — *A. vitifólium*, Presl. Lvs. lobed; fls. wide-spreading, light blue (a white-flowered var.): plant one of the hardiest. Chile. B.M. 4227, 7928. Gn. 51:1117.

L. H. B.

ACÁCIA (ancient name). *Leguminósæ*, tribe *Mimósæ*. Shrubs or trees; lvs. twice-pinnate, of many leaflets, or reduced to phyllodia or leaf-like petioles, as in Figs. 8 and 9 (except the earlier lvs. of young seedlings, and occasionally those on robust shoots); fls. yellow or white, minute, in conspicuous globular heads or cylindrical spikes, axillary, solitary or fasciculate, or diffusely paniculate at the ends of the branches; stamens very many, exserted. Australia (chiefly); a few in N. and S. America, N. and S. Africa and Asia. Ours Australian unless otherwise stated. Prop. by seeds sown under glass as soon as ripe, or by cuttings of half-ripened wood taken with a heel, in summer; the seeds should first be placed in hot water and left to soak 24 hours. The bark of most of the Australian and of some other species (especially *A. pycnantha*, *A. mollissima* and *A. decurrens*) abounds in tannins, which may eventually make their cultivation profitable in the southwest. For outdoor planting in Calif. and the S., keep in pots until large enough to place in permanent quarters, for they do not transplant well. Several African species yield the gum arabic of commerce, especially *A. Senegal*. Monographed in part by Baron von Müller in his Iconography of Australian Acacias, cited here as F. v. M. Icon.

J. Burtt Davy.

Of several hundred known kinds, not more than 50 are in cultivation, and a dozen species will cover those deserving of greenhouse culture, but these few are gems. All of this most important section thrive in a winter temperature ranging from 40° to 50°; in fact, little above the freezing point is sufficient. They do not like heat, and consequently are not adapted for forcing. If wintered cool and allowed to come along naturally with the increasing heat and light of the spring, they will flower in March and April, a season when their graceful beauty is appreciated in the private conservatory or is valuable to the commercial florist. The prevailing color of all the Australian species is yellow, varying from pale lemon to deep orange. The tall-growing kinds, or rather those inclined to make long, straight shoots, make excellent subjects for planting permanently against a glass partition of a conservatory, or against a pillar. There is scarcely a more beautiful plant than *A. pubescens*, with its slightly drooping, yellow racemes. It deserves a favored place in every cool conservatory. The Acacias are of easy culture. If planted permanently in the border, provision for drainage should be made. A good, coarse, tarfy loam, of not too heavy texture, is all they want, with the addition of a fifth part of leaf-mold or well-rotted spent hops. Few of our greenhouse pests trouble them. Water in abundance they like at all times, and in their growing season, which is the early summer months, a daily syringing is necessary. Several of the species of bushy habit are very largely grown as pot-plants in Europe, and are now largely imported and sold for the cast ern trade. *A. armata* and *A. Drummondii* are good species for this purpose. We believe, with our hot summers, the commercial man will do better to import than to attempt to grow them from cuttings. The Acacias need pruning, or they will soon grow straggling and unshapely; more especially is this true of those grown in pots. After flowering, cut back the leading shoots rather severely. Shift into a larger pot if roots demand it, and encourage growth by a genial heat and syringing, giving at same time abundance of light and air. They should be plunged out-of-doors as soon as danger of frost is past, and removed to the greenhouse before any danger of early fall frosts. Cuttings root surely but not quickly. The best material is the side shoots from a main stem in the condition that florists call half-ripened—that is, not green and succulent as for a verbena, nor as firm and hard as the wood of a hybrid perpetual rose in Nov. The wood or shoot will be in about the right condition in June. No bottom heat is needed, but the cuttings should be covered with a close frame and kept moderately moist and cool by shading. The following spring these young plants can be either planted out-of-doors, where there is a good chance to keep them well watered, or grown on in pots, as described above. A few of the finest species are *A. pubescens*, suitable for training on pillars; *A. Riceana* makes a bush or can be trained; *A. longifolia*, an erect species, deserves a permanent position in the greenhouse border. Of all the species best adapted for medium-sized, compact pot-plants, *A. armata* and *A. Drummondii* are the best. The former has small, simple, dark green lvs. and globular, pure yellow fls. *A. Drummondii* has drooping, cylindrical, pale lemon fls. As both these flower in March without any forcing in our northern greenhouses, they are very valuable acquisitions to our Easter plants. The Acacia has two distinctive charms: the foliage is either small, simple and glaucous, as in *A. armata*, or much divided, graceful and fern-like, as in *A. pubescens*. All the Acacias are among the freest-flowering of our hard-wooded plants.

Cult. by William Scott.

The species in the American trade are here described under the following numbers: A. acinacea, 7; aneura, 38; angustifolia, 16; Arabica, 49; argyrophylla, 15; armata, 5; Baileyana, 45; brachybotrya, 15; calamifolia, 3; Catechu, 52; Cavenia, 48; eclastrifolia, 16; *cinerascens*, 39; *cultrata*, 12; cultriformis, 12; cuspidata, 1; cyanophylla, 20; Cyclops, 32; dealbata, 43; decurrens, 41; diffusa, 1; dodonæifolia, 10; Drummondii, 53; extensa, 4; falcata, 17; falciformis, 18; Farnesiana, 47; filicina, 50; *genistæfolia*, 1; glabra, 15; glaucescens, 39; glaucophylla, 15; grandis, 46; Greggii, 51; harpophylla, 29; hispidissima, 46; holosericea, 40; implexa, 30; juncifolia, 2; *latrobei*, 7; *leptophylla*, 47; *leucophylla*, 40; linearis, 37; linearia, 6; linifolia, 14; longifolia, 36; *longissima*, 37; lunata, 11; Meissneri, 30; melanoxylon, 31; mollissima, 42; myrtifolia, 16; neriifolia, 22; normalis, 16, 41; obliqua, 8; obtusata, 21; *oleæfolia*, 11; Oswaldi, 27; oxycedrus, 33; *paradoxa*, 5; pendula, 28; penninervis, 18; *pentadyna*, 4; *pinifolia*, 2; pravissima, 13; prominens, 14; pubescens, 44; pulchella, 46; pycnantha, 23; *retinodes*, 22; Riceana, 35; rostellifera, 25; *rotundifolia*, 8; salicina, 24; saligna, 19; Sophoræ, 36; suaveolens, 26; *undulata*, 5; verticillata, 34.

A. *Lvs. simple; that is, reduced to phyllodia (except the earlier lvs. of young seedlings, and occasionally those of robust shoots). Figs. 7, 8 and 9.*

B. *Fls. in globular heads.*

c. *Phyll. terete, or only slightly flattened.*

1. **diffùsa**, Lindl. (*A. genistæfólia*, Link.). A tall, glabrous shrub; branches angular; phyll. ¾–1 in. long,

1–1½ lines wide, quadrangular-linear, 1-nerved: fl. hds. solitary, or 2 or 3 together; pedunces short; fls. yellow, May. B.M. 2417. B.R. 634.

Var. **cuspidàta**, Benth. (*A. cuspidàta*, Cunn.). Phyll. ¾ to rarely 2 in. long, slender, often not broader than thick.

2. **juncifòlia**, Benth. (*A. pinifòlia*, Benth.). Tall, glabrous shrub: branches slender, quite terete: phyll. 3–6 in. long, often nearly tetragonous, linear-subulate, with a scarcely prominent nerve on each side: fl. hds. solitary or in pairs; peduncles short. F.v.M. Icon. 2: 8.

3. **calamifòlia**, Sweet. Broom Wattle. Tall shrub 6–10 ft.: phyll. 3–4 in. long, linear-subulate, slightly flattened, with 1 nerve prominent or indistinct; point fine, recurved or simply oblique: fl. hds. 3 or 4, shortly racemed in the axils of the terminal phyll.: calyx shortly toothed or lobed. Feb. B.R. 839.

4. **exténsa**, Lindl. (*A. pendùla*, Regel). Shrub: branches angular or sometimes winged: phyll. 3–4 or even 8 in. long, slender, linear-subulate, almost tetragonous, with a prominent nerve on each side: peduncles 1-headed or rarely irregularly racemose in the axils of the terminal phyll.: calyx triangular, truncate. Mar.

cc. *Phyll. vertically flattened.*

D. *Veins of phyll. 1, or very rarely 2.*

E. *Fl. heads solitary or in pairs or clusters.*

F. *Length of phyll. 1 in. or less.*

G. *Stipules persistent as slender spines.*

5. **armàta**, R. Br. (*A. undulàta*, Willd. *A. paradóxa*, DC. *Mimosa paradóxa*, Poir.). Kangaroo Thorn. Fig. 7. Spreading shrub, 6–10 ft. high: branches pubescent: phyll. 1 in. long, semi-ovate, undulate, obtuse, or with a short, oblique point: heads solitary: peduncles axillary, equaling the phyll., borne all along the branches: fls. fragrant. Feb. B.M. 1653. F.E. 9: 401, 431.—Good hedge shrub. Grown also for spring bloom.

7. Acacia armata (× ½).

GG. *Stipules small, deciduous, or 0.*

6. **lineàta**, Cunn. Bushy shrub: branches pubescent, terete: phyll. ½–¾ in. long, broadly linear; point small, hooked: peduncle solitary, axillary, very slender, equaling or exceeding the phyll., glabrous: fls. rich yellow. Mar. B.M. 3346.

7. **acinàcea**, Lindl. (*A. Latrobei*, Meissn.). Shrub: branches glabrous, angular: phyll. ½–¾ in. long, about 3 lines wide, obliquely oblong or somewhat falcate, obtuse, with a small, recurved point: peduncles slender, about equaling the phyll. Mar. F.v.M. Icon. 4: 7.

8. **oblìqua**, Cunn. (*A. rotundifòlia*, Hook.). Shrub: branches glabrescent: phyll. ¼ to nearly ½ in. long, obliquely obovate or orbicular; mid-nerve terminating in a minute, recurved point: peduncles very slender, mostly exceeding the phyll. Mar. B.M. 4041.

9. **Meissneri**, Lehm. Tall shrub: young branches glabrous, acutely angular: phyll. ½–1 in. long, 2–4 lines broad, obovate-oblong or obliquely cuneate, obtuse, or with a small, hooked point: peduncles shorter than the phyll.: fls. yellow. May.

FF. *Length of phyll. 1½–4 in.*

10. **dodonæifòlia**, Willd. Tall shrub, very resinous, shining: phyll. 2–4 lines wide, oblong-linear or lanceolate, mostly obtuse, 1-nerved, lateral veins prominent and anastomosing: stipules 0: peduncles solitary or in pairs, about ⅛ in. long, Mar.

EE. *Fl. heads in axillary racemes (rarely reduced to a solitary head).*

F. *Phyll. 2 in. or less long, broad.*

G. *Racemes much exceeding the phyll.*

11. **lunàta**, Sieb. (*A. obtecifòlia*, Cunn.). Glabrous shrub: phyll. less than 1 in. long, obliquely-lanceolate or elliptical-cuneate, obtuse, or with a minute, oblique or recurved point: fls. yellow: pods linear-elliptical, 3–4 lines broad; seeds placed close to the upper suture. Apr. B.R. 1352. —Without the fruit this may easily be mistaken for *A. linifolia* var. *prominens*.

12. **cultrifòrmis**, Cunn. (*A. cultràta*, Ait.). Tall shrub, glaucous with wax when young: phyll. ½–¾ in. long, falcate-ovate or almost triangular, mucronulate, with thickened margins and usually a marginal gland at the angle on the convex side: fl. heads in axillary racemes much exceeding the phyll.: pods flat, about 3 lines broad; seeds placed close to the upper suture. Mar. R.H. 1896, p. 503. J.H. III. 34: 131.

13. **pravissima**, F.v.M. Tall shrub or small tree; glabrous: phyll. mostly 3–5 lines long, obliquely falcate-obovate, or almost trapezoid, recurved, imperfectly 2-veined; marginal gland much below the angle on the convex side: fl. heads in handsome axillary racemes much exceeding the phyll.: pods flat, about 3 lines broad; seeds placed along the center of the pod.

GG. *Racemes not, or only slightly, exceeding the phyll.*

14. **linifòlia**, Willd. Tall shrub: phyll. 1–1½ in. long, linear to linear-lanceolate, straight, rather thin; marginal gland small, near the base: fl. heads in slender, axillary racemes about equaling the phyll.: pods linear, very flat, 4–6 lines broad; seeds placed along the center. B.M. 2168. See No. 11.

Var. **pròminens**, Moore (*A. pròminens*, Cunn.). Phyll. broader, linear-lanceolate to oblong-falcate; marginal gland prominent, distant from the base. B.M. 3502.

15. **brachybòtrya**, Benth. Tall shrub: phyll. ½–1½ in., rarely, in luxuriant specimens, 2 in. long, obliquely obovate or oblong, firm, rather broad, obtuse or mucronulate: fl. heads few, in short, axillary racemes, about equaling the phyll., or rarely reduced to 1 head: fls. 20–50 in a head: pods flat, linear to narrow-elliptical.

Var. **argyrophýlla**, Benth. (*A. argyrophýlla*, Hook.). Silvery-silky, turning sometimes golden yellow: phyll. mostly ¾–1½ in. long: fl. heads often solitary. B.M. 4384.

Var. **glaucophýlla**, Benth. Glaucous and more or less pubescent: phyll. mostly ½–¾ in. long: fl. heads mostly 2–5, shortly racemose.

Var. **glàbra**, Benth. Quite glabrous: phyll. small and narrow: fl. heads small.

16. **myrtifòlia**, Willd. Shrub, rarely tall: phyll. 1–2 in. long, very variable, firm, usually acute or mucronate and narrowed at base, with thickened, nerve-like margins, and a marginal gland below the middle: fl. heads several, in short, axillary racemes about equaling the phyll.: fls. 2–4 in a head, rather large: pods linear, thick, curved, with very thick margins, 2–3 lines broad. B.M. 302, as *Mimosa myrtifolia*.

Var. **celastrifòlia**, Benth. (*A. celastrifòlia*, Benth.). Phyll. mostly 1½–2 in. long and often 1 in. broad. B.M. 4306.

Var. **normàlis**, Benth. Phyll. mostly 1–2 in. long and about ½ in. broad.

FF. *Phyll. 2–6–12 in. long (sometimes only 1½ in. in A. obtusata).*

Var. **angustifòlia**, Benth. Phyll. mostly 2–4 in. long, 2–4 lines broad.

G. *The phyll. distinctly penninerved.*

17. **falcàta**, Willd. Tall shrub or small tree; glabrous: branches angular: phyll. 3 to above 6 in. long, lanceolate-falcate, acuminate, much narrowed to the base; marginal gland close to the base or 0: sepals free, narrow: pods rather narrow; funicle encircling the seed.

18. **penninérvis**, Sieb. Tree; glabrous: branches angular: phyll. 3 to above 6 in. long, oblong to lanceolate falcate, acuminate, much narrowed to the base; margins nerve-like; gland distant from the base or 0: pods broad; funicle encircling the seed. Mar. B.M. 2754.

Var. **falciformis**, Benth. (*A. falciformis*, DC.). Phyll. mostly larger and more falcate: young shoots and inflorescence minutely hoary or golden-pubescent: pod nearly $\frac{3}{4}$in. broad.

19. **saligna**, Wendl. Shrub 6–10 ft.; branchlets angular: phyll. 4–6 in. long, falcate-lanceolate or oblanceolate, narrowed to the base, rather obtuse, glaucous and smooth, the lateral veins but little conspicuous: racemes short; peduncles short: fl. heads few, large. Mar.

20. **cyanophýlla**, Lindl. Blue-leaved Wattle. Tall shrub 18 ft.; stoloniferous: branches drooping: lower phyll. about 12 in. long; upper 6 in. or less and narrower, linear-oblong to lanceolate-falcate, much narrowed toward the base, glabrous and often glaucous: peduncles $\frac{1}{4}$–$1\frac{1}{2}$in. long: fl. heads 3–5, large, golden yellow. Mar. Gn. 52, p. 99.

21. **obtusàta**, Sieb. Tall, glabrous shrub: phyll. $1\frac{1}{2}$–3 in. long, oblong-linear, or almost spatulate, usually almost straight, rather obtuse, point not curved, thick, rigid, with thickened, nerve-like margins; marginal gland 1, distant from the base, not prominent: racemes about $\frac{3}{4}$in. long, with densely packed heads; fls. 30 or more. Mar.

GG. *The phyll. thick, usually with inconspicuous lateral veins (conspicuous in A. pycnantha).*

22. **neriifòlia**, Cunn. (*A. retinòdes*, Schlecht. *A. retinòdes*, var. *floribúnda*, Hort.). Fig. 8. Tall, handsome shrub or small tree: branchlets slender: phyll. 3–5 in. long, 2–5 lines wide, linear-lanceolate, falcate, much narrowed to the base: racemes 1–$2\frac{1}{2}$in. long; peduncles about 2 lines long: fls. bright yellow. Mar. F.v.M.Icon. 5: 9. R.H. 1896, p. 505. A.F. 13: 880.—Useful as a street tree in Calif.

23. **pycnántha**, Benth. Golden Wattle. Small tree: phyll. 3–6 in. long, lanceolate to oblanceolate, or, on vigorous shoots, even obovate-falcate, obtuse or acutish, distinctly penniveined, with a conspicuous marginal gland near the base: fl. heads in axillary racemes, on short peduncles, large, fragrant: funicle scarcely folded. Feb. R.H. 1896, p. 504.—Very variable in shape and size of phyll.

24. **salicína**, Lindl. Small tree: branches drooping: foliage pale: phyll. 2–5 in. long, $2\frac{1}{2}$–6 lines wide, oblong-linear or lanceolate, narrowed at base, thick, rigid, with a curved point; midrib and marginal veins scarcely prominent: racemes short, often reduced to 2 or 3 heads, or even only 1: peduncles slender: fls. about 20 in the head: pods straight; funicle scarlet, folded under the seed.

25. **rostellífera**, Benth. Tall shrub, perhaps only a variety of *A. salicina*, but, according to Bentham, different in aspect and the nerve of the phyll. much more prominent: phyll. linear-lanceolate, with an oblique or recurved callous point.

26. **suavèolens**, Willd. Shrub 3–6 ft. high, glabrous: branches acutely angled: phyll. 3–6 in. long, 2–4 lines wide, narrowly lanceolate to linear; margins thickened: racemes about $\frac{3}{4}$in. long before opening, inclosed in large, imbricate bracts: fls. 6–10 in a head. Apr.

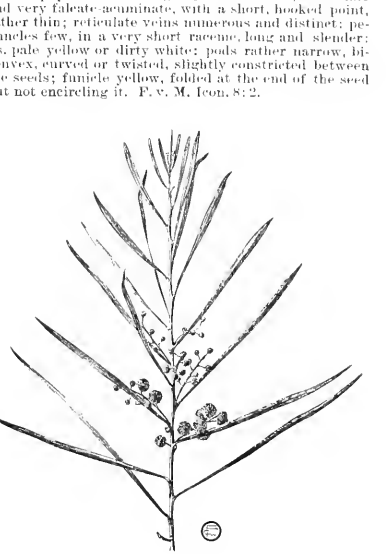
DD. *Veins of phyll. several (rarely only 2), longitudinal.*

27. **Óswaldi**, F. v. M. Tall shrub: phyll. $1\frac{1}{2}$–2 in. long, falcate-oblong to linear, rigid, mostly mucronate, finely striate, twisted, mostly 3 or 4 lines broad. F. v. M. Icon. 6: 10.

28. **péndula**, Cunn. Weeping Myall. Handsome small tree: branches pendulous: foliage pale or ash-colored, with minute pubescence: phyll. $1\frac{1}{2}$–$2\frac{1}{2}$in. long, narrowly lanceolate or almost linear-falcate, ending in a curved cusp; nerves few, indistinct: racemes very short, sometimes reduced to a solitary head; peduncles 5–6 lines long. F. v. M. Icon. 6: 8.

29. **harpophýlla**, F.v.M. Tree: branchlets slightly angular: phyll. 6–8 in. long, lanceolate, very falcate, narrowed at the end but obtuse, much narrowed at the base, coriaceous, pale or glaucous; nerves several, fine; reticulate veins few and indistinct: peduncles slender, mostly clustered in the axils: funicle short. F. v. M. Icon. 6: 9.

30. **impléxa**, Benth. Glabrous tree: branchlets nearly terete: phyll. 3–6 in. long, $2\frac{1}{2}$–5 lines wide, lanceolate and very falcate-acuminate, with a short, hooked point, rather thin; reticulate veins numerous and distinct: peduncles few, in a very short raceme, long and slender: fls. pale yellow or dirty white: pods rather narrow, biconvex, curved or twisted, slightly constricted between the seeds; funicle yellow, folded at the end of the seed but not encircling it. F. v. M. Icon. 8: 2.



8. Acacia neriifolia, narrow-leaved form.

31. **melanóxylon**, R. Br. Australian Blackwood. Tall tree, usually pyramidal, glabrous: branchlets slightly angular: phyll. mostly 3 or 4 in. long, $\frac{1}{2}$–1 in. wide, narrowly lanceolate to falcate-oblong, or even falcate-oblanceolate, much narrowed to the base, very obtuse, thick and stiff; reticulate veins numerous: racemes occasionally reduced to 1 or 2 heads; peduncles short, stout: fls. pale yellow or dirty white; petals connate above the middle: pods flat, 3–4 lines broad, often curved in a circle; funicle bright red, doubly encircling the seed. Mar. B.M. 1659.

32. **Cyclops**, Cunn. Shrub 6–10 ft.: branchlets angular: phyll. $1\frac{1}{2}$–3 in. long, nearly straight, narrow-oblong, obtuse, rigid: racemes short, occasionally reduced to 1 or 2 heads: fls. yellow; petals smooth, free: pods flat, 4–6 lines wide, curved or twisted; funicle richly colored, doubly encircling the seed. Apr. F. v. M. Icon. 8: 3.

BB. *Fls. in cylindrical, or rarely oblong, spikes.*

C. *Phyll. narrow, pungent-pointed, $\frac{1}{2}$–1 in. long.*

33. **oxycèdrus**, Sieb. Tall, spreading shrub: phyll. $\frac{1}{2}$–$\frac{3}{4}$, or rarely 1 in. long, narrowly lanceolate, acuminate, scattered, very rigid, striate, with 3 or 4 prominent nerves on each side; stipules small, often spinescent: spikes often above 1 in. long. B.M. 2928.

34. **verticillàta**, Willd. (*Mimosa verticillàta*, L'Her.). Bushy, spreading shrub: phyll. $\frac{1}{2}$–$\frac{3}{4}$in. long, linear-subulate to lanceolate or oblong, mostly whorled, rigid, with 1 prominent central nerve: stipules minute: spikes $\frac{1}{2}$–1 in. long, dense; fls. deep yellow. Apr. B. M. 110.

35. **Riceàna**, Hensl. Tall shrub or small tree, handsome, dark green: phyll. $\frac{1}{2}$–$\frac{3}{4}$in. long, linear or subulate, sometimes very narrow and 1–$1\frac{1}{2}$in. long, scattered or whorled, 1-nerved; stipules minute: spikes interrupted, slender, often above 1 in. long; fls. pale yellow. Apr. N. 1: 7.

cc. Phyll. broader, less rigid, not pungent-pointed, 1^1_2–6 in. long.

36. **longifólia,** Willd. Sydney Golden Wattle. Fig. 9. Tall, handsome shrub: phyll. 4–6 in. long, oblong-lanceolate, acuminate; longitudinal veins several, prominent: spikes 1 in. long, loose, axillary, mostly in divergent pairs; fls. golden yellow. Mar. B.R. 362. B.M. 2166. R.H. 1896, p. 504.—Useful as a street tree in Calif.

9. Phyllodia and racemes of Acacia longifolia.

Var. **Sophòræ,** F. v. M. (*A. Sophòræ*, R. Br.). Phyll. 2–3 in. long, 5–8 lines wide, broadly oblong, obtuse.

37. **lineàris,** Sims. (*A. longíssima*, Wendl.). Shrub: phyll. 4–6 in. long, linear, with 1 prominent longitudinal nerve: spikes 1–2 in. long, loose and interrupted, slender: fls. pale yellow or dirty white. B.M. 2156. B.R. 680.—Valued as a street tree in Calif.

38. **aneùra,** F. v. M. Mulga. Shrubby; often hoary, with minute pubescence: phyll. 1^1_2–3 in. long, 1–1^1_2 lines wide, narrowly linear, without prominent nerves but minutely striate, rigid: spikes short and dense on short peduncles: pods broad, flat, short. F. v. M. Icon. 10: 8.

39. **glaucéscens,** Willd. (*A. cinerásccns*, Sieb.). Glaucous tree 50 ft. or more high: phyll. 4–6 in. long, 5–12 lines broad at the middle, linear-lanceolate, narrowed at both ends, falcate, striate, and with 3–5 more prominent nerves, all free from the lower margin: spikes in pairs, 1–2 in. long: pods narrow-linear, biconvex, irregularly twisted. Mar. B.M. 3174.

40. **holosérica,** Cunn. (*A. leucophýlla*, Lindl.). Shrub or small tree 10–20 ft., white, silky: phyll. 4–6 in. long, 1–3 in. broad, oblong-lanceolate, with 3 or 4 prominent nerves confluent with the lower margin at the base: spikes mostly in pairs, sessile, about 2 in. long. Mar.

aa. *Lvs. all bipinnate.*

b. *Fls. in globular heads.*

c. *Heads in terminal-axillary panicles or racemes: stipules small or 0.*

d. *Trees: pinnæ in 8–15 pairs, fl.-heads panicled.*

41. **decúrrens,** Willd. Green Wattle. Branchlets with very prominent angles decurrent from the petioles; glabrous, or the young shoots slightly tomentose-pubescent: leaflets 1–2 lines long, narrow, rather distant: fls. whitish yellow: pods mostly less than 4 lines wide, flat, more or less contracted between the seeds. Mar.–May.

Var. **normàlis,** Benth. Leaflets 3–4 lines long.

42. **mollíssima,** Willd. (*A. decúrrens* var. *móllis*, Lindl.). Black Wattle. Branchlets with decurrent angles only slightly prominent: foliage and branchlets pubescent, the young shoots of a yellowish or golden tinge; leaflets 2–3 lines long, narrow, crowded: fls. fragrant: pods mostly less than 4 lines wide, flat, more or less contracted between the seeds. Dec.–Mar. B.R. 371.—The names of this and of the next species are often interchanged in gardens and even in herbaria.

43. **dealbàta,** Link. Silver Wattle. Branchlets with decurrent angles only slightly prominent: foliage and branchlets very glaucous or hoary, with a fine pubescence, the young shoots whitish; leaflets 2–3 lines long, narrow, crowded: pods mostly more than 4 lines wide, flat, hardly constricted between the seeds. Mar. A.F. 13: 880. R.H. 1896, p. 502.

dd. *Shrubs or small trees: pinnæ mostly in 2–8 pairs: fl. heads racemed.*

44. **pubéscens,** R. Br. Hairy Wattle. Shrub 6–10 ft.: branches and petioles hirsute: pinnæ mostly 3–8 pairs; leaflets 6–20 pairs, 1–2 lines long, crowded, linear, glabrous: racemes slender, longer than the lvs. Mar. B.M. 1263. F.R. 1: 733.

45. **Baileyàna,** F. v. M. Small, handsome tree; branches and foliage glabrous and glaucous: pinnæ 2–3 pairs; leaflets about 13 pairs, 1^1_2–2^1_2 lines long, crowded, linear: racemes 3–4 in. long. Jan. F. v. M. Icon. 12: 5. G.C. III. 15: 37.

ee. *Heads on simple, solitary, or clustered peduncles: stipules often spinescent.*

46. **pulchélla,** R. Br. Elegant shrub: branches slender, glabrous or hirsute, usually armed with subulate axillary spines: pinnæ 1 pair; leaflets 4–7 pairs, 1–2 lines long, obtuse: fl. heads solitary; fls. yellow. Apr.

Var. **grándis,** Hort. (*A. grándis*, Henfr.). Shrub 6 ft., glabrous: leaflets 8–10 pairs, longer: fls. yellow. Feb.–May. J.H. III. 35: 369 (1897).

Var. **hispidíssima,** Hort. (*A. hispidíssima*, DC.). Branches very hirsute, with long, spreading hairs: leaflets narrow: fls. white. B.M. 4588.

47. **Farnesiàna,** Willd. (*A. leptophýlla*, DC.). Popinac. Opopanax. Cassie. Huisache. Much branching shrub, 6–10 ft.: stipules straight, slender, sometimes minute spines; pinnæ 5–8 pairs; leaflets mostly 10–25 pairs, 1–2 lines long, narrow, linear, glabrous; peduncles 2 or 3 in the older axils: fl. heads large, globular, deep yellow, very fragrant: pods almost terete, indehiscent, at length turgid and pulpy. Feb.–Mar. Tex., Mex., Asia, Afr. and Austral. Grown in S. France for perfumery.

48. **Cavènia,** Bertero. Espino. Cavan. Height 20 ft.: spines stout: leaflets scabrous, scabious-pubescent, 0th-erwise near to *A. Farnesiana*, of which it is sometimes considered a mere variety. Chile.—A good hedge plant.

49. **Arábica,** Willd. Gum Arabic Tree. Fig. 10. Small tree, with spiny stipules: pinnæ 3–6 pairs, each with 40 or less very narrow leaflets: fls. white, in globular, pedunculate heads, which are usually in 3's. Arab. and Eu.

50. **filícina,** Willd. Unarmed shrub: pinnæ 2–15 pairs; leaflets 20–50 or more pairs (rarely 10–15), very small: fl. heads globular: pods linear, straight, flat, not pulpy. Tex. and Mex.

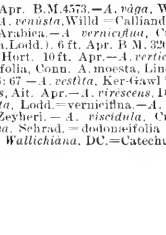
bb. *Fls. in cylindrical spikes.*

51. **Gréggii,** Gray. Small tree 10–20 ft., pubescent, often with scattered, short, stout, hooked prickles: pinnæ 2–4 pairs, ½–1 in. long; leaflets 3–5 pairs, 2 or 3 lines long, oblong or oblong-obovate, thick, and with 2 or 3 straight nerves: peduncles ½–1 in. long. Apr. Tex., S. Calif. and Mex.

52. **Cátechu,** Willd. Tree: pinnæ 8–10 pairs, each bearing 100 or less linear, pubescent leaflets: fls. yellow; spikes solitary or in 2's or 3's. E. Ind.—Yields Catechu, a valuable tannin.

53. Drummondii, Benth. Bush or small tree: pinnæ 2–4 pairs, each with 4–10 linear, very obtuse glabrous leaflets: fls. pale lemon-yellow, in dense, solitary, drooping spikes 1–1½ in. long. Austral. B.M. 5191.—Handsome, and popular for spring bloom, as at Easter.

In the following supplementary list, the heights given are those attained by the plants under glass in N Europe; in the open air in the southwest U. S. they often grow much taller, and sometimes flower 2 months earlier. Except when otherwise stated, the flowers are yellow. Those marked (*) are considered most desirable. Those marked "stove" need hothouse treatment; the others can be grown in a coolhouse, or in the open in California. —*A. abietina*, Willd.=linifolia.—*A. acanthocarpa*, Willd.=Mimosa acanthocarpa.—*A. Acapulcensis*, Kunth.=Lysiloma Acapulcensis.—*A. aciculāris*, "Needle-leaved Acacia," 4 ft.—*A. affinis*, Sweet.=dealbata.—*A. alāta*, R Br., 6 ft. May. B.R. 396.—*A. amœna*, Wendl., 3 ft. May. Near to heterophylla.—*A. angulata*, Desv.=discolor.—*A. angustifolia*, Lodd.=longifolia, var. floribunda.—*A. argyrophylla*, Hook.=brachybotrya, var. argyrophylla.—*A. aspera*, Lindl. (A. Ansfeldii, Regel. A. densifolia, Benth.). 4 ft. May.—*A. Ansfeldii*, Regel.=aspera.—*A. Bancroftiana*, Bert.=Cæsalpinia bijuga.—*A. Bartheriana*, Hort.=Berteriana?—*A. Berlandiēri*, Benth. Fls.? Mexico.—*A. Berteriana*, Balb.=Pithecolobium fragrans.—*A. bifōra*, R. Br. 3 ft. May.—*A. binervāta*, DC. 8 ft. May.—*A. brachyacantha*, Humb. & Bonpl.=Mimosa brachyacantha.—*A. brevifōlia*, Lodd.=lunata.—*A. brevipes*, Cunn.=melanoxylon.—*A. Burmanniana*, DC. Fls.? 6 ft. Ceylon. Stove.—*A. buxifōlia*, Cunn. 4 ft. Apr. Hook. Icon. 164.—*A. cæsia*, Wight & Arn. (A. Intsia, Willd.). 20 ft. E. Indies. Stove.—*A. celastrifolia*, Benth.=myrtifolia, var. celastrifolia.—*A. centrophylla*, DC. 20 ft.; white. Jamaica. Stove.—*A. Ceratonia*, Willd.=Mimosa Ceratonia.—*A. chrysotrichoides*, Hort.=Plukenetia chrysotrichys.—*A. ciliāta*, R. Br.=strigosa.—*A. cinerascens*, Sieb.=glaucescens.—*A. cochleāris*, Wendl. 4 ft. Apr. to May.—*A. concinna*, DC. 20 ft.; fls. white. E. Indies. Stove.—*A. Concordiana*, Loud.=Pithecolobium nmbellatum.—*A. conferta*, Cunn. Apr.—*A. cordāta*, a trade name, probably belongs to some other species.—*A. coriācea*, DC. 5 ft. May.—*A. cornigera*, Willd.=spadicigera.—*A. cornuliæfolia*, Desf. 10 ft. N. Africa. Stove.—*A. crassicarpa*, Cunn. 6 ft. May.—*A. cultrāta*, Hort.=cultriformis.—*A. cuneāta*, Benth. Apr.—*A. cuspidāta*, Cunn.=diffusa, var. cuspidata.—*A. cyclorum*, Hook.=obscura.—*A. dariesiifolia*, Cunn. 6 ft. June.—*A. decipiens*, var. *proināsa*, Hort.* 3 ft. May. B.M. 3244.—*A. decurrens*, var. *mollis*, Benth.=mollissima.—*A. densiflōra*, Benth.=aspera.—*A. dentifera*, Benth. Apr. B.M. 4362.—*A. dependens*, Cunn.=longifolia, var. decurvata.—*A. dētinens*, Burch. 3 ft. May. S. Afr.—*A. diptera*, Willd.=Prosopis juliflora.—*A. diptera*, Lindl. Shrub: fls.?—*A. diptera*, var. *erioptera*, Graham. Sept. B.M. 3939.—*A. discolor*, Willd. (A. angulata, Desv.). 10 ft. May.—*A. divaricāta*, Willd.=Lysiloma Schiedeana.—*A. Donkelaārii* is a trade name.—Mimosa?—*A. doratoxylon*.* "Currawang," a beautiful small tree: fls. golden yellow.—*A. drummondi*, Wight & Arn.=latronum.—*A. eburnea*, Willd. 5 ft. E. Ind. Stove.—*A. echinula*, DC.=juniperina.—*A. ēdulis*, Humb. & Bonpl.=Farnesiana.—*A. elāta*, —*.* "Pepper-tree Wattle."—*A. elongāta*, Sieb.* 6 ft. May. B.M. 3337. Especially suitable for damp, sandy land.—*A. emarginata*, Wendl.=stricta.—*A. erioclāda*, Benth. June.—*A. Esterhazia*, Mackay. 4 ft. May.—*A. falciformis*, DC.=penninervis, var. falciformis.—*A. farnesiana*, DC. E. Indies. Fls.? Stove.—*A. flexicaulis*, Benth.=Pithecolobium flexicaule, Coulter.—*A. floribunda*, Willd.=longifolia, var. floribunda.—*A. floribunda*, Hort.=neriifolia.—*A. formōsa*, Knnth.=Calliandra formosa.—*A. frondōsa*, Willd.=Leucæna glauca.—*A. fruticōsa*, Mart.=Piptadenia latifolia.—*A. genistæfolia*, Link.=diffusa.—*A. giraffæ*, Willd. "Camel-thorn." 40 ft. S. Afr. Fls.? Stove.—*A. glaūca*, Moench.=Leucæna glauca.—*A. glaūca*, Hort.=A. glaucescens.—*A. grandis*, Henfr.=pulchella, var. grandis.—*A. grāta*, Willd.=Piptadenia macrocarpa.—*A. gravēolens*, Cunn.=verniciflua.—*A. Guayaquilēnsis*, Desf.=Mimosa Gnayaquilensis.—*A. Guianēnsis*, Willd.=Stryphnodendron Guianense.—*A. gummifera*, Willd. 30 ft. Guinea. Fls.?—*A. Hematoxylon*, Willd. 20 ft. Fls. yellow or white. S. Afr. Stove.—*A. hastulata*, Sm. 4 ft. May. B.M. 3341.—*A. heteracāntha*, Burch. 15 ft.: fls.? S. Afr.—*A. heterophylla*, Willd. 5 ft. May. Mascarene Isls.—*A. hispida*, Hort.=Rohinia hispida.—*A. hispidissima*, DC.=A. pulchella, var. hispidissima.—*A. homalophylla*,* "Yarran."—*A. homomalla*, Wendl.=glaucescens.—*A. Huegēlii*, Benth.* Pale yellow. Feb.—*A. humifusa*, Cunn. Austral.—*A. hybrida*, Lodd.=lunata.—*A. intermēdia*, Cunn.=longifolia, var. floribunda.—*A. intertexta*, Sieb.=longifolia.—*A. Intsia*, Willd.=cæsia.—*A. Julibrissin*, Willd.=Albizzia Julibrissin.—*A. juniperina*, Willd.* (A echinula, DC.). 6 ft.: near to verticillata.—*A. Kalkora*, G. Don.=Albizzia Julibrissin.—*A. Kōa*, Gray. Fls.? Hawaiian Isls. Stove.—*A. Lambertiana*, D. Don.=Calliandra Lambertiana.—*A. lanigera*, Cunn. 6 ft. Apr. B.M. 2922.—*A. latisiliqua*, Willd.=Lysiloma latisiliqua.—*A. Latrobei*, Meissn.=acinacea.—*A. latrōnum*, Willd. (A. dumosa, Wight & Arn.). 20 ft.; fls.? E. Indies. Stove.—*A. laurifōlia*, Willd. 4 ft. May. Pacific Islands. Stove.—*A. Lebbeck*, Willd.=Albizzia Lebbek.—*A. leiophylla*, Benth.=saligna.—*A. lentiscifōlia*, Desf. 20 ft. Fls.? Mexico. Stove.—*A. leprōsa*, Sieb.* May. B.R. 1441. "Graceful, linear leaves, and habit of a willow."—*A. leprōsa*, var. *tenuifōlia*, Benth. Stove.—*A. leptocārpa*, Cunn. 6 ft. Apr.—*A. leptoneūra*, Benth. 6 ft. Apr. B.M. 4350.—*A. leptophylla*, DC.=Farnesiana.—*A. leucophlœa*, Willd. 12 ft.: pale yellow. Tropical Asia. Stove.—*A. leucophylla*, Colvill. holosericea.—*A. lignlata*, Cunn.=saligna.—*A. longifōlia*, var. *floribunda*, F. v. M. (A floribunda, Willd. A. intermedia, Cunn.). 6 ft. Apr. B.M. 2203.—*A. longifolia*, var. *mucronata*, F. v. M. (A. dependens, Cunn. A. mucronata, F. v. M.). Mar. B. M. 2747.—*A. longissima*, Wendl.=linearis.—*A. lophantha*, Willd.=Albizzia lophantha.—*A. lophantha*, var. *gigantea*, Hort.=Albizzia lophantha, var. gigantea.—*A. lucida*, Baill.=Albizzia lucida.—*A. Mangium*, Willd. 100 ft. Molucca Isls. Stove.—*A. macrophylla*, Willd.=Piptadenia peregrina.—*A. mollis*, Wall.=Bizzia Julibrissin.—*A. Nemu*, Willd.=Albizzia Julibrissin.—*A. neurocarpa*, Cunn.=holosericea.—*A. nigricans*, R. Br. 6 ft. Apr. B.M. 2188.—*A. nudiflōra*, Willd. (A. Rohriana, DC.). 30 ft.; white. W. Indies. Stove.—*A. obscūra*, A DC. (A. cyenorum, Hook.). 2½ ft. B.M. 4653.—*A. odoratissima*, Willd.=Albizzia odoratissima.—*A. oleæfolia*, Cunn.=lunata.—*A. oligophylla*, Hoffngg. 4 ft. Habitat? Stove.—*A. ornāta* is a name in the trade, probably of some well known species.—*A. paradoxa*, DC.=armata.—*A. pentadenia*, Lindl. 10 ft. May. B.R. 1521.—*A. pinifolia*, Benth.=juncifolia.—*A. pinnāta*, Link.=tamarindifolia.—*A. platyphylla*, Sweet. 10 ft. June.—*A. plumōsa*, Lowe. 20 ft. Brazil. B.M. 3566. A stove climber.—*A. podalyriæfolia*, Cunn.* Tall shrub. 6 C. III. 15 p 39.—*A. polyphylla*, Benth.* A beautiful pinnate-leaved species.—*A. Porteriecusis*, Willd.=Calliandra. Porteriecusis.—*A. prismatica*, Hoffngg. 6 ft. Habitat? Stove.—*A. prōmiscua*, Cunn.=linifolia, var. prominens.—*A. Pseudacacia*, Hort.=Robinia Pseudacacia.—*A. pulcherrima*, Willd.=Stryphnodendron floribundum.—*A. quadrangularis*, Link.=Calliandra tetragona.—*A. retusoides*, Schlecht.=neriifolia.—*A. ripāria*, HBK (A. sarmentosa, Griseb.). 10 ft. W. Indies. A stove climber.—*A. Rohriana*, DC.=nudiflora.—*A. rōsea*, Hort.=Robinia hispida.—*A. ruscifolia*, Cunn.=verticillata, var. latifolia.—*A. sarmentōsa*, Griseb.=riparia.—*A. scandens*, Willd.=Entada scandens.—*A. semicordāta*, Roxb. 40 ft.; fls.? E. Indies. Stove.—*A. Senegal*, Willd. 30 ft.; fls. white. Tropical W. Afr. Stove.—*A. sericiata*, Cunn. Apr.—*A. Simsii*, Cunn. Apr.—*A. Sophōræ*, R. Br.=longifolia, var. Sophoræ.—*A. spadicigera*, Ch. & Schl. (A. cornigera, Willd.). 15 ft.; pale yellow. Jamaica. B.M. 7395. Stove.—*A. speciōsa*, Willd.=Albizzia Lebbek.—*A. spectabilis*, Cunn.* Apr. B.R. 1843: 46. Remarkably beautiful.—*A. Spīni*, Balb. 15 ft.; red and yellow. Guadeloupe Isl. Stove.—*A. squamāta*, Lindl. Apr. Hook. Icon. Plant. 367.—*A. stenophylla*, Cunn. Mar.—*A. stipulāta*, DC.=Albizzia stipulata.—*A. stricta*, Willd. (A. emarginata, Wendl.). 2 ft. Mar. B.M. 1455.—*A. stuhlmannii*, Link. (A. ciliata, R. Br.). 4 ft.—*A. stromboulifera*, Willd.=Prosopis strombulifera.—*A. subulāta*, Bonpl. 4 ft. May.—*A. sulcāta*, R. Br. 2 ft. July. B.R. 928.—*A. Sūma*, Gurz. 10 ft.; fls.? E. Indies. Stove.—*A. tamarindifolia*, Willd. (A. pinnata). 4 ft.; white. S. Amer. Stove.—*A. tazifōlia*, Lodd.=Riccana.—*A. tomentōsa*, Willd. 20 ft.; fls.? E. Indies. Stove.—*A. trichōdes*, Willd.=Leucæna trichodes.—*A. triquetra*, Sieb. 6 ft. Apr.—*A. tristis*, Graham=armata.—*A. umbellāta*, Cunn. Apr.—*A. uncinata*, Lodd.=undulæfolia.—*A. undulifōlia* (A. uncinata, Lodd). 4 ft. May. B.M. 3394.—*A. urophylla*, Benth. Pale



10. Acacia Arabica.

yellow. Apr. B.M.4573.—*A. vāga*, Willd. 40 ft.; white. Brazil. Stove.—*A. venusta*, Willd.=Calliandra Portoricensis.—*A. vera*, Willd.=Arabica.—*A. verniciflua*, Cunn. (A. graveolens, Cunn. A. virgata, Lodd.). 6 ft. Apr. B.M. 3296, 3279.—*A. verticillāta*, var. *angusta*, Hort. 10 ft. Apr.—*A. verticillāta*, var. *latifōlia*, Benth. (A. ruscifolia, Cunn. A. moesta, Lindl.). 10 ft. Apr. B.M. 3195. B.R. 1846: 67.—*A. vestita*, Ker-Gawl.* 6 ft. June. B.R. 698.—*A. viminalis*, Ait. Apr.—*A. virescens*, DC. 20 ft. S. Amer. Stove.—*A. virgāta*, Lodd.=vernicifiua.—*A. viridirāmis*, Burch.=Xerocladia Zeyheri.—*A. viscidula*, Cunn. 6 ft. Feb. Gt. 1109. *A. viscōsa*, Sebrad.=dodonæifolia.—*A. vomeriformis*, Cunn. Apr.—*A. Wallichiana*, DC.=Catechu.

J. BURTT DAVY.

ACACIA, FALSE. *See Robinia Pseudacacia.*

ACACIA, ROSE. *See Robinia hispida.*

ACÆNA (from *akaina*, thorn). *Rosàceæ*. Dwarf, hardy perennial subshrubs with inconspicuous green flowers, cultivated in rockeries for their showy crimson spines, which are borne on the calyx; 1–12 in. As groundwork for dwarf, spring-flowering bulbs, as trilliums, they are unsurpassed. Useful in protecting native orchids and bog plants. Prop. by cuttings, creeping rootlets, divisions and seeds. Monoger, by T. Citerne, in Revue des Sciences Naturelles de l'Ouest, 1871, Nos. 1, 2, 3.

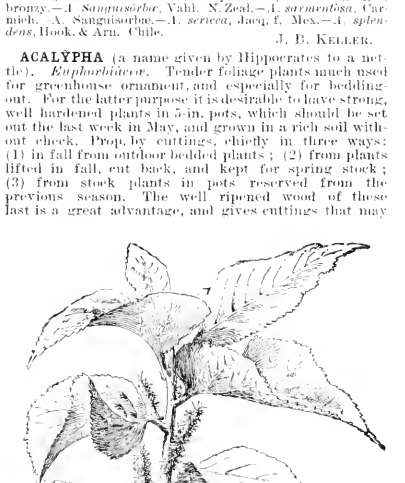
microphýlla, Hook. f. Lvs. evergreen, pale, pinnate, serrate; spines attractive all summer and autumn. N. Zeal.—Grows well in either wet or dry soils.

ovalifòlia, Ruiz & Pav. Lvs. a little larger than the latter; leaflets oblong, subemarginate. Chile. Gn. 52, p. 46.

A. argéntea, Ruiz & Pav. Lvs. silvery. Chilean Andes.—*A. adscéndens*, Vahl. Austral.—*A. cúneata*, Hook & Arn., is a good species according to some, but may = A. sericea. Magellan.—*A. millefòlia*, Nicholson. Fruit not in globular heads. Hab. ?—*A. nigrisphálla*, Lindl. Fern-like. Chile. Gn. 35, p. 177.—*A. Novæ-Zeelándiæ*, T. Kirk. Good species according to some, but may = A. microphylla.—*A. ovina*, A. Cunn. Austral.—*A. pinnatífida*, Ruiz & Pav. Chile.—*A. pulchélla*, Nicholson. Lvs. bronzy.—*A. Sanguisórbæ*, Vahl. N. Zeal.—*A. sarmentósa*, Carmich. A. Sanguisorbæ.—*A. sericea*, Jacq. f. Mex.—*A. splendens*, Hook. & Arn. Chile.

J. B. KELLER.

ACALŸPHA (a name given by Hippocrates to a nettle). *Euphorbiàceæ*. Tender foliage plants much used for greenhouse ornament, and especially for bedding-out. For the latter purpose it is desirable to have strong, well hardened plants in 5-in. pots, which should be set out the last week in May, and grown in a rich soil without check. Prop. by cuttings, chiefly in three ways: (1) in fall from outdoor bedded plants; (2) from plants lifted in fall, cut back, and kept for spring stock; (3) from stock plants in pots reserved from the previous season. The well ripened wood of these last is a great advantage, and gives cuttings that may



11. Acalypha Wilkesiana, var. Macafeana (× ⅓).

be taken with a heel. A mature stem will furnish several beside the top one. This is the best method for general purposes. Cuttings are taken below joints, and require mild bottom heat. For greenhouse ornament in fall and winter, excellent specimens may be secured from cuttings made in summer from such stock plants.

Cult. by ROBERT SHORE.

Wilkesiàna, Müll. Arg. (*A. tricolor*, Hort. ex Seem.). Lvs. ovate-acuminate, bronzy green, variously mottled with red; fls. inconspicuous. S. Sea Islands. Var. **Macafeàna**, Hort. Fig. 11. Lvs. red, marked with crimson and bronze. Perhaps the commonest variety. R.H. 1882: 288. Var. **marginàta**, Hort. Lvs. with a crimson margin. F.M. 1875: 156. Gn. 7, p. 521. Var. **musàica**, Hort. Lvs. green, with orange and red markings. Var. **obovàta**, Hort. Lvs. obovate, green, edged white when young, changing to bronzy green with rosy pink margins. Var. **triúmphans**, Hort. (*A. triúmphans*, Lind. & Rod.). Lvs. large, spotted with crimson, green, and brown. I.H. 35: 55 (1888).

Godseffiàna, Mast. Lvs. ovate or ovate-lanceolate, green, with creamy margin: fls. unknown. G.C. III. 28: 242. Gng. 6: 278. F.E. 10: 554. A.F. 13: 1286.

hispida, Burm. f. (*A. Sánderi*, N. E. Brown). Fig. 12. Cult. chiefly for its long red, amarantus-like spikes of flowers: lvs. green. E. Ind. Burm. Fl. Ind., p. 203, t. 61, f. 1. A.F. 13: 1285. A.G. 19: 453, 827. F.E. 10: 554. G.C. III. 23: 248. Gt. 47: 276. Gn. 54: 1180. Gng. 6: 279.—The leading novelty of 1899. Called by various names, as Chenille Plant, Philippine Medusa, and others.

A. colcoàta, Spreng.—*A. integrifolia*.—*A. Commersoniàna*, Baill.—*A. integrifolia*.—*A. macrophýlla*, Hort., not HBK.—*A. Wilkesiana*, var. macrophylla.—*A. marginàta*, Hort., not Spreng. *A. Wilkesiana*, var. marginata.—*A. obovàta*, Hort., not Benth.—*A. Wilkesiana*, var. obovata.—*A. integrifòlia*, Willd. 4–7 ft.: lvs. thick, glabrous, oblong, green above, colored below. Madagascar. Other trade names are *A. Hamiltoniàna* (Int. 1893), *A. Miltoniàna*, and *A. torta*.

W. M.

ACÀMPE (named from the brittle nature of the flowers). *Orchidàceæ*. Greenhouse epiphyte.

A. longifòlia, Lindl. (Vanda longifolia, Lindl.). E. Ind. A species of little decorative value, said to be sold by its synonym.

ACANTHEPHÍPPIUM (meaning unknown). Often spelled *Acanthophippium*. *Orchidàceæ*. Terrestrial stove orchids. Fls. rather large, racemose, few; sepals combined to form a broad pitcher. They do best in a compost of loam and leaf-mold. Being natives of the hottest, moist, densely shaded jungles, they require much heat and moisture during the growing period. Good drainage is essential. Prop. by dividing the pseudobulbs as soon as growth begins. Cult. by E. O. ORPET.

Javánicum, Blume. Fls. yellow and red, with distinct longitudinal stripes. Java. B. M. 4492.

A. bicólor, Lindl. Fls. purple and yellow.—*A. Curtísii*, Reichb. f. Fls. many colored. Distinguished by the five keels between the side lacinie. Malay Arch. G.C.II. 25: 169.—*A. Sylhetànse*, Lindl. Fls. white, much spotted. Himalayas.

ACANTHÒDIUM. *See Blepharis.*

ACANTHOLÌMON (*akanthos*, spine, and *limon*, sea lavender). Syn. *Armeriástrum*, *Plumbaginàceæ*. Hardy evergreen perennials; dwarf, tufted, with sharp-pointed, rigid leaves; less common than Statice and Armeria. An oriental genus of slow-growing and sun-loving plants for rockeries. Prop. by seeds (which germinate slowly) sown carefully on a warm but somewhat shaded border, and transplanted when plants are large enough to handle; by cuttings made in late summer and wintered in a frame; by very careful made divisions. Boissier describes 74 species in the Flora Orientalis. See A. Bunge, Die Gattung Acantholimon. St. Petersburg, 1872.

glumàceum, Boiss. Height 6 in.: lvs. green: fls. small, rose, on one-sided, spicate racemes, 6–9 in each short, dense spikelet. July–Sept. Armenia. F. S. 7: 677. Gn. 31: 592. R. H. 1891, p. 489.

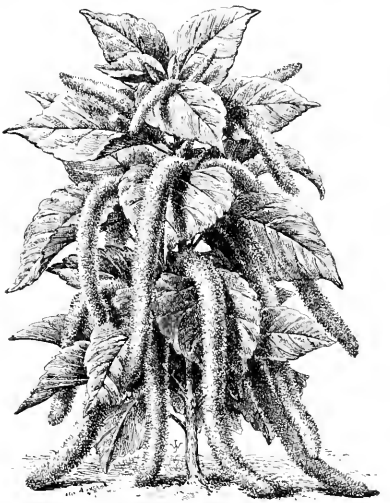
venùstum, Boiss. (*Armeriástrum dianthifòlium*, O. Kuntze). About 8 in.: lvs. grey-green, very stiff: fls. larger than the last, rose, 12–20 in each long, loose spikelet. July–Sept. Asia Minor. R.H. 1866: 450. Gn. 13: 117. B. M. 7506. Gn. 53, p. 405.

J. B. KELLER and W. M.

ACANTHOMÍNTHA. *Labiàtæ*. THORNY MINT. Tender annual, with the habit of Lamium. Its chief interest is botanical, the nearest relative of the genus being the Brazilian genus Glechon. Only two species known. Prop. by seeds in spring under glass.

ilicifòlia, Gray. Height 6 in.: lvs. petioled, ovate, bluntly toothed; fls. 3–8 in a whorl, chiefly purple, with yellow and white marks. Calif. B.M. 6750 Int. 1891. —Less desirable than Lamium, which see.

ACANTHOPÀNAX (a thorny Panax-like plant). *Araliàceæ*. Hardy ornamental trees and shrubs; lvs. alternate, long-petioled, lobed or digitate, deciduous; fls. in-



12. Acalypha hispida (A. Sanderi).

conspicuous, in umbels; petals and stamens 5; fr. a black 2–5-seeded berry. Cent. Asia and Himalayas. Prop. by seeds or by root-cuttings; *A. pentaphyllum* also by hardwood cuttings.

A. *Lvs. simple, palmately lobed.*

ricinifolium, Seem. (*Aràlia Maximòwiczii*, Hort. *Kalopànax ricinifòlium*, Miq.). Tree, 80 ft.: branches with numerous stout prickles: lvs. deeply 5–7-lobed, 9–14 in. in diam., downy beneath when young; lobes oblong-lanceolate, serrate; inflorescense terminal, large, compound. Japan. F.S. 20: 2067.—A very ornamental tree of striking subtropical effect. A new form from Japan has the lvs. less downy beneath and with short, broad lobes.

AA. *Lvs. digitate.*

sessiliflòrum, Seem. (*Panax sessiliflòrum*, Rupr. & Max.). Shrub, 12 ft.: branches with only few prickles; leaflets mostly 3, obovate-lanceolate or oblong-lanceolate, cuneate, acuminate, 4–7 in. long, irregularly crenate-serrate, nearly smooth; fls. dull purplish, sessile, in globular heads on stout, downy peduncles. Manchuria, N. China. G.C. III. 22: 339. Gt. 11: 369.—The freely produced heads of black berries are decorative.

pentaphyllum, Marsh. (*A. spinòsum*, Hort., not Miq. *Aràlia pentaphylla*, Thunb.). Shrub, 5–10 ft.: branches long and slender, with few compressed, straight prickles; leaflets 5–7, oblong-obovate or oblong-lanceolate, cuneate, acute, ¾–1½ in. long, crenate-serrate, smooth; fls. green, in long and slender-peduncled umbels; styles 5, connate. Japan.—A graceful shrub, with arching branches and bright green, shining foliage, excellent on rocky banks and slopes. Var. **variegàtum**, Hort. Lvs. edged white. F.S. 20: 2079.

A. aculeàtum, Seem. Spiny shrub: leaflets 3–5, shortly petioled, glabrous. Himalayas.—*A. divaricatum*, Seem. Allied to A. sessiliflorum. Lvs. hairy beneath; fls. pedicelled. Japan.—*A. innovans*, Franch. et Sav. Unarmed small tree: lvs. fascicolate, leaflets 3–5, nearly sessile, glabrous. Japan.—*A. sciadophylloides*, Franch. et Sav. Unarmed tree, 40 ft.: leaflets 5, long petiolulate, glabrous. Japan.—*A. setchuènum*, Harms. —Eleutherococcus senticosus.—*A. spinosum*, Miq. Allied to A. pentaphyllum. Lvs. often sparingly appressed-setose above; peduncles shorter than petioles; styles 2, separate. China.

ALFRED REHDER.

ACANTHOPHIPPIUM. See *Acanthophippium*.

ACANTHOPHŒNIX (*akantha*, thorn, and *phœnix*, a date palm). *Palmàceæ*, tribe *Arèceæ*. Tall palms, spiny, with the stout trunk ringed: lvs. terminal, equally pinnatisect, more or less armed with long slender spines, the narrow segments linear-lanceolate, acuminate, scaly below, midrib and nerves prominent, the thickened margins recurved at the base, rachis somewhat 3-sided, sheath long, smooth or spiny; spadix twice branched, pendent, with a short, thick peduncle, glabrous or tomentose, smooth or spiny, the branches slender or thick and twisted; spathes 2, compressed, deciduous; fls. red or orange; fr. black, scarcely longer than a grain of wheat. Species 3 or 4. Madagascar.

They need a temperature of 70°–90° F.; never less than 60°. The rooting medium should be somewhat light, with a quantity of crushed charcoal. Drainage should be very carefully arranged, as they demand an abundance of moisture. Prop. only by seeds, which may remain two or three years in the seed-pan before germinating. For general cult., see *Palms* and *Areca*.

crinita, H. Wendl. (*Arèca crinita*, Bory). Trunk 50–60 ft.: lvs. 7–13 ft. long; petiole densely tomentose, 4–8 in. long; leaf-sheath 2½–4½ ft. long, thickly covered with short brown bristles and spines; segments silvery white beneath. Mauritius. F.S. 16: 1706. F.R. 2: 201.—Young plants have pale, yellowish green lvs.

rùbra, H. Wendl. (*Arèca rubra*, Bory). Trunk 60 ft.: lvs. 6–12 ft. long; petiole glabrous, 2–4 in. long; leaf-sheath 2½–4½ ft. long, thickly covered with long brown-black spines; pinnæ slightly glaucous beneath: fr. globose, ½–¾ in. in diam., with a prominent ridge extending from the stigma to the base. Mauritius and Isl. Bourbon.—Young plants have dark green lvs. with red veins.

JARED G. SMITH and G. W. OLIVER.

ACANTHORHÌZA (*akantha*, thorn, and *rhiza*, root). *Palmàceæ*, tribe *Corỳpheæ*. Spineless palm, with a rather robust caudex, densely clothed with the bases of the dead sheaths; roots spinescent at the base: lvs. terminal, the orbicular blade deeply cut into 3- to many-parted cuneiform segments, glaucous below, without any rachis; petiole flattened or convex above, smooth on the margins; sheath short, fibrous; spadix compressed: the short peduncle and spreading thickened branches white; bracts and spathes elongated toward the base of the branches, coriaceous, deciduous; bractlets bristly, deciduous. Species 2 or 3. Cent. Amer. About one-fourth of the soil given them should be vegetable mold. Prop. by seeds in bottom heat.

aculeàta, H. Wendl. (*Chamærops stauracántha*, Hort.). St. spiny at base: lvs. orbicular, with a narrow sinus at the base, whitish beneath. Mex. I.H. 26: 367. B.M. 7302.—Succeeds in an intermediate house.

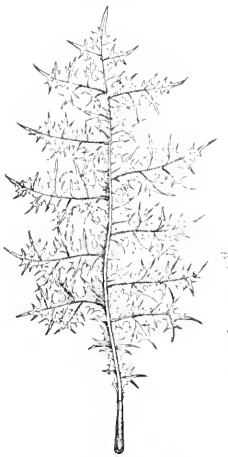
Chùco, Drude (*Thrinax Chuco*, Mart.). St. smooth, about 30 ft. high, 9–10 in. in diam., slender, flexuous: lvs. orbicular, with a narrow sinus at the base; petioles slender, 3–6 ft. long, smooth; blade 6 ft. in diam., divided to or beyond the middle; segments 15–20, lanceolate, acute, 1–2 in. wide, dark green above, paler and glandular below. Braz.

The following species are rarely seen outside of botanic gardens, and need stove temperature: *A. Wallisi*, H. Wendl. Hab. ?—*A. Warscewiczii*, H. Wendl. Panama.

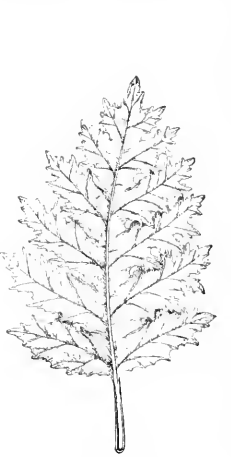
JARED G. SMITH and G. W. OLIVER.

ACÀNTHUS (*akanthos*, thorn). *Acanthàceæ*. BEAR'S BREECH. Mostly hardy herbaceous perennials of vigorous growth and broad foliage, suitable for backgrounds of borders and subtropical effects. The acanthus leaf is one of the commonest of art forms. The ornamentation of the Corinthian column is said to have been suggested by *A. spinosus*. Height 3–4 ft.: spikes 1–1½ ft. long:

fls. dull white to rose or purplish. Mostly southern Europe. *A. mollis* may have suggested the more conventionalized acanthus leaf of Roman architecture. Must be deeply mulched N. in winter. They need a rich, light, well-drained soil and much sunshine. Excessive moisture is fatal, especially in winter and spring. Fall-planted stock should always be protected for the winter by long



13. Acanthus spinosissimus.



14. Acanthus mollis.

litter or evergreen boughs, even where established plants are hardy. Prop. by division in spring or early autumn, and by seeds. Cult. by J. B. Keller.

A. *Lvs. spiny.*

spinosissimus, Desf. Fig. 13. Lvs. dark green, pinnately parted; spines glistening; fls. infrequent; autumn; spikes loose, pilose or glabrescent; spines of the bracts recurved.

spinōsus, Linn. Lvs. lanceolate, pinnatifid, pubescent; spines short, whitish; fls. smaller than in the last; summer; spikes dense, slightly villous. B. M. 1808. Gn 8: 147.

AA. *Lvs. not spiny.*

mōllis, Linn. Fig. 14. Lvs. 2 x 1 ft., cordate, sinuately pinnatifid, mostly radical; fls. summer; spikes loose, pubescent. Gn. 52, p. 239.—Also recommended as a window plant. Var. **latifōlius,** Hort. (*A. latifolius,* Hort. *A. Lusitanicus,* Hort.) is larger and hardier. Gn. 1, p. 303.

longifōlius, Poir. Lvs. radical, longer and narrower than in *A. mollis,* bright green; fls. June.—Though said to be a stove species in Eu., it is the hardiest of all at Cambridge, Mass.

A. Caroli-Alexandri, Hanuskn. 9–18 in. Lvs. few, radical, in a lax rosette, lanceolate, spiny; spike dense. Greece.—*A. cardifolius,* Linn.=Blepharis cardufolia.—*A. dioicifolius* (Dilivaria ilicifolia, duss.). Smooth greenhouse sub-shrub with leaves resembling Ilex aquifolium, the Eu. Holly. Prop. by cuttings under glass. E. Asia.—*A. montanus,* T. Anders. Lvs. pinnatifid or sinuate-spinose. W. Afr. B.M. 5516. Stove species.

ACER (classical Latin name). *Sapindàceæ.* Maple. Trees, rarely shrubs; lvs, opposite, long petioled, simple and mostly palmately lobed, or 3–5-foliolate, deciduous; fls. small, in racemes or corymbs; petals generally 5; stamens 4–12, mostly 8; fr. compound of two long-winged nutlets called samaras. Asia, especially E. Asia, N. Amer., Europe. Monograph by Pax in Engler's Bot. Jahrb., 6: 287, and 8: 177 (1885 and 1886), suppl. in the same, 16: 393 (1893), and Hook. Ic. Plant. 19, t. 1897 (1889). The maples are among our most ornamental and valuable trees for park and street planting. Nearly all assume a splendid color in autumn, especially the species of N. Amer. and E. Asia, which surpass by far the European maples. Many of them are valuable timber trees, and some American species, especially *A. saccharum,* produce sugar. For purposes of shade, the common sugar maple is best and most popular. The Norway maple makes a very dense and round head, and is excellent for lawns, but it is too low-headed for the streets. The silver maple, *A. saccharinum* and its vars., is also popular where quick-growing trees are desired. The Japanese maples are among the most striking and showy exotic small trees, and are adapted for fine grounds and for growing in pots. Prop. by seeds sown in autumn, or stratified and sown in spring. The early ripening species, like *A. saccharinum* and *A. rubrum,* must be sown soon after maturity; the varieties and rare species may be budded in summer on the typical forms or allied common kinds; some shrubby species, as *A. palmatum,* also *A. cissifolium* and *A. latum,* var. *rubrum,* may be propagated by layers or half-ripened greenwood cuttings in summer. Fancy maples are readily winter-grafted by the veneer method, the stocks being grown in pots. The Japanese kinds are usually worked on imported stocks of *A. palmatum.* Monograph of the garden forms and varieties by Graf Schwerin in Gt., 1893; see, also, G.C. II. 16: 75. About 100 species.

The following species of maple are cult. in this country: campestre, No. 8; carpinifolium, 28; circinatum, 15; cissifolium, 30; dasycarpum, 4; Floridanum, 5; Ginnala, 24; glabrum, 14; grandidentatum, 6; Heldreichi, 20; insigne, 22; Italum, 7; Japonicum, 17; latum, 12; macrophyllum, 18; Monspessulanum, 9; Negundo, 31; nigrum, 4; Nikoense, 29; palmatum (polymorphum), 16; Pennsylvanicum, 27; pictum, 11; platanoides, 13; Pseudo-platanus, 19; rubrum, 2; rufinerve, 26; saccharinum, 1; saccharum, 3; spicatum, 25; Tataricum, 23; Trautvetteri, 21; truncatum, 10.

A. *Foliage of simple, mostly palmate lvs. (occasionally 3-foliolate in No. 14); fls. polygamous or monœcious.*

B. *Bloom appearing long before the lvs., in dense lateral clusters; lvs. 5-lobed; fr. ripening in May or June.*

1. **saccharinum,** Linn. (*A. dasycárpum,* Ehrh. *A. eriocárpum,* Michx.). Silver Maple. Fig. 15. Large tree, 120 ft.; lvs. deeply 5-lobed to 5-cleft, 4–6 in. long, green above, silvery white beneath; lobes deeply and doubly serrate; fls. greenish yellow, apetalous; fr. pubescent when young. E. N. Amer. S.S. 2: 93. G.C. II. 1: 137. Em. 556.—Ornamental tree, with wide-spreading, slender branches, growing best in rich and moist soil, but succeeds almost anywhere. Lvs. turn clear yellow in fall. Many garden forms: Var. **Wieri,** Schwer. (var. *Wieri laciniatum,* Hort.). Branches pendulous; lvs. deeply cleft, with dissected lobes. A graceful variety, remarkable for its drooping branches and finely divided foliage. Var. **heterophyllum,** Hort. (var. *heterophyllum laciniatum,* Hort.). Upright; lvs. deeply cut or lobed. Var. **tripartitum,** Hort. Upright; lvs. 3-parted. Var. **luteścens,** Hort. Lvs. yellow, bronze-colored when unfolding. Var. **albo-variegātum,** Hort. (var. *Jühlkei,* Hort.). Lvs. spotted with white or rosy pink. Var. **crispum,** Hort. Lvs. deeply cut and crimped. —Linnæus evidently supposed this species to be the sugar maple, and named it accordingly. He did not know the true sugar maple.

2. **rùbrum,** Linn. Red or Scarlet Maple. Fig. 16. Large tree, 120 ft.; lvs. 3–5-lobed, 3–4 in. long, green above, pale or glaucous beneath; lobes unequally and crenately serrate; fls. red or scarlet, rarely yellowish; petals 5; fr. glabrous. E. N. Amer. S.S. 2: 94. Em. 557. G.C. II. 1: 173.—Very valuable tree for street and park planting; attractive at every season from its excellent habit, earliness of the scarlet fls., bright red fruits in late spring, and the beautiful foliage, which turns bright scarlet or orange in autumn. Var. **Columnāre,** Rchd. Of upright, columnar habit. Var. **globōsum,** Hort. Dwarf, compact; lvs. glaucous beneath; fls. bright scarlet. Var. **Drummondi,** Sarg. (*A. Drummondi,* Hook. & Arn.). Lvs. large, mostly 3-lobed, tomentose beneath; fr. bright scarlet. S. states. S.S. 2: 95. Var. **tomento-**

sum, Arb. Muse. (*A. tomentòsum*, Desf. *A. rùbrum*, var. *fulgens*, Hort.). Of moderate growth: lvs. 5-lobed, pubescent beneath; fls. bright red.

BB. *Bloom appearing with or after the lvs., distinctly stalked.*

C. *Fls. on long, pendulous, mostly hairy pedicels, in almost sessile corymbs, appearing with the lvs., apetalous; sepals connate.*

3. **sáccharum,** Marsh. (*A. saccharìnum*, Waugh., not Linn. *A. barbàtum*, Michx.). SUGAR or ROCK MAPLE. Fig. 17. Large tree, 120 ft., with gray bark: lvs. 3–5-lobed, cordate, 3–6 in. long, with narrow and deep sinuses; lobes acuminate, sparingly dentate, usually glaucous and glabrous beneath: fr. mostly with spreading wings. E. N. Amer. S.S. 2: 90. Em. 558.—An excellent street and shade tree of upright, dense growth, turning bright yellow and scarlet in autumn. It does well in almost every soil. Var. **Rugèli** (*A. Rugèli*, Pax., *A. saccharum*, var. *barbàtum*, Trel.). Lvs. 3-lobed, generally broader than long, 2–5 in. across, pale green or glaucous beneath, and at length mostly glabrous, coriaceous; lobes nearly entire. Centr. states. S.S. 2: 91, as var. *nigrum*.

4. **nígrum,** Michx. (*A. saccharìnum*, var. *nigrum*, Torr. & Gray. *A. sáccharum*, var. *nigrum*, Britt.). BLACK MAPLE. Fig. 18. Large tree, 120 ft., with black bark: lvs. cordate, with the sinus mostly closed, generally 3-lobed, with broad sinuses, the sides of the blade mostly drooping, green and pubescent beneath; lobes acute, entire or obtusely toothed: fr. with variable wings. Centr. states.—Similar to *A. saccharum*, but of duller appearance and less dense habit. Var. **monumentàle** (*A. saccharìnum* var. *monumentàle*, Temple). Of upright, columnar habit.

5. **Floridánum,** Chapm. (*A. barbàtum*, var. *Floridànum*, Sarg.). Tree, rarely 50 ft.: lvs. mostly truncate at the base, 3-lobed, $1\frac{1}{2}$–3 in. across, glaucous beneath and mostly tomentose; lobes obtuse, entire or slightly 3-lobed. Gulf states. S.S. 2: 91. G.F. 4: 148.

6. **grandidentàtum,** Nutt. Tree, 40 ft.: petioles comparatively short; lvs. slightly cordate, 3–5-lobed, with broad sinuses, 2–3 in. across, pubescent beneath, coriaceous; lobes acute or obtuse, entire or slightly 3-lobed: corymbs few-flowered, short-stalked. Rocky Mts. S.S. 2: 92.

15. Acer saccharinum (or A. dasycarpum).

CC. *Fls. in distinctly peduncled corymbs or short umbellate racemes, mostly erect, with petals and distinct sepals.*

D. *Lvs. 3–5-lobed, with obtuse, entire or obtusely toothed lobes: corymbs short-stalked: ovary pubescent: winter-buds with several outer scales.*

7. **Itálum,** Lauth. Small tree, 30 ft.: lvs. 5-lobed, 3–5 in. long, glaucous beneath and at length glabrous; lobes obtusely dentate, the middle ones often 3-lobed: corymbs somewhat drooping: fr. with slightly spreading wings. S. Eu., Orient.—A variable species, similar to a small-leaved sycamore maple. Var. **Hyrcánum,** Pax. (*A. Hyrcànum*, F. & M. *A. Taùricum*, Hort. *A. trilobàtum*, Hort., not Lam.). Petioles very slender, red, 2–4 in. long; segments of the lvs. 3-lobed, with straight margins.

16. Red Maple.—Acer rubrum.

b, staminate flowers; *a*, *c*, pistillate flowers.

8. **campéstre,** Linn. Shrub or tree, occasionally 50 ft., with corky branches: lvs. 3–5-lobed, $1\frac{1}{2}$–$3\frac{1}{2}$ in. long, green and pubescent beneath or nearly glabrous; lobes entire or the middle ones slightly 3-lobed: corymbs erect, hairy: fr. with horizontally spreading wings. Eu., W. Asia.—Shrub or tree of moderate, dense growth, with dull green foliage, valuable for planting as undergrowth and on dry ground. Many varieties and garden forms: Var. **argénteo-variegátum,** Hort. Lvs. with large white blotches. Var. **pulverulentum,** Hort. Lvs. sprinkled with white. Var. **Austriacum,** DC. Usually a tree: lvs. 5-lobed, with acute, nearly entire lobes. Var. **Tauricum,** Booth. Shrub: lvs. 5-lobed; small, lobes 3-lobed. Var. **bebecárpum,** DC. Fr. and generally the lvs. beneath pubescent.

9. **Monspessulánum,** Linn. (*A. trilobàtum*, Lam.). Shrub or small tree, 25 ft.: lvs. 3-lobed, coriaceous, 1–3 in. across, shining above, glaucous and glabrous beneath; lobes entire or with few obtuse teeth: corymbs erect: fr. with slightly spreading wings. S. Eu., N. Afr., W. Asia.—Shrub or small tree of slow growth, with a dense, rounded head and in temperate regions nearly evergreen foliage, thriving well in dry situations. Var. **Ibéricum,** Koch. (*A. Ibéricum*, Bieb.). Lvs. larger, the inner lobes usually slightly 3-lobed, obtuse.

DD. *Lvs. 5- or 7-lobed, green on both sides; lobes pointed, entire or with few pointed teeth: ovary glabrous: winter-buds with several outer scales.*

10. **truncátum,** Bunge. Tree: lvs. deeply 5-lobed and mostly truncate at the base, $2\frac{1}{2}$–4 in. across, glabrous; lobes acuminate, setosely pointed, sometimes the middle ones 3-lobed: fr. with short, diverging yellow wings. N. China.—Hardy tree, with handsome, dense foliage.

11. **pictum,** Thunb. Tree, 60 ft.: lvs. 5- or 7-lobed, 3–7 in. across, usually pubescent beneath when young; lobes entire, acuminate, sometimes very broad and short: fls. yellow: wings of the fr. upright, brown or brownish yellow, hardly twice as long as the nutlets. Manchuria, Japan. Handsome tree, with bright green foliage. Var. **Mòno,** Maxim. Lvs. more cordate: wings of the fr. reflexed.

12. **lætum,** C. A. Mey. Tree, 50 ft.: lvs. 5–7-lobed, mostly cordate, 3–6 in. across, glabrous; lobes entire, acuminate: fls. greenish yellow: wings 2–3 times as long as the nutlets. Orient, Himalayas.—Much resembling *A. pictum*, but lvs. lighter green and of more membraneous texture. Var. **rùbrum,** Hort. (*A. Ólivi-cum*, var. *rùbrum*, Hort.). Lvs. dark blood-red when

unfolding. Var. **tricolor**, Hort. Lvs. dark blood-red, sprinkled with rosy pink when young. These two beautiful forms usually remain shrubby.

13. **platanoides**, Linn. NORWAY MAPLE. Fig. 19. Large tree, 100 ft.; lvs. 5-lobed, cordate, 4–7 in. across, glabrous; lobes pointed, remotely serrate; fls. yellowish green; fr. with horizontally spreading wings. Eu., Caucasus.—Large, handsome tree, with round, spreading head, resembling somewhat *A. saccharum*. The lvs. turn pale yellow in autumn. Many garden forms, some of which are here arranged in two groups; the first being chiefly remarkable for the manner in which the lvs. are cut; the second being chiefly remarkable for their coloring.

(1) Var. **cucullàtum**, Nichols. Lvs. irregularly and shortly lobed, crimpled, light green. Var. **dissèctum**, Jacq. Similar to var. *Lorbergi*, but with darker foliage and of slower growth. Var. **globòsum**, Hort. Forming a globose head. Var. **laciniàtum**, Ait. Lvs. irregularly divided, the divisions bending downwards: growth upright. Var. **Lorbergi**, Van Houtte. Lvs. divided nearly to the base, divisions deeply lobed.

(2) Var. **álbo-variegàtum**, Nichols. Lvs. with large white blotches. Var. **aùreo-marginàtum**, Pax. Lvs. with yellow margin, somewhat irregularly lobed. Var. **ròseo-marginàtum**, Van Houtte. Lvs. small, deeply cut, with narrow pink margin. Var. **crispum**, André. Fig. 20, *c*. Lvs. small, with involute margins; of distinctly upright growth. I.H. 13: 43.

17. Common Sugar Maple.—**Acer saccharum** ($\times \frac{1}{2}$).

(2) Var. **septémlobum**, Koch (*A. septémlobum*, Thunb.). Lvs. mostly 7-lobed; lobes broad, equally doubly serrate. Var. **rùbrum**, Schwer. Lvs. large, deep red when young, becoming almost green later. Var. **reticulàtum**, André. Fig. 20, *a*. Lvs. greenish yellow, with green margin and dark green veins. I.H. 13: 18. Var. **tricolor**, Hort. Lvs. with red, pink and white spots.

(3) Var. **linearilobum**, S. & Z. (var. *scolopendrifólium*, Hort.). Lvs. divided nearly to the base; lobes linear, remotely serrate or nearly entire. Var. **atrolineàre**, Schwer. (var. *linearilobum atropurpùreum*, Nichols., var. *pinnatifòlium atropurpùreum*, Hort.). Lvs. dark red.

(4) Var. **dissèctum**, Koch (*A. polymórphum*, var. *decompósitum*, S. & Z.). Fig. 20, *f*. Lvs. divided to the base in 5–9 pinnatifid lobes. S.Z. 1:146. Var. **ornàtum**, Carr. (var. *dissèctum atropurpùreum*, Hort.). Fig. 20, *d*. Lvs. deeply cut, deep red. Var. **Frederici-Guilèlmi**, Carr. (var. *pinnatifidum ròseo-pictum*, Lem.). Lvs. finely cut, green, with white and pink spots. I.H. 14: 523. R.H. 1867: 391.

(5) Var. **sessilifólium**, Maxim. Lvs. deeply cut, with very short petioles. G.C. II. 16. Of little decorative value.

17. **Japónicum**, Thunb. Fig. 20, *b*. Small tree or shrub; petioles and peduncles downy when young; lvs. 7–11-lobed, cordate, 3–6 in. across, light green, with silky hairs when unfolding; lobes ovate, doubly serrate; fls. large, purple. Japan. S.Z. 1: 144. Var. **macrophýllum**, Van Houtte. Lvs. large, light green. Var. **aùreum**, Hort. Lvs. yellow. Var. **Pársonsi**, Veitch. (var. *filicifólium*, Hort.). Lvs. large, divided nearly to the base in 9–11 pinnatisect segments.

CCC. *Fls. in elongated, distinctly peduncled racemes or panicles.*

D. *Lvs. distinctly 5-lobed, large.*

18. **macrophýllum**, Pursh. LARGE-LEAVED MAPLE. Tree, 100 feet high; lvs. cordate, deeply 3–5-lobed or cleft, pubescent when young, pale green beneath, 8–12 in. across, middle lobe mostly 3-lobed; racemes pendulous; fr. with yellow, bristly hairs, largely winged. W. N. Amer. S.S. 2: 86, 87.—Handsome round-headed tree, remarkable for its large foliage; not hardy in the North.

Reitenbachi, Nichols. Lvs. greenish red when unfolding, turning dark blood-red in late summer. Var. **Schwèdleri**, Koch. Lvs. bright red when young, changing to dark green.

DDD. *Lvs. 3–5-lobed or 3-foliolate, doubly serrate; winter-buds small, with 2 valvate scales.*

14. **glàbrum**, Torr. (*A. Douglasi*, Hook.). Shrub or small tree, 25 ft., quite glabrous; petioles bright red; lvs. deeply 3–5-lobed or 3-parted, 1–5 in. across, dark green and shining above, pale or glaucous beneath; lobes doubly serrate. W. N. Amer. S.S. 2: 89.—Handsome shrubby maple, with graceful, shining foliage, contrasting well with the red petioles and branches; fr. often rose-colored. Var. **tripartitum**, Pax. (*A. tripartitum*, Nutt.). Lvs. small, usually 3-foliolate.

DDDD. *Lvs. 5–11-lobed, lobes serrate; corymbs long, peduncled; winter-buds with 2 valvate scales.*

15. **circinàtum**, Pursh. Small tree, rarely 40 ft.; petioles and peduncles glabrous; lvs. 7–9-lobed, 2–7 in. across, glabrous; lobes acute, doubly serrate; fls. in drooping corymbs, with purple sepals. W. N. Amer. S.S. 2: 87.—Handsome, round-headed tree or shrub, beautiful with its delicate light green foliage, red fls., rose-colored fr., and its orange and scarlet fall coloring.

16. **palmàtum**, Thunb. (*A. polymórphum*, S. & Z.). JAPAN MAPLE. Shrub or small tree, 20 ft.; petioles and peduncles glabrous; lvs. 5–9-lobed or divided, 2–4 in. across, glabrous, lobes oblong, acuminate, doubly serrate or incised; corymbs few-flowered, erect, with small purple fls. Japan. S.Z. 1: 145, 146. A.F. 12: 11.—This species and *A. Japonicum* are known as Japanese maples. They are extremely handsome shrubs of dense though graceful habit, and with elegant foliage, beautiful especially in spring for its delicate shades of green and red, and again in autumn, when the lvs. assume the most striking tints. Some of the more vigorous-growing varieties, like *atropurpureum*, *dissectum*, *ornatum*, and the typical forms, are hardy even in New England, while the most variegated forms are more tender. They grow best in partly shaded situations and in well drained, rich soil. There are many varieties, mostly introduced from Japanese gardens, of which the following are some of the best. They may be divided into 5 groups, representing various degrees of dissection of the leaves:

(1) **A. palmàtum**, var. **Thùnbergi**, Pax. (*A. palmàtum*, Thunb.). Lvs. deeply 5–9-lobed or cleft; lobes oblong-lanceolate, coarsely and doubly serrate or incised. Var. **atropurpùreum**, Van Houtte. Fig. 20, *e*. Lvs. dark purple, coarsely doubly serrate. F.S. 12: 1273. Var. **sanguíneum**, Hort., is brighter, and var. **nígrum**, Hort., darker red than var. *atropurpureum*. Var. **bicolor**, Koch. (var. *atropurpùreum variegàtum*, Hort.). Lvs. dark purple, with large carmine blotches, the lobes half purple and half carmine. Var. **aùreum**, Nichols. Lvs. yellow. Var. **versicolor**, Van Houtte. Lvs. bright green, with large white spots. F.S. 14: 1498. Var.

19. **Pseudo-plátanus,** Linn. SYCAMORE MAPLE. Tree, 70 ft. high: lvs. 5-lobed, coarsely crenate-serrate, 3^1_2–7 in. across, deep green above, glaucous and mostly glabrous beneath: racemes pendulous: fr. glabrous. Eu., Caucasus.—Large tree of vigorous growth, with large, spreading head; thrives well even in exposed situations. Many varieties and garden forms: Var. **villósum,** Prsl. Lvs. chartaceous, pubescent beneath. Var. **purpurascens,** Pax. (vars. *purpúreum* and *atropurpúreum,* Hort.). Lvs. purplish red beneath; of robust growth. Var. **Handjéryi,** Späth. (var. *Prinz Handjery,* Hort.). Lvs. purplish beneath, bright red when unfolding. Var. **Wórlei,** Hort. (var. *luteścens,* Hort.). Lvs. yellow. Var. **álbo-variegátum,** Hort. Lvs. with white blotches and spots. Var. **tricolor,** Hort. Lvs. spotted with red, changing to white.

20. **Héldreichi,** Orph. Tree: lvs. 5-lobed, the middle incisions reaching nearly to, the outer half way to the base, 3–5 in. across, glabrous, dark green and shining above, glaucous beneath; lobes coarsely and doubly serrate: panicle erect, long-stalked, ovate. S. E. Eu. Gt. 34:1185. G.C. II. 16:141.

21. **Trautvetteri,** Medw. (*A. velútinum,* Hort., not Boiss.). Lvs. slightly cordate, deeply 5-lobed, 5–7 in. across, glaucous beneath and pubescent when young; lobes coarsely crenate-serrate: panicle erect, ovate. Caucasus. Gt. 40, pp. 264–266. B.M. 6697.—Similar to *A. insigne,* but hardier and with smaller leaves.

22. **insigne,** Boiss. & Buhse. Large tree: lvs. 5-lobed, deeply cordate, 5–10 in. across, bright green above, glaucous beneath; lobes broad, coarsely crenate-serrate: panicles large, erect. Caucasus, N. Persia. G.C. III. 10: 189.—Remarkable for its large, handsome foliage; not hardy in the North. May be divided into two varieties: Var. **Van Volxémi,** Pax. (*A. Van Volxemi,* Mast.). Lvs. at length glabrous beneath. Var. **velútinum,** Boiss. Lvs. densely pubescent beneath.

DD. *Lvs. mostly 3-lobed or without lobes, green beneath.*

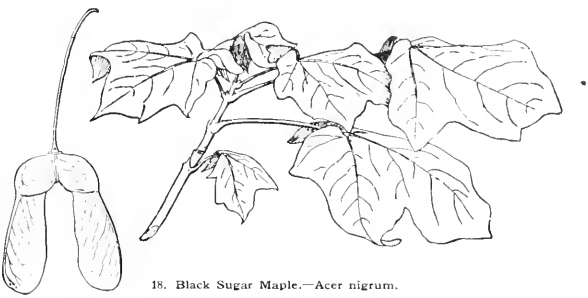
23. **Tatáricum,** Linn. Shrub or small tree, 20 ft.: lvs. roundish oval or oblong, cordate, sometimes slightly lobed, 2–4 in. long, doubly serrate, nearly glabrous: fls. in long peduncled panicles, white. S. E. Eu., Orient.—Round-headed small tree, growing best in somewhat moist soil.

24. **Ginnàla,** Max. (*A. Tatáricum,* var. *Ginnàla,* Hort.). Fig. 21. Shrub or small tree, 20 ft.: lvs. 3-lobed, 1^1_2–3^1_2 in. long glabrous, the terminal lobe elongated, doubly serrate: fls. in long peduncled panicles, yellowish, fragrant. Manchuria, N. China, Japan. Gt. 1877: 308.—Graceful shrub, with handsome foliage, turning bright red in autumn; may be used as a substitute for the Japanese maples where these are not hardy. Var. **Semenóvi,** Pax. (*A. Semenóvi,* Regel.). Shrub: lvs. smaller, deeply 3- or nearly 5-lobed. Turkestan.

25. **spicàtum,** Lam. MOUNTAIN MAPLE. Shrub or small tree, rarely 30 ft.: lvs. 3- or slightly 5-lobed, coarsely serrate, pubescent beneath, 2^1_2–4^1_2 in. long: racemes rather dense, long, upright: fr. with diverging wings, bright red in summer. E. N. Am. S.S. 2: 82, 83.—Valuable as undergrowth; lvs. turn yellow and scarlet in fall.

26. **rufinérve,** S. & Z. Tree with striped bark: branches glaucous when young: lvs. rounded at the base, 3-lobed, 3–5 in. long, doubly serrate, ferrugineously pubescent beneath when young: racemes ferrugineously pubescent. Japan. S.Z. 2:148. Var. **álbo-limbátum,** Hook. Lvs. edged with white. B.M. 5793.

27. **Pennsylvánicum,** Linn. (*A. striàtum,* Dur). STRIPED MAPLE. MOOSEWOOD. Tree, rarely 40 ft.: bark greenish, striped with white lines: lvs. slightly cordate, roundish-obovate, 3-lobed at the apex, 6–8 in. long, finely serrate, ferrugineously pubescent beneath when young; racemes glabrous, drooping. E. N. Amer. S.S. 2:84, 85. Michx. Hist. Arb. 2: 17. Em. 566.—Handsome medium-sized tree of upright, dense habit, with bright green, large foliage, turning clear yellow in autumn, and attractive even in winter from its smooth, greenish bark, striped with white.



18. Black Sugar Maple.—Acer nigrum.

DDD. *Lvs. not lobed, penninerved, doubly serrate, acuminate.*

28. **carpinifólium,** S. & Z. HORNBEAM MAPLE. Tree, 30 ft.: lvs. oblong-ovate, acuminate, sharply and doubly serrate, nearly glabrous, 3–6 in. long: raceme few-fld. S.Z. 2:142. G.C. II. 15: 564.—Very distinct, hardy species; the lvs. are almost exactly like those of Carpinus.

AA. *Foliage of 3–5-foliolate lvs. (cf. No. 14): fls. dioecious.*

B. *Petioles and young branches with a rufous, villous tomentum: fls. in terminal few-flowered racemes: winter-buds with many scales.*

29. **Nikoénse,** Max. Tree, 40 ft.: leaflets ovate or obovate, acute, entire or coarsely serrate, 2–5 in. long, villous-pubescent beneath: fr. hairy, with large wings. Japan. G.F. 6: 185.—Very distinct; lvs. turning brilliant scarlet in autumn.

19. Acer platanoides.

BB. *Petioles and branches smooth or velvety pubescent: fls. in long lateral racemes: winter-buds with 2 or 4 outer scales.*

30. **cissifólium,** Koch. (*Negúndo cissifólium,* S. & Z.). Small tree: leaflets 3, long-stalked, ovate or elliptic, cuneate, coarsely serrate, ciliate, **2½–4 in. long**: fls. in

long, upright racemes, with petals. Japan. — Handsome, round-headed tree, with slender, spreading branches and graceful bright green foliage, turning orange-yellow and scarlet in autumn; hardy.

31. **Negúndo,** Linn. (*Negúndo fraxinifólium*, Nutt. *N. accroides*, Monch.). Ash-leaved Maple. Box Elder. Large tree, 70 ft.: lvs. pinnate; leaflets 3-5, ovate or oblong-lanceolate, coarsely serrate or 3-lobed, mostly glabrous, 2-5 in. long; fls. before the lvs.; staminate fls. in pendulous corymbs, pistillate fls. in pendulous racemes. E. N. Amer. S. S. 2: 96. Michx. Hist. Arb.

20. Japanese Maples.

a Acer palmatum var. reticulatum; *b*. A. Japonicum, type; *c*. A. palmatum var.atropurpureum; *d*. var. **ornatum**; *e*. var. Thunbergii; *f*. var. dissectum.

2: 18. — Large, rapid-growing tree of spreading habit, thriving best in moist and rich soil. Much prized in the W., where it withstands cold and dryness. Largely used for shelter belts and for planting timber-claims. See picture, under *Box Elder*. Var. **Californicum,** Sarg. (*A. Californicum*, Dietr. *Negúndo Californicum*, Torr. & Gray). Branches pubescent when young; leaflets 3, densely pubescent beneath. W. N. Amer. S. S. 2: 97. Nutt. N. Am. Sylv. 2: 72. Var. **violàceum,** Arb. Muse. (*A. Californicum*, Hort.). A vigorously growing form; branches purplish with glaucous bloom or finely pubescent when young. Var. **argénteo-variegàtum,** Hort. Lvs. with broad white margin. Probably the most effective of all variegated hardy trees. F. S. 17: 1781. Var. **aúreo-maculàtum,** Hort. Lvs. spotted with yellow. Var. **aúreo-marginàtum,** Hort. Lvs. with yellow margin. Var. **aurátum,** Späth. Lvs. yellow. Var. **crispum,** G. Don. Leaflets curled. These horticultural varieties may be grafted on common Box Elder seedlings. Box Elder also grows from hardwood cuttings, like the grape.

A. acuminàtum, Wall. (*A. caudatum* Wall. *A. laevigatum*, Hort., not Wall.). Tree: lvs. 5-lobed, deeply doubly serrate, Himalayas. G. C. II. 15: 364. — *A. argutum*, Max. Small tree: lvs. small, 5-7-lobed, doubly serrate, nearly glabrous. Japan. G. C. II. 15: 725. Hardy and graceful species. — *A. Austriacum*, Tratt. = A. campestre, var. Austriacum. — *A. barbàtum*, Michx. = A. saccharum. — *A. barbinèrve*, Max. Allied to A. argutum. Lvs. 3-5-lobed, pubescent when young. Japan. — *A. Bóscii*, Spach. Probably hybrid, A. Monspessulanum × tataricum. — *A. Californicum*, Dietr. = A. Negundo, var. Californicum. — *A. Calitóri-acum*, Hort. = A. Negundo, var violaceum. — *A. capillipes*, Max. Allied to A. rufinerve. Lvs. 3-lobed, glabrous. Japan. — *A. caudàtum*, Wall. = A. acuminatum. — *A. cinerascens*, Boiss. Shrub or small tree: lvs. 3-lobed, $1\frac{1}{2}$-2 in. long. Similar to A. Monspessulanum. Persia. — *A. coriàceum*, Tsch. (A. Cretieum, Tratt. A. polymorphum, Spach). Probably A. Cretieum × Pseudo-platanus. — *A. crataegifólium*, S. & Z. Tree: lvs. oblong ovate, often slightly 2-lobed at the base, inequally serrate, glabrous. Japan. S. Z. 1: 147. Hardy. — *A. Créticum*, Linn. = A. orientale, var. Creticum, Tratt. = A. coriaceum, Tsch. — *A. diabólicum*, Blume. Tree, 30 ft.: lvs. 5-lobed, 3-6 in. across, coarsely dentate, green beneath and pubescent when young: fls. greenish. Japan. G. C. II. 15: 533. — *A. Diéckii*, Pax. Probably A. Lobelii × platanoides. — *A. dissèctum*, Thunb. = A. palmatum, var. dissectum. — *A. distylum*, S. & Z. Tree: lvs. ovate, 5-7 in. long, coarsely crenate-serrate, glabrous. Japan. G. C. II. 15: 498. — *A. Douglasii*, Hook. = A. glabrum. — *A. Drummondi*, Hook. = A. rubrum, var. Drummondi. — *A. Duretti*, Pax. Probably A. Monspessulanum × Pseudo-platanus. — *A. eriocárpum*, Michx. = A. dasycarpum. — *A. glaucum*, Marsh. = A. dasycarpum. — *A. heterophýllum*, Willd. = A. orientale. — *A. Hookeri*, Miq. Tree, 60 ft.: lvs. cordate-oblong, serrate, 4-6 in. long. Himalayas, China. — *A. Hyrcanum*, F. & M. = A. Italum, var. Hyrcanum. — *A. hybridum*, Spach. Probably A. Italum × Pseudo-platanus. — *A. hýbridum*, Bandr. = A. Bóscii. — *A. Ibéricum*, Bieb. = A. Monspessulanum, var. Ibericum. — *A. laevigatum*, Wall. Small tree: lvs. oblong, nearly entire, attenuate at the base, green beneath. Himalayas. — *A. laevigatum*, Hort. = A. acuminatum. — *A. lanceifólium*, Thun. = A. oblongum. — *A. leucoderme*, Small. (A. Floridanum, var. acuminatum, Trel.). Allied to A. saccharum. Small bushy tree with white bark: lvs. mostly 3-lobed, 3-4 in. across, greenish and finely pubescent beneath; lobes acuminate, nearly entire: corymbs glabrous. N. C., Ala. — *A. Lobélii*, Ten. Allied to A. lactum. Branches glaucous: lvs. rounded at the base; lobes mostly undulated, abruptly pointed. Italy. — *A. Mexicànum*, Pax, not Gray. = A. serratum. — *A. micranthum*, S. & Z. Shrub or small tree: lvs. 5-7-lobed; lobes sharp and doubly serrate, glabrous: fls. and fr. small. S. Z. 1: 141. — *A. Mónbei*, Max. Tree, 40 ft.: branches corky: lvs. 3-5-lobed, pubescent and pale green beneath, 4-6 in. long; lobes slightly lobed. Japan. G. F. 3: 143. — *A. montànum*, Ait. = A. spicatum. — *A. Neapolitànum*, Ten. = A. obtusatum. — *A. negléctum*, Lange, Probably A. campestre × Lobelii. — *A. oblongum*, Wall. Tree, 50 ft., lvs. ovate-lanceolate, entire, quite glabrous, glaucous beneath, coriaceous. Himalayas. — *A. obtusátum*, Waldst. & Kit. Allied to A. Italum. Small tree: lvs. tomentose beneath; lobes short, rounded: peduncles hairy. S. Eu., N. Afr. — *A. Opalus*, Ait. = A. Italum. — *A. opulifólium*, Vill. = A. Italum. — *A. orientàle*, Linn. (A. Creticum, Linn. A. sempervirens, Linn. A. heterophyllum, Willd.). Shrub, 4 ft.: lvs. nearly evergreen, orbicular or oval, entire or 3-lobed, $\frac{1}{2}$-$1\frac{1}{2}$ in. long, glabrous. Orient. — *A. palmifólium*, Borkh. = A. saccharum. — *A. pectinàtum*, Wall. Tree: lvs. 3-lobed, coarsely serrate, the middle lobe elongated, acuminate. Himalayas. G. C. II. 15: 365. — *A. polymorphum*, S. & Z. = A. palmatum. — *A. polymorphum*, Spach = A. coriaceum. — *A. purpurascens*, Franch. Very similar to A. diabolicum. Fls. purple. Japan. — *A. Rúgelii*, Pax = A. saccharum, var. Rugelii. — *A. saccharinum*, Linn. = A. dasycarpum. — *A. saccharinum*, Wangh. = A. saccharum. — *A. saccharinum*, var. *nigrum*, Torr. & Gray = A. nigrum. — *A. saccharum*, var. *columnáre*, Temple. = A. nigrum var. monumentale. — *A. saccharum*, var. *nigrum*, Britt. = A. nigrum. — *A. Schwerini*, Pax. Tree: lvs. cordate-oblong, slightly 3-lobed or entire, glaucous beneath, 5-7 in. long. Himalayas. — *A. Semenòvi*, Regel. = A. Ginnala, var. Semenovi. — *A. sempérvirens*, Linn. = A. orientale. — *A. septemlóbum*, Thunb. = A. palmatum, var. septemlobum. — *A. serrátum*, Pax (A. Mexicanum, Pax, not A. Gray). Allied to A. Negundo. Leaflets 3, pubescent, equally serrate. Mex. — *A. Sieboldiànum*, Miq. Allied to A. Japonicum. Lvs. 9-11-lobed, serrate. Fls. small, yellowish. Japan. — *A. Sikkimènse*, Miq. Tree: lvs. cordate-ovate, entire or serrate, quite glabrous, coriaceous. Himalayas. — *A. striàtum*, Dnr. = A. Pennsylvanicum. — *A. Tataricum*, var. *Ginnàla*, Hort. = A. Ginnala. — *A. Tataricum*, var. *laciniàtum*, Regel. = A. Ginnala. — *A. Tauricum*, Hort. = A. Italum, var. Hyrcanum or A. campestre, var. Tauricum. — *A. tegmentòsum*, Max. Allied to A. Pennsylvanicum. Lvs. 3-4 in. long, glabrous beneath; lobes short: fls. small. Manchuria. G. C. II. 15: 75. — *A. trifidum*, Hook. & Arn. Small tree: lvs. cuneate-obovate, 3-lobed, small, glabrous; lobes entire. China, Japan. S. Z. 2: 143. — *A. trilobàtum*, Lam. = A. Monspessulanum. — *A. trilobàtum*, Hort. = A. Italum, var. Hyrcanum. — *A. trigarbitum*, Nutt. = A. glabrum, var. tripartitum. — *A. Tschonoskii*, Max. Small tree: lvs. 5-7-lobed, 2-3 in. long, glabrous; lobes incised-serrate. Japan. Graceful, hardy, shrubby tree. — *A. Ukurunduènse*, F. & M. (A. spicatum, var Ukurunduense, Max.). Allied to A. spicatum. Small tree: lvs. 5-7-lobed, pubescent beneath, 4-5 in. long; lobes elongated, deeply serrate. Manchuria, Japan. G. C. II. 15: 172. — *A. Van Volxèmi*, Mast. = A. insigne, var. Van Volxemi. — *A. velutinum*, Boiss. = A. insigne, var. velutinum. — *A. velútinum*, Hort. = A. Trautvetteri. — *A. villósum*, Wall. Tall tree: lvs. 5-lobed, cordate, 6-8 in, across, tomentose below, coarsely serrate. Himalayas. — *A. Virginiànum*, Mill. = A. dasycarpum. — *A. Zæschènse*, Pax. = A. neglectum, Lange.

Alfred Rehder.

ACERÁNTHUS (a flower without horns). *Berberidàceæ*. Slender, hardy, herbaceous perennial.

A. diphýllus, Morr. & Decne. (Epimedium diphýllum, Lodd.). Plant rhizomatous; leaflets obliquely cordate, green above, glaucous beneath; fls. small, bluish white. Japan. B.M. 3448. L.B.C. 19: 1858.

ACHANIA. See *Malvaviscus*.

ACHILLÈA (its virtues said to have been discovered by Achilles). *Compósitæ*. Includes *Ptarmica*. Hardy herbaceous border and alpine plants of easy culture. Dwarf kinds make carpets in dry, sunny places. Large kinds suitable for wild gardens. Lvs. simple, compound or ternate; fl.-heads small, corymbose.— Prop. in spring by division, cuttings and seeds; chiefly by the first method.

A. *Rays about 5, except in double forms, half as long as the ovate-oblong involucre; fls. white, red, or yellow*

B. *Fls. white or red.*

Millefólium, Linn. MILFOIL. YARROW. Height 1–3 ft.: lvs. bi-pinnately parted, segments linear, 3–5 cleft? fls. in flat corymbs. June–Oct. Eu., Asia, Amer. Common in pastures. D. 95.— Less commonly cult. than vars. *rubrum* and *roseum*, with red or purple fls.

BB. *Fls. yellow.*

Tournefórtii, DC. (*A. Ægyptiaca*, Linn.). Height 12–18 in.: lvs. pinnatisect; segments roundish, coarsely toothed: fls. pale yellow. June–Oct. Greece.

filipendulina, Lam. (*A. Eupatórium*, Bieb.). Height 4–5 ft.: stem erect, furrowed, almost hairy: fls. in dense, convex compound corymbs, often 5 in. across. June–Sept. Orient.— Needs staking.

tomentósa, Linn. A woolly, carpet-like plant for rockeries. Height 8–10 in. Eu., Orient, N. Am. B.M. 498. Gn. 52, p. 421.

AA. *Rays 6–20, as long as or longer than the rotund or campanulate involucre; fls. white.*

B. *Lvs. not divided.*

Ptármica, Linn. SNEEZEWORT. Height 1–2 ft.: lvs. serrate: fls. in loose corymbs; all summer. N. Temp.

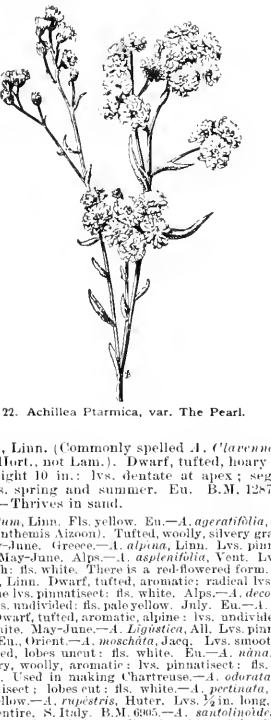
21. Acer Ginnala.

Reg.—Its full-double var., the Pearl, Fig. 22, is much used for cut-flowers and in cemeteries, and is one of the most popular of all hardy herbaceous plants. There are other varieties.

Sibírica, Ledeb. (*A. Mongólica*, Fisch. *A. ptarmicoídes*, Maxim.). Denser than the last, more erect and rigid: height 1½–2 ft.: fls. larger and in more compact corymbs. July–Sept.

BB. *Lvs. deeply divided.*

macrophýlla, Linn. Height 3 ft.: lvs. long, broad. July. Alps. Gn. 52, p. 421.— Better suited to shrubbery than herbaceous border.



22. Achillea Ptarmica, var. The Pearl.

Clavénæ, Linn. (Commonly spelled *A. Clavennæ*. *A. argéntea*, Hort., not Lam.). Dwarf, tufted, hoary alpine plant: height 10 in.: lvs. dentate at apex; segments obtuse: fls. spring and summer. Eu. B.M. 1287. Gn. 52, p. 421.—Thrives in sand.

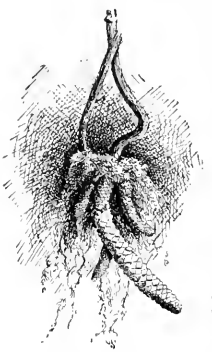
A. Ageràtum, Linn. Fls. yellow. Eu.—*A. ageratifólia*, Benth. & Hook. (Anthemis Aizoon). Tufted, woolly, silvery gray: fls. white. May–June. Greece.—*A. alpina*, Linn. Lvs. pinnatifid: fls. white. May–June. Alps.—*A. asplenifólia*, Vent. Lvs. pinnate, smooth: fls. white. There is a red-flowered form. Hab.? —*A. atrata*, Linn. Dwarf, tufted, aromatic; radical lvs. petiolate; cauline lvs. pinnatisect: fls. white. Alps.—*A. decolorans*, Schrad. Lvs. undivided: fls. pale yellow. July. Eu.—*A. Herbaròta*, All. Dwarf, tufted, aromatic, alpine: lvs. undivided, serrate: fls. white. May–June.—*A. Ligústica*, All. Lvs. pinnatifid: fls. white. Eu., Orient.—*A. moschàta*, Jacq. Lvs. smooth, pinnately parted, lobes uncut: fls. white. Eu.—*A. nána*, Linn. Dwarf, hairy, woolly, aromatic: lvs. pinnatisect: fls. white. Spring. Eu. Used in making Chartreuse.—*A. odorata*, Linn. Lvs. pinnatisect; lobes cut: fls. white.—*A. pectinata*, Willd. Fls. pale yellow.—*A. rupéstris*, Huter. Lvs. ½ in. long, linear-spatulate, entire. S. Italy. B.M. 6905.—*A. santolinoídes*, Lag. 1 ft.: lvs. pinnatisect, hairy-woolly: fls. white. July. Spain.— *A. serràta*, Retz. Lvs. pinnatifid, woolly: fls. white. Siberia? —*A. umbellàta*, Sibth. Very woolly rock plant, 4–5 in.: lvs. pinnatifid; lobes oblong, bluntish, entire or serrate: fls. white. June. Greece.—*A. Valesiaca*, Stoju. Lvs. pinnately parted: fls. white. June–Aug. Eu.

W. M.

ACHIMÈNES (Greek, *cheimaino*, to suffer from cold). *Gesneràceæ*. Greenhouse herbs, allied to gloxinias, native to tropical Amer. Fls. axillary; the 5 calyx lobes narrow and short; the corolla tube cylindrical and limb spreading; anthers 4, connivent in the corolla tube, and a rudiment of a fifth stamen; style long, usually exserted, the stigma dilated or obscurely 2-lobed.

The rhizomes of Achimenes should be potted about the first of April, in soil which has been made loose and open by the addition of about one-third leaf-mold. Six or seven of these in a 5-inch pot, or nine or ten in a 6-inch one, make specimens of the most convenient size. The young growth appears in about eighteen days, and from that time onward great pains should be taken to keep the soil moist, for a single severe drying will ruin the plants. Liquid manure should be given twice

a week after flowering begins, i.e., toward the end of May. The plants are generally tied up to slender supports as growth advances, and, so treated, make surprisingly effective specimens. They may also be allowed to grow naturally, when they will droop over the sides of the pots and flower profusely. Still another way is to pinch off the tops of the growing plants when they are 4 or 5 inches high. As this produces a branching growth, a smaller number of rhizomes should be allowed to each pot. The flowers of Achimenes are produced for several months without cessation, i.e., until Oct., and sometimes still later if the small-flowered kinds are used. As soon as blossoming comes to an end, the plants should be cut off level with the tops of the pots, which should then be stored away, putting a reversed pot on the top of each one that stands on its base, for otherwise mice may destroy all the roots. Achimenes are propagated usually by means of the natural increase of the rhizomes, but all kinds may be grown from cuttings. Another way, which produces many though weak plants, is to rub off the scales and sow them as if they were seeds. The roots should be separated from the soil during the winter, and care should be taken that they do not decay from getting too wet in the moist air of greenhouse or cellar. Some of the best species are *A. longiflora*, purplish blue; *A. longiflora* var. *alba maxima*, the best white kind; *A. patens* var. *major*, a large flower of purplish rose; *A. pedunculata*, orange; *A. heterophylla*, tubular, a fiery orange at one end and blazing yellow at the other. Some of the best varieties are Ambroise Verscheffelt, white, with a network of violet lines; Chirita, deep, intense violet-blue with white throat; Dazzle, small, vivid scarlet, and late-blooming; Lady Littleton, rich crimson; Masterpiece, rosy violet with white throat; Mauve Queen, a very large and substantial variety of *A. longiflora*, pale purple; Rose Queen, rich, rosy lake; Nisida, lavender, shading to white; *Trevirana rosea*, like Dazzle, except in color. For other points in the culture of Achimenes, see G. F. 7: 456, 477, 506, 518; 8: 16. In the grandiflora group the tubers or bulbs are clustered; in the longiflora group the tubers are pear-shaped bodies, growing on the ends of root-like rhizomes. The coccinea and hirsuta groups (Fig. 23) are late bloomers.



23. Achimenes; tubers of the coccinea section.

Cult. by W. E. Endicott.

The garden Achimenes are much confused by hybridization, and it is doubtful if any of the pure species are in general cultivation in this country. Years ago, the small red-flowered types (of the coccinea section) were frequent, but modern evolution has proceeded from the broad-flowered purple species. The following first six species seem to have contributed most largely to the present garden forms.

A. *Fls. colored, the tube usually not more than twice the length of the limb.*

B. *Blossoms small, red or scarlet.*

ocellàta, Hook. Roots small and tuberous: st. 1–2 ft.: lvs. rich green above and purple beneath, ovate, strongly serrate, with conspicuous purplish petioles; fls. small, 1 in. long, broad-tubed, spotted with black and yellow, the lobes short and obtuse and well separated, drooping on reddish peduncles. Panama. B.M. 4359.—Fine for foliage.

coccínea, Pers. Height, 1–2 ft.: st. reddish: lvs. 3-whorled or opposite, green, ovate-acuminate, serrate: fls. small, scarlet the corolla twice longer than the erect lanceolate parted calyx on short peduncles. Minute lvs. often borne in the axils. Blooms late. Jamaica.—One of the older types. See Fig. 23.

heterophýlla, DC. (*A. ignéscens*, Lem. *A. Ghiesbrechtii*, Hort.). Root fibrous: st. 1 ft. or less, dark purple, somewhat hairy: lvs. ovate-acuminate, stalked, serrate, the two of each pair usually unequal in size: fls. solitary, on peduncles somewhat longer than the leafstalks, long-tubular and slightly curved, with a narrow, nearly equal flaring limb, rich scarlet, yellow within. Mex. B.M. 4871.—This species has tubers like those of the grandiflora section.

pedunculàta, Benth. St. 1½–2 ft., hairy, reddish: lvs. opposite, small, ovate, sharply serrate, green, hairy, on short reddish stalks: fls. medium size, drooping and dilated upwards, yellow-red with dark markings and a yellow throat, the limb comparatively short; on long (4–5 in.) bracted stems. Guatemala. B.M. 4077.—Stem produces tubers.

BB. *Blossom large, with wide limb, blue, violet or purple.*

longiflòra, DC. Fig. 24. The root-like rhizomes producing pear-shaped tubers at their ends: st. 1–2 ft., hairy: lvs. opposite or 3–4-whorled, ovate-oblong, serrate, hairy, sometimes colored beneath: fls. solitary, the corolla salver-shaped, with a long and graceful tube; the limb very large and widely spreading, violet-blue and whitish beneath, the lowest segment sometimes divided. Guatemala. B.M. 3980. P.M. 9: 151.—A popular type.

24. Achimenes longiflora (× ½).

grandiflòra, DC. Lvs. mostly larger than in last, rusty below, often oblique at base: fls. very large, distinctly red-tinged. Mex. B.M. 4012.—Popular type.

pàtens, Benth. Height, 1–1½ ft.: lvs. unequal, ovate-acuminate, hispid and serrate: fls. violet-blue, with downy calyx, tube shorter than spreading crenate limb. Mex.

AA. *Fls. pure white, the tube 3–4 times the length of the limb.*

tubiflòra, Nicholson, Suppl. p. 483 (*Gloxínia tubiflòra*, Hook. *Dolichodíria tubiflora*, Hanst.). St. short, with opposite oblong-acuminate, crenate, short-petioled lvs.: fls. 4 in. long, curved, gibbous at the base, the tube downy, the pedicels opposite and 2 in. long. Argentina. B.M. 3971.—Tubers solid, much like a potato.

A. amábilis, Deene.=Nægelia multiflora.—*A. atrosanguínea*, Lindl.=A. foliosa.—*A. candida*, Lindl.=Dicyrta candida.—*A. cuprea*ta, Hook.=Episcea cuprea.ta.—*A. foliosa*, Morr. Lvs. cordate, unequal: fls. crimson, with sacate tube 1½ in. long, with narrow limb. Guatemala.—*A. gloxinæflòra*, Forkel.=Gloxinia glabrata.—*A. hirsuta*, DC. Loose grower: st. bulbiferous: fls. rather large, with swollen tube and oblique limb, rose, with yellow and spotted throat. Guatemala. B.M. 4144. P.M. 12: 7. Once popular.—*A. Jauregula*, Warscz.=A. longiflora.—*A. Kleèi*, Paxt. Dwarf: fls. pink-purple. P.M. 16: 289. Form of A. longiflora?—*A. multiflòra*, Gardn. Hairy: lvs. broad-ovate: fls. blue, fringed. Brazil. B.M. 3993.—*A. picta*, Benth.=Tydæa picta.—*A. rósea*, Lindl. Fls. pink or rose, the peduncles many-flowered. Guatemala.—*A. Skinneri*, Gordon,=A. hirsuta.—Garden forms and hybrids are *Escherii*, *floribúnda*, *intermèdia*, *Jäyii*, *Mountfórdii*, *nægeliòides*, *nana*, *venùsta* (P.M. 15: 121), *Verschaffèltii*.

L. H. B.

ACHLYS (the goddess of obscurity). *Berberidàceæ*. Hardy herbaceous perennial. Fls. minute, numerous, spicate, on a slender scape.

triphýlla, DC. Root-stock terminated by a strong, scaly winter-bud; lvs. 1 or 2; leaflets 3, fan-shaped, sinuate-dentate, $2^1/_2$ x 5 in.; scape 1 ft. long. spike 1 in. long. Spring. W. N. Amer.—An interesting and delicate plant. Int. 1881.

ACHRAS. *See Sapodilla.*

ACHYRÁNTHES. *See Iresine.*

ACIDANTHÈRA (pointed anthers). *Iridàceæ*. Tender herbaceous perennials, intermediate between Gladiolus and Ixia. Lvs. many, linear ensiform, 1–$1^1/_2$ ft. long; spikes 3–6-flowered, simple, lax; fls. long-tubed, somewhat pendulous; corms roundish, flattened, covered with a matted fiber.—Prop. by seed or by the numerous corms.

bicolor, Hochst. St. 15–18 in.; fls. creamy white, blotched chocolate brown within, fragrant; corms $^1/_2$–1 in. in diam. Abyssinia. G.F. 1: 486, 487. Gn. 47: 1014. G.C. III. 20: 395. Mn. 8: 11.—Requires a somewhat stiffer soil than the tender species of Gladiolus. May be grown in a tub outdoors during summer, and flowered within during Oct. Several corms in a large pot give good results. Corms should be dried as soon as lifted, to prevent rot.

A. aquinoctialis, Baker. St 3–4 ft., stout, stiffly erect lvs. strongly ribbed; fls. white, blotched crimson or purple within. corms large. Sierra Leone. B.M. 7393. May be a stronger growing and more tropical form of the above.

W. E. Endicott and W. M.

ACINÈTA (*immorable*, the lip being jointless). *Orchidàceæ*. Stout epiphytes with interesting pendent scapes. Pseudobulbs conspicuously furrowed, slightly compressed; leaf-blades smooth, conspicuously veined, plaited and pliable; fls. globose. As a genus it is too near to Peristeria and Stanhopea. The species are rarely seen, as they are less conspicuous in their coloring than many orchids. They require a warm house and plenty of moisture during the growing season, with a decided rest, to make them flower. Use baskets, not pots, as the flower-spikes are produced from the base of the bulbs, as in Stanhopea, and should have free egress or they will be lost. Cult. by E. O. Orpet.

Bárkeri, Lindl. (*Peristèria Bárkeri*, Batem.). Pseudobulbs sub-conic, about 5 in.; leaf-blades longer than in *A. Humboldtii*; fls. 12 or more, in pendent racemes, golden yellow spotted with brown. Mex. B.M. 4203. I.H. 2: 44. Gn. 54, p. 332. P.M. 14: 145.

Húmboldtii, Lindl. Pseudobulbs ovate, about 3 in.; leaf-blades about 1 ft. long, lanceolate, acute; scapes pendent, 2 ft. long; fls. 6 or more, chocolate colored, about 2 in. in diam. Ecuador, high elevations. Gn. 3: 11.

A. chrysantha, Lindl. Racemes pendent; fls. golden yellow, with whitish labellum and crimson or purplish column; labellum furnished with a long, blunt, papillose horn. Mex.—*A. dènsa*, Lindl. (A. Warscewiczii, Klotzsch). Fls. subglobose, fragrant, pale yellow, spotted externally with reddish brown; labellum yellow, spotted with reddish brown. Costa Rica.—*A. Humbyàna*, Reichb. f. Fls. ivory white, in loose racemes; lip spotted purple, with erect side lobes. New Grenada.—*A. sulcàta*, Reichb. f. Similar to A. Humboldtii. Fls. yellow. Oakes Ames.

ACOKANTHÈRA (mucronate anthers). *Apocynàceæ*. Tender shrubs, cult. in greenhouses North, and outdoors in Fla. and Calif. Fls. with the odor of jasmine, lasting.

spectábilis, G. Don. (*Toxicophlæa spectábilis*, Sond. *T. Thúnbergii*, Hort., not Harv.). Lvs. 3–5 in. long, short petiolate, leathery, elliptic, acute, shining above; fls. numerous, in dense axillary, branched, short cymes, pure white, very sweet scented. Natal. B.M. 6359. R.H. 1879: 270. G.F. 6: 185. G.C. 1872: 363.—Poisonous. The plants cult. under this name are said by trade catalogues to have pink or violet flowers.

venenàta, G. Don. (*Toxicophlæa cestroides*, DC. *T. Thúnbergii*, Harv., not Hort.). Fls. white or rose. Differs from the above in the well marked venation of the leaves, its flowers a third smaller, its calyx not pubescent, and its corolla-limb less widely spreading.

ACONITE, WINTER. *See Eranthis.*

ACONÍTUM. *Ranunculàceæ*. Aconite. Monkshood. Wolfsbane. A genus of hardy ornamental, perennial herbs, much used in borders, etc. Many species are planted in European gardens, but only nine have been much used in America. The number of species varies from 18 to 80, with different botanists. Native in mountain regions of Europe, temperate Asia, and five in N. Amer. Root tuberous, turnip-shaped, or thick fibrous; st. tall or long, erect, ascending or trailing; lvs. palmately divided or cleft and cut-lobed; fls. large, irregular, showy; sepals 5, the large upper sepal in shape of a hood or helmet; petals 2–5, small; stamens numerous; carpels 3–5, sessile, many-ovuled, forming follicles when ripened. The following species do well in any garden soil, but rich preferred; they thrive in open sun, but flowers last longer in shaded places. Aconites should never be planted in or too near the kitchen garden or the children's garden, as the roots and some of the flowers have a deadly poison. Prop. easily by division. Reichenbach Monographia Generis Aconiti, Leipsic, 1820, 2 vols., folio. Reichenbach Illustratio Specierum Aconiti, Leipsic, 1822–7, folio.

A. *Roots globular-tuberous.*

B. *Lvs. deeply cut, but not to the base.*

Fischeri, Reichb. (*A. Columbiànum*, Nutt. *A. Californícum*, Hort.). Stems 4–6 ft.; lvs. large, smooth, 3-parted, attractive; segments much cut and divided; fls. numerous, pale blue, panicled, pedicels pubescent; helmets hemispherico-conical. Autumn. N. Amer. and Asia. Int. 1889. B.M. 7130.

Cammàrum, Linn. (*A. dècorum*, Reichb.). St. 3–4 ft.; lvs. with short, bluntish lobes; fls. purple or blue; panicles or loose spikes few-flowered; helmet hemispherical, closed. July–Sept. Hungary. Int. 1889. *A. Storkiànum*, Reichb., is a dwarf form of this, with fewer flowers and somewhat fibrous roots.

uncinàtum, Linn. Wild Monkshood. St. slender, 3–5 ft., inclined to climb; lvs. thick, deeply cut into 3–5 cut-toothed lobes; fls. loosely panicled, but crowded at the apex; blue, pubescent, 1 inch broad; helmet erect, nearly as broad as long, obtusely conical; follicles 3. June–Sept. Low grounds of Penn. S. and W., Japan. Mn. 4: 81.—Much planted now.

BB. *Lvs. divided to the base.*

variegàtum, Linn. Erect, 1–6 ft.; lvs. variously divided into usually broad lobes and cut divisions; lower petioles long, others short or none; fls. in a loose panicle or raceme, blue, varying to whitish, rather smooth; helmet higher than wide, top curved forward; visor pointed, horizontal or ascending. July. Europe. *A. álbum*, Ait., is a pure white-flowered form of this, with rather fibrous roots.

AA. *Roots long-tuberous.*

B. *Carpels usually 5.*

Japónicum, Decne. St. erect, 3–4 ft., smooth: lvs. dark green, shining, petioled; lobes 2–3 times cut, the parts blunt and deeply toothed: fls. large, deep blue or violet, tinged with red, on loose panicles with ascending branches; helmet conical; beak abruptly pointed: follicles 5. July–Sept. Japan. Int. 1889. R.H. 1851, p. 475. Var. **cæruleum**, Hort. Fls. very abundant; panicles shortened.

BB. *Carpels 3 or 4.*

Napéllus, Linn. (*A. Tauricum*, Jacq. *A. pyramidàle*, Mill.). True Monkshood. Officinal Aconite. Fig. 25. The best known and most poisonous species, and used in medicine. Sts. erect, 3–4 ft.: lvs. divided to the base, and cleft 2–3 times into linear lobes: fls. blue, in a raceme; peduncles erect, pubescent; helmet broad and low, gaping, smoothish: fr. 3–4-celled. June–July. Gn. 12, p. 362.—Very many varieties, differing in shade of flowers, often mottled or lined with white. Var. **álbum** is nearly white. Var. **bicolor** and var. **versicolor**, much used in gardens for the large blue and white flowers. Reichenbach has divided this species into 20–30 species.

AAA. *Roots in the form of a scaly, elongated bulb, or somewhat fibrous.*

B. *Sepals deciduous.*

autumnàle, Reichb. Autumn Aconite. Fig. 26. St. 3–5 ft.: lvs. pedately 5-lobed: fls. in a simple spike, be-

coming a panicle; blue, lilac or whitish; helmet closed. Sept.–Nov. N. China.

Lycoctonum, Linn. (*A. barbàtum,* Patr. *A. squarròsum, A. ochroleùcum,* Willd.). PALE YELLOW WOLFSBANE. St. slender, simple, 3–6 ft.: lvs. deeply cut into 5–9 lobes; long petioles and under ribs pubescent: fls. yellow or whitish, in racemes; helmet a pinched elongated cone; middle sepals usually bearded: fr. usually 3-celled. June–Sept. Eu., Siberia. B.M. 2570. G.M. 34: 124.

25. Aconitum Napellus (×¾.)

BB. *Sepals persistent.*

Anthora, Linn. (*A. Pyrenàicum,* Pall.). St. 1–2 ft.: lvs. parted almost to the base, parts deeply cut and lobed, more or less hispid beneath, smoothish above; petioles long: fls. in lateral and terminal racemes, pale yellow, often large; racemes or panicles generally pubescent; spur bent back or hooked; helmet arched, but cylindrical at base; follicles 5. June–July. S. Eu. B.M. 2654.—Several varieties.

A. Chinense, Sieb. Deep blue spike of fls. from the axil of every leaf: foliage bold and handsome. B.M. 8852. P.M. 5:3.—*A. delphinifòlium,* DC. Allied to *A. Napellus.*—*A. heterophýllum,* Wall. Fls. yellow and violet. Used as a tonic medicine in India. B.M. 6092.—*A. Novaboracènse,* Gray. Probably =*A. paniculatum.*—*A. paniculàtum,* Lam. (*A. toxicum,* Reichb.). Has blue fls. L.B.C. 9:810. —*A. pyramidale,* Mill. Form of *A. Napellus.*—*A. reclinàtum* Gray, of the Alleghanies, with white fls. and large lvs., is worth cult.—*A. septentrionale,* var *Carpaticum,* Sims, is a beautiful purple kind, closely related to *A. Lycoctonum.* B.M. 2196.—*A. tortuòsum,* Willd. Once listed in the trade; not now found.

K. C. DAVIS.

ÁCORUS (ancient name of unknown meaning). *Araideæ.* Hardy, herbaceous water-loving plants. Lvs. sword-shaped, erect; spadix appearing lateral, with no true spathe; fls. inconspicuous. They thrive best in moist soil, and may be grown in shallow water or on dry land. Prop. easily in spring or autumn by division.

Cálamus, Linn. SWEET FLAG. Height 2 ft.: rootstock horizontal, pungent, aromatic. Fls. early summer. N. Amer., Eu. Var. **variegàtus,** Hort. Lvs. striped deep yellow when young, fading to a paler color later in summer. Eu.—Commoner in cult. than the type.

gramíneus, Soland. Height 8–12 in. Much smaller than *A. Calamus,* forming compact, grassy tufts. Japan. Var. **variegàtus,** Hort. Lvs. striped white. Used in hanging baskets, vases, rockeries and for cutting. Often grown indoors.

J. B. KELLER.

ACROCLÍNIUM. See *Helipterum.*

ACROCÒMIA (name means *a tuft of leaves at the top*). *Palmàceæ,* tribe *Cocoíneæ.* Spiny tropical American palms: caudex erect, solitary, ringed and swollen at the middle, densely spiny: lvs. terminal, pinnately cut; segments narrowly linear-lanceolate, long, obliquely acuminate, the naked margins recurved at the base; midnerves, rachis and petiole with long spines; fr. globose or oblong, glabrous or prickly; black or brown. Species 8, mostly difficult to distinguish; allied to Cocos. They need a rich, sandy loam. The chief danger with young plants is overpotting, as few leaves are on a plant at a time, and the roots are not abundant.

sclerocárpa, Mart. (*A. aculeàta,* Lodd.). Height 30–45 ft.: trunk cylindrical, about 1 ft. thick, with black spines 2–4 in. long: lvs. 12–15 ft. long; segments in irregular groups of 2 or 3, 2–3 ft. long, ¾–1 in. wide, smooth and shining above, whitish, appressed-pilose below, entirely free of spines, except along the midrib. Braz. to W. Ind. I.H. 15:547.—Not hardy at Onéco, Fla. Cult. in Calif. "Gru-gru" and "corojo" are native names.

Havanénsis, Hort. A slow-growing, thorny plant, of which little is known. Trade name.

JARED G. SMITH and G. W. OLIVER.

ACROPÈRA. See *Gongora.*

ACROPHÝLLUM (Greek, *top* and *leaf*). *Saxifragàceæ.* One Australian evergreen shrub, **A. venòsum,** Benth. (*A. verticillàtum,* Hook.), excellent for spring flowering in the coolhouse. Prop. by cuttings in early summer. Let the plant rest during summer. Do not expose to frost. It produces many pinkish fls. in dense spicate whorls near the top of the branches. Lvs. in 3's, sessile, dentate: fls. with 5 petals and 10 stamens. 4–6 ft. B.M. 4050.

ACRÓSTICHUM (derivation obscure). *Polypodiàceæ.* Greenhouse ferns. Includes plants of great diversity of foliage, which are often referred to many genera. Sori spread in a layer over the entire under surface of the leaf or of certain of the upper pinnæ, rarely over both surfaces. Foliage rather coarse, the leaves simple or pinnate, rarely forked. All the 140 species are plants of tropical regions, two species growing in S. Fla. Some kinds are adapted to covering walls, columns, trunks of tree ferns, etc. The kinds with long fronds are excellent for hanging baskets. As all kinds require an abundance of water at the roots, the compost should be very porous.

26. Aconitum autumnale (×½).

A mixture of two parts fibrous peat, one of chopped sphagnum, and one of coarse silver sand is recommended. For general culture, see *Ferns.*

The following species are cult. in Amer.: alienum, No. 15; aureum, 17; cervinum, 14; conforme, 7; crini-

tum, 9; flaccidum, 8; gorgonèum, 11; lomarioides, 18; muscosum, 3; nicotianæfolium, 16; osmundaceum, 19; peltatum, 20; pilosum, 5; reticulatum, 10; scandens, 12; simplex, 6; sorbifolium, 13; squamosum, 2; villosum, 1; viscosum, 4.

A. *Lvs. simple, less than 2 in. wide; veins free.* (*Elaphoglossum.*)

B. *Surface of lvs. densely scaly throughout.*

c. *Texture thin, flaccid.*

1. **villòsum,** Swz. Fig. 27. Sterile lvs. 6–9 in. long; fertile lvs. scarcely more than half as large, both with abundant slender, dark-brown scales. Mex. and W. Ind. —Dwarf, variable.

cc. *Texture thick, leathery.*

2. **squamòsum,** Swz. Lvs. 6–12 in. long, the fertile narrower, on longer stems; both surfaces matted with bright reddish brown linear or lanceolate scales. Tropics of both hemispheres.

3. **muscòsum,** Swz. Sterile lvs. 6–12 in. long, fertile much shorter; upper surface slightly scaly, the lower densely matted with ovate, rusty scales. Tropics of both hemispheres. S. 1: 211.—Very distinct in habit.

BB. *Surface of lvs. slightly scaly.*

4. **viscòsum,** Swz. Sterile lvs. 6–12 in. long, narrowed gradually at the base; the fertile shorter, on longer stems; texture leathery, the surfaces somewhat viscid. Tropics of both hemispheres.

5. **pilòsum,** HBK. Lvs. flexuous, 6–8 in. long, $\frac{3}{4}$ in. wide, with tufts of star-like scales beneath; texture herbaceous. Mex. to Columbia.—Chiefly of botanical interest.

BBB. *Surface of lvs. not scaly; texture leathery.*

D. *Margins of lvs. thick, cartilaginous.*

6. **simplex,** Swz. Sterile lvs. 4–12 in. long, with a very acute point, the lower portion gradually narrowed into a short, somewhat margined stem. W. Ind. to Brazil.

7. **conförme,** Swz. Sterile lvs. 2–9 in. long, with a bluntish point and wedge-shaped or spatulate base; fertile lvs. narrower. Tropics of both hemispheres.

DD. *Margins of leaves not thickened.*

8. **flàccidum,** Fée. Sterile lvs. 6–12 in. long, with very acute point, the lower portion gradually narrowed to the short stem; fertile lvs. on a stem 3–4 in. long. S. Amer. —Of botanical interest only.

AA. *Lvs. simple; veins uniting to form a network.*

B. *Surface of lvs. densely clothed with narrow scales.* (*Hymenodium.*)

9. **crinìtum,** Linn. Elephant-ear Fern. Lvs. 10–18 in. long, 4–8 in. wide, on densely scaly stems; fertile lvs. smaller, on shorter stems. W. Indies. F.S. 9: 936, as *H. crinitum.*—Omit sand in potting, and avoid overwatering.

BB. *Surface of lvs. mostly smooth, 6–15 in. long.*

10. **reticulàtum,** Kaulf. Lvs. on distinct stems, with wedge-shaped bases, $1\frac{1}{2}$ in. wide; veins forming copious meshes. (*Chrysodium.*) Hawaiian Islands.—Of botanical interest only.

11. **gorgòneum,** Kaulf. Lvs. tapering gradually downward to the short stem, 2–3 in. wide; veins forming meshes only near the margin. (*Aconiopteris.*) Hawaiian Isl.—Of little decorative value.

AAA. *Lvs. pinnate.*

B. *Ferns climbing with narrow, fertile pinna.*

12. **scàndens,** J. Smith. Rootstock widely climbing; lvs. 1–3 ft. long, with pinnæ 4–8 in. long; fertile pinnæ slender, 6–12 in. long; texture leathery. (*Stenochlæna.*) India. S. 1: 224.—A vigorous grower and coarse feeder, much used in cooler houses of large ferneries.

13. **sorbifòlium,** Linn. Rootstock climbing, often prickly; lvs. 12–18 in. long, 6–12 in. wide, with close veins; fertile pinnæ 2–4 in. long, narrow. (*Lomariopsis.*) E. and W. Ind. to Braz.

BB. *Ferns with creeping rootstocks and scattered lvs.*

c. *Veins united only near the margin; fertile lvs. bipinnate.*

14. **cervìnum,** Swz. Fig. 28. Lvs. 2–4 ft. long, with pinnæ 4–9 in. long, 1–2 in. wide; fertile pinnæ slender, narrow, 4–8 in. long. (*Olfersia.*) Mex. and Cuba to Braz. S. 1: 192.

cc. *Veins forming meshes everywhere.* (*Gymnopteris.*)

15. **alièNum,** Swz. Sterile lvs. 1–2 ft. long, triangular, with the upper pinnæ decurrent, and the lower at least sinuate or even incised; fertile lvs. smaller, with narrow pinnæ, the upper decurrent. Cuba and Mex. to Braz.

16. **nicotianæfòlium,** Swz. Sterile lvs. with 3–7 pinnæ which are 6–12 in. long and 2–3 in. wide, with nearly entire edges; fertile lvs. smaller, with 3–7 pinnæ 3–4 in. long, 1 in. wide. W. Ind. to Braz.

27. Acrostichum villosum (× $\frac{1}{3}$). See No. 1.

28. Acrostichum cervinum (× $\frac{1}{4}$). See No. 14

BBB. *Ferns of swampy places, growing in crowns from erect rootstocks.*

17. **aùreum,** Linn. Lvs. fertile only in the upper pinnæ, 3–6 ft. long, with pinnæ 6–10 in. long, short stalked, coriaceous. Fla. to Braz. and in the tropics of the old world. S. 1: 187.—Strong-growing. One of the best. Should be treated as an aquatic.

18. **lomarioides,** Jenman. Sterile and fertile lvs. distinct, the sterile shorter and spreading, the fertile taller and more erect in the center of the cluster; pinnæ 9–14 in. long, almost sessile. Fla. to Braz.

AAAA. *Lvs. bipinnatifid or bipinnate; veins free.* (*Polybotrya.*)

19. **osmundàceum,** Hook. Rootstock wide, climbing, with long, linear scales; sterile lvs. 2–3 ft. long, the lower pinnæ 8–10 in. long, with numerous slightly stalked segments; fertile lvs. tripinnate, with the lower pinnæ 1–2 ft. long, 4–8 in. wide, with narrow, cylindric segments $\frac{1}{4}$–$\frac{3}{4}$ in. long. W. Ind. to Braz.—Probably the handsomest of the climbing kinds.

AAAAA. *Lvs. palmate from creeping rootstocks; plants small.*

20. **peltàtum,** Swz. Lvs. 1–2 in. each way on slender stems, repeatedly forked into very narrow divisions; fertile lvs. $\frac{1}{4}$–$\frac{1}{2}$ in. wide, circular, or somewhat 2-lobed. (*Rhipidopteris.*) Mex. and W. Ind. to Braz.—A delicate and distinct plant, needing moisture all the year round.

especially in the air. Avoid unnecessary disturbances of roots. Use some partly decayed leaf-mold.

A. acuminatum, Hook., S. 1: 182. *A. caudatum*, and *A. caudàtum*, Hook., all from S. Amer., related to *A. osmundaceum*. *A. flagelliferum*, Wall. Rooting at apex of terminal penna. E. Ind. S. 1: 201.—*A. funiculaceum*. Hook. Allied to *A. peltatum*. Ecuador.—*A. Herminiéri*, Bory. Lvs. simple. Allied to *A. simplex*. W. Ind. to Braz.—*A. heteromorphum*, Klotzsch. Lvs. simple, $1\frac{1}{2}$–2 in. long. S. Amer.—*A. latifólium*, Sw. Lvs. simple, 9–18 in. long. Allied to *A. conforme*. Mex. to Braz.—*A. lepidótum*, Willd. Allied to *A. villosum*. Andes.—*A. quercifólium*, Retz. Allied to *A. flagelliferum*. Ind.—*A. serratifólium*, Mert. Pinnate, with lvs. 1–2 ft. long. Allied to *A. aureum*. Mex. to Braz.—*A. spicátum*, Linn. Simple, with sori on long contracted apex. (Hymenolepis.) E. Ind.—*A. taccefólium*, Hook. Allied to *A. flagelliferum*. Philippines. L. M. UNDERWOOD.

29. Actinidia arguta (×$\frac{1}{5}$).

ACTÆA (ancient name of the elder, transferred by Linnæus). *Ranunculàcea*. Native hardy herbaceous perennials, with showy spikes of small fls. and handsome clusters of berries in autumn. Leaflets of the twice- or thrice-ternate lvs. ovate, sharply cleft, and cut-toothed. They like rich woods and shade. Useful for rockery and wild garden. Prop. by seeds and by root-division in spring.

álba, Mill. (*A. rùbra*, Bigel.). WHITE BANEBERRY. Height, 1–$1\frac{1}{2}$ ft.; much like *A. spicata*, but the leaflets more cut, teeth and points sharper; plant smoother: fls. white, in an oblong raceme, and a week or two later: pedicels in fr. very thick, turning red: berries white, ovate-oblong, often purplish at the end. N. states. D. 53.

spicàta, Linn. COHOSH. HERB-CHRISTOPHER. Plant 1–2 ft.: lvs. bi- or triternate, serrated: fls. white or bluish, in ovate racemes: berries purplish black, oblong. Apr.–June. Eu., Jap.—Less cult. than the red-fruited var.

Var. **rùbra**, Ait. (*A. rùbra*, Willd.). RED BANEBERRY. Rather taller than *A. alba*: lvs. bi- or triternate, serrated: fl. cluster white, larger than in *A. spicata*: berries bright red, very handsome. Apr.–June. Northern states. K. C. DAVIS.

ACTINÉLLA (Greek, *small-rayed*). *Compósitæ*. Hardy perennials from W. N. Amer., for cult. in alpine gardens. Height 6–12 in.: fls. yellow, summer. Of easy cult. in light soil. Prop. by division or by seeds.

grandiflòra, Torr. & Gray. Plant densely woolly: lower lvs. pinnately or bipinnately parted, with margined petioles from broad, scarious bases; upper cauline lvs. simple or sparingly divided: fls. 2–3 in. wide, summer.—A pretty alpine plant.

scapòsa, Nutt. Plant villous: lvs. radical, linear-spatulate, 2–3 in. long, punctate, entire: fls. 1 in. wide; scapes single, leafless, 1-fld., 3–9 in. long.

A. lanàta, Pursh.—Eriophyllum cæspitosum.

J. B. KELLER and W. M.

ACTINÍDIA (*aktin*, ray; referring to the radiate styles). *Ternstrœmiàceæ*. Hardy climbing deciduous shrubs, strong-growing and excellent for covering arbors, screens, trellises, walls and low buildings. Remarkably free from insects and fungi. Lvs. alternate, long-petioled, serrate: fls. axillary, single or in corymbs, polygamous, white, cup-shaped, $\frac{1}{2}$–$\frac{3}{4}$ in. in diam.; sepals and petals 5; stamens and stigmas numerous; berry many-seeded, about 1 in. long, edible. E. Asia, Himalayas. Prop. by seeds, by greenwood cuttings in summer, or by hardwood cuttings; also by layers. Monograph by Maximowicz in Diagn. Plant. As. Nov. 6: 422.

A. *Lvs. dark green, shining, chartaceous.*

arguta, Miq. (*A. polygàma*, Hort., not Miq. *A. volúbilis*, Hort., not Miq.). Fig. 29. Petioles mostly setose: lvs. 4–5 in. long, broad-elliptic, cuneate to subcordate at the base, abruptly acuminate, smooth except the setose midrib beneath, setulosely appressed serrate: fls. 3 or more, greenish white; anthers dark purple: fr. greenish yellow, with fig-like flavor. June. Japan, Saghalin, Manchuria. A.G. 1891: 142.

AA. *Lvs. bright green, dull, membranaceous, sometimes becoming in the summer handsomely variegated above the middle: fls. fragrant: not climbing high.*

polygàma, Miq. Lvs. 3–4 in. long, broad-ovate or ovate-oblong, cuneate to subcordate at the base, appressed-serrate, mostly setose at the nerves on both sides: fls. 1–3, $\frac{3}{4}$ in. in diam.; stigmas on a short, thick style; fr. yellow. July. Japan, Saghalin, Manchuria. B.M. 7497. —The plant attracts cats like valerian.

Kolomikta, Maxim. Petioles not setose; lvs. downy beneath when young, 4–6 in. long, ovate-oblong, rounded or cordate at the base, unequally setulosely serrate, sparsely setose beneath: fls. 1–3, $\frac{1}{2}$ in. in diam.; stigmas sessile. July. Japan, Saghalin, Manchuria. R.H. 1898: 36.

A. callósa, Lindl. Allied to *A. arguta*. Lvs. mostly acute at both ends. Himalayas. ALFRED REHDER.

ACTINÓLEPIS (Greek, *a scale-like ray*). *Compósitæ*. Hardy annuals from Calif.; freely branching, and mostly yellow-flowered.

coronària, Gray (*Shórtia Californica*, Hort. *Baria coronària*, Gray). Figs. 30, 31. Lvs. opposite, except the upper ones, 2 in. or more long, deeply pinnatifid; lobes 5–7, distant, linear, entire. B.M. 3828, as *Hymenóxys Californica*.—One of the prettiest of annual flowers, and deserving of greater popularity. Excellent for edging. An everlasting.

30. Actinolepis coronaria. Nearly natural size.

31. Actinolepis coronaria. Known to the trade as Shortia Californica.

ACTINÓMERIS (from Greek *aktis*, ray, and *meris*, part, alluding to the irregularity of the rays). *Compósitæ*. Native hardy herbaceous perennials suitable for wild gardens and shrubbery. Tall, branching. Cult. like Helianthus. Prop. by division.

squarròsa, Nutt. Height 4–8 ft.: lvs. lance-oblong, acuminate, subpetiolate, tapering to both ends: fls. numerous, corymbed, yellow; rays 4–10, irregular. Autumn.

A. helianthoides, Nutt. Lvs. silky-villous underneath: rays about 8, usually more than in *A. squarrosa*. Mn. 4: 129.—*A. prócera*, Steud., is only a taller form of *A. squarrosa*.

J. B. KELLER.

ACTINÓPTERIS (*aktin*, ray, and *pteris*; the fronds radiately cut). Syn., *Actiniopteris*. *Polypodiàceæ*. Greenhouse ferns from India, resembling miniature fan-palms. The sori are linear-elongate and submarginal, and covered with indusia. *A. radiàta*, Link, is the only recognized species. L. M. UNDERWOOD.

ÀDA (a complimentary name). *Orchidàceæ*; tribe *Vándeæ*. A genus of epiphytes containing two species. Petals and sepals slightly spreading from half their length; labellum parallel with the column and united to its base. Found at high elevations on the Colombian Andes. Useful for the coolhouse, where they may be grown together with Odontoglossums, blooming in no definite season.

aurantìaca, Lindl. Fig. 32. Pseudobulbs 2–3 in., ovate to ovate-oblong, subcylindrical or slightly compressed, tapering toward the summits, bearing 1–3 narrow leaf-blades 6–12 in. long; petals and sepals narrow, pointed, channeled; labellum half as long as the petals; scape drooping, bearing racemes of cinnabar-red fls.

Lèhmanni, Rolfe. Leaves marbled with gray; labellum white.—Not much in cultivation. A recent species. OAKES AMES.

The Adas grow at the altitude of 8,500 ft. To grow them successfully, a house that can be kept very cool in summer is necessary, one having a northern exposure, such as is constructed for Odontoglossums being best, as the two plants are found growing together. Shading will be found necessary in summer during the hottest weather, preferably by roller shades, that can be rolled up in dull weather, as by this means a current of cool air is constantly passing over the glass. The temperature inside the structure can be kept below that outside in hot weather by careful airing and spraying. *A. aurantiaca* is the best known, and is much valued for its bright orange-colored spikes of bloom, which last a long time. *A. Lehmanni* is very rare in cultivation, and is distinguished, among other characteristics, by its white lip and by being a summer-blooming plant, while its companion species flowers early in spring. The usual fern fiber and sphagnum moss compost will be found best suited for their cultivation, taking care that the plants are never dry at the roots, either in summer or winter. E. O. ORPET.

ADAM-AND-EVE. See *Sempervivum tectorum*, and *Aptectrum hyemale*.

ADÀMIA. See *Dichroa*.

ADAM'S APPLE. See *Citrus Limetta*, *Musa paradisiaca*, and *Taberna montana coronaria*.

ADAM'S NEEDLE. See *Yucca*.

ADANSÒNIA (named after M. Adanson, French botanist). *Malvàceæ*. The Baobab is said to have the thickest trunk of any tree in the world. Adansonia has few congeners familiar to the horticulturist: fls. large, pendulous; petals 5, white, obovate; stamens numerous; ovary 5–10-celled; fr. oblong, woody, indehiscent, filled with a mealy pulp in which are numerous seeds.

digitàta, Linn. BAOBAB TREE. Height not more than 60 ft.; diam. said to be sometimes 30 ft. or more; lvs. palmate, with 3 leaflets in young plants, and 5–7 in older ones; fls. 6 in. across, with purplish anthers on long axillary, solitary peduncles. Africa. B.M. 2791.—Rarely cultivated in extreme S. Fla., where fr. is 9–12 in. long, and called "Monkey's Bread."

ADDER'S-TONGUE. See *Erythronium*.

ADDER'S-TONGUE FERN. See *Ophioglossum*.

ADENÁNDRA (from the glandular anthers). *Rutàceæ*. Small summer-flowering, tender shrubs from the Cape of Good Hope. Lvs. alternate, small, leathery, subsessile, entire, glandular-dotted: fls. white or rosy; petals obovate. Prop. by cuttings from the ripened wood.

fràgrans, Roem. & Schult. (*Diósma fràgrans*, Sims). BREATH OF HEAVEN. Height 2–3 ft.; lvs. oblong, obtuse, dark green above, whitish beneath, with a glandular, denticulate margin: fls. rosy. B.M. 1519.—A favorite in Calif.

ADENANTHÈRA (from the deciduous pedicillate gland on each anther). *Leguminòsæ*. Tender, unarmed evergreen tree, cult. in greenhouses only for its economic interest, and also in Calif. in the open air. Prop. by seeds, which should be softened in hot water previous to sowing.

Pavonìna, Linn. RED SANDAL-WOOD TREE. Leaflets about 13: fls. in an axillary spike. Trop. Asia, where it grows to a tree of great size.—The red lens-shaped "Circassian Seeds" are curiosities with travelers, and are used for necklaces, etc.

32. Ada aurantiaca.
a shows the lip and column.

ADENOCALÝMNA (*glandular covering*; referring to leaves, etc.). *Bignoniàceæ*. Tender climbing shrub, closely allied to Bignonia. Grown in hothouses, requiring considerable moisture. Prop. by cuttings in frames.

comòsum, DC. St. rough, punctate: lvs. opposite, trifoliolate; petioles thickened at junction with the blades: racemes so densely clothed at first with large bracts as to suggest the aments of the hop-vine; fls. 2 in. across, brilliant yellow, trumpet-shaped; upper lip of 2, and lower lip of 3 rounded, waved lobes. Braz. B.M. 4210.

ADENOCÁRPUS (from the *glandular pod*, which easily distinguishes it from allied genera). *Leguminòsæ*. Shrubs, rarely small trees, more or less pubescent: lvs. alternate, trifoliolate, small: fls. papilionaceous, yellow, in terminal racemes; calyx 2-lipped: fr. a glandular pod, oblong or linear, compressed. About 14 species in S. Eu., Asia Minor, N. and W. Afr., Canary Isl. Low shrubs, rarely more than 3 ft., of spreading habit, with handsome fls. produced profusely in spring; very attractive when in full bloom. They require a sunny position and well drained soil. They are especially adapted for temperate regions, but do not bear transplanting well, and should be grown in pots until planted. They are also handsome greenhouse shrubs, and grow best in a sandy compost of peat and loam. Prop. by seeds and greenwood cuttings in spring; sometimes also by layers and grafting.

frankenioìdes, Choisy. (*A. anagyrus*, Spreng.). Branches pubescent: lvs. persistent, crowded; leaflets linear-oblong, cuspidate: fls. crowded, in short racemes; calyx glandular, the lateral segments of the lower lip longer than the middle one, exceeding the upper lip. Teneriffe.

intermèdius, DC. Branches villous: lvs. deciduous, grouped; leaflets obovate or oblong-lanceolate: fls. in elongated racemes; calyx glandular, middle segment of

the lower lip longer than the lateral ones, much exceeding the upper lip. Italy, Spain, Sicily.

decórticans, Boiss. (*A. Boissiéri,* Webb). Shrub or small tree, 15–25 ft.: branches tomentose: lvs, crowded, persistent; leaflets linear, pubescent; racemes short, compact: calyx villous, segments nearly equal. Spain. R.H. 1883: 156. G.C. II. 25: 725. Gn. 30: 572.—Resembles English Gorse, but is thornless. Bark peels naturally. Thrives in poor, sandy soil.

A. anagýrus, Spreng. *A. frankenioides.*—*A. Boissiéri,* Webb =*A. decorticans.*—*A. complicatus,* Gay. (*A. parvifolius,* DC.). Branches nearly glabrous; racemes elongated; calyx glandular. S. W. France, Spain. B.M. 1587, as *Cytisus divaricatus.*—*A. commutatus,* Guss. (*A. Telonensis,* DC.). Branches villous, pubescent: racemes loose; calyx villous. Spain, Orient.—*A. divaricatus,* Boiss.=*A. intermedius* when held to include *A. commutatus* and *complicatus.*—*A. foliolósus,* DC. Branches and lvs. crowded, villous; racemes compact, many-flowered; calyx villous. Canary Isl.—*A. grandiflorus,* Boiss. Branches and lvs. glabrous; racemes few-flowered; calyx pubescent. S. France, Spain.—*A. hispánicus,* DC. Branches velvety-pubescent; lvs. tomentose beneath: racemes dense, many-flowered; calyx glandular. Spain.—*A. parvifolius,* DC.=*A. complicatus,* Gay.—*A. Telonénsis,* DC.=*A. commutatus.*—*A. Telonensis,* Nicholson—*A. grandiflorus.* ALFRED REHDER.

ADENÓPHORA (*gland-bearing;* referring to the cylindrical nectary which surrounds the base of the style). *Campanulàceæ.* A genus of hardy herbaceous perennials separated from Campanula only by minor characters, as the tricocular ovary and cylindrical nectary. Fls. blue, nodding, on short pedicels, produced freely in midsummer in slender but stiff, erect panicles or loose racemes. For culture, see *Campanula.* Prop. by seeds or cuttings in spring. The plants do not take kindly to division or other disturbance of the roots. Many other species than those in the trade are worthy.

commùnis, Fisch. (*A. liliifòlia,* Schur. *A. Fischeri,* G. Don. *A. liliifólia,* Ledeb.). Radical lvs. petiolate, ovate-rotund, cordate, crenate-dentate; cauline lvs. sessile, ovate-lanceolate, coarsely serrate; fls. numerous, in a pyramidal panicle; lobes of the calyx triangular; style exserted.

Lamárckii, Fisch. Lvs. ovate-lanceolate, sharply serrate, ciliate: fls. racemose; lobes of the calyx lanceolate; style not exserted.

Potanìni, Hort. Shrubby: spikes 2–3 ft. high: fls. $1^1/_4$ in. across, light blue. July–Aug. Int. 1899.

J. B. KELLER and W. M.

ADENÓSTOMA (*aden,* gland, *stoma,* mouth; calyx with 5 glands at the mouth). *Rosàceæ.* Shrubs, rarely small trees: lvs, linear, small; fls, white, about 1-5 in. broad, in terminal panicles; petals 5, stamens 10–15: fr. a small akene. Two species in Calif. Heath-like evergreen shrubs; very handsome when in full bloom. They may be cult. in temperate regions in a sunny position and well drained soil. *A. fasciculàtum* stands many degrees of frost. Prop. by seeds and greenwood cuttings in spring.

fasciculàtum, Hook. & Arn. Shrub, 2–20 ft.: lvs. fasciculate, linear; panicles rather dense, 2–4 in. long: fls. nearly sessile. May–June. Ranges northward to Sierra Co. The characteristic shrub of the chaparral or chamisal regions of the coast ranges of Calif. Int. 1891.

sparsifòlium, Torr. Shrub or small tree, 6–12 ft., rarely 30 ft., resinous: lvs. alternate; panicles loose; fls. pedicelled, larger, fragrant. S. and Lower Calif. Int. 1891. ALFRED REHDER.

ADÉSMIA (*not bound;* referring to the free stamens). *Leguminòsæ.* Tender shrubs from Chili.

A. balsamica, Bertero. Lvs. $1–1^1/_2$ in. long; leaflets 10–16 in pairs: racemes 3–8 fld.; fls. $^2/_3$in. across, golden yellow. B.M. 6921.—Has the odor of balsam. Not in Amer. trade.

ADHATÒDA (native name). *Acanthàceæ.* Tender shrubs, distinguished from Justicia by the less spurred anthers, and often by the habit and calyx. For culture, see *Justicia.*

cydoniæfòlia, Nees. Lvs. opposite on short petioles, ovate; lower lip broadly obovate, purple. Brazil. B.M. 4962. F.S. 12: 1222. R.H. 1873: 110.—Cult. in Calif.

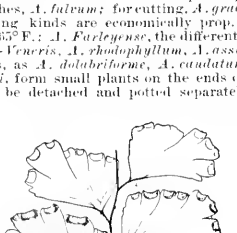
A. Vásica, Nees. Lvs. ovate-lanceolate, acuminate: fls. white, streaked red. Ceylon. B.M. 861 as *Justicia Adhatoda.*

ADIÁNTUM (Greek, *unwetted*). *Polypodiàceæ.* MAIDENHAIR FERN. A large genus of widely distributed ferns of tropical countries largely, with polished black or purplish stems, mostly smooth foliage to which water will not adhere, and marginal sori attached under neath an incrolled portion of the segment, which thus forms a protecting indusium. The requirements of cultivation are plenty of space, good drainage, and a compost of peat, loam and sand. Of the one hundred or more species, five are natives, of which *A. pedatum* is the best known.

L. M. UNDERWOOD.

The genus Adiantum furnishes us some of the most useful and popular species of commercial ferns. They are easy of cultivation. They need a slightly shaded position, moderately moist atmosphere, and a temp. of 60–65° F. The soil should be composed of rich loam and leaf-mold in equal parts, and should be kept moderately moist. Some of the most useful ones for general purposes (given under their trade names) are: *A. amulum,* grows about 12–15 in. high, and has very graceful dark green fronds; *A. bellum,* a dwarf, very compact species 6–8 in.; *A. cuneatum, A. cuneatum* var. *grandiceps,* with long, heavily-crested, drooping fronds; *A. cuneatum* var. *variegatum* makes a neat specimen; *A. concinnum,* gracefully drooping dark green fronds 15 in. long, with overlapping pinnæ; *A. concinnum* var. *latum,* of upright growth, is 24 in. high; *A. decorum* is very useful, 12–15 in., and has young fronds of a pleasing metallic tint; *A. excisum* var. *multifidum; A. formosum; A. Fergusonii; A. fragrantissimum; A. pubescens; A. tenerum* and var. *roseum; A. Wiegandi; A. LeGrandi,* very dwarf; *A. mundulum,* a very neat, dwarf species; *A. rubellum,* a dwarf species with mature fronds light green, young fronds of a deep ruby tint. The above may easily be grown from spores, if sown on a compost consisting of half each of finely screened, clean soil and leaf-mold or peat, and placed in a moderately moist and shady place in the greenhouse in a temp. of 60° F. To be grown most economically, they should be transplanted in clumps of 3 or 4 plants as soon as the first pinnæ have appeared, and, as soon as strong enough, potted off, either in clumps or singly.

Some very desirable species to grow into large, tall specimens are: *A. Æthiopicum, A. Bausei, A. Collisii, A. Fergusoni, A. formosum, A. Lathomii, A. Peruvianum, A. princeps, A. rhomboideum, A. Sancta Catharina, A. trapeziforme,* and *A. Williamsii.* The following are also recommended for special purposes: for fern-dishes, *A. falvum;* for cutting, *A. gracillimum.* The following kinds are economically prop. by division, temp. 65° F.: *A. Farleyense,* the different varieties of *Capillus-Veneris, A. rhodophyllum, A. assimile,* etc. Some kinds, as *A. dolabriforme, A. caudatum* and *A. Edgeworthii,* form small plants on the ends of fronds, which may be detached and potted separately, and if



33. Fruiting pinnules of Adiantum pedatum.

kept in a close atmosphere will in a short time grow into choice little plants. Temp. 65–70° F. The last three kinds are adapted for hanging baskets.

NICHOL N. BRUCKNER.

The following species are in the American trade, the names in italics being synonyms: (*A. róseum* is an undetermined horticultural name, possibly referable to A.

rubellum): *ornatum*, No. 28; *Æthiopicum*, 24; affine, 9; *amabile*, 29; *assimile*, 24; *Bausei*, 19; bellum, 27; Capillus-Veneris, 26; caudatum, 2; Collisii, 22; concinnum, 23; cuneatum, 28; curvatum, 16; *cyclosorum*, 30; *decorum*, 30; diaphanum, 8; digitatum, 35; *dolabriformе*, 1; *Edgeworthii*, 2; *elegans*, 30; *emarginatum*, 20; excisum, 25; Farleyense, 18; *Fergusoni*, 26; formosum, 11; *fragrantissimum*, 28; gracillimum, 34; hispidulum, 17; intermedium, 10; Jordani, 20; Kaulfussii, 5; *Lathomi*, 19; *LeGrandi*, 34; lunulatum, 1; macrophyllum, 4; *Mairisii*, 26; monochlamys, 32; Moorei, 29; *mundulum*, 28; Novæ-Caledoniæ, 14; Oweni, 30; *pulmatum*, 35; pedatum, 15; Peruvianum, 3; polyphyllum, 7; *princeps*, 19; *pubescens*, 17; pulverulentum, 12; *rhodophyllum*, 19; *rhomboideum*, 13; rubellum, 31; *Sanctæ Catharinæ*, 6; *Siebrechtii*, 30; *speciosum*, 35; tenerum, 19; trapeziforme, 6; *variegatum*, 28; venustum, 33; *Versaillense*, 28; *Victoriæ*, 19; villosum, 13; Wagneri, 30; *Wiegandi*, 30; Williamsii, 21.

34. Adiantum Farleyense.

A. *Fronds with a single row of small leaflets on either side, rooting at the apex.*

1. **lunulàtum,** Burm. (*A. dolabriforme*, Hook.). Fronds 1 ft. long on blackish wiry polished stipes; lower leaflets nearly semicircular, all on hair-like stalks. India, Trop. Amer., Australia.

2. **caudàtum,** Linn. (*A. Edgeworthii*, Hook.). Fronds 6 in. to 1 ft. long on short brownish densely hairy stipes; leaflets deeply cut into several spreading narrow lobes. Old World.

AA. *Fronds with usually a single row of large leaflets on either side, not rooting at the apex.*

3. **Peruviànum,** Klotzsch. Fronds 1 ft. or more long, on polished stipes, with obliquely ovate pointed leaflets, 2 in. long by 1^1_2 in. wide, on slender stalks; sori 8–10 on either side of the leaflet, twice as long as wide. Peru.

4. **macrophyllum,** Swartz. Fronds 1 ft. long, on rather stout polished stipes, with 4–6 pairs of wedge-shaped sessile leaflets 1^1_2–2 in. long by $^3_4$–1 in. wide; indusium nearly continuous on either side of the leaflet. Trop. Amer.

5. **Kaulfussii,** Kunze. Fronds 6–8 in. high, on slender black stalks; leaflets 5–11, 2 in. long, $^1_4$–1 in. wide, with unequal base; indusia very long and narrow, forming an almost continuous marginal band on either side of the leaflets. Mex., W. Ind.

AAA. *Fronds at least bipinnate, the segments dimidiate, i.e. with the veinlets all springing from the lower side of the leaflet, which is twice as long as broad.*

B. *Leaflets 1^1_2–2 in. long.*

6. **trapeziförme,** Linn. Fronds 18 in. or more high, with the terminal leaflet longer than the lateral; leaflets trapezoidal, with parallel sides, $^1_2$–$^3_4$ in. wide, lobed, and with numerous sori. *A. Sanctæ-Catharinæ* is a form with deeper lobes. Trop. Amer.

BB. *Leaflets smaller, an inch or less long.*

c. *Stalks polished, smooth.*

7. **polyphyllum,** Willd. Fronds often tripinnate, with stout black stalks; pinnæ 6–8, long, with closely set leaflets which are $^3_4$–1 in. long, the upper margin curved, with 4–6 circular or oblong indusia. S. Amer.

8. **diáphanum,** Blume. Fronds simply pinnate or usually with 1 or 2 pinnæ at the base; leaflets $^1_2$in. long, $^1_4$in. wide, with numerous sori placed in the sinuses of the inner and outer edges. Asia to N. Zeal.

9. **affine,** Willd. Fronds bipinnate, with a central pinna and several lateral ones; leaflets not exceeding $^3_4$in. long, $^1_4$in. wide, the upper edge parallel with the lower, and crenate, bearing numerous rounded sori on the upper and outer margin. N. Zeal.

cc. *Stalks polished but somewhat tomentose.*

10. **intermèdium,** Swartz. Fronds 1 ft. or more long, with a terminal pinna and 1–3 lateral ones on each side; leaflets 1 in. or more long, with interrupted sori on the upper and two-thirds of the outer margins. Trop. Amer.

ccc. *Stalks rough or hairy.*

11. **formòsum,** R. Br. Fronds 1–2 ft. long, two-thirds as broad, mostly tripinnate, with rough scabrous stalks and rather small deeply lobed leaflets $^1_2$–$^3_4$in. long, with rounded and toothed outer margins. Austral.

12. **pulverulèntum,** Linn. Fronds often a foot long, with a large terminal pinna and several lateral ones, bipinnate; stalks purplish, hairy, as are also the rachises; leaflets $^3_4$–1 in. long, $^1_4$in. wide, closely placed, the outer edge rounded or truncate. W. Ind.

13. **villòsum,** Linn. (*A. rhomboideum*, Swartz). Fronds large, with a terminal and several lateral pinnæ 6–12 in. long, on stout villous-hairy stalks; leaflets numerous, nearly 1 in. long $^1_2$in. wide, trapezoidal, with the inner side parallel to the rachis; indusia forming an almost continuous line along the upper and outer margins. W. Ind. and S. Amer.

14. **Nòvæ-Caledòniæ,** Keys. Fronds 6–8 in. long and wide, somewhat pentagonal, once pinnate with one or two secondary basal pinnæ on the lower side at base; leaflets attached to the rachises by a broad base, nearly 1 in. long, pointed, irregularly incised, bearing 1–4 rounded sori next to the base. New Caledonia.

AAAA. *Fronds forked, the two branches bearing pinnæ from the upper side.*

B. *Stalks polished, smooth.*

15. **pedàtum,** Linn. Fig. 33. Common Maidenhair of our northern states, with circular fronds on purplish stalks 1 ft. or more high.—Sometimes transplanted into gardens, requiring a shady, moist and protected place.

16. **curvàtum,** Kaulf. Fronds forked and with the main divisions once or twice forked; leaflets 1–1^1_2 in. long, nearly $^1_2$in. wide, the upper margin rounded and lobed. Braz.

BB. *Stalks scabrous (or rough).*

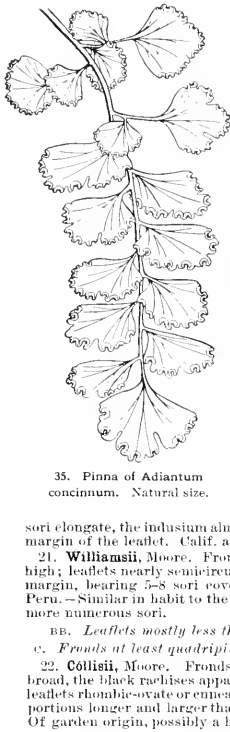
17. **hispidulum,** Swartz (*A. pubescens*, Schk.). The two divisions branching like a fan, with the largest pinnæ 6–9 in. long, made up of numerous leaflets $^1_2$in. or more long, two-thirds as broad, with numerous circular indusia on the upper and rounded outer margin. Old World.

AAAAA. *Fronds at least bipinnate, often tripinnate or quadripinnate, with numerous rather small fan-shaped or wedge-shaped leaflets with veins radiating from the base.*

B. *Leaflets an inch or less across.*

C. *Edges deeply cut into a series of narrow lobes.*

18. **Farleyénse,** Moore. Fig. 34. Fronds often reaching 15–24 in. in length, forming a rich profusion of closely overlapping pinnæ, light green; leaflets more or less wedge-shaped at base, with curved sides and the outer margin rounded and deeply cut into 10–15 narrow lobes, which rarely bear sori. Barbadoes. I.H. 19: 92.—Said to be a garden variety of *A. tenerum*, but apparently a good species.



35. Pinna of Adiantum concinnum. Natural size.

CC. *Edges not laciniately cut.*

19. **ténerum,** Swartz. Fronds deltoid, 12–15 in. long, two-thirds as wide, the terminal leaflets equally, the lateral unequally wedge-shaped at base, all of them rhombic and deciduous when dry, with 10 or less small sori on the outer and inner margins. *A. Lâthomi*, *A. Victóriæ*, *A. rhodophýllum*, *A. princeps*, and *A. Brúsei* are horticultural forms. Fla. and Trop. Amer.

20. **Jórdani,** C. Muell. (*A. emarginátum*, D. C. Eaton, not Hook.). Fronds 1 ft. or more long, 6 in. wide, mostly twice pinnate, with nearly semicircular leaflets; sori elongate, the indusium almost continuous around the margin of the leaflet. Calif. and Oreg.

21. **Williamsii,** Moore. Fronds triangular, nearly 1 ft. high; leaflets nearly semicircular, 3–4-lobed on the outer margin, bearing 5–8 sori covered with oblong indusia. Peru.—Similar in habit to the last, but smaller and with more numerous sori.

BB. *Leaflets mostly less than a half inch across.*

C. *Fronds at least quadripinnate, broader than long.*

22. **Cóllisii,** Moore. Fronds 1 ft. or more long, very broad, the black rachises apparently repeatedly forking; leaflets rhombic-ovate or emeate, those towards the outer portions longer and larger than those nearer the base.—Of garden origin, possibly a hybrid.

CC. *Fronds mostly triangular or oblong, longer than broad.*

D. *Shape of leaflets rhombic, the indusia kidney-shaped or nearly circular.*

23. **concínnum,** HBK. Fig. 35. Fronds 2–3-pinnate, 12–18 in. long, 6–9 in. wide, on rather stout black stalks; leaflets rhombic-oblong, slightly lobed; sori 4–8 on each leaflet, usually set close together. Mex. to Braz.

DD. *Shape of leaflets roundish with obtuse base, small or medium size.*

24. **Æthiópicum,** Linn. (*A. assímile*, Swartz). Fronds 1 ft. or more long on slender stalks, 2–3-pinnate, rather narrow; leaflets roundish or obscurely 3-lobed, the margin finely serrulate; sori 2–3 to a leaflet, with oblong or kidney-shaped indusia. Afr. and Austral.

25. **excísum,** Kunze. Fronds 2–3-pinnate, 6–12 in. long, 3–4 in. wide; leaflets about ¼in. wide, roundish, with the margin cut into small rounded lobes; sori large, 2–4 to each leaflet, kidney-shaped or circular. Chile.

DDD. *Shape of leaflets distinctly cuneate at the base.*

E. *Indusia oblong or indistinctly lunate.*

26. **Capillus-Véneris,** Linn. (*A. Férgusoni*, *A. Mairísii*, Moore). Fig. 36. Fronds 2–3-pinnate, 6–20 in. long, 3–8 in. wide; leaflets nearly ½in. wide, more or less irregularly lobed at the outer margin; sori 1–3 to each leaflet, with oblong or more or less elongate narrow indusia. Native southward, and widely distributed throughout the Old World.—Exists in many varieties, some of them deeply lobed, like *A. Farleyense*; a compact imbricated form is very effective.

27. **béllum,** Moore. Small, 3–8 in. high, bipinnate; leaflets with the outer margin crose and often divided into 2–3 shallow lobes; sori 2–3 to each leaflet, rather long and broad or somewhat lunate. Bermuda.

EE. *Indusia nearly circular, with a narrow sinus.*

28. **cuneátum,** Langs. & Fisch. (*A. amábile*, *A. mándalum*, Moore. *A. Versaillénse*, *A. fragrantíssimum*, Hort.). Fronds 3–4-pinnate, deltoid, 6–15 in. long, 5–9 in. wide; leaflets numerous, obtuse or broadly wedge-shaped at base, the margin rounded and more or less crenately lobed; sori 3–5 to each segment, with rather small rounded indusia. Braz.—Runs into many forms, of which *A. variegátum* is one.

29. **Moórei,** Baker (*A. amábile*, Moore, not Liebm.). Fronds 2–3-pinnate on long slender stalks, 6–15 in. long; leaflets ¼–½in. long, rhomboidal, with wedge-like base, deeply lobed; sori of medium size, 4–6 to each leaflet. Peru.

30. **Wágneri,** Mett. (*A. décorum*, *A. Wieyandi*, *A. élegans*, *A. Owéni*, *A. cyclosórum*, Moore). Fronds 2–3-pinnate, 6–9 in. long, 4–6 in. wide; lateral leaflets rhomboid, the terminal cuneate, slightly lobed or incised; sori 4–6 to each leaflet, with very large membranous circular indusia. Peru.—*A. Sitbrechtii*, Hort., "supposed to be a cross between *A. decorum* and *A. Williamsii*," has strong, graceful fronds thickly set with round pinnules of firm texture.

31. **rubéllum,** Moore. Fronds 4–6 in. long, deltoid, bipinnate; texture membranous, bright green, reddish when young; leaflets ½in. wide, deltoid or the lower rhomboid, the outer margin deeply lobed and the lobes finely toothed; sori round at the apices of the lobes. Bolivia.

36. Pinna of Adiantum Capillus-Veneris. Natural size

32. **monochlàmys,** D. C. Eaton. Fronds ovate-deltoid, 6–12 in. long, tripinnate; leaflets ¼in. wide, cuneate at the base, the upper edge rounded, slightly toothed, with a single sorus or rarely two in a decided hollow at the upper edge. Jap.

33. **venùstum,** Don. Fronds ovate-deltoid, tri-quadripinnate, 6–12 in. long; leaflets cuneate at the base, ¼in. wide, with the upper edge irregularly rounded or with 3 indistinct lobes, finely toothed, bearing 1–3 sori in distinct hollows. Ind.

BBB. *Leaflets minute, innumerable; fronds 4-6-pinnate.*

34. **gracillimum,** Hort. Fronds 1 ft. or more long, nearly as wide, 4–6-pinnate, with innumerable very small leaflets, which are ⅛–¼in. wide and usually bear a single sorus or rarely two.—Dense, compact forms are in cult. under the name of *A. LeGrándi.*

AAAAAA. *St. climbing, several ft. long, 3–4 pinnate.*

35. **digitàtum,** Presl. (*A. speciósum,* Hook. *A. pal mátum,* Moore). Fronds 2–3 ft. long on a stalk 18 in. or more long, with palmately lobed leaflets 1 in. or more wide. S. Amer.

L. M. UNDERWOOD.

ADLUM, JOHN. Plate II. Grape experimenter, and author of "Memoir on the Cultivation of the Vine," 1823 and 1828, the first separately published American grape book. Born in York, Pa., Apr. 29, 1759. Died at Georgetown, D. C., Mar. 1, 1836. He was a soldier in the Revolution, major in the provisional army in the administration of the elder Adams, and later a brigadier-general in the militia of Pennsylvania. He was also a surveyor and civil engineer. He also held an associate judgeship in Lycoming county, Pennsylvania, having been appointed by Gov. Mifflin. He was a friend of Priestly, and endeavored to apply the scientific knowledge of his time to agriculture. He early became interested in the amelioration of the native grapes, and established an experimental vineyard in the District of Columbia. He endeavored, but without success, to secure the use of certain public land in Washington for the purpose of "cultivating an experimental farm." He brought the Catawba grape to public notice. He was a pioneer in the awakening industrial activity of our new country. The botanist, Rafinesque, commemorated his name in the pretty genus Adlumia; but otherwise he has remained practically unknown until very recently. For further information, see Bailey, "Evolution of our Native Fruits."

L. H. B.

ADLÙMIA (from John Adlum). *Fumariàceæ.* A hardy biennial vine, which climbs over high bushes in our moist woods. Sow seed in spring in a damp, cool place. Transplant in fall, if possible, if transplanted at all. It flowers the first season.

cirrhòsa, Raf. CLIMBING FUMITORY. MOUNTAIN FRINGE. ALLEGHENY VINE. Figs. 37, 38. Climbs by the slender young leaf-stalks. Lvs. thrice pinnate; leaflets cut-lobed, delicate: fls. white or purplish, in ample panicles. G.W.F. 13.

ADÒNIS (a favorite of Venus, after his death changed into a flower). *Ranunculàceæ.* Hardy annual and perennial herbs with showy flowers. Six well known species, natives of temperate regions of Eu. and Asia. Fls. solitary, terminal; petals 5–16, yellow or red; carpels many: st. about 1 foot high, very leafy: lvs. alternate, cut into very narrow divisions: fr. an akene. Culture easy in any good soil, light, moist earth preferred. They thrive in full sun or partial shade; the perennial species well suited for rockwork, borders, etc. Annuals prop. by the seeds, which are slow-germinating, sown in autumn or earliest spring; perennials by seeds or root divisions.

A. *Annuals: fls. crimson or scarlet.*

B. *St. simple except at top; center of fl. yellow.*

æstivàlis, Linn. PHEASANT'S EYE. Stems erect, often branched at top: fls. crimson; petals flat, obtuse, half longer than calyx. June. Var. **citrina,** Hoffm., is a garden variety with citron-yellow fls.

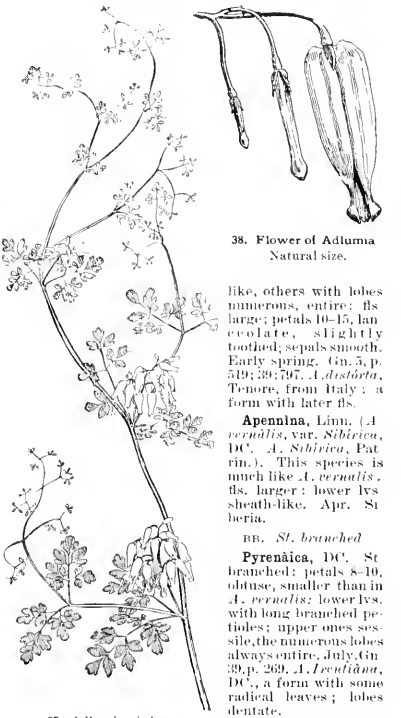
BB. *St. branched; center of fl. dark.*

autumnàlis, Linn. FLOS ADONIS. Fig. 39. St. branched: fls. small, crimson, with dark center, globose; petals 6–8, concave, slightly larger than calyx. May–July. Gn 12, p. 131.—Sparingly naturalized.

AA. *Perennials: fls. yellow.*

B. *St. not branched.*

vernàlis, Linn. (*A. Apennìna,* Jacq. *A. Daùrica,* Reichb.). SPRING ADONIS. St. simple: lower lvs scale



38. Flower of Adlumia
Natural size.

37. Adlumia cirrhosa.

like, others with lobes numerous, entire: fls large; petals 10–15, lanceolate, slightly toothed; sepals smooth. Early spring. Gn. 5, p. 549; 39; 797. *A. distórta,* Tenore, from Italy: a form with later fls.

Apennìna, Linn. (*A vernàlis,* var. *Sibírica,* DC. *A. Sibírica,* Patrin.). This species is much like *A. vernalis.* fls. larger: lower lvs sheath-like. Apr. Siberia.

BB. *St. branched*

Pyrenàica, DC. St branched: petals 8–10, obtuse, smaller than in *A. vernalis;* lower lvs. with long branched petioles; upper ones sessile, the numerous lobes always entire. July. Gn 39, p. 269. *A. Tenuifòlia,* DC., a form with some radical leaves; lobes dentate.

Volgénsis, Stev. (*A Volgénsis,* Hort.) Much like *A. vernalis,* but st. branched: lvs. scale-like at base, petioled or sessile above: fls. like *A. Pyrenaica,* but sepals pubescent on under side. Apr. Volga region

A. Amurensis, Regel & Radde, a beautiful species, with broad yellow fls; not much cult. in Amer.; has many Japanese varieties. B.M. 7490. G.M. 40: 360. Gn. 52: 1225.—*A. microcarpa,* DC. is a pale-flowered variation of *A. æstivalis.*—*A. parviflòra,* Fisch. Allied to *A. æstivalis.*

K. C. DAVIS.

ÆCHMÈA (from *aichme,* point; referring to the rigid points on the calyx). *Bromeliàceæ.* The Æchmeas are closely allied to the Billbergias, from which they are distinguished by smaller flowers, which are little exserted from the calyx and not widely expanding, short filaments and small anthers, sharp-pointed sepals and conspicuous sharp-pointed flower-bracts. They are epiphytic herbs, of about 60 species, natives of Trop. S. Amer. Flower-cluster arising from a cluster or rosette of long, hard leaves, which are usually serrate; petals 3, tongue-shaped, obtuse or pointed, 2–3 times the length of the spine-pointed calyx-lobes; stamens 6, shorter than the

petals: ovary inferior, 3-celled. The flowers are subtended by (in the axils of) flower-bracts; the entire head or flower-cluster is often reinforced or subtended by conspicuous leaf-bracts; in the compound-inflorescence types, the individual branches are usually subtended by branch-bracts. In some species, as *Æ. Lalindei* and *Æ. Mariæ-Reginæ*, the large colored leaf-bracts are the most conspicuous part of the plant. In others, as *Æ. Veitchii*, the entire head is the showy part. Monograph

39. Adonis autumnalis.

by Baker, Journ. Bot. 1879: 129, 161, 226. Includes *Canistrum*, *Echinostachys*, *Hohenbergia*, *Hoplophytum*, *Lamprococcus*, *Peronenthra*, *Pothuava*; and some of the species have been referred to *Billbergia*, *Cryptanthus*, *Guzmannia*, *Tillandsia*, *Chevaliera*, etc. For culture, see *Billbergia*.

A. *Fls. 2-ranked on the branchlets.*

distichántha, Lemaire. Lvs. 2–3 ft. long, with a dilated base 4–5 in. long and half as wide, the blade rigid and channelled, edges prickly: scape 1–1½ ft.: fls. in a bipinnate panicle 4–7 in. long and half as wide, the petals tongue-shaped and red-purple, longer than the obtuse-cuspidate sepals: fl.-bract pocket-like, ¼in. long. Braz. B.M. 5447.

AA. *Fls. multifarious,—in several or many rows on the spike or branchlets.*

B. *Inflorescence simple.*

c. *Ovary compressed or flattened.*

Lalíndei, Lind. & Rod. Large (3–4 ft.), with long and broad spine-edged lvs.: spike very dense, greenish white, from the color of the aggregated calices, the fls. subtended by many deflexed, showy red, long-pointed, entire bract-lvs: corolla not exserted. New Granada. I.H. 30: 481.—Striking.

Mariæ-Reginæ, Wendl. Smaller than the last in all its parts: petals blue-tipped when young, fading to crimson like the bracts, half as long again as the mealy cuspidate sepals; fl.-bracts entire, small, not showy: bract-lvs. toothed. Costa Rica. B.M. 6441.—One of the best species.

Veitchii, Baker. Lvs. spotted, serrate: petals pale, a little longer than the sepals: fl.-bracts conspicuous, toothed, scarlet: bract-lvs. greenish, erect, serrate, not encompassing the inflorescence. S. Amer. B.M. 6329.—Referred to Ananas by Bentham & Hooker.

cc. *Ovary terete (cylindrical).*

D. *Head oblong.*

Lindeni, Koch (*Hoplophytum Lindeni*, Morr.). Lvs. dilated and entire at base, the blade minutely toothed and 2–3 ft. long, the tip broad-rounded and short-cuspidate: petals lemon-yellow, twice as long as sepals. Braz. B.M. 6565.

DD. *Head globose.*

calyculàta, Baker (*Hoplophytum calyculàtum*, Morr.). Lvs. about 1 ft. long, with an oblong, dilated base, the blade minutely toothed and rounded at the tip, but terminated with a minute cusp: scape shorter than the lvs., with several deciduous lanceolate bract-lvs.: petals tongue-shaped, not half an inch long, bright yellow: fl.-bracts small, entire, reddish. S. Amer.

fasciàta, Baker (*Billbérgia fasciàta*, Lindl. *B. rhodocyánea*, Lemaire). Lvs. 1–2 ft. long, with an oblong entire clasping base, the blade strongly toothed and the back marbled with whitish cross-lines, the tip rounded and mucronate: scape 1 ft. high, floccose, the several bract-lvs. pale red and erect; petals ¾in. long, pink. Braz. B.M. 4883. B.R. 1130. F.S. 3: 207.—Inflorescence sometimes forked.

BB. *Inflorescence branched (or compound).*

c. *Calyx and ovary not longer than the fl.-bract.*

glomeràta, Hook. Lvs. strongly toothed, 1½–2 ft. long: fls. in dense, rounded spikes disposed in a narrow panicle 1 ft. long; petals blue or violet, longer than the calyx: fl.-bracts long, pointed, scarlet (in one variety whitish). Braz. B.M. 5668.

cc. *Calyx prominently longer than the fl.-bract.*

D. *Panicle large, 3-pinnate; petals bright red.*

spectábilis, Brongn. Lvs. 2–2½ ft. long, minutely serrate: fl.-bracts very small; petals twice as long as sepals. Guatemala. R.H. 1875: 310.

DD. *Panicle 1- or 2-pinnate; petals blue or violet.*

E. *Fls. pedicellate.*

cæruléscens, Hort. Lvs. 1¼–2 ft. long, with small prickles: panicle 4–5 in. long, 2-pinnate, with lax few-fld. crowded branches; petals bluish red, ⅓in. long: fl.-bracts none or minute. S. Amer. Gt. 1871: 694.—Produces white berries.

EE. *Fls. sessile.*

cœléstis, Baker. Lvs. much as in the last: panicle deltoid, 3–5 in. long, 2-pinnate, floccose, the lower branches subtended by red branch-bracts 1 in. long; petals nearly half an inch long, blue. S. Amer.

fúlgens, Brongn. (*Æ. discolor*, Hort.). Lvs. broad, with small distant teeth, with a broad cuspidate end: panicle large, simple above, branched below, glabrous, bearing numerous fls.; petals blue-tipped, exceeding the rich red calyx; fl.-bracts minute or none: branch-bracts yellowish. S. Amer. B.M. 4293.

Weilbachii, F. Didr. Lvs. rather short, overtopped by the red-stemmed and red-bracted scape: panicle narrow, 1-pinnate, the fls. rather crowded, blue and red. S. Amer. R.H. 1871: 170.

Var. **Leodiénsis**, André. Lvs. violet and spotted: fls. shorter. Braz.

Æ. augústa, Baker. Allied to Æ. Mariæ-Reginæ. Plant large: fls. small, rose; petals short-protruded; panicle 1 ft. high, deltoid. Braz. R.H. 1881, p. 437 (as Hohenbergia ferruginea).—*Æ. aurantiaca*, Baker. Pl. vigorous: lvs. expanded in the middle: fls. yellow, 2 in. long. S. Amer. B.H. 1873: 15 (as Canistrum aurantiacum).—*Æ. Barleri*, Baker. Fls. 2-ranked; corolla pale yellow. Honduras.—*Æ. Brasiliénsis*, Regel. Lvs. much dilated at base, whitish below, black-toothed: petals light blue, calyx and rachis red: panicle branched. Braz. Gt. 1885: 1202.—*Æ. bromelifólia*, Baker. Dense spike: lvs. whitish below, 3–4 ft. long, serrate or spinescent: fls. light yellow. S. Amer.—*Æ. Cornúi*, Carr. =Æ. nudicaulis.—*Æ. Drakeánæ*, André. Lvs. whitish, finely dentate: spike simple and lax; fls. long-tubular, light blue; bracts and ovaries coral-red: berries rose, becoming blue. S. Amer. R.H. 1888, p. 401.—*Æ. exsúdans*, Morr. Lvs. whitish below: spike globular and dense, mucilaginous; petals yellow. Braz. L.B.C. 9: 801. B.H. 1878: 303.—*Æ. Fürstenbergii*, Morr. =Streptocalyx Fürstenbergii.—*Æ. ferruginea*, Carr. =Æ. augusta.—*Æ. Hystrix*, Morr. Lvs. lepidote, whitish, crowded: spike oblong, dense; fls. purple, tomentose. Guatemala.—*Æ. macracantha*, Brongn. =Æ. Schiedeana.—*Æ. Melinónii*, Hook. Panicle 3-pinnate, dense; petals bright red: lvs. spiny, 1½–2 ft. Guaiana. B.M. 5235.—*Æ. Mexicana*, Baker. Lvs. long and large, fine-toothed: panicle 3-pinnate, long and lax, the peduncles mealy; petals crimson. Mex.—*Æ. miniata*, Hort. =Billbergia thyrsoidea!—*Æ. myriophýlla*, Morr. Allied to Æ. distichantha. Lvs. narrow, 2–3 ft., spiny, silvery-scaly on the back: fls. red, the petals fading blue. Trop. Amer. B.M. 6939.—*Æ. nudicaulis*, Griseb. Lvs. long and straight, brown-toothed: bract-lvs. snb-tending: spike large, brilliant red; petals yellow. Trop. Amer. R.H. 1885: 36 (as Æ. Cornúi, which is a form with shorter and denser spike).—*Æ. paniculígera*, Griseb. Lvs. large and long:

panicle 1-2 ft. long, with few-flowered branches; scape tall, reddish, downy; fls. purple. Trop. Amer.—*Æ. Schiedeana*, Schlecht. (*Æ. macracantha*, Brongn.). Lvs. large, rigid, strongly armed; panicle 3-pinnate, pubescent; fls. pale yellow. Mex. Gt. 1894:455.—*Æ. zebrina* is Billbergia zebrina. L. H. B.

ÆGLE (from *Ægle*, one of the Hesperides). *Rutàceæ*, tribe *Aurantieæ*. Small, strongly spinose trees, with alternate, trifoliolate leaves. Distinguished from the nearly related genus Citrus (particularly *C. trifoliata*) by the hard, gourd-like rind of its fruit and its viscous, woolly seeds.

Mármelos, Correa. Elephant Apple. Marédoo. Bengal Quince. Bael Fruit. Small tree; fr. large, 2–4 in. in diam., round or pear-shaped. Trop. Asia.—Cult. in S. Fla. and Calif., and in hothouses. The wood is valued for its strength, and the sweet, aromatic pulp is used medicinally in India for diarrhœa and dysentery, and also as a lemonade and conserve. H. J. Webber.

ÆGOPÒDIUM (*aix*, goat, and *podion*, a little foot; probably from the shape of the leaflets). *Umbellifera*. Goutweed. Coarse, hardy herbaceous perennial, with creeping rootstocks, biternate lvs., sharply toothed, ovate leaflets, and white fls. in umbels.

Podagrària, Linn., var. **variegàtum**, is a variegated form of this European weed, which makes attractive mats of white-margined foliage. Common in yards.

AERÁNTHUS. Consult *Angræcum*.

AËRÌDES (Greek, *air-plant*). *Orchidàcea*, tribe *Vándeæ*. Epiphytes; stems erect, roundish; lvs. distichous, strap-shaped and spreading, coriaceous, deeply channeled at the base, obtuse; peduncles from the axils of the lvs.; fls. in loose or dense racemes; petals narrower than the sepals. A genus of remarkably beautiful plants, which develop well under cultivation. Species confined to the tropics of the Old World. The genus Aërides, though not in general cultivation, has many sterling qualities to recommend it. Some of the species produce dense racemes of great beauty, which emit a pleasing fragrance, and for decorative purposes have few if any rivals in the Orchid family. The genus offers no exceptional difficulties to the horticulturist. Oakes Ames.

All the species of Aërides are of easy culture in the warmest greenhouse—one that has a minimum temperature of 65° F. in winter being best. They should be kept constantly moist, well shaded, and warm, with fresh live sphagnum round the roots at the base of the stems. *A. odoratum* is perhaps the best known. Other favorites are *A. Lawrenciæ* and *A. Fieldingii*; the latter often has racemes 18 inches or more long, of a beautiful rose color. Cult. by E. O. Orpet.

Following are in the American trade: *A. affine*, No. 11; Amesianum, 9; Augustianum, 8; Ballantineanum, 4; Bermanicum, 1; crassifolium, 15; crispum, 14; *cylindricum*, 18; Dayanum, 2; Ellisii, 2; *expansum*, 10; falcatum, 10; Fieldingii, 13; Godefroyanum, 11; *Houlletianum*, 10; Japonicum, 16; *Larpenta*, 10; Lawrenciæ, 9; Leeanum, 6; Leonàvi, 10; Lindleyanum, 14; Lobbii, 11; marculosum, 12; majus, 1; maximum = ?; mitratum, 19; multiflorum, 11; odoratum, 1; pallidum = ?; purpurascens, 1; quinquevulnerum, 5; radicosum, 17; *Reichenbachii*, 4; Rœbelenii, 5; Rohanianum, 4; *roseum*, 11; Sanderianum, 9; Savageanum, 3; suavissimum, 4; Thibautianum, 7; vandarum, 18; virens, 2; Warneri, 14.

A. *Odoratum section: middle lobe of labellum narrow-oblong.*

1. **odoràtum**, Lour. Lvs. 6–8 in. long, 1–1¼ in. wide, unequal at apices, deep green; peduncles not branched, pendulous; fls. numerous, crowded; racemes cylindrical, as long as or longer than the lvs.; lateral sepals ovate; petals obovate-lanceolate, white, with a carmine apical spot; labellum trilobed, midlobe magenta, side lobes white, dotted with magenta; spur recurved, greenish or white. Cochin China. B.M. 4139. Gn. 49, p. 158. Gt. 8:273. B.R. 18:1485. Var. **Bermánicum**, Reichb. f. Fls. smaller than in the type, the apices of the petals with mauve lines and dashes instead of blotches. Var. **purpurascens**, Hort. Produces large racemes, sepals and petals tipped with pale amethyst. Var. **màjus**, Hort. Fls. larger; racemes longer.

2. **virens**, Lindl. Peduncles 12–15 in. long, 15–20 fld.; spur dotted with magenta; petals and sepals tipped with magenta. Java. P.M. 14:197. B.R. 30:41.—This species is very similar to *A. odoratum*, of which it is considered by some to be a geographical form. Var. **Ellisii**, Hort. (*A. Ellisii*, Hort.). Sepals and petals white, suffused with rose, tipped with amethyst-purple. Var. **Dayànum**, Hort. Racemes very long; fls. bright, large.

3. **Savageànum**, Hort. Sepals white at base, dotted with purple, otherwise crimson-purple; petals similar, narrower; labellum crimson-purple, with a greenish, straight spur; midlobe denticulate on the margin.

4. **suavissimum**, Lindl. (*A. Reichenbachii*, Linden. *A. Rohanianum*, Reichb. f.). Plant robust, more lax in habit than type; fls. 20–30, 1½ in. across; petals and sepals white, suffused with carmine at apices; labellum trilobed, yellowish dotted and suffused with carmine; apex of spur white. Straits of Malacca. Var. **Ballantineànum**. Racemes shorter; blooms earlier; sepals and petals tipped with amethyst-purple.

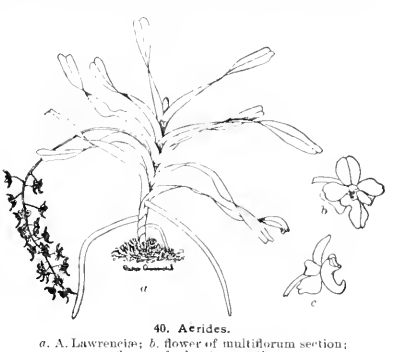
5. **quinquevùlnerum**, Lindl. Racemes 1 ft. long; fls. crowded; dorsal sepal and petals equal, lateral sepals orbicular, all tipped with magenta; midlobe of labellum magenta. P.M. 8:241. Var. **Rœbelenii** (*A. Rœbelenii*, Reichb. f.). Sepals and petals shading to green at bases, petals denticulate; lobes of the labellum lacerated, midlobe rose-colored. Manila.

6. **Leeànum**, Reichb. f. Peduncles much longer than the lvs.; pedicels rose-color; sepals rose-purple, white at base; petals similarly colored; labellum small; midlobe deep purple; spur green tipped. India.

7. **Thibautiànum**, Reichb. f. Racemes pendulous, longer than the lvs.; sepals and petals rose-color; labellum amethyst-purple; midlobe narrow, acute. Malaya.

8. **Augustiànum**, Rolfe. Petals and sepals shaded with rose; spur long, straight. Philippine Isls. G.C. III. 7:233.

9. **Lawrenciæ**, Reichb. (*A. Lawrenciànum*, Hort.). Largest species of the section. Fls. 20–30, 1¾–2 in. in diam.; sepals and petals flushed with amethyst-purple at the apices; labellum yellowish; midlobe amethyst-purple. Philippine Isls. Gn. 35:702. Var. **Amesiànum**,



40. Aerides.
a, A. Lawrenciæ; *b*, flower of multiflorum section; *c*, flower of odoratum section.

Kranzl. More robust; fls. more intense in color. Var. **Sanderiànum**, Hort. Lvs. narrow; fls. yellowish, with amethyst on face of spur, otherwise like the species.

AA. *Falcatum section: lateral lobes of labellum falcate.*

10. **falcàtum**, Lindl. & Pax. (*A. Larpèntæ*, Hort. *A. expànsum*, Reichb. f.). Lvs. loosely arranged, 6–8 in. long, 1½ in. broad; fls. loosely arranged on racemes 1 ft.

long, 1^1_4 in. in diam.; sepals and petals white, tipped with amethyst; side lobes of labellum falcate, pale amethyst; front lobe convex, denticulate, keeled above, amethyst in center, margined with white and barred with rose; spur short. Upper Burmah. Var. **Houlletiànum** (*A. Houlletiànum*, Reichb. f.). Fls. large, 1^1_4 in. in diam.; petals and sepals pale buff, magenta apical blotch; labellum creamy white; side lobes penciled with magenta, front lobe keeled. Cochin China. B.R. 21: 205. R.H. 1891: 324. Var. **Leonæi** (*A. Leonæi*, Reichb. f.). Side lobes blunt and retuse.

AAA. *Multiflorum section; apical lobe of labellum hastate.*

B. *Peduncles not ascending.*

11. **multiflorum**, Roxb. (*A. affine*, Wall. *A. vîscosum*, Lodd.). Plant compact, dwarf: lvs. stout, leathery, 6–10 in. long, dotted with brown (?); scapes 15–20 in. long, often branching; fls. small and crowded; petals and dorsal sepals ovate, equal in length, rose-colored shading to white at the base, dotted and spotted with crimson, inferior sepals pale, less spotted; labellum cordate-rhomboid at right angles, with other segments scarcely trilobed, deep rose; spur compressed, very short. India. B.M. 4049. Gt. 8: 267. Var. **Lòbbi** (*A. Lòbbii*, Hort.). Lvs. crowded; peduncles more branching; fls. more intensely colored; very distinct. I.H. 15: 559. Var. **Godefroyànum**, Hort. (*A. Godefroyànum*, Reichb. f.). Fls. larger than in type and more brilliant in color. R.B. 17: 169. This is the most widely distributed of the East Indian species, if we except *A. odoratum*.

12. **maculosum**, Lindl. Plant compact: lvs. dark spotted: racemes pendent, sometimes branching; sepals and petals pale rose, dotted with purple; anterior lobe rose-purple, white at base. India.

13. **Fieldingii**, Lodd. FOX-BRUSH ORCHID. Tall: lvs. glossy, 7–10 in. long; peduncles pendulous, branched near the base, 18–24 in. long; fls. crowded, petals and sepals white, suffused and dotted with rose; labellum scarcely trilobed, white suffused with rose. Sikkim, Assam.

14. **crispum**, Lindl. St. brownish: lvs. rigid, 5–8 in. long; peduncle often branched, pendulous; fls. not dense, large; petals and sepals white, flushed with rose-crimson, deeper colored on dorsal surfaces; lip trilobed, side lobes small, midlobe rose-amethyst. S. Ind. B.M. 4427. F.S. 5: 438. Gn. 4, p. 85. B.R. 28: 55. Var. **Lindleyànum**, Hort. Larger: fls. paler, racemes branching. Var. **Wärneri**, Hort. Dwarf: fls. smaller and paler than in type.

15. **crassifòlium**, Par. & Reichb. f. Compact in growth: lvs. 6–10 in. long; fls. 1^1_2 in. in diam.; petals and sepals bright rose-magenta, shading off towards bases; labellum trilobed, side lobes subfalcate, rose-magenta, front lobe ovate, deeper colored. Burma.

16. **Japónicum**, Reichb. f. Smallest species of the genus in cult.: lvs. 3–4 in. long, linear oblong: fls. few; peduncles loosely racemose; sepals and smaller petals greenish white, lateral sepals barred with amethyst-purple; labellum crenate, ridged, dark violet, with 2 erect lobules. Japan. B.M. 5798.—This interesting species marks the N. limit of the genus Aërides. Requires cooler treatment than the other species.

BB. *Peduncles ascending.*

17. **radicòsum**, Reichb. Lvs. 8 in. long, 1 in. wide; peduncles ascending, 8–10 in. long, sometimes branching near the base; fls. $^3_4$ in. across, purplish; sepals and petals pale rose, verging on crimson; column winged. India.

AAAA. *Vandarum section: lip various: lvs. terete.*

18. **vandárum**, Reichb. f. (*A. cylindricum*, Hook.). St. slender: lvs. 4–6 in. long, channeled above, clasping at bases, alternate: peduncles 2–3 fld.: fls. 1^3_4–2 in. in diam.; segments undulate; sepals white, lanceolate; petals white, irregularly obovate; lip trilobed, nearly divided in front, dentate, sides erect. Sikkim Himalaya, 4,000–5,000 ft. B.M. 4982. J.H. III. 34: 417.—Much like *Vanda teres* in foliage. Subtropical species.

19. **mitrátum**, Reichb. f. Lvs. semi-terete: racemes many-fld.; sepals and petals white; labellum rose-purple. Burma. B.M. 5728.

OAKES AMES.

ÆRVA (name of no signification). *Amarantàceæ*. Tender herbs or shrubs, allied to Achyranthes. Lanate plants of Trop. Asia and Afr., with perfect or imperfect fls., the perianth segments short and hyaline: stamens 5 or 4, sterile filaments intervening: fls. very small, usually in clusters, white or rusty.

sanguinolenta, Blume (*A. sanguínea*, Hort.). Lvs. 1^1_2–2^1_2 in. long, opposite or alternate, ovate, acuminate, soft, pubescent, pale beneath. Java.—Cult. for its dark red leaves.

ÆSCHYNÁNTHUS (*aischunē*, ashamed, ugly, and *anthos*, flower; probably referring to the wide-mouthed gaping of the fls.). *Gesnerâceæ*. About 40 species of tropical Asian twining or rambling parasitic small shrubs, bearing very showy, more or less fleshy tubular fls., and cult. in warm houses (stoves): lvs. opposite or verticillate, thick, or even fleshy: perfect stamens 4, ascending under the upper part of the imperfectly 2-lobed corolla; stigma entire: capsule 2-valved.

Nearly all the species of this exceedingly interesting genus are from the hot, tropical forests of Java and Borneo, where they grow in company with orchids and other plants on the trunks of trees. The fls., which are produced in the axils of the lvs. and at the ends of the shoots, last a long time in perfection. Being epiphytal under natural conditions, they should be put in a rooting medium which will require renewal not oftener than once in two years. They must have perfect drainage, as they suffer from stagnant moisture, but during the period of growth they must have copious supplies of water. Prop. by seeds, cuttings, and division. Cuttings are the most satisfactory in building up a flowering plant from the beginning. Seeds are slow, and divided pieces, unless their roots are in a good condition previous to the operation, do not make as good plants as cuttings. Cuttings should be taken early in the spring, and kept close until they are rooted and established in small pots. During the first year they should not be allowed to bloom, but encouraged to make growth by pinching out the ends of the shoots and shifting into larger pots as they require it. Most of the kinds look their best when grown as basket plants suspended from the roof of the stove. Wire baskets are best. In preparing them, first put in a lining of moss, next a goodly quantity of rough cinders, and the rooting material may consist of chopped fibrous peat, sphagnum, charcoal, and small pieces of pots or bricks, with a little coarse-grained sand. For a basket 12 in. across, several small plants out of 3-inch pots may be used, and in a hot, humid atmosphere the growth is encouraged until the sides of the receptacle are covered. During winter they should be rested by withholding water to a certain extent, and decreasing the temperature considerably. A good method of growing the scandent kinds, where facilities are at hand, is to start the small plants on blocks of wood, attach those to damp but warm walls, to which they will cling by means of the roots thrown out from every leaf joint.

41. Æschynanthus pulchra ($\times\frac{1}{2}$).

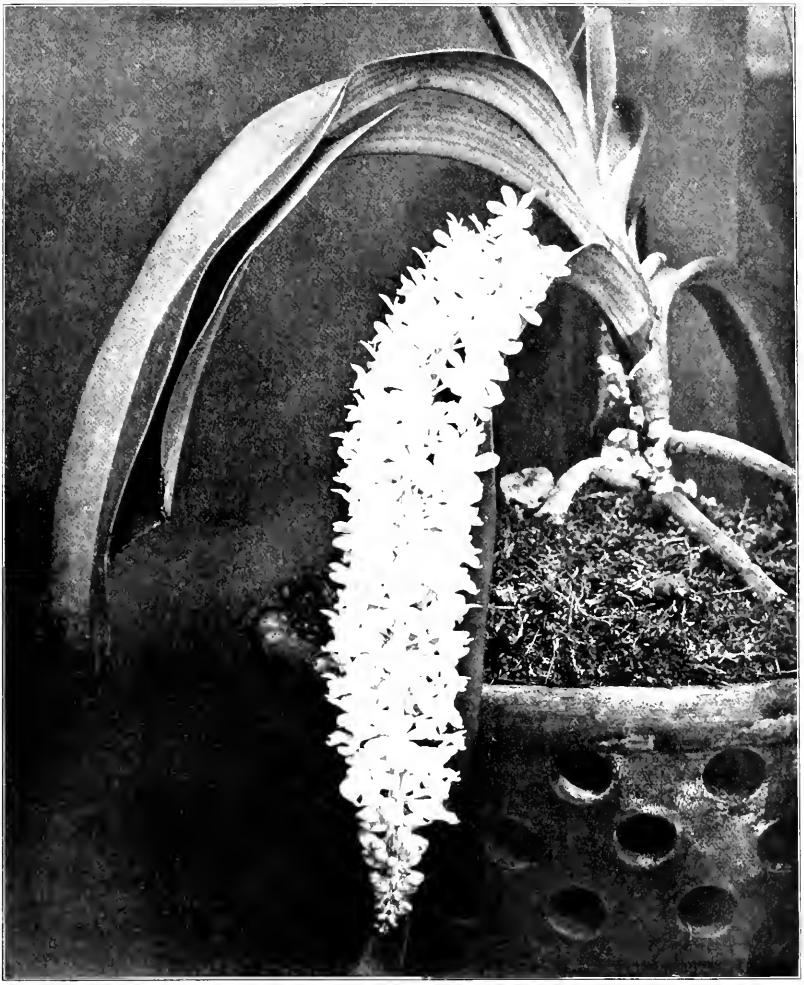
Cult. by G. W. OLIVER.

A. *Calyx deeply 5-parted, the lobes acute.*

grandiflòra, Spreng. St. creeping, mostly herbaceous, 4–5 ft.: lvs. lanceolate, acuminate, 4–5 in. long, repand-serrate, fleshy: fls. aggregated; calyx fleshy and short; corolla arched-tubular, 2–3 in. long, downy, orange-scarlet. E. Ind. B.M. 3843. P.M. 5: 241.—Will succeed in an intermediate house.

AA. *Calyx tubular, entire or shortly 5-toothed.*

pùlchra, Don (*Æ. pùlcher*, DC.). Figs. 41, 42. Trailing: lvs. broadly ovate, distantly small-toothed; corolla glabrous, brilliant scarlet, 3 times longer than the glabrous greenish calyx. Java. B.M. 4264. R.B. 18: 13. R.H. 1883: 204. P.M. 16: 161.



Aërides Fieldingii

Lobbiàna, Hook. The commonest species in cult. in this country: differs from *Æ. pulchra* in narrower and nearly entire lvs., corolla downy and projecting only twice or less the length of the purple downy calyx. Java. B.M. 4260, 4261.

Æ. Boschiàna, De Vr.=*Æ. Lamponga.*—*Æ. bilyeux,* Wall. Lvs. lanceolate: calyx tubular, short-toothed, glabrous: corolla about 2 in. long, orange-red, pubescent. E. Ind. B.M. 4891.—*Æ. Javanica,* Hook. Allied to *Æ. pulchra*: differs in pubescent

42. Æschynanthus pulchra.

calyx and corolla. B.M. 4503. F.S. 6:558.—*Æ. Lampónga,* Miq. Lvs. ovate or elliptic, obtusish, entire: calyx cylindrical, glabrous: corolla twice as long (2 in.), pubescent, scarlet. Sumatra. P.M. 13:175.—*Æ. longiflòra,* Blume. Vigorous: lvs. 3–5 in. long: calyx deeply cut, the divisions linear-subulate: corolla tubular, scarlet, very long: fls. fascicled. Java. B.M. 4328. P.M. 15: 25. —*Æ. miniàta,* Lindl. Fls. vermilion, in 3's in the axils of the oval or elliptic entire lvs.: corolla pubescent. Java, Borneo. P.M. 16: 65.—*Æ. speciòsa,* Hook. Branches knotty: lvs. large, oval-lanceolate, nearly sessile, the upper ones verticillate or in 3's: fls. fascicled, numerous: calyx with linear-subulate divisions: corolla large, orange-red, curved. Java. B.M. 4720. P.M. 14:199. Gn. 51:1109.—*Æ. splèndens,* Lindl. & Paxt.=*Æ. speciosa.* —*Æ. splendida,* garden hybrid, with scarlet-spotted black fls., in terminal fascicles.—*Æ. tricolor,* Hook. Lvs. small, oval or lanceolate, hairy at the base: calyx obconic, pubescent: corolla small, pubescent, blood-red, throat orange, upper lobes striped black or purple: fls. mostly in trios. Borneo. B.M. 5031. R.B. 10: 7. I.H. 5:169. F.S. 13:1384. J.H. III. 35:571.

L. H. B.

ÆSCULUS (ancient name of some oak, or mast-bearing tree). *Sapindàceæ.* Horse-chestnut. Buckeye. Deciduous trees and shrubs: lvs. opposite, long-petioled, digitate; leaflets 5–7, large, serrate: fls. symmetrical in terminal, showy panicles; petals 4–5, stamens 5–9: fr. a large trilocular capsule with 1–6 seeds. N. Amer., E. Asia, Himal., N. Greece. Ornamental trees and shrubs with handsome fls.; hardy except the Californian and Himalayan species, growing best in moist and loamy soil. The larger-growing species are excellent shade trees, and the fls. are showy and interesting. The fr. is not edible. Prop. by seeds, to be sown in the fall or stratified, or by grafting and budding on common species, and the shrubby forms also by layers. *Æ. parviflora* prop. also by root-cuttings.

A. *Winter-buds resinous: claws of the petals not longer than the calyx; stamens exserted.*

B. *Petals 4–5; calyx campanulate, 5-lobed; stamens 5–8; fr. globular. (Hippocastanum.)*

Hippocástanum, Linn. Common Horse-chestnut. Fig. 43. Large tree, 60–80 ft.; leaflets 5–7, sessile, cuneate-obovate, acuminate, obtusely serrate, nearly glabrous: panicles 8–12 in. long, very showy; fls. white, tinged with red: fr. echinate. May. From Himalayas to N. Greece.—Many garden forms, as var. **flòre plèno,** with double fls.; bears no fr. I.H. 2:50. Var. **pùmila,** Dipp. Dwarf form. Var. **umbraculifera,** Hort., with compact, roundish top. Var. **laciniàta,** Dipp. (var *dissecta,* Hort., var. *heterophylla,* Hort.), leaflets laciniate. Var. **Mémmingeri,** Hort., leaflets dotted with white. Some other variegated forms. The horse-chestnut is one of the most popular of shade trees on the continent of Europe, and is also much planted along roads and in parks and private grounds in this country. It is particularly adaptable for bowers and places where seats are desired, as the top stands heading-in and makes a very dense shade. Hardy in the N. states.

turbinàta, Blume (*Æ. Sinénsis,* Hort., not Bunge.). Tree, 30 ft.: petioles pubescent; leaflets 5–7, nearly sessile, cuneate-obovate, crenate-serrate, pubescent beneath when young: panicles 6–10 in. long, dense and rather narrow: fls. yellowish white, smaller than those of *Æ. Hippocastanum:* fr. rugose. June. N. China, Japan. G.C. III. 5: 717.

cárnea, Hayne (*Æ. Hippocástanum* × *Pàvia. Æ. rubicánda,* Loisel.). Tree, 20–40 ft.: leaflets mostly 5, nearly sessile, cuneate-obovate, crenate-serrate, nearly glabrous: panicles 5–8 in. long; fls. varying from flesh-color to scarlet: fr. with small prickles. B.R. 1056. L.B.C. 13:1242. F.S. 2:229–30.—Many garden forms, according to the different shades in coloring, and one with double fls. Commonly planted in parks and on roadsides. Handsome and desirable.

BB. *Petals 4, white or pale rose-colored; calyx 2-lipped; stamens 7–9; fr. pear-shaped, smooth. (Calothyrsus.)*

Califórnica, Nutt. Tree with broad top, 30–40 ft.: leaflets 5–7, petioled, oblong-lanceolate, cuneate or obtuse at the base, sharply serrate, smooth: panicles 3–8 in. long, rather dense. Calif. B.M. 5077. R.H. 1855, p. 150. Gn. 49, pp. 490, 492. S.S. 2:71, 72. F.S. 13:1312.

AA. *Winter-buds not resinous; claws mostly longer than the 5-toothed calyx.*

B. *Petals 4, yellow to scarlet; stamens included or somewhat exserted: leaflets petioled. (Pavia.)*

glàbra, Willd. (*Æ. Ohioènsis,* Michx. *Pàvia glàbra,* Spach. *P. pùmila,* Spach.). Small tree 15–30 ft.: leaflets 5, oval or cuneate-obovate, finely serrate, smooth: panicles 5–6 in. long; fls. greenish yellow; claws as long as the calyx; stamens exserted: fr. echinate. May. N. Amer. B.R. 24:51. S.S. 2:67, 68. Var. **argùta,** Robins. (*Æ. argùta,* Buckl.) Shrub: leaflets 6–7, obovate-lanceolate, unequally serrate.

43. Opening foliage of Æsculus Hippocastanum.

octándra, Marsh. (*Æ. flàva,* Ait. *Æ. lùtea,* Wangh. *Pàvia lùtea,* Poir.). Large tree, 40–90 ft.: leaflets 5, oblong-obovate or elliptical, cuneate, equally serrate, smooth or pubescent beneath: panicles 4–6 in. long; petals yellow, very dissimilar; stamens 7, shorter than the petals: fr. smooth. May–June. N. Amer. L.B.C. 13:1280. S.S. 2:69, 70. Var. **discolor** (var. *hýbrida,* Sarg. *Æ. flàva,* var. *purpurascens,* Gray. *Æ. discolor,* Pursh. *Æ. Michaùxii,* Hort.). Lvs. tomentose beneath: fls. red or purple. B.R. 310. An intermediate form is *Æ. neglécta,* Lindl. B.R. 1009.

versicolor, Dipp. (*Æ. octándra* × *Pávia*. *Pávia hýbrida*, Spach. *Æ.* or *P. Lyóni*, Hort.). Intermediate between *Æ. octandra* and *Æ. Pavia*. Lvs. pubescent beneath: fls. yellow, tinged with red or nearly red.

Pàvia, Linn. (*Pávia rúbra*, Poir. *P. Michaùxi*, Spach.). Shrub or small tree, 4–20 ft.: leaflets oblong or elliptical, acute at both ends, finely serrate, smooth or pubescent beneath: panicles 4–7 in. long, loose: fls. purplish to dark red: petals very dissimilar: stamens mostly 8, nearly as long as the petals: fr. smooth. May–June. N. Amer. B.R. 993. L.B.C. 13:1257. Var. **hùmilis** (*Æ. húmilis*, Lodd.). Low shrub, 2–4 ft.: leaflets coarsely and unequally serrate, tomentose beneath: fls. red, tinged with yellow; calyx dark red. B.R. 1018.—Many garden forms, as var. **carnea,** Hort. Fls. flesh-colored. Var. **atrosanguínea,** Hort. Fls. very dark red. Var. **Whitleyi,** Hort. Fls. brilliant red. Var. **péndula,** Hort. (*P. péndula*, var. *péndula*, Hort.). Dwarf form, with pendulous branches: lvs. smooth. Some forms with variegated lvs.

BB. *Fls. pure white, small; petals 4–5; stamens more than twice as long as the petals.* (*Macrothýrsus.*)

parviflòra, Walt. (*Æ. macrostáchya*, Michx. *Pávia álba*, Poir.). Shrub, 3–10 ft.: leaflets 5–7, elliptical or oblong-ovate, nearly sessile, finely serrate, pubescent beneath: panicles 8–16 in. long, narrow; fr. smooth. July–Aug. S. states. B.M. 2118. Gng. 7:81.—One of the handsomest plants for a lawn clump.

Æ. Chinénsis, Bunge. Allied to *Æ.* turbinata. Leaflets distinctly petioled, rounded at the base. China.—*Æ. Indica*, Colebr. Fls. similar to *Æ.* Hippocastanum: lvs. obovate-lanceolate, distinctly petioled, smooth. Himal. B.M. 5417.—*Æ. Parryi*, Gray. Similar to *A.* Californica. Leaflets small, obovate, evanescent-tomentose beneath: calyx 5-lobed. Calif. G.F. 3:356.

ALFRED REHDER.

ÆTHIONÈMA (*aithō*, scorch, and *nema*, filament; probably referring to appearance of stamens). *Cruciferæ.* Dwarf shrubs for the hardy herbaceous border or rockery. Less common than Iberis. The genus differs from Iberis in having all its petals equal, and from Lepidium in having its four stamens longer, winged and toothed. Fls. various shades of pink and purple. W. B. Hemsley, in Gn. 9, pp. 108, 109.

They dislike a moist or stiff soil or shady places; but in light, sandy loam, on dry and sunny slopes, they are compact and branchy, and when once fairly established will last for many successive years without replanting or renewal, while under the opposite conditions the plants grow feeble and lanky, and may die after a year or two. They keep fully as well as the Candytufts in water, and can be cut with longer and straighter stems. Prop. by seeds in spring or by cuttings in summer; annual and biennial kinds by seeds. J. B. KELLER.

coridifòlium, DC. (*Ibéris jucúnda*, Schott & Kotschy). Branches numerous, thick, 4–6 in. high: lvs. crowded, short, nerveless, linear or linear-oblong, acute or obtuse: fls. smaller and later than in the next, in dense, short, rounded racemes. Chalky summits of Lebanon and Taurus. B.M. 5952.—Good for edging. *A. pulchéllum* was sold under this name for many years.

grandiflòrum, Boiss. & Hohen. Branches 1–1½ ft.: lvs. usually longer than in *Æ. coridifolium*, more linear and more acute: fls. as large as those of *Arabis alpina*, in slender, elongated racemes; petals 4 times as long as the sepals. Persia. Gn. 9:5.

Pérsicum, Hort. Stout, erect, shrubby, dwarf. Fls. deep rose. Best of dwarfs. Int. 1892, by J.W. Manning.

pulchéllum, Boiss. & Huet. Similar to *Æ. coridifolium*, but more diffuse and trailing. Fls. smaller and brighter-colored; petals 2½ times as long as the sepals. Persia. Gn. 25:436. W. M.

AGALMŸLA (*agalma*, ornament, and *hulē*, wood; an ornament to the woods in which they grow wild). *Gesnerāceæ.* Tender climbers from Java, which may be grown in a basket like Æschynanthus.

A. longistyla, Carr., is considered a synonym of the next. R.H. 1873:270.—*A. staminea*, Blume. St. rooting from the lower surface: lvs. alternate, with an abortive one opposite the base of each; petioles 4–8 in. long; blade as long, ovate, serrate: fls. in large axillary sessile fascicles of 12–14; stamens exserted. B.M. 5417. P.M. 15:73. F.S. 4:358.

AGANÍSIA (Greek *aganos*, desirable). A small genus of tropical American epiphytal orchids, little cult. in N. Amer. Botanically allied to Warrea and Zygopetalum. Need a humid atmosphere. Grown on blocks in high temp. Prop. by dividing pseudobulbs.

tricolor, N. E. Brown. Fls. in a raceme; sepals whitish; petals light blue; lip in the form of a saddle, marked with orange-brown. S. Amer.

pulchélla, Lindl. Fls. white, blotched yellow on the lip, in a racemose spike from the base of the bulb. S. Amer.

The above species are the only ones known to have been offered in the Amer. trade. There are 5 or 6 others. *A. cerúlea*, Reichb. f. Fls. in axillary peduncles, blue-blotched, the lip bristled. Braz. —*A. cyanea*, Benth. & Hook. (not Reichb., which = Acacallis cyanea). Much like *A. tricolor*, the lip blue and undulate at the tip. B.R. 1845:28, as Warrea cinerea, Lindl.; also, W. cyanea, Lindl. (see Rolfe, *Cat. C.* III. 6, p. 492).

AGAPÁNTHUS (*agapē*, love, and *anthos*, flower). *Liliàceæ.* Conservatory plants, with tuberous rootstocks, tall simple scape, and 2-bracted umbel of handsome fls.: perianth with 6 wide-spreading divisions, nearly regular: pod many-seeded; seeds flat, winged above: foliage evergreen.

In this country, Agapanthuses are usually grown in tubs (the roots are apt to burst pots), and are flowered in late spring or early summer in the conservatory, window garden, or living room. The plant is kept dormant during winter, as in a frame or light cellar, only enough life being maintained to prevent the lvs. from falling (the var. *albidus* usually loses its leaves). When in bloom, give abundance of water. Plants will bloom many years if given a large enough tub, not allowed to become overcrowded in the tub, and supplied with manure water, sending up many clusters each year. Good results can also be obtained in single pots. It forces well. If kept dormant until spring, they may be bedded in the open, or massed in vases, for summer bloom. Prop. by dividing the roots (and rarely by seeds). Old roots break up more easily if soaked in water a few hours. When dormant, the plant will stand a few degrees—usually 10° or less—of frost.

umbellàtus, L'Her. AFRICAN LILY. LILY OF THE NILE. Fig. 44. Lvs. 2 ft. long and numerous, thick, narrow;

44. Agapanthus umbellatus.

scape rising 2–3 ft. from the leaf-rosette, bearing an umbel of 20–50 handsome blue fls.: perianth funnel-shaped, with a short tube. Cape of Good Hope. B.M. 500.—One of the best known of half-hardy liliaceous plants. There are white-flowered varieties (the best known is var. **álbidus**); dwarfs, as var. **minor** and var. **Mooreánus,** both with blue fls.: giant forms, as var. **máximus** (both blue

and white-fld.), with scape 4 ft. high; double-fld. variety; variegated-lvd. varieties, as var. **aŭreus** and var. **variegātus**; var. **Leichtlinii**, a compact-trussed blue form; and others. L. H. B.

AGÁRICUS. A genus of fleshy fungi, considered under *Mushroom*.

AGATHÆ̀A. See *Felicia*.

ÁGATHIS (*agathis*, glome; the fls. in clusters). Tender Australian conifers, allied to Araucaria, yielding Dammar resin. Cones axillary, globular or short.

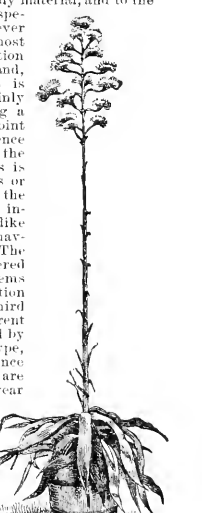
robŭsta, Hook. (*Dámmara robústa*, C. Moore). Branches somewhat verticillate, horizontal: lvs. broad, oval-lanceolate, obtuse: tree reaching 130 feet in Austral. —Cult. in Calif.

45. Agave Americana, as commonly grown in greenhouses.

AGÀVE (Greek, *agauos*, admirable). *Amaryllidàceæ*. Important decorative and economic plants from hot American deserts, the most familiar of which is *A. Americana*, the AMERICAN CENTURY PLANT. St. short or wanting: lvs. mostly in a close rosette, mostly stiff and more or less fleshy, persisting from year to year, the margins mostly armed with teeth and the apex tipped with a more or less pungent spine: fls. in spikes or panicles; perianth 6-parted, more or less funnel-shaped; stamens 6, mostly long-exserted; style 1; ovary inferior, 3-celled; seeds numerous, flat, thin, triangular, black. Some species flower but once and die, others occasionally, while others flower from year to year. The number of species is about 150, although more than 325 have been described. One of the largest collections is at Kew, where there are 85 named species. The largest collections in the United States are at the Botanical Garden of Washington and the Missouri Botanical Garden, where there are about 75 species each. Amateurs often cultivate a greater number of species than are described in this account. Agaves are essentially fanciers' or amateurs' plants. This noble group of plants has never received the attention it deserves, and yet no genus of plants in America furnishes so many suitable decorative plants. Sir Joseph Hooker places it next to the palm and aloe, but the former is a great family of 1,100 species. While in the United States we think of the Agaves only as decorative plants, yet in Mexico, their native home, they are the most useful of plants. Many species furnish fiber, others soap, while still others produce the two great Mexican drinks, *Pulque* and *Mescal*. Pulque, which is a fermented drink, is obtained from several species, especially *A. atrovirens*. Mescal, which is a distilled drink, is usually not obtained from the same species as Pulque, although there is a general belief to the contrary. The species from which is made most of the Mescal used in Mexico is unknown. The species vary so much in size and form that they can be used in a great many ways. Some of the smaller species are suitable for the house, and even some of the larger species are so used. The larger species are well adapted for vases in large gardens and grounds, along walks, terraces, etc. These plants, coming, as they do, from arid or even desert regions, where they have a hard struggle to exist, can be grown with little or no care, but they respond very quickly to good treatment. The species are propagated in various ways; some produce suckers at the base or even underground shoots; others give off buds from the stem, which fall off and take root, or may be detached and planted; while not a few produce bulblets in the flower-clusters, and sometimes in great abundance, while all may be produced from seed. But as most of the species flower only after a long interval, and many have not yet been known to flower in cultivation, this latter means of propagation can not be relied upon. In cultivation, fruit is set very sparingly or not at all without artificial pollination, although this can be accomplished with very little trouble. Monograph by J. G. Baker, Amaryllideæ, 1888. J. N. ROSE.

None of the Agaves are at all difficult to grow. The soil should be principally loam and sand, and if any vegetable soil be given it should be in small quantities. Good drainage and firm potting are necessary. To grow small plants of the large-leaved kinds into good-sized specimens quickly, they should be plunged out in a sunny spot in spring, taking care that the pots are large enough so that they will not require repotting in the fall. Nearly all of the large-growing kinds are easily increased from suckers, which, when the plants are grown in a pot-bound condition, are produced very readily. They should only be taken off from the parent plant when furnished with sufficient roots to give them a start. Some kinds are raised only from seeds, which, when freshly gathered, germinate in a few weeks. Cult. by G. W. OLIVER.

The classification of the Agaves is a very difficult one. This is partially owing to the great number of species, to the difficulty of preserving study material, and to the infrequency of flowering in many species. In fact, many species have never been known to flower. The most usable characters for classification are to be found in the leaves, and, although such an arrangement is more or less artificial, it is certainly the most satisfactory in naming a collection. From a botanical point of view, however, the inflorescence shows the true relationship of the species. In this way the genus is usually divided into three groups or subgenera. These are: First, the *Euagave*, having a paniculate inflorescence, with candelabra-like branches. Second, the *Littæa*, having a dense spike of flowers. (The section *Littæa* has been considered by some a good genus, but it seems to connect with the first section through certain species.) The third section, *Manfreda*, is very different from the above, and is considered by the writer as a distinct generic type, although treated here in accordance with general usage. Manfredas are all herbaceous, appearing each year from a bulbous base, the lvs. are soft and weak, dying down annually, while the inflorescence is a slender open spike, with solitary fls. from the axils of bracts.



46. Agave Americana in flower.

The following Agaves are here described: albicans, No. 30; Americana, 1; *Amurensis*, 27; *angustifolia*, 3; applanata, 7; atrovirens, 5; attenuata, 19; *Beaucarnei*, 28; Botteri, 29; brachystachys, 40; *Candelabrum*, 3; Celsii, 31; *coarctata*, 5; cochlearis, 6; dasylirioides, 36; densiflora, 32; Deserti, 10; echinoides, 34; Elemeetiana, 20; *ensiformis*, 34; filifera, 13; geminiflora, 16; Gilbeyi, 26; *glaucescens*, 19; heteracantha, 22; horrida, 26; *ixtlioides*, 3; Kerchovei, 28; Kochii, 27; *latissima*, 5; Lecheguilla, 23; *Lehmanni*, 5; macracantha, 8; macu-

lata, 39; maculosa, 38; Mexicana, 2; micracantha, 33; mitis, 33; *mitraeformis*, 5; Nissonii, 25; *potatorum*, 11; Potosina, 41; Primglei, 4; recurva, 34; *Richardsii*, 34; rigida, 3; *rigidissima*, 28; *Salmiana*, 5; schidigera, 14; Scolymus, 11; Schottii, 18; Shawii, 9; Sisalana, 3; striata, 34; stricta, 34; Taylori, 17; *Thuacanensis*, 5; univittata, 21; Utahensis, 12; vestita, 15; Victoriæ-Reginæ, 24; Virginica, 37; xylonacantha, 27; yuccæfolia, 35.

A. *Foliage persisting from year to year: inflorescence dense, many-fld.: plants flowering after a more or less long interval, often but once, in others occasionally.*

B. *Inflorescence a compact panicle; fls. borne in clusters near the ends of horizontal branches. (Euagave.)*

1. **Americàna**, Linn. COMMON CENTURY PLANT. Figs. 45, 46. Plants becoming very large; lvs. 40–50, either straight or the tips recurved; the margin scalloped between the sharp teeth: fl. 3 in. long, yellow. The most common species in cult. A.F. 7: 503. Gn. 12, p. 397. G.C. III. 19: 17. Gn. 47, p. 59. F.E. 10: 595. Trop. Amer. Several varieties, of which var. **picta**, var. **variegàta** (B. M. 3654) and var. **recurvàta** are the best known.—Some forms have lvs. striped, and others bordered with yellow. This species is the one which is commonly grown as a tub plant by florists, being used out-of-doors in the summer for lawn and porch decoration.

2. **Mexicàna**, Lam. Plants becoming very large: lvs. 20–30; similar to *A. Americana*. Common in Eu. Int. about 1817, from Mex. G.C. II. 19: 149.

3. **rigida**, Miller. St. wanting or sometimes 4 ft. long: lvs. thin, narrow, elongated; the margin either smooth or toothed. S. Mex. Perhaps more than one species included under this name. *A. angustifolia*, Haw., seems to belong here. B.M. 5893, as *A. ixtlioides*. Gng. 5: 89.

Var. **elongàta**, Baker (*A. Candelàbrum*, Todaro). St. much elongated.

Var. **Sisalàna**, Engelm. SISAL HEMP. Margin of the lvs. entire. Yucatan. Naturalized on Fla. keys.—Recommended for cult. on a large scale in certain cheap lands of Fla. Largely grown in Yucatan as a fiber plant, the fiber being exported to U. S. and used in making cheap cordage.

4. **Pringlei**, Engelm. Lvs. sword-like, very stiff, 18 in. or less long, narrowed from near the base to the sharp tip, the margin with small, hooked, brown prickles: fl. 1½ in. long, yellow. Lower Calif.

5. **atrovirens**, Karw. (*A. Thuacanénsis*, Karw. *A. Salmiàna*, Otto). Often attaining a great size: lvs. few, 10–30, becoming 9 in. broad and 7–9 ft. long, very thick at base and glaucous throughout, tipped with a stout spine; the upper part of the margin horny: fl. 4 in. long. Mex. G.C. II. 8: 177.—Several species have passed under this name.

Var. **latissima** (*A. latissima, coarctàta, Lèhmanni*, and *miltæformis*, Jacobi). Lvs. broader, oblong-spatulate (8–9 in. broad above the middle).

6. **cochleàris**, Jacobi. PULQUE PLANT of W. Mex. Very similar to the above, but lvs. longer and a foot wide, not glaucous. Int. about 1867, but rare in collections.

7. **applanàta**, Lem. Stemless: lvs. sometimes 150, 3–3½ in. broad, stiff and glaucous, with long, pungent end spine: fl. 3 in. long, greenish yellow.—A beautiful species from Mex. Int. about 1862.

8. **macracántha**, Zucc. Small, stemless, compact: lvs. about 50, a foot long, very stiff and pungent, glaucous: fls. in a lax raceme. Int. about 1830, from central Mex. G.C. II. 8: 137.

9. **Shàwii**, Engelm. Stemless: lvs. 50–60 or even more, oblong-spatulate, 8–10 in. long, dull green and slightly glaucous, with a brown tip-spine an inch long, the edge with upturned brown teeth ½ in. or less long: fls. 3–3½ in. long, greenish yellow. S. Cal. Int. about 1875.

10. **Desérti**, Engelm. Stemless: lvs. few, in a rosette, oblanceolate, a foot or less long, deep concave above, very glaucous, tip-spined, the lower half of the blade with hooked prickles: fl. yellow, 2 in. or less long. S. Cal. Int. about 1875.

11. **Scólymus**, Karw. Lvs. 20–40, 9–18 in. long, 3–6 in. wide, glaucous; the margin indented between the teeth: fl. 2–3 in. long, yellowish. Mex. Gn. 12, p. 397. Int. about 1880.—Said to be common, with several varieties. *A. potatòrum*, Zucc., may be only a form of the above.

12. **Utahénsis**, Engelm. Stemless: lvs. sword-like, 1 ft. or less long, thick and rigid, the sharp tip-spine an inch long, the margin with triangular teeth, glaucous: fl. an inch long. Utah and Ariz.

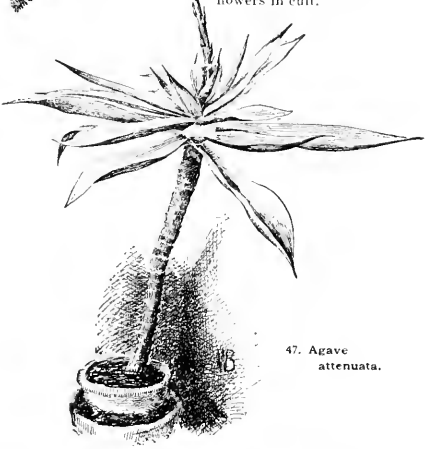
BB. *Inflorescence a dense, cylindrical spike: fls. usually borne in twos. (Littæa.)*

C. *Margins of lvs. not toothed.*

D. *Lvs. linear, stiff, smooth, with the margins splitting off into fine threads.*

13. **filifera**, Sahn-Dyck. Plant small, compact, about 1 ft. in diam.: lvs. about 100, linear, stiff, 9 or 10 in. in diam., light green in color, with a very pungent tip: fl. 2 in. long, brownish: stalk 5–8 ft. long. Mex. G.C. III. 21: 167. I.H. 7: 243.—Several species are often found in collections under this name.

14. **schidigera**, Lem. Very similar to the above, but with somewhat broader lvs. and the margin splitting off into white ribbons. Mex. B.M. 5641.—Frequently flowers in cult.



47. Agave attenuata.

15. **vestita**, Watson, also of the type of *A. filifera*, is a very recently described and introduced species. Lvs. more bronzy than that species. Mex. table lands. A.G. 1892: 609.—It deserves a place in any large Agave collection.

16. **geminiflòra**, Ker-Gawl. (*Bonapártea júncea*, Haw.). Lvs. often 200–300, narrowly linear, somewhat recurved, 1½–2 ft. long, somewhat convex on both sides: flower stalk sometimes 25 ft. long. Mexico, where it grows commonly along streams. B.R. 1145. F.S. 7, p. 6.—Very common.

17. **Tàylori**, Hort. A garden hybrid of *A. geminiflora* and *A. densiflora* is often seen in cult. Mn. 7: 111. G.C. II. 8: 621.

18. **Schóttii**, Engelm. (*A. geminiflòra* var. *Sonòræ*, Torr.). Stemless: lvs. linear, 1 ft. or less long and only ⅔ in. broad, flat or concave, very rigid, sharp-tipped, the margin usually with white threads: fls. 1½ in. long. S. Ariz. B.M. 7567.

DD. *Lvs. broad and fleshy.*

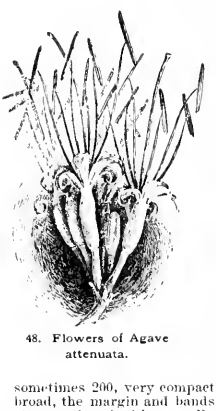
19. **attenuàta,** Salm-Dyck (*A. glaucéscens,* Hook.). Figs. 47–49. St. 4–5 ft., crowned by a great mass of lvs., sometimes 6 ft. in diam.: lvs. about 20, 2–3 ft. long, 6–8 in. broad at the widest point, very glaucous on both sides; fl.-spike 5 ft. long; fl. 2 in. long, greenish yellow. G.F. 10:95. G.C.II. 2:218, 223. G.C. III. 17:455, 457. B.M. 5333. Gn. 51,p. 407.—This is one of the most majestic of the Agaves. It has flowered only twice in the United States,—in the Washington Botanical Garden, in 1897 and 1898.

20. **Elemeetiàna,** Koch. Very near the above, but stemless: lvs. about 25, 1^1_2–2 ft. long, 4^1_2–6 in. wide; pale. B.M. 7027. G.C. II. 8:749.—A var. **subdentàta** is sometimes sold.

CC. *Margins of lvs. more or less toothed.*

D. *Border of lvs. horny throughout.*

21. **nnivittàta,** Haw. Stemless: lvs. about 50, rigid, 2–2^1_2 ft. long, dark green except a pale band down the center: fls. yellowish. Mex. B. M. 6655.—Int. about 1830.



48. Flowers of Agave attenuata.

22. **heteracántha,** Zucc. Very common. Forms seen in collections show a very polymorphous species. Stemless: lvs. about 20, with a pale band down the center; teeth widely separated, never banded, 12 in. long, 2 in. broad. Mex.—Numerous varieties. Int. 1862.

23. **Lecheguilla,** Torr. Rather common in collections, but usually passing as *A. heteracantha.* Seemingly a good species, though referred by Baker to *A. heteracantha.* Lvs. not banded, and spine very long. W. Tex. and N. Mex.

24. **Victòriæ-Reginæ,** Moore. Stemless: lvs. sometimes 200, very compact, rigid, 6–8 in. long, 1^1_2 in. broad, the margin and bands on the back white, obtuse at apex, tipped with a small spine. Mex. Gn. 8, p. 351. G.C. II. 4:485; II. 18:841. I.H. 28:413.—A very remarkable species. Int. in 1872, but now seen in all collections. Probably more cult. than any other kind except *A. Americana.*

25. **Nissoni,** Baker. A small species usually growing in clumps; especially desirable for large vases. Lvs. 5–6 in. long, with a pale band down the center. Mex.—Not known to have flowered.

26. **hòrrida,** Lem. Stemless: lvs. about 40, compact, rigid, with a very stout end spine, not striped: fls. nearly 2 in. long, yellowish. Mex. B.M. 6511.—Many forms.

Var. **Gilbeyi,** Baker. Lvs. with a pale stripe down the center. G.C. I. 33:1305. Gt. 1874, p. 84.

27. **xylonacántha,** Salm-Dyck. Stout-stemmed: lvs. 20 or less, sword-like, 3 ft. or less long, with a sharp brown point, slightly glaucous green, with a few darker green lines on the back, the margin with a few large teeth: fls. 1^1_2in. or less long, greenish yellow. Mex. B.M. 5660. G.C. II. 7:523.—*A. Amarénsis* and *A. Kóchii,* Jacobi, are forms of this species.

28. **Kerchòvei,** Lem. (*A. Beaucárnei,* Lem. *A. rigidíssima,* Jacobi). Stemless: lvs. 20–30, sword-like, a foot or less long, rigid, dull green with a pale central band above, not dark-lined below, with lanceolate curved teeth: fls. 1^1_2in. long. Mex. G.C. II. 7:523.—Many forms, as **diplacántha, macrodónta, pectinàta.**

DD. *Border of lvs. not horny.*

E. *Lvs. oblong, with small teeth.*

29. **Bótteri,** Baker. Stemless: lvs. 50, 2 ft. long, broad, pale green; triangular teeth on margin, crowded and black. Mex. B.M. 6248.—A very beautiful species.

30. **álbicans,** Jacobi. Stemless: lvs. about 30, in a dense cluster, 15 in. or so long, 3–3^1_2in. wide, tapering to a weak spine, glaucous on both sides, the margin lined with small black teeth: spike of fls. about 15 in. long: fls. yellowish. Mex. B.M. 7207. G.C. II. 8:717.—This is one of the smaller Agaves. It does not die down after flowering. A form with variegated lvs.

31. **Célsii,** Hook. (*A. Celsiàna,* Jacobi). Stemless: lvs. 20–30, oblong-spatulate, 2 ft. or less long, not strongly spine-tipped, the marginal lanceolate spines unequal, glaucous: fls. 2 in. or less long, purplish green, the tube very short. Mex. B.M. 4934.

32. **densiflòra,** Hook. Stemless: lvs. 30–40, oblanceolate-spatulate, 3 ft. or less long, glaucous when young but becoming green, the end-spine $^1_2$in. long, the marginal deltoid prickles 1 line or less long: fls. 2 in. or less long, greenish brown. Mex. B.M. 5006.

33. **mitis,** Salm-Dyck. Short-stemmed: lvs. 30, oblanceolate, 15 in. or less long, 3 in. at broadest part, tip-spine weak, the teeth very small and green or only obscurely brown-tipped, green: fls. 2 in. long. Mex.—*A. micracántha,* Salm-Dyck, is very similar.

EE. *Lvs. very narrow, weak, the surface mostly ribbed: the margin minutely serrulate*

34. **striàta,** Zucc. Stemless or nearly so: lvs. 150–200, linear from a wide base, 2^1_2ft. or less long, scabrous on the edge, sharp-tipped, glaucous-green, and ribbed on both surfaces: fl. 1^1_2in. long, brown-green. Mex. B.M. 4950. Cult. under several forms, as var. **recúrva,** Baker. Lvs. larger and more falcate, not sharp-tipped. Var. **stricta,** Baker (*A. stricta,* Salm-Dyck). Dwarf: lvs. very stiff, 1 ft. long. Var. **echinoides,** Baker (*A. echinoides,* Jacobi. *A. ensiformis* and *A. Richardsii,* Hort.). Dwarf and stiff: lvs. only $^1_2$ft. long.

35. **yuccæfòlia,** DC. St. short: lvs. 20–40, much nerved, linear and recurved, with a pale center, entire or nearly so. Mex. B.M. 5213.—Int. about 1800.

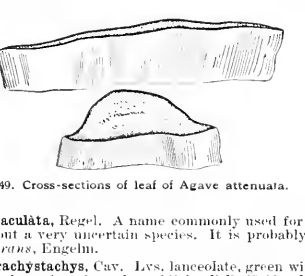
36. **dasyliroides,** Jacobi. Stemless: lvs. about 100, linear, stiff, very glaucous, serrulate, finely striate vertically on both faces: fl. nearly 2 in. long, yellow. Mex. B.M. 5716.

AA. *Foliage weak and soft, dying down annually: inflorescence a slender open raceme or spike: st. arising from true bulbs.* (*Manfreda.*)

37. **Virginica,** Linn. Lvs. few, green, 6–20 in. long, spreading, lanceolate; pale green or brown mottled, with a narrow white and nearly entire margin: stalk 3–6 ft. high: fls. greenish. S. states. B.M. 1157.

Var. **tigrina,** Engelm., a form from South Carolina and Missouri, has spotted lvs.

38. **maculòsa,** Hook. Fig. 50. Basal lvs. 6–10, blotched with brown or green, soft and fleshy, somewhat recurved, the margin serrulate: st. 15–25 in. high, bearing a few scattered lvs. or leaf-like bracts: fls. 10–25, nearly sessile, 2 in. long, purplish; stamens a little longer than the segments of the fl. S. Tex. B.M. 5122.—Generally labelled *A. maculata.*



49. Cross-sections of leaf of Agave attenuata.

39. **maculàta,** Regel. A name commonly used for the above, but a very uncertain species. It is probably *A. protuberans,* Engelm.

40. **brachystachys,** Cav. Lvs. lanceolate, green with a pale nearly entire edge: fls. reddish. B.R. 25:55.—Rare in collections, but a very important plant in Mexico, furnishing much of the "amole" of the natives.

H. **Potosina**, Rob. & Greenm. An odd little species, resembling very much *A. Virginica*. Sometimes met with under the name of *Delpinoa gracillima*.

The gardener may find the following names (those marked * are or have been offered by American dealers): *A. Bouchetana*, Peacock, is considered by J. G. Baker to be a form of *A. ferox*.—*A. Bonchei*, Jacobi. Fls. in spikes. lvs. oblanceolate, glaucous when young, brown-toothed. Int. 1864. G.C. III. 21:166, 167. B.M. 7558.—*A. Caribæa*, Baker. Fls. in spikes: lvs. lanceolate, with very minute and close teeth. Isle of Martinique.—*A. calcarata*, Hort.—*A. chloracantha*, Salm-Dyck. Fls. in spikes: lvs. oblanceolate, bright green, weak-spined. Int. about 1860.—*A. coccinea*, Roezl. Has never fld. Apparently common in Europe, with at least one variety. Lvs. spatulate, dark green, repand-prickly.—*A. corcheoscens*, Salm-Dyck, is a glaucous-leaved variety of *A. lophantha*.—*A. Corderoyi*, Baker. Has never fld. in cult.: lvs. sword-like, rigid and spreading, channelled, spine-edged.—*A. decipiens*. "Tall-growing: lvs. dark green. Fla."—*A. Engelmanni*, Trelease. A.F. 8:309.—*A. exhoscens*, Hort.—*A. ferox*, Koch. Said to be not uncommon in cult., but it has never fld. lvs. slightly glaucous, the brown teeth ¼in. long. G.C. III. 20:525.—*A. Franzosini*. "Large-growing, of peculiar blue color."—*A. Guatimiana*, Hort.—*A. Ghiesbreghtii*, Koch. Int. about 1862. Several varieties. Lvs. glossy green, minute-toothed. It has never fld. Some plants circulated under this name are *A. pruinosa*.—*A. grandidentata*, Jacobi, is a var. of *A. horrida*.—*A. Gustaviana*, Hort. Considered by Baker as belonging to *A. Maximiliana*. Lvs. slightly glaucous, with brown prickles.—*A. Henriquesi*, Baker. Fls. in spikes: lvs. lanceolate-oblong, rigid, brown-edged and prickly.—*A. Houlletii*, Jacobi. Has never fld. in cult. Lvs. oblanceolate, not spiny.—*A. Jacquiniaræ*, Schult. Now considered a variety of *A. horrida*. Lvs. oblanceolate, very glaucous, with black prickles. B.M. 5097.—*A. Margaritæ*. "Dwarf, very compact and prickly. Lower Calif."—*A. marmorata*, Roezl. Fls. in panicles: lvs. glaucous, repand-prickly.—*A. Mexiliio*. "Pale stripe down the center of the leaf: similar to *A. Lechegnilla*, but of larger and stouter growth."—*A. micracantha*, Salm-Dyck. A small-spined form of *A. horrida*.—*A. Miradorensis*, Jacobi. Fls. in panicles: lvs. oblanceolate, the prickles very small.—*A. Nickelsi*. "Similar in appearance to *A. Victoriæ-Reginæ*, except that it is of much more robust growth, the lvs. being thicker and the white markings on same being broader and more distinct." F.E. 7:618.—*A. Ousselghemiana*, Jacobi.—*A. albicans*.—*A. Palmeri*, Engelm. A beautiful species from Ariz. and Mex. Stemless: lvs. oblanceolate, glaucous, repand-prickly.—*A. Parryi*, Engelm. Now considered as a variety of *A. applanata*.—*A. polyacantha*, Haw. Fls. in spikes: lvs. oblanceolate, green and brown, brown-toothed. Int. about 1820.—*A. pruinosa*, Lem., see Ghiesbreghtii.—*A. pulchérrima*, Hort.—*A. Regeliana*, Jacobi = *A. horrida*.—*A. Rohini*, Hort.—*A. rupicola*, Regel. Fls. in spikes: lvs. oblanceolate, bright green, jagged.—*A. Sonoræ*. "Resembling *A. Americana*, but ashy gray in color, and of smaller growth: thorns on points of lvs. much longer." Calif.—*A. Simonsi*, Hort. Same as above?—*A. spectabilis*, Todaro. Lvs. nearly 200, lanceolate, very glaucous, brown-toothed.—*A. subulata*, Hort.—*A. sylvestris*, Hort.—*A. Tallinensis*, Hort.—*A. Vandervaneni*, Jacobi. Lvs. oblong-spatulate, dull green, brown-edged and toothed.—*A. Verschaffeltii*, Lem. Is usually considered a form of *A. Scolymus*. I.H. 15:564.—*A. Wildingii*, Todaro. Lvs. few, oblong, bright green, with small brown teeth. J. N. Rose.

AGDÊSTIS (a mythical hermaphrodite monster, the genus being an anomalous one in its order). *Phytolaccàcew*. A monotypic genus. Tender climbing shrub from Mex. Cult. in Calif.

clematidea, Moç. & Sesse. Lvs. alternate, petiolate, cordate: fls. axillary or in terminal, branched, racemose cymes, white, star-shaped; sepals 4; petals 0.

AGERÀTUM (Greek for *not growing old*, probably applied first to some other plant). *Compósitæ*. About 40 species of trop. Amer. herbs, with opposite stalked lvs. and blue or white fls. in small terminal cymes or panicles.

conyzoides, Linn. (*A. Mexicànum*, Sims, and Hort.). Fig. 51. Annual and pubescent: lvs. ovate-deltoid, crenate-serrate: fls. blue or white, or varying to rose. Ordinarily a rather loose-growing plant a foot or two high, but there are dwarf and compact forms: also variegated forms. Trop. Amer. B.M. 2524.—This is the common ageratum of garden-ers and florists. It is easily grown from seeds, sown in the border where the plants are to stand, or started in the house or hotbed. If the plants are to be used for bedding, they should be placed a foot or less apart. They thrive in any garden soil and exposure. They bloom all summer; and if sown in late summer or fall, they give winter bloom under glass.

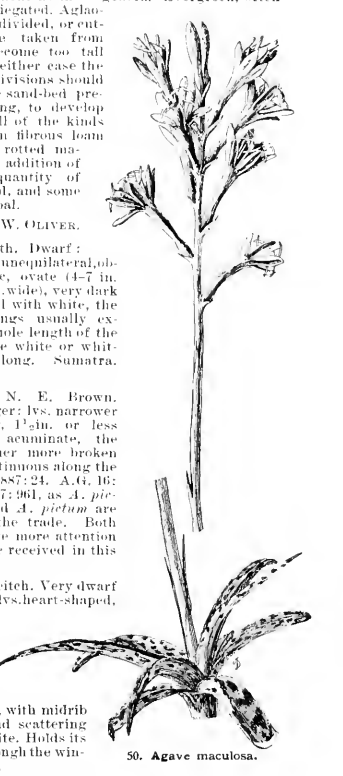
The plant sold as *A. conspicuum* is an Eupatorium; and that sold as *A. Lasseauxii* is a Conoclinium.

L. H. B.

AGLÀIA (Greek, *splendor*: from the order and general appearance). *Meliàcew*. Tender tree from China, with minute, yellow, fragrant fls., said to be used in perfuming certain teas. Prop. by cuttings.

odoràta, Lour. Lvs. alternate, 5–7 pinnate: fls. in axillary, branching panicles. Cult. sparingly in Calif.

AGLAONÈMA (Greek, *bright thread*). *Aroìdew*. About 15 species, of trop. Asia and Africa, allied to Arum, Alocasia and Dieffenbachia, and requiring essentially the same treatment as those genera. Evergreen, often beautifully variegated. Aglaonema may be divided, or cuttings may be taken from plants that become too tall and weak. In either case the cuttings and divisions should be put into the sand-bed previous to potting, to develop new roots. All of the kinds will succeed in fibrous loam enriched with rotted manure, with the addition of a moderate quantity of leaf-mold, sand, and some crushed charcoal.


50. *Agave maculosa*.

Cult. by G. W. Oliver.

pictum, Kunth. Dwarf: lvs. somewhat unequilateral, oblong or elliptic, ovate (4–7 in. long and 2–3 in. wide), very dark green, blotched with white, the central markings usually extending the whole length of the midrib: spathe white or whitish, 1–1½in. long. Sumatra. I.H. 29:445.

nebulòsum, N. E. Brown. Somewhat larger: lvs. narrower (5–8 in. long, 1½in. or less wide), more acuminate, the markings rather more broken and not so continuous along the midrib. I.H. 1887:24. A.G. 16:361, and F.E. 7:961, as *A. pictum*.—This and *A. pictum* are confused in the trade. Both species deserve more attention than they have received in this country.

costàtum, Veitch. Very dwarf and compact: lvs. heart-shaped, thick, 3 in. wide, one-third longer than wide, seldom exceeding 5 in. long, dark, shining green, with midrib ivory-white and scattering blotches of white. Holds its tufted lvs. through the winter. Moluccas.

A. commutatum, Schott.=Scindapsus Cuscuaria.—*A. Rèbiànii*, Hort., is "a fine decorative plant, with thick, leathery foliage" (Manda).—*A. versicolor*, Hort., is probably a form of either *A. pictum* or *A. nebulosum*.

L. H. B.

AGRIMÒNIA (old name of obscure meaning). *Rosàcew*. Agrimony. Hardy native herbs, with interruptedly pinnate lvs. and small, numerous, yellow fls., produced through summer. Lvs. aromatic, astringent. Sometimes cult. in shrubbery and wild gardens.

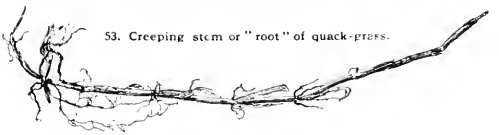
Eupatòria, Linn. (*A. officinàlis*, Lam.). Common Agrimony. Fig. 52. Petals twice as long as calyx, latter making a small, lightly adhering bur. Cult. in herb gardens to make a tonic tea, also in wild borders. Common in woods; also native to Eu. Grows 2–3 ft. high, in little clumps, from a short rootstock.

odoràta, Mill. Lfts. narrower than in *A. Eupatoria*; leaflets pubescent; lobes more deeply crenate-dentate; petals more than twice as long as the calyx. Italy. Occasionally cult. in Am. J. B. KELLER and W. M.

51. Ageratum conyzoides.

AGROPŸRUM (Greek for *field* and *wheat*). *Gramineæ*. Perennials or annuals, with leaf-blades flat or convolute; spike terminal, usually stiff; spikelets large, 3-8-fld., compressed, sessile at each joint of the simple spike, the side of the spikelet placed next the axis. Species about 30. Temperate regions of Amer. and Eu.

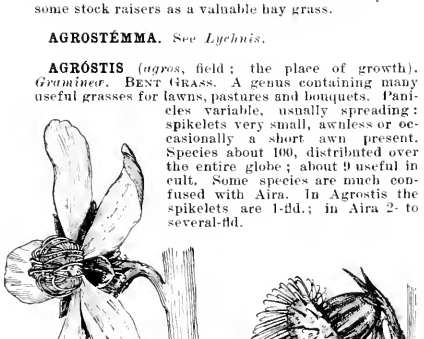
répens, Beauv. QUACK GRASS. COUCH GRASS. QUICK GRASS. QUITCH GRASS. A smooth, pale green or glaucous perennial, very variable, with the internodes of the rootstock long. In many places it has become one of the worst weeds, spreading inveterately by its underground stems. Fig 53. It may be destroyed by constant and thorough tillage. Often valuable to hold loose lands. Considered by some stock raisers as a valuable hay grass.



53. Creeping stem or "root" of quack-grass.

AGROSTÉMMA. *See Lychnis.*

AGRÓSTIS (*agros*, field; the place of growth). *Gramineæ*. BENT GRASS. A genus containing many useful grasses for lawns, pastures and bouquets. Panicles variable, usually spreading; spikelets very small, awnless or occasionally a short awn present. Species about 100, distributed over the entire globe; about 9 useful in cult. Some species are much confused with Aira. In Agrostis the spikelets are 1-fld.; in Aira 2- to several-fld.



52. Agrimonia Eupatoria (× 3). Flower and bur.

Spikelets about 1 line long; panicle-branches short. Perennial lawn and pasture grasses.

B. *Awnless spikelets.*

alba, Linn. CREEPING BENT GRASS. A well known perennial, creeping or stoloniferous, 1–3 ft.; sheaths smooth; leaf-blade linear or narrowly lanceolate, 1–8 in. long, scabrous; panicle open, 4–10 in. long, the branches sometimes widely spreading; spikelets about 1 line long; ligula 1–4 lines long.—Suitable for meadows, pasture mixtures, or exclusively for lawn-making.

Var. **vulgàris**, Thurb. (*A. vulgàris*, With.). RED-TOP. FINE BENT GRASS. Distinguished from the type by the smaller ligule, which is truncate, and less than 1 line long.—Commoner in cult. than the type.

Var. **stolonífera**, Linn. (*A. stolonífera*, Linn.). Panicle contracted linear; culms extensively creeping or stoloniferous; ligule 1–4 lines long.

BB. *Awned spikelets.*

canina, Linn. BROWN or DOG'S BENT GRASS. RHODE ISLAND BENT GRASS. Slender, creeping, 1–2 ft.; panicle pyramidal, 4–6 in. long; spikelets near the ends of the branches, very small, 1·9 of an in. long; small bent awn on back of flowering glume. Int. from Eu.—Makes a close sod.

AA. *Spikelets about ½ line long; panicle-branches long and hair-like. Annual ornamental grasses.*

B. *Culms, lvs. and panicle-branches smooth.*

nebulòsa, Boiss & Reut. (*A. capillàris*, Hort.). CLOUD GRASS. Fig. 54. A low grass, with extremely delicate, feathery-like panicle and small spikelets: lvs. few and very small. Spain.—Very useful for vases and bouquets.

minutiflóra, Hort. Very similar to *A. nebulosa*, but smaller, with fewer lvs. and shorter panicles.—Useful for vases and bouquets.

BB. *Culms, lvs. and panicle-branches scabrous.*

scàbra, Willd. ROUGH-BENT. TICKLE GRASS. FLY-AWAY GRASS. HAIR GRASS. SILK GRASS. Hair-like, delicate, with widely spreading, capillary panicles, which at maturity break away from the culm and fly about in the wind: spikelets very small, clustered at the ends of the branches.—Before panicle expands it is often sold in the vicinity of large towns for dry bouquets.

A. élegans, Hort., not Thore, and *A. pulchélla*, Hort. These names are applied by florists to Aira elegans and Aira caryophyllea, which see.

P. B. KENNEDY.

AGUACATE, ALLIGATOR PEAR, AVOCADO. *See Persea.*

AILÀNTHUS (from its native name *Ailanto*, meaning *Tree of Heaven*). *Simarubàceæ*. Large trees: lvs. alternate, large, pinnate, deciduous: fls. small, in large terminal panicles, polygamous; petals 5; stamens 10; fr. consisting of 1–5 distinct samaras. Five species in Cent. and S. Asia and N. Austral.—Large, ornamental trees of loose and somewhat spreading habit, with elegant, feathery foliage. Very rapid growers. Good for smoky cities. Suckers from the roots. Prop. by seeds and root cuttings.

glandulòsa, Desf. (*A. Japónica*, Hort.). TREE OF HEAVEN. Tree, 60 ft.: lvs. odd-pinnate, 1½–2 ft. long; leaflets 13–25, petiolulate, ovate-lanceolate, nearly glabrous near the base, with 2–4 coarse teeth, each with a large gland beneath: fls. greenish: samaras 1½ in. long. June. China, cult. in Japan.—Valuable tree for street planting, much used in the temperate regions and naturalized in some localities; somewhat tender north in

a young state. For street planting, the fertile plant only should be used, because the male exhales a disagreeable odor when flowering, and the pollen is said to cause catarrhal troubles. It grows in almost any soil, but best in a light and somewhat moist one, and stands dust and smoke well. Var. **erythrocarpa** (*A. erythrocárpa*, Carr. *A. rùbra*, Hort.). Lvs. darker green above and more glaucous beneath; fr. bright red, very effective in late summer and autumn. Var. **pendulifòlia**, Carr. Lvs. very large, drooping.—The Ailanthus foliage gives a tropical effect when the growth is very strong. If plants are cut back to the ground after they have become established (in two or three years after planting), they will throw up very strong shoots and make an excellent screen, as shown in Fig. 55. This practice may be repeated year after year. Sumacs, paulownias, basswoods, mulberries, and other fast-growing things may be treated in this way. The Ailanthus foliage is very like that of the Cedrela (which see for illustration of differences).

54. Agrostis nebulosa.

A. excélsa, Roxbg. Tall tree; lvs. 3 ft. long, abruptly pinnate; leaflets 20-28, teeth without glands. India. Can be grown only in tropical regions or in the hothouse.—*A. flavéscens*, Carr. = Cedrela Sinensis.

ALFRED REHDER.

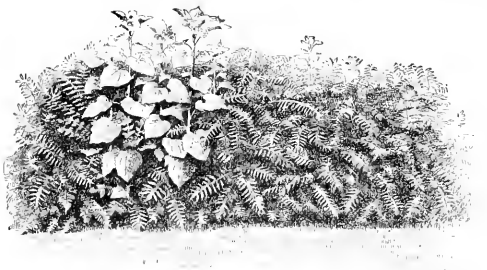
AÌRA (an ancient Greek name for Darnel). *Gramíneæ*. HAIR GRASS. A genus containing delicate annual grasses, with slender, loose panicle-branches; spikelets very small, of two perfect contiguous flowers; flowering glume acutely 2-cleft at the apex, bearing a slender twisted awn below the middle. Eu., N. Afr.—This genus is much confused with Agrostis by florists. Nat. from Eu. and cult. for dry bouquets.

caryophyllèa, Linn. (*Agróstis élegans*, Hort., not Guss.). A slender and elegant tufted annual, 10-20 in. high, bearing a very diffuse panicle of purplish and at length silvery scarious spikelets.

élegans, Gaud. (*Agróstis élegans*, Hort., not Guss.). A slender, erect and very pretty annual, from a few inches to a foot high, with widely spreading capillary panicles of many small spikelets.

A. cæspitosa, Linn. = Deschampsia cæspitosa.—*A. cærùlea*, Linn. = Molinia cærulea, Mönch.—*A. flexuosa*, Linn. = Deschampsia flexuosa.

P. B. KENNEDY.

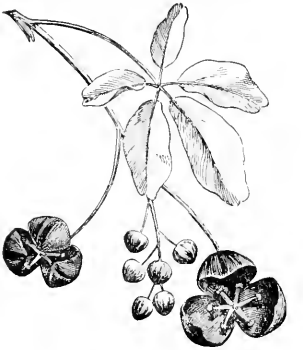


55. Ailanthus shoots; with a few sunflower plants.

AIR-PLANT. In common speech, any plant which grows on the trunk or in the top of another plant is called an air-plant. The proper term is *epiphyte* (that is, *growing on a plant*). In horticulture, the term air-plant is usually applied to epiphytal orchids, tillandsias, and the like. Most of these grow upon old bark, perhaps deriving some of their nourishment from the bark, but most of it from the air and rain. They are not parasites,—do not derive their support from the juices of the host.

AJÙGA (*not yoked*; the calyx not bilabiate). *Labiàtæ*. BUGLE WEED. Hardy herbaceous European perennials, creeping by stolons. Height 6-12 in.; fls. numerous, in whorls, normally blue or purple, with rosy or white varieties. Prop. by division or seeds.

Genevénsis, Linn. (*A. rugòsa*, Hort. *A. alpina*, Hort.). St. erect; cauline lvs. oblong-elliptic or obovate, narrowed at the base; lower ones petiolate; floral lvs. ovate or wedge-shaped, coarsely toothed, sparsely hairy; upper fl.-whorls spicate; lower whorls distant.



56. Akebia quinata.

The expanded flowers are pistillate; the others are staminate.

pyramidàlis, Linn. St. erect; cauline lvs. obovate, hardly petiolate, in a 4-sided pyramid; floral lvs. broadly ovate, the highest often colored; all lvs. entire; fl. whorls usually all spicate.

réptans, Linn. St. prostrate; lvs. ovate or obovate, entire or sinuate, shiny.—A low, dense, fast-spreading creeper, excellent for covering shady slopes. The typical and white-fld. forms are less cult. than the following: Var. **rùbra**, Hort. More valued for its dark purple lvs. than its blue fls. Var. **variegàta**, Hort. Lvs. splashed and edged creamy yellow.

metállica var. **crìspa**, Hort., int. by Henderson, 1899, is described as dwarf (4-5 in.), with curled, metallic glossy and blue fls. in a pyramidal spike. A bedding plant, int. from Germany.

J. B. KELLER and W. M.

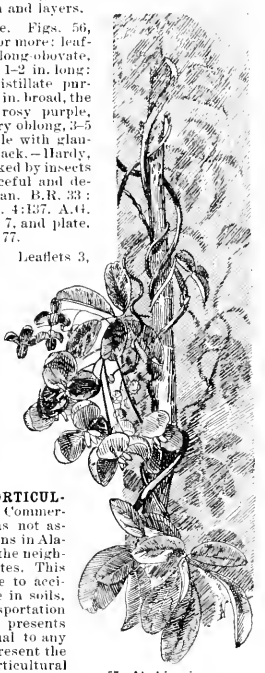
AKÈBIA (from *Akebi*, its Japanese name). *Berberidàceæ*. Twining glabrous shrubs: lvs. long-petioled, digitate, coriaceous; fls. monœcious in axillary racemes, pistillate at the base, staminate at the end of the raceme; sepals 3; fr. consisting of one or more very large, oblong berries with numerous seeds. Two species in Japan and China. Very ornamental, hardy climbing shrubs of graceful appearance, especially adapted for places in which very dense shade is not wanted. They require a sunny position and well drained soil; also valuable in the cool greenhouse for covering pillars and walls, growing best in a sandy compost of loam, leaf soil

and peat. In Japan the fr., which is very showy, but with us rarely produced, is eaten, and the stems are much used for wicker-work. Prop. by seeds, by greenwood or hardwood cuttings, and also by root division and layers.

quinàta. Decaisne. Figs. 56, 57. Climbing 12 ft. or more: leaflets 5, oval or oblong-obovate, entire, emarginate, 1–2 in. long: fls. fragrant, the pistillate purplish brown, about 1 in. broad, the staminate smaller, rosy purple, in early spring: berry oblong, 3–5 in. long, dark purple with glaucous bloom, seeds black.—Hardy, handsome, not attacked by insects or fungi. Very graceful and desirable. China, Japan. B.R. 33: 28. B.M. 4864. G.F. 4:137. A.G. March, 1891, Figs. 5, 7, and plate. R.H. 1853:141. S.Z. 77.

lobàta, Decaisne. Leaflets 3, broadly ovate, coarsely crenate: fls. in long racemes, smaller than those of *A. quinata*. Japan, China. B.M. 7485. A.G. March, 1891, p. 140. S.Z. 1: 78.—*A. clematifòlia* and *A. quercifòlia*, Sieb. & Zucc., are probably only varieties of this species.

ALFRED REHDER.



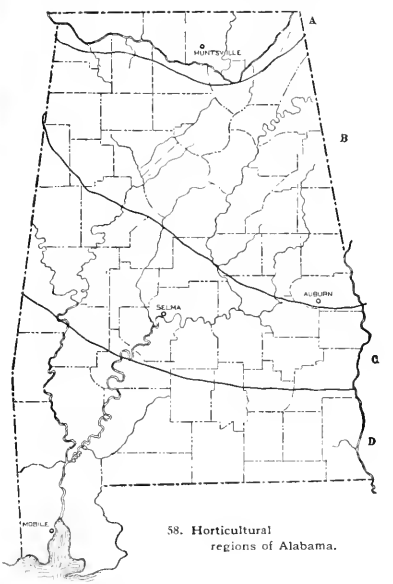
57. Akebia vine.

ALABAMA, HORTICULTURE IN. Fig. 58. Commercial horticulture has not assumed the proportions in Alabama that it has in the neighboring southern states. This must be largely due to accidental causes, since in soils, climate and transportation facilities the state presents conditions fully equal to any of the others. At present the most important horticultural centers are at the extreme northern and southern ends of the state. Mobile has long been known as one of the chief sources of supply for early vegetables for the northern and western markets, and the truck business is gradually extending from Mobile county to the adjoining counties of Baldwin and Washington. Early cabbage and Irish potatoes are the most important crops, though snap beans, peas, radishes, and many other vegetables are grown in considerable quantities. The tomato, so important a market crop in many southern localities, is very little grown here, owing largely to the prevalence of bacteriosis, often called southern tomato blight.

Huntsville, in northern Alabama, has a large and flourishing nursery business. Several large wholesale establishments are located there, and the fertile Tennessee River Valley lands prove to be admirably adapted to the growth of a good quality of nursery stock. Over 1,300 acres are now devoted to this business in this neighborhood, the annual shipments fill 150 cars, including 1,500,000 fruit trees, besides roses and other ornamentals; and the sum of $40,000 is paid out annually for labor.

Beginnings have been made in fruit and vegetable growing at various other points in the state, particularly at Cullman, Montgomery, and Evergreen, on the Louisville and Nashville railroad, and at Fruithurst, in northeastern Alabama, on the Southern railway. No data have been secured as to the total shipment from these various points, but the combined amount is very small, as compared with those from the Mobile region. One road, the Mobile and Ohio, forwarded 343 cars of home-grown fruits and vegetables from the Mobile depot during 1897. These figures do not include the shipments from other stations on this line, nor those carried by the Louisville and Nashville.

Such, in brief, is the present status of commercial horticulture in Alabama. In attempting to outline the possibilities of its future development, it will be necessary to glance at some of the more prominent topographical features of the state. For our purpose, it may be roughly divided into four regions. First, at the north is the Tennessee River region, or, as it is often called, the grain belt (Fig. 58, A). Its strong clay soils produce abundant crops of corn, wheat, clover and timothy, and were originally covered by a heavy growth of hardwood timber. Next comes the mineral belt (B), including the mountain region of northeast Alabama, and extending in an irregular way nearly across the state to its western border. This is a large region, containing a great variety of soils, ranging from rich creek and river bottoms, and the fertile red soils characteristic of the Piedmont region of Georgia, to barren sands and sterile, rocky hillsides. The surface is very much broken, and great areas are still covered with the original forests of mixed pine and hard woods. Below the mountain country, and forming an irregular belt or girdle across the middle of the state, is the prairie region (Fig. 58, C). This is narrow at the east, where the mountains press farthest southward, but broadens out toward the western border. The soil varies, in some places being light and sandy, but for the most part it is a dark, retentive loam, resembling that of the northern prairies. While cotton is a staple crop in all parts of the state, this is preëminently the cotton belt. Below the prairie comes the timber belt (D), covering the southern third of the state, and extending to the Gulf. Before the advent of the lumberman this extensive region was an unbroken forest of long-leaf yellow pine, with magnolias and other broad-leaved evergreens bordering the water courses. The surface is rolling, or in



58. Horticultural regions of Alabama.

some parts very hilly. The soil is a light, sandy loam, usually underlaid with red or yellow clay. It is naturally poor, being deficient in potash and phosphoric acid, and yields only scanty crops without fertilizers. It can, however, be made very productive by judicious manuring, and it builds up rapidly under intelligent intensive farming. This region is well adapted, both by soil and climate, to the production of early vegetables, and it seems probable that the business of truck-farming will ultimately spread widely from its present center at Mobile. Among fruits most promising for this region are grapes, oriental pears, figs, Japanese persimmons and strawberries. Satsuma oranges on hardy trifoliata stocks can be safely planted at the extreme south, and peaches and Japanese plums in the more northerly portion. Pecans thrive admirably, and the better kinds should be widely planted.

The soils of the prairie region, being mostly rather cold and wet in the spring, are not well adapted to early vegetables. Their fruit-growing capacity has not been fully tested, cotton claiming almost universal attention. Peaches and plums will thrive on some of the lighter soils, though the trees are usually short-lived. Apple trees grow well on the heavier prairie soils, and it seems probable that with a proper selection of varieties and due attention to spraying, their cultivation would prove profitable.

The mineral or mountain region presents so great a variety of soils and conditions that it is hard to characterize it as a whole. Some portions present almost ideal conditions for peaches, plums and grapes, and in the moister, heavier lands apples thrive and yield abundantly. If the people of Alabama ever interest themselves in fruit-growing as their neighbors in Georgia do at the present day, then these choice mountain locations will certainly be covered with orchards and vineyards, and this mountain region will advance to the first place in the magnitude of its horticultural interests.

The northern region already has its well established nursery business, which seems destined to increase. Owing to late spring frosts, peach and plum crops are too uncertain here to make commercial plantings advisable. It is, however, a promising apple country, and strawberries, raspberries and blackberries succeed well. An undeveloped but promising industry for this region would seem to be the growing of late crops of cabbage and Irish potatoes for the southern market. The alluvial soils found here seem well adapted for this purpose, and all the southern towns and cities offer a near and ready market.

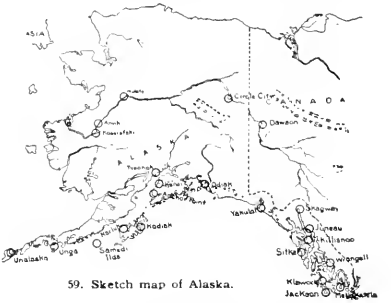
F. S. EARLE.

ALÂNGIUM (from the Malabar name). *Cornâceæ*. A few species of shrubs or small trees of the Old World tropics, with alternate entire evergreen lvs. and small, perfect purple fls. in axillary clusters. Rarely cult. in Old World stoves, but probably not in the Amer. trade.

ALASKA, HORTICULTURE IN. Fig. 59. When considered from a horticultural or agricultural point of view, Alaska may be very conveniently divided into two divisions, the southern coast region and the interior. These two regions differ very materially in their climate, and may be ultimately found as unlike in their possibilities. The climate of the coast region, which extends from Dixon's Entrance on the southeast to Unalaska on the southwest, is characterized by a heavy rainfall, a great preponderance of cloudy weather, and a rather low summer temperature, with little or no diurnal variation in the readings of the thermometer. The winter temperature is not excessively cold, zero weather being seldom experienced, while in the summer it is seldom high. The average rainfall, as shown by data from the Government Weather Service, varies from 55.9 inches at Killisnoo to 92.1 at Unalaska, about one-third of the precipitation falling during the growing period, from May to September. The data concerning the interior portion of the country are mainly from along the Yukon River, that being the great thoroughfare of the region. Here the rainfall is slight, and during summer clear skies are the rule. The intense cold of winter is followed by comparatively warm temperature in the summer, with a growing period of about four months, although occasional frosts have been reported from the upper part of the valley during the summer months.

The soils of the two regions are very similar, being largely of vegetable origin overlying rock or glacial deposits. In the coast region arable areas are confined to rather narrow valleys and the slopes along the sea. In the interior are reported more extensive areas of comparatively level land. Of the coast region, the most extensive area of land adapted to cultivation is that on the Kenai Peninsula, and, extending across Cook Inlet, is continued up the Sushitna River. This region, on account of its position relative to ocean currents, partakes more of the climatic characteristics of the interior, although still somewhat modified.

The accompanying map shows regions where some attempts have been made in gardening, from which definite reports have been secured. From the data at hand



59. Sketch map of Alaska.

it seems probable that the local supplies of hardy vegetables might be produced nearer at hand than the Puget Sound. This is undoubtedly true of the southeastern portion of the country, where the production need be limited only by the demand for such supplies and the ability to secure arable lands at a cost that will permit the producer to compete with the Sound country. For some time certain economic features will enter into the subject of extensive horticulture. Among these are the high price of labor, the standard being at present determined by the wages paid for gold mining, the question of transportation, and the rather limited markets.

As it exists at the present time, horticulture in Alaska is of a very primitive type. A few gardens here and there, with perhaps a row of berries along the side and an occasional fruit tree, represents nearly all that is done along this line. Near Juneau and at Killisnoo are market-gardens of considerable importance, but elsewhere only small areas are cultivated.

It has been said that during the Russian occupancy of the country many attempts were made to cultivate gardens and fields, but the data are often so meager and contradictory as to throw doubt upon the sincerity of the endeavor. In the accompanying account, it is desired to place on record some of the horticultural achievements as gathered from reports from gardeners in many places, as well as the personal observations of the writer during two seasons in the country.

FRUITS.—The great abundance both in kind and quantity of native fruits, especially berries, has doubtless contributed to the delay in the attempted introduction and cultivation of other sorts. Some effort has been made in this line, as is shown by the presence at Sitka of a number of old apple trees, remnants of the Russian days, which bear a very inferior fruit. A few young bearing trees of unknown variety are grown at the same place. At Wrangell there are apple trees of what are thought to be the Red June variety in bearing, and young thriving trees are known to be at Juneau and Metlakahtla. Plum and cherry trees have been recently planted in several places, but so far have not fruited. The mountain ash (*Sorbus sambucifolia*) is grown as an ornamental tree in a number of places. Currants flourish wherever planted, and gooseberries have been seen, but they were usually

badly mildewed. Cuthbert raspberries do exceedingly well at Wrangell and Sitka, the fruit being of fine size and quality. The same is true of strawberries at the several places where they are cultivated. Attempts have been made at a number of places to cultivate some of the indigenous fruits, and the dewberry or "knesheneka" (*Rubus stellatus*), wild currants (*Ribes rubrum* and *R. bracteosum*), and the strawberry (*Fragaria Chilonsis?*) have all been domesticated, and their fruit is fully equal, if not superior, to the wild product.

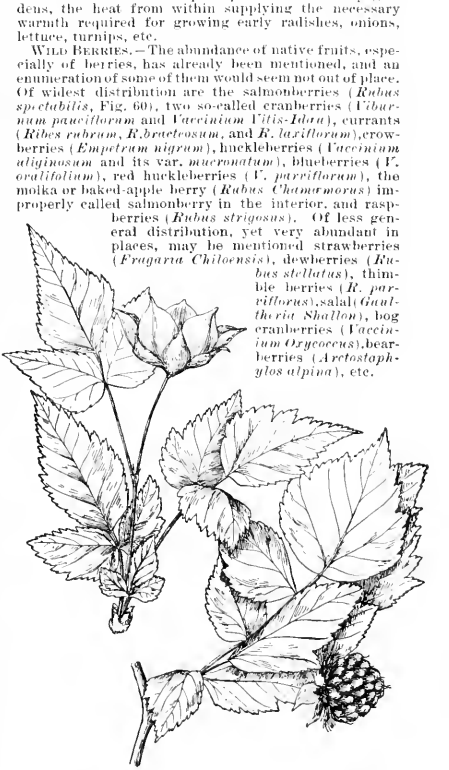
VEGETABLES.—More attempts have been made to grow vegetables than fruits, and some definite data have been obtained, showing what varieties are known to be adapted to Alaskan conditions. Most of these data have been secured from Sitka and Wrangell, in the southeastern part of the country, and from the Holy Cross Mission, near Koserefski, on the lower Yukon. A recent report from the latter place states that potatoes of fine quality, weighing $1^{3}/_{4}$ pounds, and turnips weighing $5^{1}/_{2}$ pounds, were grown during the summer of 1898. In addition, notes were given of some of the varieties of vegetables adapted to the region, as follows: Cabbage—Early Jersey Wakefield, Flat Dutch, and Drumhead; cauliflower—Early Snowball, Early Dwarf Erfurt; turnips—Early Flat Dutch, Yellow Globe, and Extra Early Milan; rutabagas—Improved American; radish—French Breakfast and Chartier; onions—Extra Early Red and Yellow Danvers; lettuce—Golden Heart; peas—American Wonder and Early Alaska; beets—Eclipse and Edmand's Blood Turnip; carrot—Oxheart; parsley—Extra Early Double Curled; celery—White Plume. Giant Pascal; rhubarb—Victoria.

The same varieties, with numerous additions, have succeeded in the coast region. Snap beans, Challenge Black Wax and Golden Wax, have done fairly well at Sitka, where some experiments were conducted by the United States Department of Agriculture during 1898, and the English Windsor is quite in its element. At this place the Philadelphia Butter and San Francisco Market lettuce made fine heads of a most superior quality. Parsnips and carrots grow well, and salsify and spinach were successfully grown at Sitka for perhaps the first time. Peas were found to grow and yield well, and in addition to the varieties above given, some of the dwarfs and the Norwegian Sugar peas continued to produce their crop until cut off by the frost. The blood beets, Extra Blood Turnip and Extra Early Egyptian, grew well at Sitka, but in many places beets are a failure on account of their tendency to run to seed. This undesirable trait on the part of biennial plants is shared by other vegetables, principally turnips, although cabbage and cauliflower have been reported as doing likewise. It is believed by some growers that the flat type of turnip is more subject to run to seed than the globe type. Celery of exceedingly fine quality has been grown at a number of places, although at Kadiak specimens were seen in which the central axis was greatly elongated. The leaf-stalks were also lengthened in about the same proportion, and this trait was not considered undesirable.

Potatoes are more extensively grown than any other crop, and the quality varies with the variety, locality, season, and culture. Usually little choice is exercised in the matter of varieties, but Polaris, Beauty of Hebron, and Early Rose appear well adapted to the conditions existing in this region. The two last are the most extensively known varieties, and very favorable reports have been received from a few trials of the Polaris. Season and method of planting undoubtedly exert a strong influence on the crop. If the soil, which usually contains a high proportion of organic matter and moisture, is well drained or thrown up into beds, as is the custom in many places, good potatoes can be grown in the average season. In some parts of the country, especially from Cook Inlet westward, the natives cultivate a small round potato, called the Russian, that seems to be well suited to the country. It is said to have been brought from Siberia fifty or more years ago. Close planting of potatoes, as well as almost every other vegetable, is the rule, and often to this fact alone may be attributed many failures. The object seems to be to grow a large crop by planting an abundance of seed. The result is a large growth of tops that completely shade the ground, thinning being seldom or never practiced. Along the coast, where cloudy weather is the rule, it is safe to say that the sun's rays never strike the ground after the growing season has become well advanced. Under such conditions it is not an uncommon sight to see a crop of small potatoes borne in the axils of the leaves above ground, no tubers being formed below the surface.

In general, considerable judgment is shown in the choice of garden sites. A southwestern slope is always preferred, and if well drained the garden is usually a thrifty one. In many places the earth is thrown up into beds 4 or 5 feet wide and the crop planted crosswise the beds. Where it can be easily obtained, sand is added to warm and to lighten the soil. Kelp is extensively employed as a fertilizer in some places, but its value when added to a soil already largely composed of vegetable debris is questionable. Gardens have been successfully maintained at Dawson, Circle City, and other of the great mining centers of the upper Yukon, and the dirt roof of the miner's cabin is frequently utilized for early gardens, the heat from within supplying the necessary warmth required for growing early radishes, onions, lettuce, turnips, etc.

WILD BERRIES.—The abundance of native fruits, especially of berries, has already been mentioned, and an enumeration of some of them would seem not out of place. Of widest distribution are the salmonberries (*Rubus spectabilis*, Fig. 60), two so-called cranberries (*Viburnum pauciflorum* and *Vaccinium Vitis-Idæa*), currants (*Ribes rubrum*, *R. bracteosum*, and *R. laxiflorum*), crowberries (*Empetrum nigrum*), huckleberries (*Vaccinium uliginosum* and its var. *myrtoides*), blueberries (*V. oralifolium*), red huckleberries (*V. parvifloram*), the moika or baked-apple berry (*Rubus Chamæmorus*) improperly called salmonberry in the interior, and raspberries (*Rubus strigosus*). Of less general distribution, yet very abundant in places, may be mentioned strawberries (*Fragaria Chilonsis*), dewberries (*Rubus stellatus*), thimble berries (*R. parviflorus*), salal (*Gaultheria Shallon*), bog cranberries (*Vaccinium Oxycoccus*), bearberries (*Arctostaphylos alpina*), etc.



60. Salmonberry, one of the wild fruits of Alaska.

FLORICULTURE.—This branch of horticulture is not wholly neglected in Alaska, although but few data are available. Many of the hardier plants of the old-fashioned flower garden are to be seen. Pansies of great size and brilliant color are common, and they remain in flower all summer. In some parts of the country sweet peas do well, and poppies, nasturtiums, mignonette,

sweet alyssum, chrysanthemums, stock, candytuft, verbenas, and marigolds are not uncommon where any attempt is made to grow flowers. Window gardens and boxes add many sorts to the list already given.

A single season's experimentation at Sitka, under the direction of the Office of Experiment Stations, United States Department of Agriculture, has shown that much can be accomplished in horticulture if rational methods of culture and a proper selection of varieties and seed be followed. WALTER H. EVANS.

For further information, consult Yearbook of Dept. of Agric. for 1897, and Bulletin 48, Office Exp. Sta., Dept. Agric. L. H. B.

ALBÉRTA (from Albertus Grotus, commonly known as Albertus Magnus). *Rubiàcæ.* Tender evergreen shrub from Natal, suitable for greenhouse. Little known in commerce in this country.

mágna, E. Mey. Bark pale: lvs. 4–5 in. long, obovate-oblong, obtuse, entire, narrowed into a short, stout petiole; midrib stout: panicle terminal, erect, 6 in. high and nearly as broad at the base; corolla tube 1 in. long, slightly swelling in upper part; lobes 5, small, triangular, recurved. B.M. 7454. G.C. III. 22: 416. Gn. 53:1171.

ALBÍZZIA (after Albizzi, an Italian naturalist). *Leguminòsæ.* Trees or shrubs, unarmed: lvs. alternate, bipinnate; leaflets small, oblique: fls. in axillary, pedunculed spikes or globular heads; calyx and corolla tubular and 5-lobed; stamens long, exserted: fr. a large strap-shaped pod. Twenty-five species in trop. and subtrop. regions of Asia, Afr. and Austral. Ornamental trees and shrubs with graceful, feathery foliage and yellowish, white or red fls. in summer. For cult., see *Acacia.*

A. *Fls. in cylindrical axillary spikes: lvs. semi-persistent.*

lophántha, Benth. (*Acàcia lophántha,* Willd.). Shrub or small tree, 6–20 ft.: lvs. with 14–24 pinnæ, each with 40–60 leaflets, about 5 lines long, linear, obtuse: spikes mostly 2, about 2 in. long, yellowish. S. W. Australia. B.M. 2108. B.R. 5:361. L.B.C. 8:716.—Sometimes cult. as greenhouse shrub and flowering in spring, and in the open in the S. Often known as *Acacia speciosa.* There is a var. **gigantea** in the trade.

AA. *Fls. in globular heads: lvs. deciduous.*

B. *Stamens united only at the base.*

C. *Leaflets ovate or oblong, obtuse.*

Lébbek, Benth. (*Acàcia Lébbek,* Willd. *A. speciòsa,* Willd.). Tall tree; lvs. with 4–8 pinnæ, each with 10–18 leaflets, obliquely oblong or oval, 1–1½in. long, nearly sessile: fls. greenish yellow, in short-peduncled, axillary heads, 3–4 together. Trop. Asia, N. Austral.

occidentàlis, Brandeg. Small tree, 15–25 ft.; lvs. with 8 pinnæ, each with 6–10 leaflets, oblique-oval, ¾–1½in. long, glabrous: fls. yellowish, in axillary heads. June–July. Mex., Low. Calif.—Perhaps only a variety of *A. Lebbek,* and not indigenous.

odoratíssima, Benth. (*Acàcia odoratíssima,* Willd.). Tall tree; lvs. with downy rachis; pinnæ 6–14, each with 16–50 leaflets, oblique-oblong, ¾–1 in. long, glaucous beneath: heads few-fld., numerous, greenish white, forming large, terminal panicles. E. Ind.

prócera, Benth. (*Acàcia prócera,* Willd.). Tall tree; lvs. with nearly glabrous rachis; pinnæ 6–10, each with 12–16 leaflets, oblique-oblong, 1–1½in. long, glabrous: heads few-fld., greenish white, forming large, terminal panicles. Trop. Asia, Austral.

Moluccàna, Miq. Tree: rachis of the lvs. with many glands; pinnæ 14, each with 12–40 leaflets, obliquely elliptic-oblong, glaucous and pubescent beneath. Moluccas.

CC. *Leaflets falcate, with the midrib close to the upper edge, acute.*

Julibríssin, Durazz. (*Acàcia Julibríssin,* Willd. *A. Nèmu,* Willd. *Albízzia rósea,* Carr.). Tree, 30–40 ft.: rachis of the lvs. with a small gland at the base; pinnæ 8–24, with numerous leaflets, falcate-oblong, ¼in. long: heads pink, crowded on the upper end of the branches. Trop. and subtrop. Asia and Afr. R.H. 1870: 490. F.S. 21: 2199.—This plant is the hardiest species, and will stand many degrees of frost. Hardy as far north as Washington.

Var. **móllis,** Benth. (*A. móllis,* Boiss. *Acàcia móllis,* Wall.). Leaflets broader, densely pubescent.

stipulàta, Boiss. (*Acàcia stipulàta,* DC.). Tall tree: young branches with large, persistent stipules: rachis of the lvs. with many glands, pubescent; pinnæ 12–40, with numerous leaflets, oblong-linear, ¼–⅝in. long, pubescent beneath: heads in axillary simple or terminal compound racemes. Trop. Asia.

BB. *Stamens connate into a long, narrow tube.*

fastigiàta, Oliv. (*Zýgia fastigiàta,* E. Mey.). Tree: branches and petioles rusty-pubescent; pinnæ 8–14, each with 16–30 leaflets, trapezoid-oblong, ⅛–½in. long, pubescent beneath: heads in terminal corymbs on the end of the branches. Trop. Afr. ALFRED REHDER.

ALBÛCA (*whitish;* the color of the first-described species). *Liliàceæ.* Tender bulbs from the Cape of Good Hope allied to Ornithogalum, and treated in the same way. Prop. by offsets or seeds.

aùrea, Jacq. Bracts yellow: fls. 10–30, pale yellow, upright.

màjor, Linn. Bracts red: fls. 6–15, greenish yellow, nodding. B.M. 804. L.B.C. 12: 1191.

ALCHEMÍLLA (from an Arabic name). *Rosàceæ.* Hardy herbaceous perennials with corymbose, inconspicuous fls., suitable for rockeries and front rows of borders. Of easiest culture. Height 6–8 in. Prop. by division or seeds. Native in Eu., and *A. arvénsis* is sparingly naturalized in this country. There are also tropical species.

alpina, Bieb. Lvs. digitate, 5–7 cut; leaflets usually 7, lanceolate-cuneate, obtuse, serrate at apex, silky hairy beneath, shiny. Eu.

sericea, Willd. Lvs. larger than in *A. alpina,* 5–7 nerved, digitate; leaflets 7, lanceolate, acute, deeply serrate from the middle to apex, downy beneath. Caucasus.

vulgàris, Linn. (*A. montàna,* Schmidt). LADY'S MANTLE. Lvs. 7–9 nerved, 7–9 cut; reniform, plicate-concave. N. Temp. Zone. J. B. KELLER.

ALDER. See *Alnus.*

ÁLETRIS (Greek word for *female slave* who ground corn; alluding to apparent mealiness of the fls.). *Hæmodòraceæ.* Hardy perennial, smooth, stemless, bitter herbs. Lvs. thin, flat, lanceolate, grass-like, in a spreading cluster: fls. small, in a spiked raceme, terminating a slender scape 2–3 ft. high; perianth not woolly, but wrinkled and roughened with thick set points which give a mealy appearance. July–Aug. They like a moist but sunny situation. Prop. slowly by division or seeds.

aùrea, Walt. Fls. bell-shaped, fewer and shorter than in *A. farinosa,* yellow; lobes short, ovate. Eastern N. Amer. B.M. 1418, erroneously as *A. farinosa.*

farinòsa, Linn. Fls. longer and more tubular than in *A. aurea,* white; lobes lanceolate-oblong. N. Amer. L.B.C. 12: 1161.

Japónica, Hort. Fls. reddish or deep purple, in long spikes. J. B. KELLER.

ALEURÍTES (Greek: *farinose* or *floury*). *Euphorbiàceæ.* Half dozen or less tropical species of evergreen trees, with small monœcious white fls. in terminal, lax cymes and alternate, entire or 3-lobed lvs. with 2 glands at the top of the petiole.

triloba, Forst. CANDLENUT, or CANDLEBERRY TREE. Small tree, with 3–5-lobed pubescent lvs., originally from the eastern tropics, but now widely distributed: cult. for its edible nut, which is spheroidal, uearly 2 in. in diam., 2-loculed, each compartment containing a walnut-like seed. The dried kernels are burned for illumination by natives. The nuts yield oil which is used in food or as a dryer in paint. The oil is variously known as Indian Walnut Oil, Kekune Oil, Kukui Oil. Sparingly cult. in S. Calif. and S. Fla. Fruits in S. Calif.

cordàta, Steud. Lvs. broadly ovate, acuminate, deeply cordate, 3-5 cuspidate or lobed. S. China.—Yields an excellent lac varnish. L. H. B.

ALFÁLFA, LUCÉRNE (*Medicàgo sativa*, Linn.). A deep-rooted perennial forage plant of the *Leguminòsæ*. The plant grows a foot or two high, bears pinnate lvs. with 3 ovate-oblong toothed leaflets, and small head-like racemes of purple clover-shaped fls. It is native to Eu. In the arid parts of the U. S. it is the staple hay and forage plant, and it is also grown to a considerable extent in the E. Two to six mowings may be made each year from established meadows. Fifteen to 20 lbs. of seed are sown to the acre; and the seed is preferably sown alone, without another crop. Alfalfa should not be pastured the first year. In two or three years it becomes thoroughly established and productive, and it should continue for many years. June grass often runs it out in a cool, moist climate. Alfalfa often becomes a weed in waste places.

ALFILÉRIA. The West American or Spanish name for *Erodium cicutàrium*, L'Her. *Geraniàceæ*. A hairy annual which is used for pasture in dry regions.

ÁLGA, plural **ALGÆ**. A general name for chlorophyll-bearing thallophytes. They are flowerless plants, allied to the fungi, and generally inhabit water. Those occurring in salt water are known as seaweeds. None are cultivated. The green "moss" on flower-pots is made up of algæ.

ALGARÒBA is the fruit of *Ceratonia siliqua*

ALHÀGI (its Mauritanian name). *Leguminòsæ*. Low, spiny, much branched shrubs: lvs. oblong, small, obtuse, entire, alternate; fls. papilionaceous, in few-fld. racemes. Summer. Three closely allied species from Greece and Egypt to Himalayas, producing the Persian or Alhagi Manna. They may be cult. in temperate regions in dry and sunny positions and prop. by seeds and greenwood cuttings under glass with a little bottom heat.

A. camelòrum, Fisch. Camel's Thorn. Glabrous at length: ovary glabrous. Cau. to Himal.—*A. mauròrum*, DC. Pubescent: ovary pubescent. Egypt to Persia.—*A. græcòrum*, Boiss. Very spiny and more densely pubescent: ovary pubescent. Greece. Alfred Rehder.

ALÍSMA (derivation doubtful). *Alismàceæ*. Hardy aquatics, with small white or pale rose fls. on scapes with whorled, panicled branches. Perennial by a stout proliferous corm. Usefnl in ponds. Prop. by division or seeds.

Plantàgo, Linn. Water Plantain. Lvs. variable, but usually broadly cordate-ovate; thinner and narrower when growing under water. Panicle 1–2 ft. long. Common in swales and still waters in U. S.; also in Eu.

A. nàtans, Linn., is now referred to the monotypic genus Elisma (E. natans, Buch.). It is native to Eu., and is offered in foreign catalogues. Fl. white, single, on a long peduncle: floating lvs. elliptic and obtuse.

ALKÀNNA, ÁLKANET. See *Anchusa*.

ALKEKÉNGI. See *Physalis*.

ALLAMÁNDA (Dr. Allamand, Leyden). *Apocynàceæ*. Greenhouse shrubs, mostly climbers. Lvs. entire, whorled: fls. terminal, large and funnel-shaped, with a flat-spreading or reflexed limb, the tube inflated below the throat: ovary 1-loculed: stamens 5, the filaments very short.

Allamandas are of easy culture. They are usually grown in the ground or in large tubs, and trained on the rafters. For best results, they should have plenty of sun. The bushy kinds, as *A. neriifolia*, *A. grandiflora* and *A. Williamsi*, may be grown as specimen plants in pots. The strong kinds, as *A. Schottii*, are sometimes used as stocks upon which to graft the weaker ones, particularly if root plants are desired. Prop. by cuttings of growing wood in a bottom heat of 75°; also by layers. The species are much confused.

A. *Fls. purple.*

Blanchétii, DC. (*A. violàcea*, Gardn.). Lvs. in 4's, hairy on both sides: fls. in terminal clusters, 3 in. across, salmon-purple: habit of *A. cathartica*. Brazil. B.M. 7122. Int. into U. S. in 1893.

AA. *Fls. yellow or orange.*

B. *Corolla with a swollen or bulb-like base.*

neriifòlia, Hook. A stocky, bushy grower, useful for pots, although it usually needs to be staked or grown against a support if allowed to take its full course: lvs. in 3's–5's, glabrous, oblong or elliptic, acuminate: corolla smaller than *A. Schottii* or *A. Hendersoni*, deeper yellow, streaked with orange. S. Amer. B.M. 4594. —Early and profuse bloomer.

BB. *Corolla tube long, slender and stem-like.*

c. *Lvs. and calyx more or less hairy.*

nóbilis, Moore. A strong, tall climber, with purple twigs: lvs. in 3's or 4's, large, acuminate, very short-stalked: fls. very large (4–5 in. across), nearly circular in outline of limb, bright, clear yellow, with magnolia-like odor. Finest fls. in the genus. Braz. B.M. 5764.

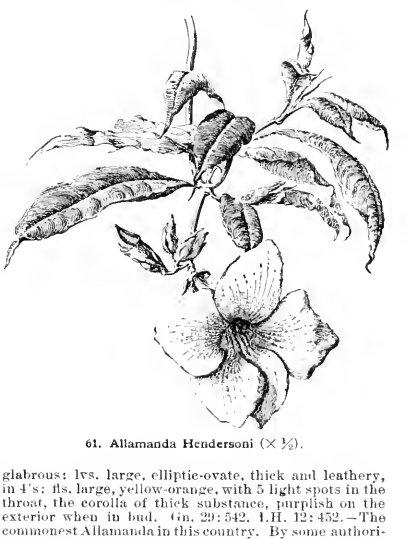
cc. *Lvs. and calyx glabrous (except perhaps in A. Williamsi).*

D. *Plant tall-climbing.*

cathártica, Linn. Lvs. rather small, obovate, usually in 4's, and more or less wavy-margined, thin, acuminate: fls. golden yellow, white-marked in the throat, the lobes acuminate on one angle, 3 in. or less across, the tube gibbous or curved. S. Amer. B.M. 338. P.M. 8: 77. —The species first described, but now rarely seen in cultivation.

Schóttii, Pohl. Strong-growing, suitable for rafters: young shoots and petioles slightly pubescent, the older stems warty: lvs. in 3's or 4's, broadly lanceolate and acuminate: corolla large, rich yellow, the throat darker and beautifully striped. Braz. B.M. 4351, but this portrait is considered by Index Kewensis to belong to *A. cathartica*. *A. magnifica*, introduced into the U. S. in 1893, is probably a form of this species.

Héndersoni, Bull. (*A. Wardleyàna*, Lebas.). Fig. 61. Tall and vigorous, free-flowering, excellent for roofs:



61. Allamanda Hendersoni (× ½).

glabrous: lvs. large, elliptic-ovate, thick and leathery, in 4's: fls. large, yellow-orange, with 5 light spots in the throat, the corolla of thick substance, purplish on the exterior when in bud. Gn. 29: 542. I.H. 12: 452.—The commonest Allamanda in this country. By some authorities considered to be a variety of *A. cathartica*; by others referred to *A. Schottii*. Int. from Guiana by Henderson & Co., St. John's Wood, England, and distributed by Bull about 1865.

DD. *Plant erect-bushy.*

grandiflòra, Lam. St. thin and wiry: lvs. thin, ovate-lanceolate, pointed, usually in 3's: fls. somewhat smaller than those of *A. Henderson'i* but larger than *A. cathartica*, lemon- or primrose-yellow. Braz. Gn. 39: 794. P. M. 12: 79.—Thrives well when grafted on stronger kinds.

Williamsi, Hort. Very dwarf: lvs. and young growth generally somewhat pubescent, the lvs. long and narrow, acuminate usually in 4's; fls. in continuous clusters, rather smaller than those of *A. Hendersoni* and of better substance, fragrant. Gn. 40: 832.—Certificated in Eng. in 1891 by B. S. Williams & Son, and int. in U. S. in 1893. Supposed to be a hybrid. Promising for pots.

L. H. B.

ALL-HEAL. See *Brunella vulgaris.*

ALLIGATOR PEAR, AGUACATE, AVOCADO. See *Persea.*

ALLIUM (ancient Latin name). *Liliàceæ.* Bulbous plants, mostly cult. in the open; but a few, of which *A. Neapolitanum* is an example, are often grown indoors. Fls. in a simple umbel, from a 1–2-lvd. usually scarious spathe; stamens and perianth segments 6; style slender, the stigma either entire or parted.

Alliums are of the easiest cult., for which consult BULBS. For the vegetable-garden members of the genus, see CHIVES, GARLIC, LEEK, ONION, SHALLOT. *Allium vineale*, a bad weed in parts of the northeastern states, has a slender scape sheathed below with hollow thread-shaped lvs., and greenish rose-colored fls. (or bulblets in the place of fls.).

The following species are known to be in the Amer. trade: acuminatum, No. 4; anceps, 26; attenuifolium, 21; Bidwellìæ, 23; Bolanderi, 17; cernuum, 9; Cusickii, 16; falcifolium, 25; fimbriatum, 24; Geyeri, 13; hæmatochiton, 11; *Hermettii*, 3; madidum, 15; Moly, 1; Neapolitanum, 3; platycaule, 27; reticulatum, 12; roseum, 5; Sanbornii, 20; scaposum, 14; Schœnoprasum, 8; senescens, 6; serratum, 22; stellatum, 19; tricoccum, 7; unifolium, 18; validum, 10; Victorialis, 2.

62. Allium Neapolitanum.

A. Campthèticum, catalogued by Meehan, is perhaps a form of some other species. It is described as "dull pink. July. 1½ ft."

I. Exotic garden Alliums.

A. *Fls. yellow.*

1. **Moly,** Linn. Lvs. flat, broad: fls. numerous, in a dense umbel, in early spring. S. Eu. B.M. 499.—Well known, and a favorite for massing. Hardy in the N.

AA. *Fls. white or whitish.*

B. *Lvs. very broad, obtuse.*

2. **Victoriàlis,** Linn. Tall: lvs. ovate or broad-oblong, short: fls. greenish white, in large heads. Spring. Siberia. B.M. 1222.—Hardy.

BB. *Lvs. narrow, acute or tapering.*

3. **Neapolitànum,** Cyr. Fig. 62. Lvs. long and rather narrow, loose-spreading, shorter than the scape: fls. large, pure white, with colored stamens on long pedicels. Eu.—Needs protection if grown outdoors. Much used for cut-flowers in winter and spring. The most popular species. *A. Hermèttii grandiflòrum*, recently introduced from Holland, is a clear white odorous variety, well adapted to forcing.

AAA. *Fls. pink, rose, or lilac.*

B. *Segments with recurved tips.*

4. **acuminàtum,** Hook. Scape 4–10 in.: lvs. 2–4, not longer than the scape, very narrow: umbel many-fld.: perianth segments a third longer than the stamens, the inner ones serrulate. W. Amer.

BB. *Segments not recurved.*

5. **roseum,** Linn. Scape 12–18 in.: lvs. narrow, with inrolled tips: fls. few (10–12), on long pedicels in an open umbel. S. Eu. B.M. 978.

6. **senéscens,** Linn. Scape 1–2 ft.: lvs. narrow, erect, often twisted: fls. rather small, numerous, in a rather dense head. Eu. B.M. 1150.

II. The above species comprise those which are in general cultivation in this country. Aside from these there are various native species, mostly from western America, which are offered by dealers in American plants. These are recorded below. Monograph of American Alliums by Sereno Watson, in Proc. Amer. Acad. Sci. 14: 226.

A. *Bulbs clustered, narrowly oblong; scape terete.*

B. *Lvs. elliptic-lanceolate, 2 or 3.*

7. **tricóccum,** Ait. COMMON WILD LEEK. Fls. greenish white on scape 4–12 in. high in early spring. Grows in clumps. N. Eng. to Wis. and N. C.

BB. *Lvs. terete and hollow, several.*

8. **Schœnóprasum,** Linn. CIVES or CHIVES. Fls. rose-color, in dense little heads; lvs. short, in dense mats. N. U. S. and Eu.

BBB. *Lvs. linear, flat or channelled.*

9. **cérnuum,** Roth. Fls. rose-colored or white, in open, nodding umbels. Alleghanies W.

10. **válidum,** Wats. Fls. rose-colored or nearly white, in dense erectish umbels: scape 1–2½ ft., very stout. Nev., Cal., Or.

11. **hæmatochiton,** Wats. Fls. deep rose, in a small, erect umbel: bulb-coats deep red: scape 1 ft. or less high. Cal.

AA. *Bulbs usually solitary, globose to ovate: scape terete or nearly so.*

B. *Coats of bulbs fibrous.*

12. **reticulàtum,** Fraser. Scape 3–8 in.: fls. white to rose, with thin segments. W. Amer. B.M. 1840, as *A. stellatum.*

13. **Geyeri,** Wats. A foot high: fls. rose, with broad acute segments. W. Amer.

BB. *Coats of bulbs not fibrous.*

C. *Lvs. 2 or several.*

D. *Ovary with only 3 crests, or none at all.*

14. **scapósum,** Benth. Fls. white, red-veined, in a loose, few-fld. umbel: bulbs dark: scape 1 ft. or more. W. Amer.

15. **mádidum,** Wats. Fls. white or nearly so, in a many-fld. umbel: bulbs white: scape less than 1 ft., angled. Or.

16. **Cùsickii,** Wats. Fls. rather numerous, nearly white: lvs. 2, ⅛ in. wide: scape 3–4 in. Or.

17. **Bolanderi**, Wats. Fls. rose, few, the segments serrulate; scape 4–10 in. Calif.

18. **unifolium**, Kellogg. Lvs, several, narrow and flat; scape stout, 1–2 ft.; fls. rose, 10–30, the segments ovate-lanceolate, exceeding stamens and style. Calif.

DD. *Ovary distinctly 6-crested; fls. usually rose-colored.*

E. *Scape usually more than 6 in. high (in the wild).*

19. **stellatum**, Fraser. Bulb-coats reddish; scape 6–18 in.; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in. long; stamens and styles exserted. W. Amer. B.M. 1576.

20. **Sánbornii**, Wood. Bulb-scales white; scape 12–24 in.; pedicels shorter; umbel densely many-fld.; stamens and styles exserted. Calif.

21. **attenuifolium**, Kellogg. Lvs. channelled; scape slender, 6–15 in., leafy below; umbel dense; fls. nearly white. W. Amer.

EE. *Scape usually less than 6 in. high (in the wild).*

22. **serratum**, Wats. Lvs. very narrow; filaments broadened at the base. W. Amer.

23. **Bidwellíæ**, Wats. Scape 2–3 in.; umbel few-fld., the pedicels $\frac{1}{2}$in. long; filaments filiform. Calif.

CC. *Lf. solitary, linear or filiform; scape 2–5 in. high; capsule 6-crested.*

24. **fimbriatum**, Wats. Lf. filiform and revolute; scape 3 in.; fls. deep rose, stigma 3-cleft. S. Calif.

AA. *Bulbs mostly solitary; scape stout, 2-winged; lvs. 2, broad.*

B. *Stamens not exserted.*

25. **falcifolium**, Hook. & Arn. Fls. rose, the segments minutely glandular-serrate and twice longer than stamens; scape 2–3 in. W. Amer.

26. **anceps**, Kellogg. Fls. white, with purplish veins, the segments little longer than stamens. Calif., Or.

BB. *Stamens exserted.*

27. **platycaule**, Wats. Fls. rose, the segments long-acuminate; scape 3–5 in. Calif. B.M. 6227, as *A. anceps*.

L. H. B.

ALLOPLÉCTUS (*diversely plaited*; referring to appearance of the calyx). *Gesneràceæ*. Tender tropical evergreen shrubby plants, with tubular yellowish axillary fls., borne singly, to be grown in hothouses and given the treatment required by Gesneras.

A. repens, Hook. Trailing by means of roots thrown out between the pairs of lvs.: lvs. ovate, coarsely serrate, hairy or smooth; calyx pale green, blotched with purple; corolla yellow, tinged red, gaping; tube swollen at the base; limb of four spreading segments, the uppermost being twice cut. E. Ind. B.M. 4250. —*A. spurstíllorus*, Mart. Erect; lvs. ovate-oblong, acute entire; petiole and nerves beneath often red; calyx of 5 cordate or triangular dark blood or purple sepals, forming a striking contrast to the yellow club-shaped densely hairy corolla; limb of corolla of 5 equal segments. Braz. B.M. 4216, erroneously as *A. dichrous*.

ALLSPICE. The dry berry of the Pimento (*Piménta officinàlis*, Lindl.), an evergreen tree of the *Myrtàceæ*. The tree grows in the W. Indies. Jamaica yields much of the product. The fresh berry is about the size of a pea. It is borne in clusters. The word allspice is also applied to various plants with aromatic fragrance, as Calycanthus.

ALMOND. A name given to the tree and fruit of *Prúnus* (*Amýgdalus*, Baill. (*Amýgdalus communis*, Linn.), of the *Rosàceæ*. It is also applied to certain dwarf ornamental trees or bushes, as Flowering Almond (see *Prunus*). The Almond has been cultivated from time immemorial. It is thought to be native to the Mediterranean basin. Some enquirers have supposed it to be the original of the peach, but this idea is evidently untenable. The flowers are peach-like and handsome (Fig. 63). The Almond nut of commerce is the pit or stone of a peach-like fruit (Fig. 64). The fleshy part, which is so thick and edible in the peach, is thin and hard, and it splits at maturity. There are two general tribes or races of Almonds,—the bitter and the sweet. The former has a bitter kernel, which is used in the manufacture of flavoring extracts and prussic acid. It is grown mostly in Mediterranean countries. Of the sweet or edible Almonds, there are two classes,—the hard-shell and the soft-shell. The former is of little value, and is not grown to any extent. The soft-shell type produces the edible Almonds of commerce. Some of the thinnest-shelled forms are known as Paper-shells. It was once thought that almond-growing could be successfully practiced in the peach-growing sections of the East, but vagaries of late spring frosts, and other difficulties, have caused the effort to be abandoned commercially. Individual Almond trees are occasionally seen, and they frequently bear profusely. They are nearly as hardy as the peach. The commercial cultivation of the Almond is confined to western America, and the remainder of this account is, therefore, written from the Californian standpoint.

63. Flower of common Almond ($\frac{1}{2}$).

L. H. B.

Almond-growing in California has received the attention of horticulturists for nearly half a century, and during the whole of its course the industry has been marked by vicissitudes which, it must be admitted, are not yet ended. Two chief sources of difficulty are now clearly discerned to have attended the effort from its beginning, and present knowledge may enable planters to avoid, in the future, errors which have led to much disappointment and loss—the vestiges of which still encumber the ground, though clearing is proceeding rapidly. Thus far the Almond tree has yielded more firewood than any other single fruit tree which has been largely planted in California, and yet planting has continued, in the hope of better results, until in 1897 there were about 1,500,000 trees included in the reports of the county assessors, of which number about two-thirds had attained bearing age at that date. The product of 1897 was 218 carloads, and the competition in the eastern markets with imported Almonds was so grievous that prices fell below what is considered a profitable return. In 1898, because of untimely frosts, the product fell to 25 carloads, which is counted about equal to the local consumption of the Pacific coast. At the present time, 1899, planting has practically ceased, and a considerable acreage of thrifty trees of bearing age is being cleared for other purposes, because growers in certain places are out of patience with the Almond. In spite of these facts, the Almond will remain an important California product, through the satisfactory performance of trees enjoying favorable environment.

The two chief sources of failure with the Almond are the sterility of many varieties without cross-pollination, and the extreme propensity of the tree for early blooming, with the consequent destruction of the bloom or the young fruit by temperature very little below the freezing point. These two evils have been singularly associated historically, and only lately have they been shown to be independent factors and both of them demanding the closest attention from planters. At first it was thought that the wide planting of self-sterile varieties by themselves was the cause of disappointment, because, after years of chopping-out or grafting-over old, unproductive trees to the Prune d'Agen, for which it is an excellent stock, it was observed, by chance, that the Languedoc variety adjacent to Drake's seedling, of local origin, was heavily laden with nuts when it was sterile without such association. Attention was then directed to the growth of seedlings, and a large lot of seedlings of the bitter Almond, grown by A. T. Hatch, exhibited such satisfactory bearing habit and such striking variation toward new types of the soft-shell sweet Almond that the growth of new, selected California seedlings was seized upon as a panacea for the previously experienced troubles with the Almond. These new varieties were conceived to be not only self-fertile but hardy, and large plantations were made without due regard to the frosty character of the locations. Low valley lands of great area, and some extent of high plateaux, were planted. Fine, large trees grew only to lose their crops year after year by frosts

from February to April, until the growers cast the trees upon the wood-pile. As a deduction of the experience of several decades, we have arrived at what seems now to be the proper conception of the situation of the Almond in California, which is, that the most prolific varieties must be chosen, must be associated for purposes of cross-pollination, and must be planted in places of least liability to frost. There is a factor of some moment in the late-blooming habit of some varieties, which will be considered presently.

The soil best suited to the Almond is a light, well-drained loam. The tree makes a strong and rapid root-growth, and is more tolerant of drought than any other of our leading deciduous fruit trees. For this reason, as well as to avoid frost, it is often desirable to place the Almond on the higher and drier lands of the valley—providing the soil is not heavy and too retentive of surplus water in the rainy season. The root is most intolerant of standing water, and will quickly die if exposed to it. Because of its thrift in light, dry soils the Almond root is used rather largely as a stock for the Prune d'Agen, and to some extent for the peach in the dry valleys.

Almond trees are grown by budding into seedlings grown from either the sweet or the bitter hard-shell Almonds, the bud being set during the first summer's growth of the seedling, and then either planted out as a dormant bud the following winter or allowed to make one season's growth on the bud in the nursery. The tree grows so rapidly, both in root and top, that only yearling trees are used.

At transplanting, the young trees are cut back so as to form a low head with only about a foot of clear trunk. They are allowed to make free growth during the following summer, and in the following winter are cut back so as to encourage branching on the main limbs within a foot of their attachment to the trunk. At the same time the branches are reduced to 4 or 5 in number, symmetrically arranged around the stem and at good distance from each other, so that they shall not unduly crowd each other as they enlarge. Another full growth during the following summer and another cutting back the following winter give the trees the vase-form on the outside, with enough interior branches to fill the inside of the tree without crowding. Thus the tree is systematically pruned after each of its first two years' growth in the orchard. After that, shortening-in of the branches usually ceases, and the third summer's growth is allowed to stand for fruit-bearing, with only thinning-out of growth to prevent crowding. This thinning-out has to be done from time to time in later years, otherwise the tree becomes too thick, and interior branches dwindle for lack of light. The amount of thinning varies in the different climates of the state: the greater the heat, the denser the tree for its own protection. With the proper adjustment of heat and light, fresh bearing wood may be encouraged in the lower part of the tree, otherwise it becomes umbrella-shaped, with the fruit wood at the top and bare poles below.

The Almond is the earliest bloomer of our common fruits. It puts forth flowers sometimes as early as January, but the usual date is about February 10 for the earliest bloomers in the warmer parts of the state, with the later bloomers at intervals thereafter until April 1. Records of full bloom of a number of varieties widely grown in California, which have been kept at the University of California sub-station, situated in the Sierra foot-hill region, show the following succession: Commercial, February 27; Sultana and Paper-shell, March 10; King and Marie Duprey, March 11; IXL, March 12; Languedoc, March 19; Nonpareil, March 20; Routier Twin, March 24; Pistache, March 25; Drake Seedling, April 2. Obviously the late bloomers have greater chance of escaping frost, and there is at present some disposition to make this a consideration in selecting varieties for planting. The dates just given show an extreme variation in time of blooming. Some years the intervals are much shorter, but the relation seems to be constant. The crop ripens from August 15 to October 1, according to locality. Early maturity does not follow early blooming—that is, as with other fruits, the first to bloom are not necessarily the first to ripen.

64. Almond nuts ($\times \frac{1}{3}$).

Not less than 25 varieties of Almonds have been grown to a greater or less extent in California. Varieties of foreign origin have almost wholly given place to selected seedlings of local origin, and of these a very few constitute the main crop at present. These are named in the order of their acreage, as follows: IXL, Nonpareil, Ne Plus Ultra, Drake, Paper-shell, Languedoc. Of these, the IXL and Nonpareil occupy not less than three-fourths of the acreage.

In handling the crop the local climate modifies methods somewhat, and the growth-habit is also involved. In regions very free from atmospheric humidity in the summer, the hull opens readily and discloses a clean, bright nut, which can be marketed without treatment. Where this is not the case, and the nut is more or less discolored, bleaching in the fumes of sulfur has to be practiced. The nut must be dry before sulfuring, or the fumes will penetrate and injure the flavor of the kernel. Sulfured nuts also lose largely in power of germination. The practice is to gather the nuts, dry for a few days in the sun, then spray with water very lightly, so that only the surface of the shell is moistened, and then use the sulfur. In this way a light color can be secured without penetration of the fumes. The nuts can usually be gathered from the ground as they naturally fall, or can be brought down by shaking or the use of light poles. Some varieties are more easily harvested than others, and the same variety falls more readily in some localities than in others. A greater or less percentage, according also to variety and locality, will have adhering hulls, and for clearing them locally-invented machines, called almond hullers, are used. Early rains in some localities are apt to stain the nuts. Such stains cannot be removed by sulfuring, and the nuts have to be crushed and the product marketed as kernels for the use of confectioners. Machinery is also used for this operation, and a considerable fraction of the product reaches the market in this form.

The standard of excellence in the Almond, from a commercial point of view, as learned by the experience of California producers, is that the kernel must be as smooth, symmetrical and plump as possible. The twinning of kernels, welcome as it may be to searchers for philopenas, results in misshapen kernels, which are very objectionable to the confectioners, who are very large users of Almonds. Constancy to single kernels is therefore a good point in a variety.

Large proportion of kernel to shell by weight is also, obviously, an important point to almond buyers. At the same time, the shell may be so reduced in strength as to break badly in shipping in sacks and in subsequent handling. Incomplete covering also exposes the kernel to the sulfur and to loss of flavor. The ideal is such degree of thinness of shell as can be had with complete covering of the kernel and durability in handling.

Careful comparison of the proportion of kernel weight to gross weight of the popular California varieties, as compared with a leading imported variety, was made by a committee of the California Horticultural Society, with the following result: From one pound of each of the following varieties the net weight of kernels in ounces was: Imported Tarragona, 6 2-5; California Languedoc, $7\frac{1}{2}$; El Supremo, $7\frac{1}{2}$; Drake, $8\frac{3}{4}$; IXL, 9; Commercial, $9\frac{1}{4}$; La Prima, $9\frac{1}{2}$; Princess, $9\frac{1}{2}$; Ne Plus Ultra, 10; King, 10; Paper-shell, 11; Nonpareil, 11 to 13.

EDWARD J. WICKSON.

ALMOND, DEMERARA. See *Terminalia Catappa*.

ALMOND, FLOWERING. See *Prunus*.

ALNUS (the ancient Latin name). *Cupulifèræ*, subfamily *Betulàceæ*. ALDER. Trees or shrubs: lvs. alternate, shortly petioled, deciduous; fls. apetalous, monœcious in catkins, staminate ones elongated and pendulous, pistillate ones erect, short, developing into an ovoid, ligneous cone with persistent scales: fr. a small nutlet. Twenty species in the northern hemisphere, in America south to Peru. Hardy ornamental trees and shrubs, suitable for planting on damp soil, where they grow very rapidly, but *A. cordata, firma, Japonica*, and also *A. tinctoria* prefer somewhat drier soil. The profuse male catkins are pleasing in early spring. The wood is valuable for its durability in water. Usually prop. by seeds gathered in the fall and well dried: sown in spring with but slight covering, and kept moist and shady, they germinate soon; a slight covering with moss, taken off when the seedlings appear, will be useful. At the end of the same year or the following spring the seedlings are transplanted, usually into rows 1–2 ft. apart and 6 in. from each other. After two years they can be planted where they are to stand. The shrubby species, also *A. glutinosa*, grow from hardwood cuttings placed in moist and sandy soil, also from layers, and *A. incana* from suckers. Rarer kinds are grafted on common potted stock in early spring in the propagating house; grafting out-of-doors is rarely successful.

Index: aurea, No. 10; cordata, 5; *cordifolia*, 5; denticulata, 10; firma, Sieb. & Zucc., 2 and 4; glauca, 6; glutinosa, 10; imperialis, 10; incana, 6; incisa, 10; Japonica, 4; laciniata, 6 and 10; maritima, 3; multinervis, 2; *oblongata*, 3 and 10; *Oregana*, 8; *pyrifolia*, 5; rubra, 8; rubrinerva, 10; rugosa, 9; *serrulata*, 9; Sibirica, 1; *tiliacea*, 5; *tiliæfolia*, 5; tinctoria, 7; viridis, 1.

A. *Fls. opening in the spring with the lvs.; pistillate ones enclosed in buds during the winter: fr. with broad membraneous wings. Almobetula.*

1. **viridis**, DC. GREEN ALDER. Shrub, 3–6 ft.: lvs. usually rounded at the base, round-ovate or oval, sharply serrate, 1½–4 in. long, pale green and pubescent on the veins beneath: cones 3–4, oblong, slender peduncled. Northern hemisphere, in the mountains, in different varieties.—Hardy low shrub with handsome foliage, of very pleasant effect on rocky streamlets, with its long, male catkins in spring. Var. **Sibirica**, Regel. (*A. Sibirica*, Hort.). Sometimes tree, 25 ft.: lvs. larger, cordate-ovate.

2. **firma**, Sieb. & Zucc. Tree, to 30 ft.: lvs. oblong-lanceolate or ovate-lanceolate, sharply and doubly serrate, with 10–15 pairs of veins, 2–4 in. long, often nearly glabrous beneath: cones 2–4, peduncled. Japan.

Var. **multinérvis**, Regel. Lvs. with 14–24 pairs of veins, thicker.—Handsome tree with dark green lvs., growing on dry and rocky soil; quite hardy.

AA. *Fls. opening in the fall from catkins of the same year: lvs. not plicately folded in the bud.*

3. **maritima**, Nutt. (*A. oblongàta*, Regel., not Ait. nor Willd.). Tree, to 30 ft.: lvs. cuneate, oblong or obovate, shining above, pale green beneath, glabrous, remotely and crenately serrate, 2–4 in. long: cones 2–4, large, on short, stout peduncles. Del., Md. S.S. 9: 458. G.F. 4: 269. Nutt. N. Am. S. 1: 10.—Ornamental shrub or small tree with handsome shining foliage, attractive in autumn with its male catkins.

AAA. *Fls. opening in early spring before the lvs., from catkins formed the previous year and remaining naked during the winter.*

B. *Lvs. not plicate in the bud, green beneath, veins arcuate, ending mostly in the incisions: female catkins usually solitary in the axils.*

4. **Japónica**, Sieb. & Zucc. (*A. firma*, Hort., not S. & Z.). Tree, 50–80 ft.: lvs. cuneate, oblong-lanceolate, acuminate, sharply and irregularly serrulate, glabrous at length, bearded in the axils of the veins beneath, 2–6 in. long: cones 3–6, peduncled. Japan. G.F. 6: 345. —Tall, pyramidal tree with dark green foliage; the largest and perhaps the most beautiful of all Alders.

5. **cordàta**, Desf. (*A. cordifòlia*, Ten. *A. tiliàcea*, Hort.). Small tree, 20–50 ft.: lvs. cordate, ovate or roundish, acuminate, 2–4 in. long, bearded in the axils beneath, glandular when young: cones 1–3, peduncled. Italy, Caucasus. L.B.C. 13: 1231. G.C. II. 19: 285.—Round-headed tree with handsome, distinct foliage, changing orange yellow in autumn, resembling that of a linden or pear, therefore sometimes as *A. tiliæfolia*, or *A. pyrifolia*, in gardens. Not quite hardy North.

BB. *Lvs. plicate in the bud, the veins going straight to the points of the larger teeth: female catkins 3–6 in every axil.*

C. *Under side of lvs. glaucous; not bearded.*

6. **incàna**, Willd. Shrub or tree, to 60 ft.: branches pubescent: lvs. oval or oblong-ovate, acute, 1¼–4 in. long,

65. Alnus glutinosa (× ¼).

doubly serrate, pubescent or nearly glabrous beneath: cones 4–8, mostly sessile, ½in. long. Northern hemisphere, in different varieties.

Var. **glàuca**, Ait. (*A. glàuca*, Michx.). Shrub, to 12 ft.: lvs. often nearly glabrous beneath. N. Amer., Eu. Em. 251.

Var. **vulgàris**, Spach. Tree, to 50 ft.: lvs. usually densely pubescent beneath: cones 1 in. long. Eu., Asia.

Var. **pinnatífida**, Spach. (var. *laciniàta*, Hort.). Lvs. pinnately lobed or cleft, with dentate lobes.

7. **tinctòria**, Sargent (*A. incàna*, var. *tinctòria*, Hort.). Tree, to 60 ft.; lvs. broadly ovate, 4–6 in. long, membranaceous, coarsely doubly serrate, slightly lobed, glaucous and rufously pubescent on the veins beneath. Japan. G.F. 10: 473.—Handsome ornamental tree of very vigorous growth, with large foliage.

8. **rùbra**, Bong. (*A. Oregàna*, Nutt.). Tree, 40–50 ft.: lvs. oblong-ovate, 3–5 in. long, crenate-serrate, slightly lobed, revolute on the margin, nearly glabrous beneath; petioles and veins orange colored: cones 6–8, oblong. W. N. Amer. S.S. 9: 454. Nutt. N. Amer. S. 1: 9.

CC. *Under side of lvs. green or brownish green; usually bearded.*

9. **rugòsa**, Spreng. (*A. serrulàta*, Willd.). Shrub, to 25 ft.: lvs. usually cuneate, obovate or elliptic, acute or rounded at the apex, 2–5 in. long, finely serrate, usually pubescent on the veins beneath: cones short-stalked. E. N. Amer., from Mass. south. Em. 248.

10. **glutinòsa**, Gærtn. BLACK ALDER. Fig. 65. Tree, to 70 ft.: lvs. orbicular or obovate, rounded or emarginate at the apex, 2–5 in. long, irregularly obtusely serrate, with 5–7 pairs of veins, nearly glabrous beneath, glutinous when unfolding: cones distinctly peduncled. Eu., N. Afr., Asia, naturalized in some localities in N. Amer.—A vigorously growing tree with dark green, dull foliage, valuable for planting in damp situations. Commonly planted in many forms: Var. **aùrea**, Versch. Lvs. yellow. I. H. 13: 490. Var. **denticulàta**, Ledeb. (*A. oblongàta*, Willd.). Lvs. usually cuneate, serrulate.

S. Eu. Var. **imperiàlis**, Desf. Fig. 66. Lvs. deeply pinnately lobed with lanceolate or nearly linear lobes. Var. **incisa**, Willd. (var. *oxyacanthifòlia*, Spach.). Lvs. small, deeply incised, like those of *Crataegus oxyacantha*. Var. **laciniàta**, Willd. Lvs. pinnately lobed; lobes oblong.

66. Alnus glutinosa, var. imperialis (· $\frac{1}{2}$)

Var. **rubrinèrvia**, Dipp. Lvs. large and shining, with red nerves and petioles; pyramidal tree of vigorous growth, very handsome.

A. acuminàta, HBK. Tree: lvs. usually ovate and pubescent beneath, doubly serrate. C. Amer., north to Ariz.—*A. Ahobèhla*, Hort.=A. viridis.—*A. barbata*, C. A. Mey. Allied to A. glutinosa. Lvs. pubescent on the veins beneath, ovate. Caucasus. Perhaps hybrid of A. glutinosa×subcordata.—*A. Canadensis*, Hort.=A. rugosa.—*A. communis*, Desf.=A. glutinosa.—*A. cordifòlia*, Ten.=A. cordata.—*A. crispa*, Pursh=A. viridis.—*A. firma*, Hort.=A. Japonica or A. subcordata.—*A. glauca*, Michx.=A. incana.—*A. Jorullènsis*, HBK. Allied to A. acuminata: lvs. oblong-lanceolate, coarsely dentate. C. Amer.—*A. macrocàrpa*, Ludd., not Regel.=A. glutinosa var.—*A. macrophylla*, Hort.=A. subcordata.—*A. oblongàta*, Willd.=A. glutinosa, var. denticulata.—*A. oblongàta*, Regel.=A. maritima.—*A. oblongifòlia*, Torr. Tree, 20–30 ft.: lvs. oblong ovate, cuneate, doubly serrate, 2–3 in. long; strobiles $\frac{3}{4}$–1 in. long, pedunc'led. N. Mex. and Ariz. S.S. 9: 457.—*A. Oregàna*, Nutt.=A. rubra.—*A. orientalis*, Decaisne=A. subcordata.—*A pubèscens*, Tsch. (A. glutinosa×incana). Lvs. roundish-ovate or obovate, irregularly serrate, pubescent beneath. Natural hybrid.—*A rhombifòlia*, Nutt. Tree, 60–80 ft.: lvs. cuneate, oval or ovate, 2–$3\frac{1}{2}$ in. long, finely serrate, yellowish green and puberulous beneath; strobiles oblong, pedunc'led. W. N. Amer. S.S. 9: 456.—*A. serrulàta*, Willd.=A. rugosa.—*A. Sibirica*, Hort., not Fisch.=A. viridis Sibirica.—*A. sinuàta*, Rydb. Allied to A. viridis. Shrub, 3–16 ft.: lvs. slightly lobed, serrulate, glabrous, thin. W. N. Amer.—*A. subcordàta*, C. A. Mey. (A. orientalis, Decaisne. A. firma, Hort., not S. & Z. A. macrophylla, Hort.). Tree, 30–50 ft.: lvs. rounded at the base, ovate or oblong, 2–6 in. long, crenately serrate, often pubescent beneath. Allied to A. cordata. Caucasus, Asia Minor.—*A. subrotùnda*, Hort.=A. glutinosa var. denticulata.—*A tenuifòlia*, Nutt. (A. incana, var. virescens, Wats. A. occidentalis, Dipp.). Small tree, occasionally 30 ft.: lvs. ovate, 2–4 in. long, slightly lobed and doubly serrate, green and nearly glabrous beneath. W. N. Amer. S.S. 9: 455.—*A. undulàta*, Willd.=A. viridis.

ALFRED REHDER.

ALOCÀSIA (name made from *Colocasia*). *Aroideæ*. Stove foliage plants, of 30 or more original species, from trop. Asia and the Malayan Isls. Closely allied to Caladium and particularly to Colocasia, which see. These three genera differ chiefly in characters of fruit. Monogr. by Engler in DeCandolle's Monographiæ Phanerogamarum, Vol. 2. In 1890, 52 species and specifically named hybrids were in cult. (Bergman, Jour. Soc. Nat. Hort. France. I.H. 37: 80).

Alocasias are propagated by suckers or cuttings of the rhizomes, placed in small pots containing a mixture of light, fibrous peat and sand in equal proportions, and plunged in a close frame or propagating box with bottom heat. They may also be grown from seeds sown in 4-inch pots, in a light, peaty soil in a temperature of 75° F. The month of March is the best time for propagating. The evergreen species (as *A. cuprea*, *longiloba*, *Lowii*, *Regina*) thrive best in a compost of two parts fibrous peat and sphagnum moss and one part lumps of fibrous loam, to which should be added a sprinkling of silver sand and a few nodules of charcoal to keep the whole sweet. The herbaceous species (as *A. macrorhiza*) do best in good fibrous loam to which $\frac{1}{3}$ of well-rotted cow-manure or pulverized sheep-manure has been added. Perfect drainage of the pots is absolutely necessary, and in potting, the evergreen species should be coned up two or three inches above the rim of the pot, and finished off with a surfacing of live sphagnum moss. The season of active growth commences about the first of March, when they should be given a temperature of 70° at night, with a rise of 15° by day, and the atmosphere must be kept in a humid condition. They should be given a position free from draughts and direct sunlight. They require an abundance of water at the roots as the leaves develop, and are greatly benefited by an occasional watering of clear liquid sheep or cow-manure water. To obtain the best development of the leaves, heavy syringing should be avoided, but frequent spraying on all fine days with an atomizer sprayer is very beneficial. Towards winter the humidity of the atmosphere and the supply of water to the roots should be reduced with the evergreen species, and gradually withheld altogether as the leaves mature with the herbaceous species. The temperature during winter should not fall below 60°.

Cult. by E. J. CANNING.

The propagation of most of the Alocasias consists of cutting up the stems, so that each piece will have at least one dormant bud. The pieces should be placed amongst moss, in a hot propagating frame, where they vegetate quickly. Such kinds as *A. Sanderiana*, *A. macrorhizæ*, var. *variegata*, and *A. Jenningsii* (Colocasia) have creeping rhizomes, at the ends of which small resting tubers are formed. These should be carefully collected, and the two first named started in a propagating frame in a pan of moss and sand. *A. Jenningsii* roots readily in ordinary soil. Most of the kinds require a soil which is very fibrous, with a little moss added. The pots should be half filled with potsherds as drainage.

Cult. by G. W. OLIVER.

A. *Lvs. distinctly notched or undulate on the margin.*

princeps, Nicholson. Lvs. sagittate, the basal lobes narrow and spreading, the margins deep-sinuate; upper surface olive-green, with darker veins, the under lighter colored, with brown veins and margin; petioles brown-spotted, slender. E. Ind.

Sanderiàna, Bull. Fig. 67. Lvs. long-sagittate, with deeply notched margin, the basal lobes wide-spreading; deep glossy green with metallic reflection, with prominent white margins and veins; petioles brownish and striped. Philippines. Gng. 1897: 84.—One of the best of recent introductions. Runs into various forms, and has entered largely into cultivated hybrids.

AA. *Lvs. plane and entire on the margin.*

B. *Markings chiefly on the petioles, the blades green.*

zebrina, Koch & Veitch. Lvs. triangular-sagittate; petioles beautifully marked with large zigzag bands of green. Philippines. F.S. 15: 1541–2.

Villeneùvei, Lind. & Rod. Lvs. sagittate-ovate, the veins of lighter green and prominent, basal lobes very unequal; petioles spotted with chocolate-brown. Large. Borneo. I.H. 34: 21.—Named for de Villeneuve, Brazilian ambassador to Belgium.

BB. *Markings or coloration chiefly on the leaf-blades.*

C. *Veins and midrib light yellow.*

Lindeni, Rod. Lvs. cordate-ovate, long-pointed, 8–12 in. long, bright green, with yellowish veins curving off

from the midrib and vanishing near the margin; petioles nearly white. New Guinea. I.H. 33: 603.—Bruised lvs. emit a strong odor.

cc. Veins and midrib white or silvery.

longiloba, Miq. (*A. gigantea*, Hort.). Petioles 2 ft., greenish white, mottled purple; blade sagittate, 18 in. long, the basal lobes very long and erect, the upper surface green, with silvery or gray bands along veins and midrib, the under surface light purple. Java.

Putzeysi, N. E. Brown. Much like *A. longiloba*: lvs. broader (oval-sagittate), dark metallic green, prominently veined and bordered white, the petioles pale red-purple, under surface dark purple. Sumatra. I.H. 29: 439.—More brilliant than *A. longiloba*, and has wider spaces between the veins.

Thibautiana, Mast. Petioles 3 ft., greenish; blade 2 ft. long and 18–20 in. broad, ovate-cordate, the basal lobes broad and rounded, olive-green, with broad silvery veins and rib, the under surface deep purple. Borneo. G.C. III. 17: 485. I.H. 28: 449.

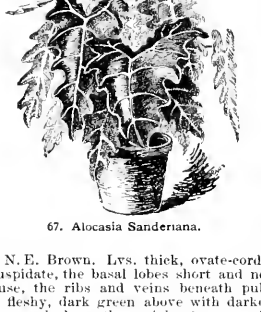
Löwii, Hook. Petioles 2–3 ft., rose-color; blade narrow-ovate, 18 in. long and a third as wide, long-pointed, the basal lobes long-acute, upper surface olive-green, with very distinct silvery bands, under surface rich purple. Borneo. B.M. 5376. A.F. 1895: 559 as var. *grandis*. Var. **picta**, Hook. (B.M. 5497), has surface covered with small white reticulations. This var. is *A. Veitchii*, Schott. (var. *Veitchii*, Engler).

ccc. Veins white and leaf blotched and mottled.

macrorhiza, Schott. Large, reaching 10 or 15 ft.: leaf-blades 3 ft. long, long-sagittate and pointed, the lobes short and obtuse, margin often somewhat wavy, the midrib very broad and conspicuous, the blotches or patches of green and white (in the var. *variegata*, which is the common form) very striking. Ceylon. I.H. 8: 305.—One of the commonest species. Lvs. sometimes almost white.

cccc. Veins dark or purple, or the leaf dark-colored.

cùprea, Koch (*A. metallica*, Schott.). Petioles 2 ft. or less long, green; blade ovate and peltate, 18 by 12 in., notched at the base and cuspidate at the point, dark metallic green with darker rib and veins, the under side rich purple. Borneo. B.M. 5490. I.H. 8: 283. Lowe, 60. Gn. 50: 336.—One of the best, and common.



67. Alocasia Sanderiana.

Regina, N. E. Brown. Lvs. thick, ovate-cordate, obtuse or cuspidate, the basal lobes short and nearly or quite obtuse, the ribs and veins beneath pubescent, somewhat fleshy, dark green above with darker veins and brown-purple beneath; petioles terete, pubescent, spotted purple. Borneo. I.H. 32: 544.

Several cult. varieties and hybrids are in the trade in this country: *A. argyrea*, hybrid of longiloba×Pucciana; *Batavièn̈sis*, petiole dark purple; lf.-blade dark green; *Chantrièri* (raised by Chantrier Bros., Mortefontaine, France), hyb. of cuprea×Sanderiana, with long wavy lvs., purple below and prominently white-veined (I.H. 35: 64. R.H. 1887, p. 465); *Chélsoni*, cuprea×longiloba, with lvs. purple below and green above; *gigas*, much like Villeneuvei; *intermèdia*, hybrid by Veitch 25 years ago; *La Sallèana*; *Lucièana*, Thibautiana×Putzeysi, with lvs. dark green above and whitish veins and margins, purple beneath (I.H. 44: 27); *Mortefontainèasis*, Löwii×Sanderiana; *Pucciàna*, Putzeysi×Thibautiana; *Sèdeni*, cuprea×Löwii, with ovate-peltate lvs. purple beneath and white veined above (I.H. 24: 292); *Van Houttei*.

The following names are also in our trade: *A. illustris*=Colocasia antiquorum; *Jènningsii*=Colocasia affinis; *Johnstonii*=Cyrtosperma Johnstoni; *Marchallii*=Colocasia Marchalli; *violàcea*=Colocasia antiquorum?

The following may be expected to appear in the American trade: *A. Augustiniana*, Lind & Rod. Lvs. peltate and wavy, green above and below, with pale nerves, the petioles brown-spotted; allied to *A. zebrina*. I.H. 33: 593. New Guinea?—*A. Curtisi*, N. E. Brown. Petioles 3 ft. or less, purple-barred; lf.-blade 20 in. or less, and half as wide, shining green and grey-ribbed above, deep purple beneath. Penang.—*A. eminens*, N. E. Brown. Lvs. peltate, the blade 2 ft. or less long and nearly half as broad, purple beneath, green and light-veined above; petioles 5 ft. or less, barred. E. Ind.—*A. gracilis*, N. E. Brown. Large: lvs. 2 ft. or less long, ovate-sagittate, half as broad, black-green below, bright green above; petioles 4 ft. or less, blackish. E. Ind.—*A. guttata*, N. E. Brown. var. *imperatis*, N. E. Brown. Lvs. sagittate, acute, 1½ ft. or less long and half as broad, purple beneath, brown-green and dark-blotched above. Borneo. I.H. 33: 541.—*A. Jubar*, Schott. St., 6 ft. or more, stout and fleshy: lvs. very large (often 3 ft. across), ovate-cordate, bright green on both sides. E. Ind. F. S. 21: 2206.—*A. Margaritæ*, Lind. & Rod. Lvs. slightly peltate, wavy, shining green with blackish midrib, the veins and brownish petioles pubescent. New Guinea. I.H. 33: 641.—*A. marginata*. Said to have come from Braz. Lvs. 2 ft. or less long and very broad, slightly wavy, rolled and short-pointed, pale green, striped and mottled with purple; petioles brown-marked.—*A. plumbea*, Hort. =grandis?—*A. recessa*, N. E. Brown. Dwarf and compact, the petioles 6 in. long, blade less than 1 ft. long, bright green, with rib and nerves olive-green. B.M. 7498. Philippines.—*A. Rodigusiana*, Andre. Thibautiana×Regina.—*A. Sanderiàna*, var. *Gaudericnsis*, Rod. Lvs. wavy margined, purple and blotched beneath. I.H. 43: 55.—*A. scabriuscula*, N. E. Brown. Lvs. spreading, not deflexed, sagittate and not peltate, shining green above and paler beneath. Borneo.—*A. sinuata*, N. E. Brown. Lvs. sagittate and sinuate, dark green above with lighter areas, and whitish green below. Philippines.—*A. Watsoniana*, Hort. =Putzeysi.—*A. Warrisiana*, Masters. Lvs. erect, toothed, not sagittate, lanceolate and long-pointed, dark green; petioles purple-spotted, winged. G.C. III. 23: 243. F.E. 10: 886. Gn. 55: 183. Celebes.

L. H. B.

ALOE (Arabic name). *Liliàceæ*, tribe *Aloìneæ*. Acaulescent or variously caulescent succulents: lvs. often large, usually crowded in rosettes or along end of st.: fls. red or yellow, often paler-striped, straight, tubular, with short, straight limb, equaled or surpassed by the stamens. Afr., especially in the Cape region, one species about the Mediterranean and extensively naturalized in all warmer parts of the world, and one in China. Plants of the coolhouse, best planted out in a well-drained place in summer, when they flower prettily. Prop. by seed, which usually is not true to name, and by suckers or cuttings well dried-off. Branching for this purpose may be induced by scaring the crown of old plants. Hybrids are said to occur with Gasteria (*A. Bedingbausii*=*A. aristata*×*G. nigricans*; *A. Beguinii*=*A. aristata*×*G. verrucosa*; *A. Lapairii*=*A. aristata*×*G. maculata*; *A. Lynchii*=*A. striata*×*G. verrucosa*, and *A. Nowotnyi*=*A. aristata*×), and with *Lomatophyllum* (*A. Hayeri*=*A. serrata*×*L.* sp.). J. G. Baker, in Jour. Linn. Soc. Bot. 18, pp. 152–182.

WILLIAM TRELEASE.

Old plants of Aloe will keep healthy for several years in the same pots without a renewal of soil, and flower freely at the same time. The soil most suited to their needs is sandy loam three parts, lime rubble and broken brick one part, with a little decayed manure to strengthen the mixture. Very firm potting is necessary. Drainage is a more important item than soil, and must be perfectly arranged to enable the surplus water to run freely from the soil. Broken bricks are preferable to pieces of pots, large pieces for the bottom of the pot or tub, and smaller pieces above, till the last layer is quite fine. Some of the species need freer rooting conditions than others. *A. ciliaris* will grow from 5–7 ft. in a season. *A. Abyssinica* is of robust growth, and differs from most others in the color of the flowers, which are pure

yellow, most of the others being orange and orange-scarlet. *A. plicatilis* makes an ornamental tub plant when 4 or 5 ft. high. Except during the period in which the species are in active growth, they need very little water, the principal idea being to keep the soil sweet and porous even when in growth. At all times the air of the house should be as dry as possible, full sunshine not hurting them. Prop. by seeds, suckers and cuttings. The arborescent kinds should be rooted after they have completed growth. Dust over the cut part of the cutting with powdered charcoal and dry in sunshine before putting it in to root. Insert singly in as small pots as they will go into, and plunge in a sand bed. Very little moisture is necessary while rooting. G. W. OLIVER.

The generic or scientific name Aloe is a Latinized form of an Arabic name. As an English word it is pronounced in two syllables, thus, A'loe. Popularly this word is loosely used, the common American Aloe being *Agave Americana*, the commonest "Century Plant." The "bitter aloes" of commerce is a resinous juice much used as a laxative. The best quality is called "Socotrine or Zanzibar Aloes," a product of *A. Perryi*, which was known by the Greeks of the Fourth century B.C. to come from the island of Socotra. The "Barbadoes Aloes" is the product of *A. vera*, a species much planted in the West Indies. Genera allied to Aloe are Apicra, Gasteria, Haworthia, Pachidendron, and Phylloma. The group is an extremely difficult one for the botanist, there being few authentic specimens in the herbaria, because of the large size of the plants, the infrequent flowering, and the difficulty of suitably drying them.

Aloes are much cultivated as decorative plants, being amongst the most popular of desert and succulent plants for their stiff, harsh and rugged habit. They are often grouped about large public buildings, where they emphasize certain architectural features. Large collections are to be seen only in botanic gardens and in the collections of a few fanciers. The largest dealer has nearly a hundred kinds, but grows only five or six kinds in quantity. For index to the following species, see supplementary list, p. 51. W. M.

A. *Arrangement of lvs. spiral (except in seedlings).*

B. *Form of lvs. broadly lanceolate, acute : size of lvs. moderately large.*

C. *Border of lvs. thin, horny : margin entire or denticulate.*

D. *Color of lvs. grayish : shape of lvs. flattened.*

1. **striàta,** Haw. (*A. paniculàta,* Jacq. *A. albo-cincta,* Hort.). Caulescent : lvs. at length large, finely dark-lined, scarcely mottled, with entire white border : inflorescence compound, broadly cymose : fls. red, constricted above the ovary. Cape. B.M. 5210. Hybrids with *A. serrulata* and *A. grandidentata* occur, having toothed lvs.

68. Aloe serrulata.

Var. **rhodocincta** (*A. rhodocincta,* Hort. *A. Haudiuriana,* Naud.). Lvs. purplish, very glaucous, with entire reddish border.

2. **serrulàta,** Haw. Fig. 68. Lvs. less striate, obscurely mottled, the white border denticulate : inflorescence less cymose. Cape. B.M. 1415.

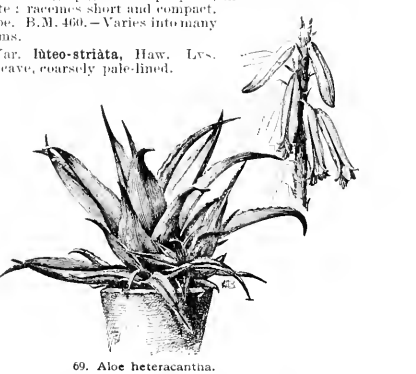
DD. *Color of lvs. clearer green : shape of lvs. more concave : teeth small and cut nearly through the border.*

3. **macrocárpa,** Tod. Lvs. interruptedly green-lined, more evidently mottled: inflorescence branched with elongated racemes. Abyssinia.

4. **Schimperi,** Tod. Lvs. coarsely green-lined, scarcely mottled; racemes short and cymose. Abyssinia, China?

CC. *Border of lvs. usually only near the apex : mottling present.*

5. **saponària,** Haw. (*A. distícha,* Mill., not Linn. nor Thunb. *A. umbellàta,* DC.). Shortly caulescent : lvs. somewhat gray-green or purplish, the small teeth remote : racemes short and compact. Cape. B.M. 460.—Varies into many forms.



69. Aloe heteracantha.

Var. **lùteo-striàta,** Haw. Lvs. concave, coarsely pale-lined.

6. **latifólia,** Haw. (*A. saponária,* var. *latifólia,* Hort.). Lvs. apple-green, thick and broad, concave, the conspicuous pale blotches irregularly transversely confluent; teeth large, mostly curved, rather remote : racemes short and dense. Cape. B.M. 1346.

7. **commutàta,** Tod. Lvs. rather thinner : racemes several, somewhat elongated. Abys.

8. **obscùra,** Mill. (*A. picta,* Thunb.). Lvs. rather narrower and thinner : racemes elongated. Cape. B.M. 1323.

9. **grandidentàta,** Salm. Lvs. and racemes still more elongated. Cape.

CCC. *Border of lvs. nearly absent : mottling scarcely present : lvs. involute at tip.*

10. **glaùca,** Mill. (*A. rhodacántha,* DC.). Caulescent: lvs. not mottled, very glaucous, the irregular red or brown teeth subconfluent : inflor. simple, densely racemose; fls. red, scarcely constricted above the ovary. Cape. B.M. 1278. A hybrid with *A. humilis,* var. *incurva,* is *A. cgauca.*

Var. **muricàta,** Sch. Lvs. glaucous, with large teeth, those on the keel or apex more developed.

11. **heteracántha,** Bak. (*A. inérmis,* Hort., not Forsk.). Fig. 69. Nearly stemless, often densely cespitose : lvs. dark green, sometimes with a few obscure yellowish green spots, slightly striate at base, entire or with a few remote small teeth. Cape? B.M. 6863.

BB. *Form of lvs. ovate-lanceolate, acute, thick, mostly tuberculate on the back : size of lvs. large.*

12. **férox,** Mill. (*A. muricàta,* Schult. *A. hórrida,* Haw. *Pachidéndron férox,* Haw.). Caulescent, unbranched: lvs. crowded at summit, glaucous, the margin and both surfaces remotely coarsely pungently toothed: inflor. branched, with elongated very dense racemes; fls. reddish, with stamens twice as long as the perianth. Cape. B.M. 1975. G.C. II. 3 : 243.—Varies into several less muricate forms.

13. **mitriformis,** Mill. (*A. mitraformis,* Willd., not DC. nor Haw. *A. Commélyni,* Willd. *A. spinulósa,* Salm. *A. pachyphýlla,* Hort. *A. xanthacántha,* Willd.). Fig. 70. Somewhat branching: lvs. spaced along the stem above, dark green, with strong, separated marginal teeth, both faces usually muricate : inflor. sometimes branched, with short, compact racemes : stamens not exserted. Cape. B.M. 1270.—Varies into numerous forms.

BBB. *Form of lvs. elongated, gradually tapering: size of lvs. large: border absent: teeth usually coarse.*

14. **Bainesii,** Dyer. (*A. Barberæ*, Dyer.). A very large forking tree, in cultivation becoming tall, though at first slender: lvs. very concave, dark green, remotely dentate, spaced along the stem above, with white-margined sheathing base: inflor. short and compact, the reddish fls. tumid. S. Afr. G.F. 3:115. G.C. II. 19, pp. 566–571, ff. 117, 119, 120, 122. B.M. 6848.

15. **vera,** Linn. (*A. vulgaris*, Lam. *A. Barbadensis*, Mill.). Low or small, slender tree: lvs. broader, less channeled, pale gray-green, coarsely dentate, not sheathing: fls. yellow. Suckers, freely produced in cultivation, have clear apple-green mottled linear lvs. Mediterranean region, and naturalized through the warmer parts of the world.—The oldest known and probably the commonest species.

Var. **officinalis,** Forsk. (*A. rubescens*, DC. *A. Indica*, Royle). Lvs. purplish: fls. red-orange. Orient.

16. **Succotrina,** Lam. (*A. sinuata*, Thunb., not Willd.). Related to the last: lvs. relatively narrower, dark green, coarsely serrate: fls. red, variously tipped and striped. Cape. B.M. 472. Gn. 45, p. 303.—A hybrid with *A. ciliaris* is *A. de Laetii*.

Var. **purpurascens,** Gawl. (*A. purpurascens*, Haw. *A. rumosa*, Haw.). Lvs. purplish. B.M. 1474.

17. **arborescens,** Mill. (*A. fruticosa*, Lam.). Low, slender tree: st. roughened by old leaf bases: lvs. dark green, glaucescent, coarsely green-dentate to hooked serrate when separated, with whitish sheathing bases: fls. red. Cape. B.M. 1306.

Var. **frutescens,** Salm. (*A. frutescens*, Salm.). Smaller, suckering freely: lvs. blue-glaucous, the sheathing bases coarsely green-striate.

BBBB. *Form of lvs. lanceolate, acute, flat: size of lvs. small: border absent: teeth ciliate: mottling absent: lvs. sheathing, with perfoliate margin.*

18. **ciliaris,** Haw. St. elongated, very slender, branched: lvs. dark green, the slender white teeth longer about the base: inflor. axillary, somewhat elongated, loosely few-fld.: fls. red. Cape.

BBBBB. *Form of lvs. various, thick, plano-convex: size of lvs. small: border absent: mostly toothed on the back: mottling absent: lvs. crowded.*

19. **brevifolia,** Mill. (*A. prolifera*, Haw.). Short-stemmed: lvs. spreading, broadly lanceolate, acute, shortly and pungently white-toothed; a few similar teeth occasionally on both surfaces. Cape. B.R. 996.

20. **humilis,** Mill. (*A. echinata*, Willd. *A. suberecta*, Haw. *A. subtuberculata*, Haw.). Acaulescent: lvs. ascending, lanceolate, gradually attenuate, loosely soft-serrate, both surfaces coarsely tuberculate or echinate: raceme somewhat elongated, loosely fld: fls. red. Cape.—An extremely variable species, of the habit of certain Haworthias.

Var. **Candollei,** Bak. L.B.C. 15:1481. Var. **incurva,** Haw. B.M. 828. Var. **acuminata,** B.M. 757. L.B.C. 16:1504. Var. **minor,** Hort., is in cult.

21. **aristata,** Haw. (*A. longiaristata*, Schult.). Lvs. ascending, attenuate into a long bristle. Cape.

AA. *Arrangement of lvs. 3-ranked: lvs. rather small.*

22. **variegata,** Linn. Short-stemmed: lvs. erect, v-shaped, acute, with finely warty horny white margin and keel, mottled, the pale blotches variously transversely confluent: raceme short, rather loose: fls. reddish. Cape. B.M. 513. F.E. 8:98.—Common.

AAA. *Arrangement of lvs. 2-ranked: lvs. elongated.*

23. **Cooperi,** Bak. (*A. Schmidtiana*, Regel.). Acaulescent: lvs. subereet, linear-oblong, sharply-grooved and keeled, mottled, faintly striate, the small white teeth subconfluent: inflor. subcymose: fls. reddish or brownish, tumid below. Cape. B.M. 6377. Gt. 970.

24. **plicatilis,** Mill. (*Rhipidodendron plicatile*, Haw.). Becoming tall and stout, branching: lvs. glaucous, flat, lingulate, obtuse, serrulate and bordered at least near the apex: inflor. shortly racemose: fls. reddish, the petals nearly free within the tube. Cape. B.M. 457.

WILLIAM TRELEASE.

In the following alphabetic list are included (1) the more important species (which are numbered, and have been fully described previously), (2) synonyms of the above (which are followed by the sign of equality and a number), (3) the less important species (which are briefly described in the present list, but not previously). Those marked with an asterisk (*) are advertised in the catalogues: *A. Abyssinica*, Lam., var *Pæcockii*, Bak. Lvs. 20–30 in a dense sessile rosette, 1^1_2 ft. long, 5–6 in. broad at base, glaucous green, not mottled, the margins with close, spreading, deltoid spines, with horny reddish brown tips: inflor. as long as the lvs., a 6–8-branched panicle. B.M. 6620.—*A. Africana*, Mill. St. stout, marked with scars of fallen lvs.: lvs. alternate, st.-embracing, concave; teeth conical, reddish orange at tip. scape bearing a dense many-fld. spike of long cylindrical fls. B.M. 2517.—*A. agavæfolia*, Tod. Allied to *A. triflora*. St. short: lvs. dense, copiously white-spotted, lanceolate; teeth large: fls. racemose, red. Trop. Afr.—*A. albocincta*=1.—*A. arborescens*, 17.—*A. aristata*, 21.—*A. Barbadensis*=15.—*A. Bainesii*, 14.—*A. Barberæ* 14.—*A. brachystachys*, Bak. Allied to *A.* Abyssinica. St. long, slender: lvs. ensiform, in a dense rosette at the top of the st., all drooping, except the youngest, 1^1_2–2 ft. long, 2 in. broad above the dilated base, bright green, not mottled; marginal prickles deltoid, not brown: peduncle flexuose; raceme dense; bracts with 5–7 distinct brown stripes. Zanzibar. B.M. 7299.—*A. breviifolia*, 19.—*A. Chinensis*, Bak. Allied to *A.* Abyssinica. Lvs. 15–20 in a sessile rosette, $\frac{1}{2}$–1 ft. long, 1^1_2–2 in. wide at base, deeply channelled in upper part, pale green: scape simple, 1^1_2 ft. long; bracts few, distant, small, deltoid. B.M. 6301. Hab.?—*A. ciliaris*, 18.—*A. Commelyni*=13.—*A. commutata*, 7.—*A. Cooperi*, 23.—*A. cyanea*=10.—*A. dichotoma*, Linn. f. Allied to *A.* Bainesii. Arborescent: st. tall, much branched. B.M. 7299.—*A. distans*, Haw. (*A. mitræformis*, var *brevifolia*). St. 3 or more ft. high: lvs. ovate-acuminate, concave, scattered along the st., with a few white spots on the back; teeth short, distant: fls. red, tipped green. S. Afr. B.M. 1362.—*A. distichа*=5.—*A. echinata*=20.—*A. elegans*, Tod. Little known. Not mentioned by Baker. Hab.?—*A. ferox*, 12.—**A. frutescens*, Salm.=17.—**A. fruticosa*=17.—*A. glauca*, 10.—*A. gracilis*, Haw. Allied to *A.* arborescens. St. long: lvs. loosely arranged, 6–10 in. long, 1 in. wide at the base, ensiform, acuminate, not lined or spotted; prickles minute, spreading, tipped brown: fls. yellow, tube with long lanceolate segments.—**A. grandidentata*, 9.—*A. Grèvei*, Bak., in the Pictæ group, is readily distinguished by the elongated racemes and the strong

70. Aloe mitriformis.

constriction of the perianth below the middle. Lvs. 12–15, in dense rosette, lanceolate, channelled, bright green; prickles connected by a narrow horny line; fls. pale salmon; bracts awl-shaped, purplish. Cape? B.M. 6520.—*A. Haubrixiana* = 1.—*A. heteracantha*, H.—*A. Hildebrandtii*, Bak. St. 1½–2 ft.; internodes spotted white; lvs. loosely arranged, 6–10 in. long, glaucous green; teeth small, ascending; inflor. a lax panicle, 1½ft. long, with 10–12 branches; remarkably prolific of fls. B.M. 6981. —*A. horrida*—12.—*A. humilis*, 20.—*A. Indica* = 15.—*A. inermis*, H.—*A. isaogas*, Brown. A hybrid of *A. dreparioides* × *A. echinata*. G.C. II. 24: 41.—*A. Kirkii*, Bak. St. very short; lvs. 30–40, in a dense rosette, green, not spotted; teeth large; inflor. 2 ft. long, 3-branched; fls. red. Zanzibar. B.M. 7386.—*A. kniphofioides*, Bak. Acaulescent; lvs. linear, rigid, serrulate; inflor. an elongated raceme. Hook. Icon. 1930.—*A. de Lattii* = 16.—**A. latifolia* = 6.—*A. longiaristata* = 21.—*A. Lindii*, Bak. A very distinct species with no marginal prickles; st. short; lvs. 7–8, in a dense rosette, 1 ft. long, 2 in. wide at base, pale green, not spotted; peduncle much longer than lvs; panicle of 4–5 long, lax racemes; a marked character. B.M. 7448.—*A. maccracantha*, Bak. St. 2–3 ft.; lvs. 20–30, in a dense rosette, lanceolate, bright green, much lined; prickles large, brown and horny in upper half; inflor. a dense corymb; fls. yellow, tinged red; tube constricted above the globose base. B.M. 6580. Said to be the finest of all spotted Aloes.—**A. macracarpa*, 3.—*A. medica*, Hort. Alverson = ?—*A. micracantha*, Haw. Lvs. linear, 1½ft. long, 1½in. wide at base, deeply channelled, mottled; spines very minute, white; fls. greenish red, in a lax unbel-like raceme; bracts large, ovate-acuminate, striate. S. Afr. B.M. 2272.—*A. minima*, Bak. Hook. Icon. 2223. A recent and little known species.—**A. mitriformis* = 13.—**A. mitriformis*, 13.—*A. muricata* = 12.—*A. nobilis*, Haw. Allied to *A. distans* and *A. mitriformis*. Sts. long; lvs. loosely disposed, not spotted, ovate-lanceolate; fls. red. S. Afr.—*A. obscura*, 8.—*A. pachyphilla* = 13.—**A. paniculata* = 1.—*A. percussa*, Tod.—*A. Abyssinica*.—*A. Pérrii*, Bak. St. 1 ft. long; lvs. 12–20, in a dense rosette, lanceolate, 1 ft. long, 3 in. wide at base, dull green, tinged red near the keen; spines ¼in. apart; peduncle purplish; racemes oblong-cylindrical, 3–6 in. long; fls. red. Socotra. B.M. 6596.—**A. picta* = 8.—*A. plicatilis*, 24.—*A. pratensis*, Bak. Allied to *A. humilis*. St. none; lvs. 60–80, not spotted; spines large, red-brown, horny; peduncle 1 ft. long, stout; bracts many. B.M. 6705.—*A. prolifera* = 19.—*A. purpurascens* = 16.—*A. reunion* = 16.—**A. rhadacantha* = 10.—**A. rhodacanta* = 1.—**A. rosco-cincta*, Hort. Blanco = ?—*A. rubescens* = 15.—**A. saponaria*, 5.—*A. Schimperi*, 4.—*A. Schmidtiana* = 23 = *A. Scilliaris*, Hort. Alverson. Typographical error for *A. ciliaris*? —**A. scopelinia*, Hort. T. B. Shepherd = ?—*A. Serra*, DC. Allied to *A. brevifolia* and *A. glauca*.—*A. serrulata*, 2.—*A. sinuata* = 16.—**A. Socotrana* = 16.—*A. spinulosa* = 13.—*A. striata*, 1. —*A. subcrecta* = 20.—*A. subfoveolata* = 20.—*A. succotrina*, 16. —*A. tricolor*, Bak. Differs from *A. saponaria* by its racemose (not capitate) inflorescence, and tube constricted in the middle; white spots very numerous, oblong, in single or double lateral rows; fl. tube spotted white at base. B.M. 6324.—*A. umbellata* = 5.—**A. variegata*, 22.—**A. vera*, 15.—*A. virens*, Haw. Allied to *A. humilis*. Stemless; lvs. 30–40, lanceolate, white spotted, channelled, not lined; prickles green; raceme lax, 15–18 in. long; fls. red. B.M. 1355.—**A. vulgaris*, 15.—*A. xanthacantha* = 13.

ALONSÒA (Alonzo Zanoni, Spanish botanist). *Scrophulariàceæ*. Trop. Amer. plants, cult. as annuals in the open, or rarely grown in pots. They are tender, and need protection from frost. Seeds are usually started under glass in the N., although plants bloom well from seeds sown directly in the open. Use only finely prepared soil. Fls. showy; plant of good habit. The corolla is very irregular and turned upside down by the twisting of the pedicel, bringing the larger lobe uppermost; stamens 4; lvs. (at least below) opposite or in 3's. Cult. species mostly from Peru and Mex.

incisifòlia, Ruiz & Pav. (*A. urticæfòlia*, Hort. *Celsia urticæfòlia*, Sims, B.M. 417). About 2 ft. high, erect; lvs. ovate to oval-lanceolate, long-stalked, deeply cut-toothed; fls. nearly ½in. across, very irregular (somewhat hood-shaped), scarlet, with protruding organs, on slender axillary peduncles. Also a white-fld. var.—Annual; but perennial in warm countries or under glass.

Var. **Warscewiczii,** Boiss. (*A. Warscewiczii*, Regel. *A. grandiflòra*, Hort.). Fls. larger (often 1 in. across), rose-red, the plant more herbaceous and more perfectly annual. Also white-fld.—The commonest form in our gardens.

myrtifòlia, Roezl. Plant 2–3 ft.; lvs. broad-lanceolate, canaliculate, prominently serrate; fls. large, scarlet (a white var.).—Perennial under glass. Useful for winter-growing in pots.

linifòlia, Roezl. Plant 1½ft. or less high; lvs. lanceolate or narrower, entire; fls. bright scarlet.

A. acutifolia, Ruiz & Pav. Lvs. less cut than in *A. incisifolia*: scarlet.—*A. cavaliculata*, Ruiz & Pav. Lvs. less cut than in *incisifolia*: fls. smaller: st. 4-angled.—*A. lucanis*, Ruiz & Pav. Lvs. linear, entire or very nearly so, often fascicled: fls. scarlet. Greenhouse.—*A. Matthewsii*, Benth. Lvs. lanceolate, toothed: fls. scarlet, in terminal racemes. Greenhouse.

L. H. B.

ALOŸSIA. See *Lippia*.

ALPINE GARDENS. In the successful culture of alpine plants, the most important point is to give them as near their natural alpine conditions as possible. So far as soil is concerned this is not difficult, but when it comes to moisture with good drainage and surrounding atmospheric conditions, especially in the dryer atmosphere of some of our western states, we have a more difficult task. In their natural homes, many of the alpines are found growing under very similar conditions to our bog plants, and the two classes, for the most part, may be brought together in cultivation. Of course, the mountain Primula might never withstand the stagnation to which the roots of the water Arum (*Peltandra Virginica*) penetrate in the wet bog, nor should we expect the Peltandra to survive the wintry blasts to which the Primula is exposed, but the two may be grown together with very good results in a moist, springy situation, in the same bed and soil. Any light, sandy soil, well drained, but through which water is constantly passing in and out, so that there is no stagnation and always a little moisture on the surface (which makes it cooler from the evaporation), will answer for most of the bog plants and the majority of the alpines also. There should be a natural slope to the surface of the ground for such conditions, and if the surface is undulating, so as to make some parts drier than others, those plants which require the most moisture can go into the wettest places. Alpines like a deep soil, into which their roots can penetrate. Leaf-mold should be used in place of any manure, and if the soil is a very fine one a mixture of gravel should be introduced. Shade and sun are rather necessary, as some of the alpines would hardly stand the full scorching sun of our hottest days in summer, even though the surface of the soil were moist, while others require full sun. Alpines have been successfully grown in sphagnum moss. This is done with best results in the rockery, where the various pockets are filled with the fresh moss and the plants set in it. Water should be supplied often enough to keep the moss always moist. The evaporation from the wet moss creates a cool atmosphere around the plants, thus giving them a condition somewhat like that which they have in alpine regions, surrounded by mountain fogs, or in the moist bog. Many alpine-garden plants are not confined to alpine situations. They grow in moist places in much lower altitudes as well. Such species as *Houstonia cærulea*, *Parnassia Caroliniana*, and *Smilacina stellata* may be mentioned among these. Most of the alpines, when set in the fresh, damp sphagnum, do nicely in full sun, but for the alpine ferns shade should be given. Those which grow in drier places, like the little *Woodsia glabella* or *W. hyperborea*, need less shade and moisture, while *Asplenium viride* and *A. Trichomanes* want more moisture about their roots, and deep shade.

F. H. Horsford.

ALPÍNIA (Prosper Alpinus, an Italian botanist). *Scitamineæ*. Stove herbs, cult. both for lvs. and the racemes or panicles of fls. The fl. has 3 exterior parts and 4 interior parts. The lowermost part is lobed or tubular. Stamens with petal-like filament. They need high temperature, much water, light soil, and abundance of room. After flowering, allow them to rest in heat, but do not dry them off. Prop. by dividing the ginger-like roots.

Alpinia contains many handsome species, but only a few are common in cultivation. They are tropical plants, and require a moist air and a temp. of 55° to 60° F. A mixture of 2 parts loam, 1 part leaf-mold, and 1 part dried cow-manure forms an excellent compost. While growing, they need an abundance of water, and the large-growing kinds require large pots or tubs. The plants are prop. by division in the spring. *A. nutans* is grown for its handsome fls., and attains a height of 12 or 13 ft. *A. rittata* is popular on account of its variegated foliage. *A. mutica* has very showy fls., but is probably not in the American trade.

Cult. by Robert Cameron.

nùtans, Roscoe. SHELL-FLOWER. Striking plant, reaching 10–12 ft., with long, lanceolate glabrous long-veined lvs.; fls. orchid-like, yellow with pink, sweet-scented, in a long, drooping, terminal, spike-like raceme. E. Ind. G.C. III. 19:301. I.H. 43:259. B.M. 1903. P.M. 13:125. R.H. 1861, 51.—Fine for foliage masses, and an old favorite.

vittàta, Hook. (*Amòmum vittàtum*, Hort.). Lower lvs. in tufts, lanceolate, with whitish bars or stripes between the nerves; fls. red, in axillary spikes. South Sea Islands. A.F. 8:787. Gn. 4, p. 25.

71. Pinna of Alsophila australis.

álbo-lineàta, Hort. A plant 3–4 ft. high, with broad bands of white and pale green on the elliptic-lanceolate lvs. Probably a form of some other species.

Other species are *A. Alliighas*, Roscoe, fls. in terminal panicles, white and rose; *A. magnifica*, Roscoe = Amomum; *A. Japonica*, Miq., once int. into U. S. by Pitcher & Manda; *A. mútica*, Roxbg., fls. white and yellow, with crimson veins, in spicate racemes.

L. H. B.

ALSEUÓSMIA (*alsos*, grove, and *osme*, fragrance). *Caprifoliàceæ*. Tender greenhouse shrub from New Zealand.

A. macrophýlla. A Cunn. Lvs. 3–6 in. long, elliptic or oblanceolate, acute, serrate; fls. in small axillary clusters, drooping, 1½in. long, creamy with dull red streaks; corolla lobes fimbriate. B.M. 6951.

ALSIKE. See *Clover* and *Trifolium*.

ALSÓPHILA (Greek, *grove-loving*). *Cyatheàceæ*. A genus of tropical tree ferns, with simple or forked free veins, round sori, and no indusia. Numerous species are found in the tropical regions of both hemispheres.

Of the different species of Alsophila, only one is in general commercial use. *A. australis* is a very graceful and rapidly growing tree fern, with finely divided fronds of a pleasing shade of light green, with the stipes thickly covered with light brown, hairy scales. It is grown from spores, which can only be obtained from old and large specimens, and which, like the spores of most commercial ferns, will germinate very freely if sown on a compost consisting of finely screened soil, leaf-mold and sand in equal parts. To develop a good crown of fronds in old specimen plants which may look starved, the stem may be covered to any thickness consistent with good appearance with green moss, which may be attached with thin copper wire, and which, if kept continually moist, will soon be thickly covered with fine roots. Alsophilas should be grown in a temperature of 60° F., and the soil should never be allowed to become very dry.

Cult. by NICHOL N. BRUCKNER.

A. *Lvs. bipinnate; rachises merely fibrillose.*

Rebéccæ, F. Muell. Lvs. ample, from a caudex 8 in. or so high; pinnæ 12–15 in. long, with 20–30 pinnules on each side, which are 2–3 in. long and serrate or crenate throughout. Australia.

AA. *Lvs. tripinnatifid or tripinnate; rachises armed with spines.*

B. *Segments long, strongly curved; pinnules tapering to a slender point.*

excélsa, R. Br. Lvs. coriaceous, with more or less woolly rachises; pinnæ 6–10 in. wide, with crowded pinnules, which are provided with about 20 pairs of segments, which are strongly curved and more or less enlarged at the ends. Norfolk Is.—Said to have a trunk 60–80 ft. high.

Cooperi, Hook. Smaller than the last; rachises with pale brown scales; pinnæ spear-shaped, with linear pinnules 4–5 in. long. Queensland.

lunulàta, R. Br. Lvs. rather thick herbaceous, from smooth rachises; pinnules close, 5–6 in. long, with 20–30 pairs of segments, which are finely serrate throughout.

BB. *Segments ½in. or less long.*

australis, R. Br. Fig. 71. Rachises straw-colored; lvs. ample, with primary pinnæ 18 in. long, 6–10 in. wide; pinnules deeply pinnatifid, with segments broadest at the base, ovate-oblong and sharply serrate. Tasmania and Australia.

férox, Presl. (*A. aculeàta*, J. Sm.). Rachises brownish; pinnæ 12–18 in. long; pinnules narrow, 3–4 in. long, ⅛–⅛in. wide, with 15–18 pairs of segments, which are narrow and slightly serrate. Trop. Amer.

AAA. *Lvs. quadripinnatifid.*

oligocarpa, Fee. Fig. 72. Rachises smooth, grayish straw-colored; pinnules 1½–2 ft. long, the segments ligulate, deeply pinnatifid, with blunt lobes; sori median, 4–6 on the lower lobes. Columbia.

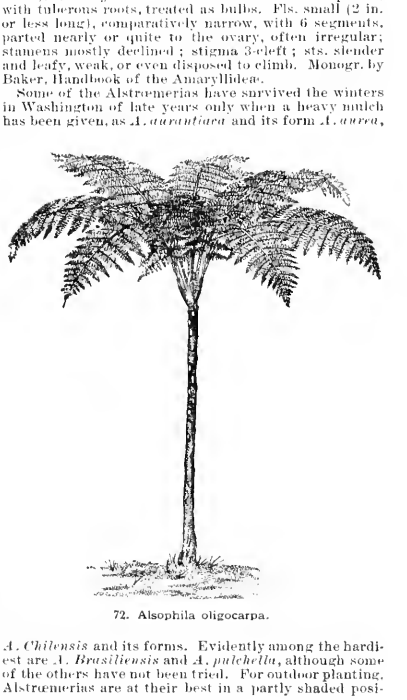
L. M. UNDERWOOD.

ALSTÒNIA (Dr. Alston, once professor of botany at Edinburgh). *Apocynàceæ*. Between 30 and 40 species of trees or shrubs of E. Ind. and Australia, with small white fls. in terminal cymes, and simple entire lvs. in whorls or opposite. *A. scholàris*, R. Br., is the Devil-tree or Pali-mara of India, the bark of which is medicinal. Trees yield caoutchouc.

macrophýlla, Wall. A tall tree, with milky juice, sparingly cult. in S. Fla., and perhaps in S. Calif.

ALSTRŒMÈRIA (Baron Alstrœmer, friend of Linnæus). *Amaryllidàceæ*. Coolhouse and stove plants, with tuberous roots, treated as bulbs. Fls. small (2 in. or less long), comparatively narrow, with 6 segments, parted nearly or quite to the ovary, often irregular; stamens mostly declined; stigma 3-cleft; sts. slender and leafy, weak, or even disposed to climb. Monogr. by Baker, Handbook of the Amaryllideæ.

Some of the Alstrœmerias have survived the winters in Washington of late years only when a heavy mulch has been given, as *A. aurantiaca* and its form *A. aurea*,



72. Alsophila oligocarpa.

A. Chilensis and its forms. Evidently among the hardiest are *A. Brasiliensis* and *A. pulchella*, although some of the others have not been tried. For outdoor planting, Alstrœmerias are at their best in a partly shaded posi-

tion, and at all times during their growth the roots must have an abundance of water. In fact, there is little use in attempting their cultivation out-of-doors where these conditions cannot be given. In colder climates, the Alstroemerias can be grown very successfully by planting-out in spring, and, as soon as they die down, lift, and keep over winter in a place from which frost is excluded. An annual lifting, or, when grown in pots, an annual shaking-out, should be given, because they increase to such an extent that the younger and smaller crowns are apt to take the nourishment from the large, flowering crowns. The largest ones ought to be separated from the smaller ones, and either grown in pots or planted outside when the proper time arrives. In this way the genus will become much more popular than it now is, either for cutting or for the decoration of the border. The soil best suited to their requirements is largely composed of vegetable humus; when this is not to be had, old, well-decayed cow or stable manure should be incorporated with the soil. When they are planted outside, the tubers should be put deep in the ground, and the soil should be well worked for at least 15 inches. The tubers are slightly egg-shaped, attached to a common stem; the roots are made from the ends of the tubers, and also from near the growing points of the crowns.

One of the best for greenhouse work is *A. Pelegrina*, var. *alba*. Other kinds which may be considered tender north of Washington are *A. hæmantha*, *A. versicolor* (or *Peruviana*) and its forms, *A. Hookerii* and *A. violacea*. Some of the Van Houtte hybrids, raised from Hookerii and hæmantha, are extremely pretty, but, with the others, they are rather unsuitable for pot-culture, owing to the peculiar formation of the roots.

The species are easily raised from seeds, which should be sown rather thinly in deep pans, and allowed to remain without pricking off or shifting for the first season.

Cult. by G. W. Oliver.

A. *Lvs. of fl. stem (or scape) broad, oblong or oblong-spatulate.*

pulchélla, Linn. f. (*A. psittacina*, Lehm.). Sterile st. a foot or less long, with aggregated petioled lvs.: flowering st. 2–3 ft., with scattered lvs.: fls. in a simple umbel, on pedicels 1–1½ in. long, long-funnel-shaped, the segments unequal, dark red and tipped with green and spotted inside with brown; stamens nearly as long as limb. Brazil. Fig. 73 is a copy of the *A. psittacina*, B.M. 3033.—An old garden plant.

73. Alstroemeria pulchella (× ½).

Chilénsis, Cree. Stout, 2–4 ft.: lvs. scattered, obovate or spatulate, or the upper becoming lanceolate, twisted at the base, fringed, somewhat glaucous: fls. large, rose or red (or varying to whitish), the two lower segments longer and straighter: umbel with 5 or 6 2-fld. peduncles. Chile.

AA. *Lvs. of fl. st. lanceolate (at least the lower ones).*

B. *Fls. purplish or red.*

Pelegrina, Linn. Fl. st. stout, a foot or less high: lvs. about 30, thin, ascending, 2 in. or less long and ½in. or less wide: fl. 2 in. or less long, lilac, the outer segments broad and cuspidate, the inner ones spotted red-purple: umbel few-rayed, normally simple, but becoming compound in cult. Also a pure white var. Chile. B.M. 139. Gn. 46, p. 472. L.B.C. 13: 1295.

hæmántha, Ruiz & Pav. (*A. Simsii*, Spreng.). Fl. st. 2–3 ft.: lvs. crowded and thin, somewhat stalked, 3–4 in. long and ¾in. or less long, the upper becoming linear, glaucous beneath: fls. 2 in. or less long, bright red tipped green, the inner ones with red-purple spots on a red-yellow ground: umbel very compound, the branches 4–6 in. long. A white-fld. variety is cult. Chile. B.M. 2353, as *A. pulchella*.

BB. *Fls. yellow or yellowish.*

aurantiàca, Don. Fl. st. 2–4 ft. high: lvs. nearly 50, thin, somewhat petiolate, slightly glaucous below, 3–4 ft. long and ½in. wide: fls. 10–30, in a compound umbel, the perianth bright yellow, outer segments tipped green and inner ones spotted brown. There is a form with pale, unspotted fls. Chile. B.M. 3350, as *A. aurea*. Gn. 26: 472.

Brasiliénsis, Spreng. St. 3–4 ft.: lvs. remote, thickish, oblong-lanceolate, 2 in. long: fl. 1¼ in. long, in a 5-rayed umbel (each ray bearing 1–3 fls.), the segments oblong-spatulate and reddish yellow, the inner ones spotted brown; stamens shorter than segments. Brazil.

AAA. *Lvs. of flower stem linear.*

versicolor, Ruiz & Pav. (*A. Peruviana*, Van Houtte. *A. sulphùrea* and *A. tigrina*, Hort.). Fl. st. short (1 ft. or less high); lvs. many, the lower ones about 1 in. long: fls. 1 in. long, in a nearly simple umbel, yellow spotted purple, the segments all oblanceolate and acute. A marginate var. Chile.

Ligtu, Linn. Fl. st. 1½–2 ft.: lvs. 20–30, thin, the lowermost becoming lanceolate, 2–3 in. long: fls. 1½ in. long, in a nearly or quite simple umbel, whitish, lilac or pale red, streaked purple, the inner segments often obtuse. Var. **pulchra**, Baker (*A. pùlchra*, Sims, B.M. 2421. *A. Flòs-Mártini*, Ker.), has narrower and longer lvs., and all the segments acute or cuspidate. Chile. Common and variable in cult. *A. Hoòkeri*, Lodd., is a form of *A. Ligtu*.

The *A. Ligtu* of B.M. 125 is *A. caryophyllèa*, Jacq., with long-clawed, very unequal segments in two sets or lips, red and red-striped. Brazil.

violàcea, Phill. St. 1–2 ft.: lvs. scattered and spreading, 1 in. or less long, those on sterile shoots larger, ovate-oblong and 5-nerved: fls. on forked pedicels in a 5-rayed umbel, 1½–2 in. long, bright lilac, the outer segments obovate, truncate and with a short cusp, the inner oblong-acute, spotted. Chile.

L. H. B.

ALTERNANTHÈRA. See *Telanthera*.

ALTHÆA (Greek, *to cure*). *Malvàceæ*. Tall biennial or perennial herbs, of the warm-temperate regions of the Old World, of about a dozen species. Fls. axillary, solitary, or racemose in the axils or at the summit of the stem, with 6–9 bracts below the calyx. *A. frùtex* and *A. cælèstis*, Hort., are *Hibiscus Syriacus*.

officinàlis, Linn. Marsh Mallow. Downy: lvs. ovate, often heart-shaped or 3-lobed, frequently undivided, tomentose: fls. 1 in. across, blush or rose, clustered in the axils of the lvs. Perennial. E. Eu.—Root used for mucilage and for other purposes; also medicinal. The root of commerce has its brown outer covering removed. Rarely cult., but occasionally escaped in marshes near the coast.

rósea, Cav. Hollyhock, which see for culture. St. strict and spire-like, hairy: lvs. large and rough, rounded-heart-shaped, wavy-angled or lobed: fls. large and nearly sessile, in a long wand-like raceme or spike, in many forms and colors. Biennial. China. B.M. 3198.

ficifòlia, Cav. Biennial, 5–8 ft.: lvs. 7-lobed, toothed. fl. yellow or orange, large, in terminal spikes, showy. Eu. Int. by Franceschi, Cal., as *A. sidæfòlia*.

L. H. B.

ALUM ROOT. See *Heuchera*.

Sweet alyssum used as a border plant

ALÝSSUM (classical name). *Cruciferæ*. Low plants, mostly perennials and used for rockwork. The Sweet Alyssum is one of the commonest annuals, grown both in the open and forced in benches, beds or pots. It is of the easiest culture, either indoors or out. The compact vars. are most prized for pot-culture. Under glass, requires temperature of a carnation house. It will stand considerable frost in the open, and may be sown early; it blooms all summer, and until killed by winter. Useful for window gardens and baskets. For winter bloom, sow seeds late in Aug. or in Sept. When blooms begin to fail, cut back the plant, and it will bloom again. The perennial species are usually prop. by dividing the roots; also by cuttings and seeds.

74. Sweet alyssum (× ¼).

A. *Fls. white.*

maritimum, Lam. (*A. odorátum*, Hort.). SWEET ALYSSUM. Fig. 74. A low, spreading, light green annual, with lanceolate or linear entire lvs., tapering to the base, and small honey-scented fls. in terminal clusters, which become long racemes. Eu. Many cult. vars.: **Bénthami** or **compáctum**, a dwarf and compact form, not over 6 in. high; **variegátum**, with pale white-edged lvs.; **giganteum**, robust, broad-lvd.; **procúmbens**, of spreading habit; and various horticultural forms with trade names.

spinósum, Linn. A woody-stemmed little perennial, with lanceolate acute silvery lvs., spiny fl. branches, and very small numerous fls. Eu. Rockwork; 3–6 in.

AA. *Fls. yellow: perennials.*

B. *Lvs. ½ in. or less long.*

serpyllifólium, Desf. (*A. alpéstre*, Linn.?). Dwarf (3–4 in. high), somewhat woody at the base, with roughhoary lvs., and pale yellow fls. in racemes. Eu. Int. 1892

BB. *Lvs. 1 in. or more long.*

saxátile, Linn. GOLDEN-TUFT. A foot high, woody at base; lvs. oblanceolate or ovate-lanceolate, entire or wavy, hoary-tomentose; fls. golden yellow, numerous, in little compact clusters. Eu. B.M. 159. A.F. 5:37. —Common in rockwork, making a spreading mat, blooming in early spring. There is a dwarf var. (*compáctum*), and a pretty variegated variety sold as *A. variegátum*.

Gemonénse, Linn. Less hardy than the last; lvs. lanceolate, velvety; fls. lemon-yellow; st. usually more woody at base. Eu.

rostrátum, Stev. (*A. Wierzbickii*, Heuff.). About 20 in.; lvs. 2 in. long, broad-oblong, pointed, hairy; fls. deep yellow, in dense heads, in summer. Asia Minor.

argénteum, Vitm. Dwarf and dense grower, 15 in. or less; lvs. oblong-spatulate, silvery beneath; fls. yellow in clustered heads, all summer. Eu.

L. H. B.

AMANÌTA. See *Mushroom*.

AMARABÒYA (native name). *Melastomàcew*. A genus of only three species of tender shrubs from New Grenada, which are showy both in foliage and flower. Lvs. large, opposite, sessile, with three prominent nerves, brownish red beneath; fls. large, cymose; petals usually 6; stamens 12–15. For cult., see *Pleroma*. Not known to be in American trade.

A. amábilis, Linden. Fls. white, margined carmine; stamens white; style red, exserted. I.H. 34:9.—*A. princeps*, Linden. Fls. carmine; stamens white; styles white. I.H. 34:4.—*A. splendida*, Linden. Fls. 6 in. across; petals narrower at the base than in the other species; stamens yellow; style red, exserted. I.H. 34:34.

AMARÁNTUS (Greek, *unfading*). *Amarantàcew*. AMARANTH. Coarse annual plants, grown for foliage and the showy fl.-clusters. Related to the Cockscomb. The Amaranths are usually treated as open-air annuals. They thrive best in a hot and sunny situation. In very rich soil the lvs. become very large but usually lack in bright coloring. Seeds may be sown in the open or in frames. The dwarf and compact vars., which often have beautifully variegated foliage, may be grown in pots or used for bedding. Give plenty of room.

A. *Lvs. linear-lanceolate, long and drooping.*

salicifólius, Veitch. Graceful pyramidal habit, 3ft.; lvs. 5–8 in. long and ¼in. wide, wavy, bronze-green, changing to orange-red. Philippines. G.C.I. 1871:1550. F.S. 19:1929.

AA. *Lvs. broad, mostly ovate.*

B. *Spikes drooping.*

caudátus, Linn. LOVE-LIES-BLEEDING. Fig. 75. Tall and diffuse (3–5 ft.); lvs. ovate to ovate-oblong, stalked, green; spikes red, long and slender, naked, in a long and drooping panicle, the terminal one forming a long, cord-like tail. Also vars. with yellowish and whitish panicles. India. G.W. 6:709.—Common, and an old favorite.

atropurpùreus, Hort. Foliage blood-red. Probably a form of *A. caudatus*. Perhaps the same as Roxburgh's *A. atropurpureus* from India.

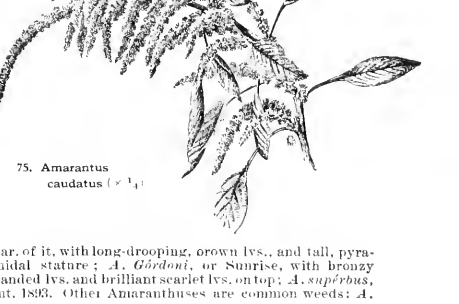
BB. *Spikes erect.*

hypochondriacus, Linn. PRINCE'S FEATHER. Tall and glabrous; lvs. oblong-lanceolate, acute; spikes blunt, aggregated into a thick, lumpy terminal panicle, of which the central part is elongated; bracts long-awned.—An old garden plant, with the heavy heads variously colored, but mostly purple. Lvs. mostly purple or purple-green. Probably Asian. Cult. also as *A. erúentus* and *A. atropurpùreus*. Sometimes a weed in cult. grounds.

paniculàtus, Linn. St. usually pubescent; lvs. usually broader than in the last, and spikes acute or acutish, and in an open, more graceful terminal panicle; bracts awn-pointed.—Common, and sometimes a weed. Lvs. usually green, but often blotched or bright purple. A showy form is *A. speciósus*, Sims, B.M. 2227. Cult. also as *A. sanguíneus*. Probably originally Asian.

Gangéticus, Linn. (*A. melanchólicus*, Linn.). Usually a lower plant, 3 ft. or less and often only 1 ft., with thin, ovate-pointed lvs., and fls. in short, glomerate, interrupted spikes, both terminal and axillary.—Very variable. Cult. by Amer. Chinese (Fig. 76) as a pot-herb under the name of Hon-toi-moi, with green lvs. (Bailey, Bull. 67, Cornell Exp. Sta.). A form used for bedding, with foliage red, yellow and green, is JOSEPH'S COAT, or *A. tricolor* (G.W. 6:709). A form with fiery red lvs. is known as *A. bicolor*. Various dwarf and compact bedding forms. Used more for foliage than for fl. panicles. Asian.

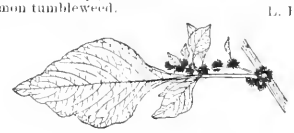
Other garden Amaranthuses are *A. Abyssínicus*, dark red; *A. gibbósus*, Hort., a form of *A. paniculatus*; *A. Hénderi*, probably a hybrid with *A. salicifolius*, or a



75. Amarantus caudatus (× ¼)

var. of it, with long-drooping, crown lvs., and tall, pyramidal stature; *A. Górdoni*, or Sunrise, with bronzy banded lvs. and brilliant scarlet lvs. on top; *A. supérbus*, int. 1893. Other Amaranthuses are common weeds: *A.*

retroflexus, Linn., *A. chlorostachys*, Willd., *A. albus*, Linn., *A. blitoides*, Wats., *A. spinosus*, Linn. The two first are known as pigweeds and beet-roots; the third is a common tumbleweed. L. H. B.



76. Amarantus Gangeticus (× $\frac{1}{4}$).

AMARYLLIS (classical name). *Amaryllidàceæ*. Bulbous plants from Cape of Good Hope, flowering in late summer or in fall, the lvs. appearing later. Perianth with a short ribbed tube, the divisions oblong or lanceolate, the filaments distinct and no scales between them, fls. 5–12, in an umbel, on a tall scape. Monogr. by Herbert, Amaryllidaceæ, 1837; and by Baker, Handbook of the Amaryllideæ.

In dealing with the culture of Amaryllis, it is customary to speak of the genus in its horticultural sense, —to include Hippeastrum and related things. Such is the understanding in the following cultural directions. There are two widely differing methods of cultivating the Amaryllis to produce showy flowers in the spring months,—the border method and the pot method. Any one trying both of these methods will soon come to the conclusion that they differ not only in method, but in flower-producing results. The first method is to plant the bulbs out in a prepared border after they are done flowering, say about the middle of May. The border selected should have perfect drainage, and, if convenient, be situated on the south side of a house or wall, fully exposed to the sun during the greater part of the day. The bulbs are set out in rows, necessarily with as little disturbance of the roots as possible, because if they are bulbs which have undergone similar treatment the previous year, by the middle of May they have made a considerable number of new roots; besides, the foliage also has gained some headway, and may be considered in the midst of actual growth. In planting, carefully firm the soil around the old balls, give one watering, and on the succeeding day, after the surface of the soil has been raked over, cover to the depth of 2 inches with half-decayed cow-manure. With frequent waterings during the summer and the removal of weeds, they will need no more attention until the approach of cool weather, when they should be lifted, sized, and potted; however, at this season, if wet weather has predominated, some of the bulbs will be in a semi-dormant state, while the majority will yet be in active growth. Here is the drawback to this method: the roots are large and fleshy, they take up considerable room in a 6- or 7-inch pot, and the soil cannot be evenly distributed amongst them, neither can it be made as firm as it should be. The result is the partial decay of the roots and leaves, and in the spring, when the flower scapes appear, they are developed at the expense of the bulb, through having insufficient roots to take up nourishment from the soil. The flowers which are produced are small, few in number, and do not show what the Amaryllis is capable of. To partly ameliorate these conditions, the bulbs in active growth at lifting time may be heeled-in on a greenhouse bench until they gradually ripen, taking care that some of the soil is retained on the roots; otherwise the ripening process is altogether too rapid, so that the roots and leaves suddenly lose their robust nature, become flabby, and eventually die. For this method, it can be said that a larger number of bulbs can be grown with less trouble than by the pot method, but neither bulbs nor flowers compare in size with those kept in pots the year round. For the purpose of simply increasing stock, the outdoor method is to be preferred. Most of the kinds are naturally evergreen; potting under those conditions is best done either after the plants have made their growth in the fall or after they have finished flowering in April. When done in the fall, they are allowed to remain rather dry during the winter; this will keep the soil of the original ball in a sweet condition until the time arrives to start them into growth, which may be anywhere after the 1st of January, or even earlier if necessary. They will winter all right, and keep their foliage, in a brick frame in which the temperature is not allowed to fall below 45° F. By the beginning of February, in a structure of this sort, they will be showing flower-scapes, and should then be taken to a position where more heat and light can be given. A weak solution of cow-manure will much help the development of the flowers. When in bloom, a greenhouse temperature, with slight shade, will prolong the flowering period. After flowering, the greatest care should be taken of the plants, as it is from that period till the end of summer that the principal growth is made. A heavy loam, enriched with bone-dust and rotted cow-manure, suits them well. The seeds of Hippeastrums should be sown as soon as ripe, covered very lightly with finely sifted leaf-mold, and if this shows a tendency to dry too quickly, cover with panes of glass until germination takes place. As soon as the first leaves are developed, they should be potted in the smallest sized pots and kept growing. In the propagation of varieties, it will be found that the large bulbs make two or more offsets each season; these should not be detached until it is certain that they have enough roots of their own to start with after being separated from the parent. If a well-flowered specimen clump is desired, the offsets may be allowed to remain attached to the parent; they will, in most cases, flower the second year under generous treatment. *Amaryllis Belladonna* and the plant known as *A. longiflora* (really a Crinum) are hardy in the District of Columbia; *A. longiflora* thrives even in damp, heavy soils, with no protection, and flowers abundantly each year. The seeds are about the size of a chestnut, and if not gathered as soon as ripe, they are apt to germinate on the surface of the ground during the next rainy spell succeeding the ripening. *A. Belladonna* needs a warm, sheltered spot, with deep planting. Cult. by G. W. Oliver.

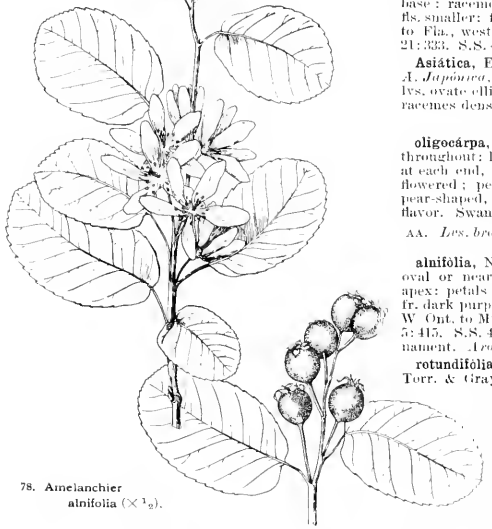
77. Amaryllis Belladonna.

Belladónna, Linn. Belladonna Lily. Fig. 77. Scape 2–4 ft., with a 2-lvd. dry spathe or involucre just underneath the umbel: fls. lily-like, short-tubed, and flaring, with pointed segments and style, and 6 stamens deflexed, on short pedicels, fragrant, normally rose-color; scape solid: lvs. strap-shaped, canaliculate and acute. B.M. 733. Gn. 33:641, 47, p. 46, 49, p. 276, 54:414. G.C. III. 24:315. An old favorite. There are varieties ranging from white to red, and varying in shape and size of fls. *A. blanda*, Gawl (B.M. 1450), is a large form, with white fls., fading to blush. *A. Hillii*, Hort., said to be from N. China, and reported as hardy in New England, is apparently a Lycoris. For var. **rósea perfécta,** see Gt. 45, p. 443; **spectábilis tricolor,** 45, p. 358. See *Brunsvigia* for *A. gigantea* and *orientalis;* Crinum for *A. longifolia* and *ornata;* Hippeastrum for *A. aulica, equestris, fulgida, Johnsoni, Leopoldii, purdina, procera, Regina, reticulata, vittata;* Lycoris for *A. aurea;* Nerine for *A. Nerine;* Sprekelia for *A. formosissima;* Sternbergia for *A. lutea;* Vallota for *A. purpurea;* Zephyranthes for *A. Atamasco* and *candida*. The following trade names probably belong to other genera, most likely to Hippeastrum: *A. crócea, Graveana, macrántha, rutílgens, A. erubéscens*, of Horsford's Cat., 1899 (by mistake printed *erubescens*), is Zephyranthes erubescens, Wats. It is not now offered. L. H. B.

AMASÒNIA (after Thomas Amason, early American traveler). *Verbenàceæ*. Greenhouse shrub from Trinidad, with long, tubular, hairy yellow fls. and bright red bracts, which remain attractive two or three months at a time.

calycina, Hook. f. (*A. panícea*, Hort. not Vahl.). Lvs. 6–12 in. long, elliptic, acuminate, coarsely irregularly toothed or sinuate, glabrous, except the floral ones: fls. 1½–2 in. long, drooping; calyx nearly 1 in. long, red. B.M. 6915. Gn. 27: 479. R.B. 20: 13.

AMBROSÍNIA (Giacinti Ambrosini, an Italian). *Aroídeæ*. A dwarf, perennial, tuberous herb of Italy and Algeria. Half-hardy; planted in the open or in pots, and blooms in the fall. A single species.



78. Amelanchier alnifolia (×⅓).

Bássii, Linn. Three or 4 inches: lvs. 2 or 3, overtopping the spathe, the leaf-blade ovate or ovate-elliptic, obtuse, often retuse: spathe ¾ in. long, tipped with a brown tail, divided lengthwise, the anthers being in one compartment (which has a hole to admit insects), and the solitary ovary in the other, thus preventing automatic close pollination. B.M. 6360.—Prop. by seeds started inside or in frames, or by division in spring. There is a narrow-leaved form (var. *angustifólia*, Guss.), a spotted-leaved form (var. *maculàta*, Engler), and a form with pale green reticulations (var. *reticulàta*, Engler).

L. H. B.

AMELÁNCHIER (Savoy name). *Rosàceæ*. Shrubs or small trees of Eu., Asia and Amer.: lvs. alternate, simple, usually serrate: fls. white, in racemes, rarely solitary; calyx tube campanulate, 5-lobed, lobes narrow, reflexed, persistent; petals 5; ovary 2–5-celled, each subdivided and containing 2 ovules: berry round or oblong, with prominent cavity, red or dark purple, sweet, juicy. Temperate regions around the globe. Species few and closely related. Desirable for ornament, the dwarf varieties also valuable as fruit-bearing plants. Bloom very early in spring, often before lvs. appear. They thrive upon a variety of soils and over a wide range, succeeding well in dry climates. Prop. by seeds or suckers. *A. ovàlis* and *A. alpina* of horticulturists, sometimes purporting to come from Eu., are our native *Pyrus nigra*, which see. See *Juneberry*.

A. *Lvs. acute or acuminate, finely serrate.*

B. *Petals narrow, lanceolate, oblanceolate or spatulate.*

Canadénsis, Medic. COMMON SHAD-BUSH. Tree, 25–40 ft., upright, narrow, oblong, round-topped: trunk tall, straight: branches small, spreading: lvs. oval or ovate, acute or acuminate, rounded or cordate at base, sharply and finely serrate, soon becoming glabrous: fruit globose. Early summer. Newfoundland to Fla., west to Ark. and Minn. S.S. 4: 194.

Botryàpium, DC. (*A. Canadénsis*, var. *oblongifólia*, Torr. & Gray). COMMON DWARF JUNEBERRY. Bush or small tree: lvs. and flower-stalks whitish woolly when young, often nearly or quite glabrous when old; lvs. oblong, broadly elliptical, seldom cordate, often pointed at base: racemes dense, shorter than in *A. Canadénsis*; fls. smaller; fr. juicy, of good flavor. New Brunswick to Fla., west to Mo. and Minn. B.M. 7619. G.C. III. 21: 333. S.S. 4: 195, as *A. Canadénsis* var. *obovàlis*, Sarg.

Asiática, Endl. (*A. Canadénsis*, var. *Japónica*, Miq. *A. Japónica*, Hort.). Small tree with slender branches: lvs. ovate elliptical, acute, densely woolly when young: racemes dense, compound. China and Jap.

BB. *Petals broad, obovate.*

oligocárpa, Roem. Low shrub 2–9 ft., nearly glabrous throughout: lvs. thin, narrowly ovate or oblong, pointed at each end, finely and sharply serrate: racemes few-flowered; petals broad, obovate: fr. dark blue-purple, pear-shaped, with heavy bloom, sweet, of pronounced flavor. Swamps, Lab. to N. Y. G.F. 1: 247.

AA. *Lvs. broader, obtuse or rounded at apex, coarsely serrate or dentate.*

alnifólia, Nutt. Fig. 78. Shrub: lvs. thick, broad, oval or nearly circular, coarsely toothed toward the apex: petals narrowly obovate or oblanceolate, cuneate: fr. dark purple or blue, with bloom, large, sweet, juicy. W Ont. to Mich., New Mex. and westward. G.F. 1: 185; 5: 415. S.S. 4: 196.—A valuable species for fruit or ornament. *Aronia alnifolia* of some lists.

rotundifólia, Roem. (*A. Canadénsis*, var. *rotundifólia*, Torr. & Gray). Low, straggling bush: lvs. rounded, coarsely serrate: fr. ripening after *A. Canadénsis*. N. Brunswick to Minn.

spicàta, Dec. Small bush 1–3 ft.: lvs. elliptic or oval, rounded at both ends or somewhat cordate at base: fls in numerous 4–10-fld. racemes: plant woolly on young growths, but becoming glabrous. Dry, rocky places. Pa. and N. J.

vulgàris, Mönch. SERVICE-BERRY. Dwarf shrub: lvs. roundish, coarsely serrate, woolly beneath when young: racemes short; petals long-narrowly oblanceolate: fr. blue-black. Cent. Eu.—Cult. for ornament; also for fr. under the name of European Juneberry.

FRED W. CARD.

AMES, FREDERICK LOTHROP (June 8, 1835–Sept. 13, 1893), of the fourth generation of a family distinguished in the history of Massachusetts enterprise, was born in North Easton, in that state. He was graduated from Harvard College in the class of 1854, and devoted his life to the management of great commercial and industrial interests. Business did not occupy all his attention; he was a Fellow of Harvard College, a trustee of the Massachusetts Society for Promoting Agriculture, and of the Museum of Fine Arts; and an active and faithful director of charitable and benevolent institutions. A munificent patron of arts and sciences, he was successful in stimulating the increase of knowledge in many fields of human research. Devoted through his whole life to horticulture, he gained distinction for his wide and accurate knowledge of tropical orchids and their cultivation, and his collection of these plants at his country place in his native town was the most complete

in the New World. His important services to botany and horticulture are commemorated in *Lælia Amesiana*, *Lælia anceps* var. *Amesiana*, *Phalænopsis F. L. Ames*, *Cypripedium Amesianum*, *Cypripedium insigne* var. *Amesianum*, *Vanda Amesiana*, *Stanhopea Amesiana*, *Miltonia vexillaria* var. *Amesiana*, *Odontoglossum Rossia* var. *Amesiana*, and *Cattleya Hardyana* var. *Amesiana*. C. S. SARGENT.

AMHÉRSTIA (Countess Amherst and her daughter, Lady Amherst, promoters of botany in India). *Leguminòsæ*. One of the noblest of flowering trees, native to India, where it reaches a height of 40 ft. and more. Gaudy red fls. 8 in. long, with wide-spreading petals, the upper ones gold-tipped, and colored petal-like bracts, in long, hanging racemes: lvs. pinnate, nearly 3 ft. long. The tree first flowered in Eng. in 1849. It requires hothouse treatment. The fls. last only 2 or 3 days. Demands rich, loamy soil, and abundant moisture during the growing season, after which the wood must be ripened firm. B.M. 4453. F.S. 5: 513–516.

AMIANTHIUM. See *Zygadenus*.

AMMÒBIUM (Greek, *living in sand*). *Compósitæ*. Hardy herb, cult. as an everlasting or immortelle. Florets perfect, yellow, surrounded by a dry, silvery white involucre, and subtended by chaffy scales; pappus of 2 bristles and 2 teeth. Commonly treated as an annual, but seeds are sometimes sown in Sept., and the plant treated as a biennial. Of easiest culture, the seeds being sown where the plants are to grow. In the N., sow seeds in spring. Cut the fls. before they are fully expanded, and hang in a dry, shady place. They will then remain white.

alàtum, R. Br. Three ft. or less high, erect and branchy, white-cottony, the branches broadly winged: early root-lvs. ovate at the ends and long-tapering below (javelin-shaped); st.-lvs. linear or linear-lanceolate, entire or nearly so: heads 1–2 in. across, the involucre becoming pearly white. Australia. A large-headed form is var. **grandiflòrum**. L. H. B.

AMMÓCHARIS (*amaos*, sand; *charis*, beauty). *Amaryllidàceæ*. Greenhouse bulb from Cape of Good Hope. J. G. Baker, Amaryllideæ, p. 96. For cult., see *Bulbs*.

falcàta, Herb. Bulb ovoid, sometimes 6–9 in. in diam., with brown tunics: lvs. 1–2 ft. long, 1 in. wide, strap-shaped, spreading, produced before the lvs.: fls. 20–40, in an umbel, bright red, fragrant. Winter. Probably the fruit figured in B.M. 1443 is that of a *Brunsvigia*, mismatched with the flowers.

Ammocharis falcata requires rich, loamy soil. It starts to grow in the spring. Give plenty of water during growing season in summer. It can be cultivated out-of-doors. When perfected and finished in autumn, the bulb can be put under the greenhouse bench; keep moderately dry in sand or earth; can be potted in January, after which it will soon throw out its fine, fragrant blooms. Cult. by H. A. SIEBRECHT.

AMMONIACAL CARBONATE OF COPPER. See *Fungicide*.

AMMÓPHILA (Greek, *sand-loving*). *Gramíneæ*. A coarse perennial, with long, hard rootstocks. Spikelets 1-fld., in large, spike-like panicles, jointed above the empty glumes; flowering glume surrounded at the base by a tuft of hairs; axis of spikelet terminating in a small bristle-like rudiment. Species one. En. and N. Amer.

arenària, Link. (*A. arundinàcea*, Host.). BEACH GRASS, MARRAM GRASS. Abundant along the sandy coasts of the Atlantic, and the great lakes. Adapted for binding drifting sands of coasts. P. B. KENNEDY.

AMÓMUM (Greek-made name). *Scitamináceæ*. Hothouse ginger-like herbs, with narrow entire lvs., and fls. in dense cone-like spikes, which are usually near the base of the plant or on a scape. Closely allied to Alpinia (which see for culture).

Cárdamon, Linn. CARDAMON. Thick, spicy, lanceolate lvs.: plant 4–8 ft.: fls. brownish, in a recumbent compound spike. E. Ind. Produces the Cardamou seeds of commerce. Not to be confounded with *Elettaria Cardamomum* (which see).

Other species are *A. angustifòlium*, Sonner, with linear-lanceolate lvs. and yellow fls., Madag.; *A. Danielli*, Hook., lvs. lanceoblong and fl. large, red and yellow, Afr.; *A. Granum-Paradisi*, Linn. (*A. grandiflorum*, Smith), with colored stems and white-tinted fls., Afr.; *A. magnificum*, Benth. & Hook. (Alpinia magnifica, Roscoe), 10–12 ft., fls. very numerous, in a gaudy bracted head, large, red, Mauritius. B.M. 3392; *A. rittatum*, Hort. Alpinia vittata; *A. vitellinum*, Lindl., with oval lvs. and yellow fls. E. Ind. L. H. B.

AMÓRPHA (Greek *amorphos*, deformed; the fls. are destitute of wings and keel). *Leguminòsæ*. Shrubs: lvs. alternate, odd-pinnate, deciduous, with entire leaflets: fls. in dense, terminal spikes, small, papilionaceous, but without wings and keel; stamens exserted: pod short, slightly curved, with 1–2 seeds. Eight species, 6 in N. Amer. Hardy flowering shrubs, with graceful foliage, well adapted for small shrubberies, especially in somewhat dry and sunny situations. Prop. usually by seeds; also by greenwood cuttings under glass in early summer, or by hardwood cuttings, placed in sheltered situations early in fall and left undisturbed till the following autumn. They may be grown, also, from layers and suckers.

canéscens, Nutt. LEAD PLANT. Low shrub, 1–3 ft., densely white-canescent: lvs. sessile, 2–4 in. long, leaflets 21–49, nearly sessile, oval or ovate-lanceolate, 4–7 lines long: fls. blue, the spikes crowded into terminal panicles. June. S. states. Mn. 5: 107. B.M. 6618. R.H. 1896: 280.—Handsome free-flowering shrub of dense habit, well adapted for rockeries and borders of shrubberies in sunny and well-drained situations.

fruticòsa, Linn. BASTARD INDIGO. Shrub, 5–20 ft.: lvs. petioled, 6–16 in. long, leaflets 11–21, oval or elliptic, mostly obtuse and mucronulate: spikes dense, 3–6 in. long, usually in panicles; fls. dark purple. From Wis. and Pa. south. B.R. 5: 427.—Interesting ornamental shrub of spreading habit, with fine, feathery foliage; remarkable for the unusual color of its dark violet-purplish fls. A very variable species; slightly differing forms have been described, and are cult. under many different names, as, e. g.: *A. Caroliniana*, Croom; *croceolanata*, Wats.; *dealbata*, Hort.; *elata*, Hort.; *fragrans*, Sweet; *glabra*, Desf.; *lavigata*, Nutt.; *Lewisi*, Lodd.; *Ludoviciana*, Hort.; *mimosifolia*, Hort.; *ornata*, Wend.; *paniculata*, Torr. & Gr.; *Tennesseensis*, Shuttlew.; *Texana*, Buckl.

A. Californica, Nutt. Allied to *A. fruticosa*. Pubescent: sts. and leaf-stalks furnished with prickly glands: spikes usually single. Calif.—*A. herbàcea*, Walt. (*A. pubescens*, Willd.), 2–4 ft.: lvs. nearly sessile, pubescent or glabrous; leaflets with black glands beneath: spikes mostly panicled; fls. blue or white. S. states. L.B.C. 7: 689.—*A. microphýlla*, Pursh. (*A. nana*, Nutt.). One ft. high: leaflets small, ¼in. long, crowded, glandular beneath: spikes usually single. From Minn. and Iowa west to Rocky Mts.—*A. virgàta*, Small. Allied to *A. fruticosa*. Perennial, 2–6 ft., sparingly branched: leaflets broad, coriaceous: spikes single or few. S. states. ALFRED REHDER.

AMORPHOPHÁLLUS (Greek-made name). *Aràdeæ*. Giant aroids, from the eastern tropics, grown as curiosities in hothouses. Spathe (or "flower") springing from the great bulb-like tuber in advance of the lvs., the latter usually pedately compound; differs from Arum and related genera by technical characters. Monogr. by Engler in De Candolle's Monographiæ Phanerogamarum, vol. 2, 1879.

Amorphophalluses are propagated by offsets of the tubers. Towards the end of March the plants should be taken from their winter quarters and placed on the stages of a moderately warm greenhouse and kept moist, where, if the tubers are strong enough, they will soon flower. The leaves begin to grow immediately after the flowering season. Towards the end of May they should be planted out in the open ground, or they may be used in subtropical bedding. Plants should be lifted in the fall, before frost, and potted in any good, rich soil, and placed in a warm greenhouse to ripen off the leaves, after which they may be stored away under the greenhouse stages, or any convenient place where the temperature does not fall below 50°, giving just sufficient moisture to keep the tubers from shriveling.

Cult. by EDWARD J. CANNING.

Rivièri, Dur. DEVIL'S TONGUE. SNAKE PALM. Fig. 79. Scape (sent up in early spring) preceding the lvs., 3–4 ft., dark colored and speckled with light red; lf. often 4 ft. across, pedately decompound, the petiole mottled, standing on a stalk like an umbrella; spathe rosy, calla-like, with a long-projecting and slender dark red slightly curved spadix, the whole "flower" often measuring 3 ft. long. Cochin China. R.H. 1871, p. 573.—The best known species in Amer. gardens. Has a strong and disagreeable odor.

79. Inflorescence and bit of leaf of Amorphophallus Rivieri.

campanulátus, Blume. STANLEY'S WASH TUB. Scape lower (2 ft. or less); spathe nearly or quite 2 ft. broad and 15 in. high, with a horizontal, spreading fluted border (not calla-like), red purple on the margin and grayish, spotted white lower down, and becoming purple in the center; spadix 10–12 in. high, the purple top enlarged and convoluted; lf. much as in *A. Rivieri;* tuber weighing 8–10 lbs., shape of a flat cheese. An old garden plant from E. Ind. B.M. 2812. F.S. 15:1602–3. G.C. 1872:1720, 1721; Ill. 5:755.

gigantèus, Blanc. "Fl. larger than *A. campanulatus* (often 2 ft. across) and much more pleasing in color, shading from deep red to cream color towards the center. The club-shaped spadix is dark maroon, with yellow and red base. After flowering, the foliage-stem appears,—a stout stem of deep green color, mottled with gray. After growing at the rate of several inches a day, it expands into a large palm-like leaf, of a rich, dark green color, often measuring 5 ft. across." Blanc, 1892, received "under this name from India." *A. campanulatus?* Probably not the *A. giganteus* of Blume.

Simlense. Blanc. "Fl. 15 in. long, the inside of peculiar golden color, spotted purple; the back is metallic brown. Fine palm-like foliage." The cut in Blanc's catalogue shows a spathe produced into a long foliaceous summit, and a long, slender, recurved spadix. Probably of some other genus: very likely an Arisæma.

A. Aëtèi, Hort. (Corynophallus Azelii, Schott) = Hydrosme leonensis.—*A. Eichleri,* Hook f. Spathe 2 in. across, purple and white; spadix 5 or 6 in. high, thick, brown; lf. single, much divided. W. Afr. B.M. 7091.—*A. Lacourtii,* Linden. (Pseudodracontium Lacourtii, N.E.Br.). Petioles barred with yellow; blades much cut, green, spotted white. Cochin China. I.H. 25:316.—*A. Leopoldianus,* Nicholson (Hydrosme Leopoldiana, Masters). Spathe reddish, long acuminate on one side, with undulate margins; spadix 2–3 ft., terete, recurved; lf. 2–3 ft. across. Congo. I.H. 34:22; 42, f. 49.—*A. nitidus,* Lem. I.H. 12:424 = Dracontium asperum.—*A. Titanum,* Beccari. One of the most remarkable plants known. Tuber 5 ft. in circ.; lf.-stalk 10 ft.; lf.-blade 45 ft. in circ.; spathe 3 ft. in diam.; spadix 6 ft. high. Bloomed at Kew in 1890, the tuber dying thereafter. Sumatra. B.M. 7153-5. G.C. III. 5:748.

L. H. B.

AMPELÓPSIS (Greek *ampelos,* vine, and *opsis,* likeness). *Vitàceæ.* Shrubs, climbing by tendrils opposite the lvs.; lvs. alternate, petioled, digitate, bipinnate or simple; corymbs opposite the lvs. or terminal; fls. perfect, greenish and small; petals and stamens usually 5; fr. a 1–4-seeded berry. Allied to Vitis, but easy to distinguish, even in the winter state, by its bark bearing lenticels and the white pith of the branches, while Vitis has a shredding bark and brownish pith. About 20 species in N. Amer., E. Asia and Himal. Hardy and ornamental climbing vines, thriving in almost any soil. Prop. by seeds and by hardwood or greenwood cuttings. *A. quinquefolia* is usually increased by hardwood cuttings, while *A. tricuspidata* grows best from seeds planted under glass or out-of-doors; also from greenwood cuttings in spring or early summer, under glass. Layers also root readily. All species may be prop. by cuttings with a good eye placed in sandy soil under bell-glasses in Sept. Monogr. by Planchon in De Candolle, Monographiæ Phanerogamarum, 5:447–463. Cf. *Cissus.*

A. *Tendrils mostly disk-bearing; berries dark purple with blue bloom, pea-sized.* (*Parthenocissus.*)

quinquefólia, Michx. (*A. hederàcea,* DC. *Vitis quinquefólia,* Lam.). VIRGINIA CREEPER. Fig. 80. High-climbing; lvs. digitate; lfts. usually 5, elliptic or oblong-obovate, coarsely serrate. N. Amer. Enc. 2:535. Var. **radicantissima,** Rehder. Young branches and lfts. beneath pubescent; tendrils with many ramifications and well developed disks. Var. **murorum,** Rehder. (*A. hederàcea,* var. *murórum,* Focke. *A. muroràm* and *muràlis,* Hort.). Inflorescence and tendrils like the former; lfts. glaucous and glabrous beneath. Var. **Engelmanni,** Hort. Similar to the last, with smaller and more dense foliage. Var. **latifólia,** Dipp. (*A. Röglei,* Hort.). Of vigorous growth; lvs. very large, shining. Var. **Græbneri,** Rehder. Pubescent, intense scarlet in fall. Gt. 48: 1462. Var. **vitàcea,** Knerr. Aërial roots none, and the tendrils scarcely disc-bearing; berries large and early. Mich. to Kans. Does not cling to walls.—A very valuable climber of vigorous growth, coloring bright scarlet in autumn; the varieties *radicantissima* and *murorum* well adapted for covering walls, clinging firmly, growing more straight upward than the following species.

triensipidàta, Sieb. & Zucc. (*A. Veitchi,* Hort. *A. Röglei,* Hort. *Vitis incónstans,* Miq.). JAPANESE IVY. BOSTON IVY. Figs. 81, 82. High-climbing, with short and disciferous tendrils; lvs. 3-lobed or 3-foliolate, coarsely and remotely dentate, shining and glabrous on both sides; racemes short-stalked. China, Jap. R.B. 1877: 11. Gng. 4:353, 1:373.—A hardy and very useful climber, clinging firmly and covering walls densely; the glossy foliage stands dust and smoke well, and turns to a brilliant orange and scarlet in fall. Probably the favorite of all hardy vines in cities.

AA. *Tendrils without disks: not climbing very high.*

B. *Lvs. not lobed or rarely tricuspidate.*

cordàta, Michx. (*Vitis indivisa,* Willd. *Cissus Ampelópsis,* Pers.). Nearly glabrous; lvs. cordate, roundish-ovate, acuminate, acutely serrate; berries bluish or greenish. From Ill. and Ohio south.

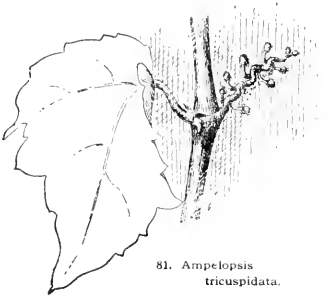
BB. *Lvs. 3–5-lobed or divided.*

heterophýlla, Sieb. & Zucc. Lvs. cordate, slightly 3- or deeply 3–5-lobed, nearly glabrous and shining beneath, lobes serrate or incised: berries light blue, puncate. E. Asia. B.M. 5682. Gt. 1873: 765.—Well adapted for covering rocks and low trellis work; handsome in autumn, with its freely produced light blue berries.

80. Leaves and fruit of Virginia Creeper (×1/3).

Var. **élegans,** Koch (*A. tricolor,* Hort.). Lvs. blotched and striped with white, flushed pink when young; slow-growing and tender. Gn. 54, p. 5.

aconitifòlia, Bunge. (*A. quinquefòlia*, var. *aconitifòlia*, Hort.). Lvs. 3- or 5-cleft, the middle lobe often pinnately lobed, shining and nearly glabrous beneath; berries small, yellow. N. China. Var. **dissécta,** Koehne (*A. dissecta*, Carr. *A. affinis*, var. *dissecta*, Hort.). Lvs. 5-parted, the middle or the three inner lobes pinnatifid. R.H. 1883, p. 318. Gn. 5, p. 523.—Graceful climber for trellis work.



81. Ampelopsis tricuspidata.

Showing a young leaf and the disks on the tendrils by which the plant is attached to walls

serjaniæfòlia, Bunge. Roots tuberous: lvs. 3-5-parted or digitate, chartaceous, shining and dark green above, the divisions pinnate, with winged rachis, the pinnæ separate from the wings: berry small, blue, punctate. Jap., N. China. Gt. 16: 531. R.H. 1870, p. 17.

BBB. *Lvs. bipinnate, leaflets distinctly stalked.*

arborea, Koehne (*Vitis bipinnàta*, Torr. & Gr. *Cissus stàns*, Pers.). St. erect or somewhat climbing: pinnæ and leaflets usually 5; leaflets ovate or cuneate-obovate, coarsely toothed, ½–1½ in. long: berries dark purple. S. states, Mex.

A. bipinnata, Michx. =A. arborea.—*A. brevipedunculàta*, Koehne=A. heterophylla, var. =*A. citrulloides*, Hort.=heterophylla.—*A. Davidiana*, Mottet=Vitis Pagnucci.—*A. dissecta*, Hort.=A. aconitifolia, var. dissecta.—*A. hederàcea*, DC.=A. quinquefolia—*A. hederacea*, Hort =A. quinquefolia, var. muorum —*A. Höggi*, Hort.=A. tricuspidata.—*A. humulifòlia*, Bunge. =A. heterophylla var.—*A. incostans*, Miq.=*A.* tricuspidata.—*A. Japonica*, Hort.=A. tricuspidata.—*A. laciniàta*, Carr.=A. aconitifolia.—*A. napiformis*, Carr.=A. serjaniæfolia.—*A. orientàlis*, Planch. Allied to A. arborea. Petioles longer; lvs. ovate-elliptic, quite glabrous; petals and stamens 4. Orient.—*A. Roylei*, Hort =A. quinquefolia, var. latifolia or A. tricuspidata.—*A. rubricaulis*, Carr.=A. aconitifolia.—*A. sempervirens*, Hort =Cissus striata.—*A. Sobolùi*, Hort.=A. heterophylla, var. elegans.—*A. triparlita*, Carr =A. aconitifolia.—*A. trifoliata*, Carr.=A aconitifolia.—*A. tuberòsa*, Carr.=A. serjaniæfolia.—*A. Veitchi* Hort.=A. tricuspidata.—*A. Virginiàna*, Hort.=A quinquefolia

ALFRED REHDER.

AMPELOVÍTIS. See *Vitis*.

AMPHICARPÆA (Greek, alluding to the two kinds of fruits). *Leguminòsæ*. A half-dozen little herbaceous vines of E. Amer. and Himalayas, bearing subterranean cleistogamous fls.: lvs. pinnate, of 3 leaflets: fls. small, purplish. Two common species are *A. monoica*, Nutt., and *A. Pitcheri*, Torr. & Gray (also known as *Falcata comosa* and *F. Pitcheri*). Not known to be in cult.

AMPHICÒME (*amphi*, both, and *kome*, hair; the seeds having a tuft of hair at both ends). *Rubiàceæ*. Greenhouse herbaceous rockery plants from the Himalayas, with large, rosy, funnel-shaped, 5-lobed fls.

A. argyta, Royle. Height 3 ft.: leaflets in 3–4 pairs, sessile, lanceolate, acuminate, deeply serrate: fls. in terminal racemes, fewer than in the next; corolla tube not orange-colored; calyx lobes long, awl-shaped. P.M. 6:79.—*A. Emòdi*, Royle. Height 1½–3 ft.: leaflets in 5–7 pairs, cordate-ovate, obtuse, shortly petiolulate, margin crenate-lobate: fls. at first corymbose; corolla tube and throat orange; calyx lobes short, thick, fleshy. B.M. 4890. Gn. 8, p. 25. Gn. 38, p. 458. F.S. 11:1109.

AMSÒNIA (named for Charles Amson). Called also *Ansonia*. *Apocynàceæ*. Tough-barked perennial herbs of eastern N. Amer. and Jap., with terminal panicles of blue or bluish narrow-limbed small fls. in May and June, the inside of the corolla tube bearing reflexed hairs. Grown in the hardy border, mostly with shrubbery. Prop. mostly by dividing the clumps; also by seeds and by cuttings in summer.

Tabernæmontàna, Walter (*A. latifòlia*, Michx. *A. salicifolia*, Pursh. *Tabernæmontàna Amsònia*, Linn.). Glabrous or nearly so, 2–3 ft.: lvs. willow-like, ovate to lanceolate, acuminate, alternate, short-petioled; fls. many, with lanceolate spreading lobes, succeeded by slender, milkweed-like follicles or pods 2–3 in. long. Holds its foliage late. N.C. to Tex. B.M. 1873. L.B.C. 592. B.R. 151. G.W.F. 48.

angustifòlia, Michx. (*A. ciliàta*, Walt.). Villous when young, the stem 1–3 ft.: lvs. linear to lance-linear, an inch or two long, much crowded, margins becoming revolute: corolla lobes ovate-oblong to linear-oblong. S. states. Int. 1883.

L. H. B.

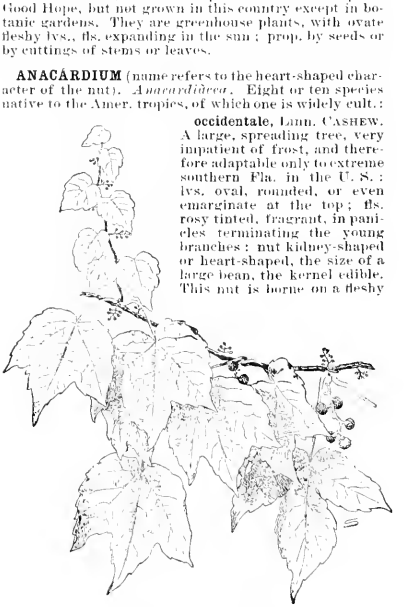
AMYGDALÓPSIS. See *Prunus*.

AMÝGDALUS (Greek-made name, referring to the furrowed pit). *Rosàceæ*. A name given to the peaches, apricots and their kin, but here treated as a section of the genus Prunus, which see.

ANACÁMPSEROS (Greek-made name). *Portulacàceæ*. Succulent herbs, of a dozen species, from the Cape of Good Hope, but not grown in this country except in botanic gardens. They are greenhouse plants, with ovate fleshy lvs., fls. expanding in the sun; prop. by seeds or by cuttings of stems or leaves.

ANACÁRDIUM (name refers to the heart-shaped character of the nut). *Anacardiàceæ*. Eight or ten species native to the Amer. tropics, of which one is widely cult.:

occidentale, Linn. CASHEW. A large, spreading tree, very impatient of frost, and therefore adaptable only to extreme southern Fla. in the U. S.: lvs. oval, rounded, or even emarginate at the top; fls. rosy tinted, fragrant, in panicles terminating the young branches: nut kidney-shaped or heart-shaped, the size of a large bean, the kernel edible. This nut is borne on a fleshy



82. Ampelopsis tricuspidata.

receptacle (the cashew apple) which varies from the size of a cherry to that of a pear, from white to yellow and red, and is acid and edible. Gn. 11, p. 211.—A vinous liquor is made from the apple. The kernel of the nut yields oil, and is edible when roasted; the shell of the nut is exceedingly acrid, even the fumes from the

roasting being highly irritant. The tree yields a gum which is the basis of a varnish, being used to protect books and woodwork from the ravages of white ants and other insects. The tree grows 20–40 ft. high. L. H. B.

ANAGÁLLIS (Greek, meaning *delightful*). *Primulàceæ*. PIMPERNEL. Annual, biennial or perennial herbs cult. in the open. In Amer. only the annual species are generally known. Fls. axillary; lvs. in pairs or 3's. These are easily grown in a warm soil, the seed usually being sown where the plants are to grow. The perennials are prop. by division and are grown in glass houses, or well protected if grown in the open.

arvénsis, Linn. POOR MAN'S WEATHER-GLASS. Spreading and low; lvs. ovate, pale, shorter than peduncles; fls. small, red to white, the petals fringed with glandular teeth. Annual. Eu.—Often runs wild. Fls. said to close on the approach of rain.

Var. **cærùlea**, Neilr. (*A. cærùlea*, Lam.). Blue fls. Supposed to be more tender.

linifòlia, Linn. More upright, a foot high; lvs. linear or lanceolate; fls. ½in. in diam., blue. Many named varieties, in various colors and habits. Biennial or perennial, but most of the annual Anagallises of gardens are supposed to be forms of it, as *A. grandiflòra*, Andrews (blue annual); *A. collina*, Schousb. (vermilion, greenhouse); *A. Morélli*, Linn. (blue, greenhouse); *A. Wilmoreàna*, Hook (purple). S. Eu. and N. Afr. B.M. 319, 831 (as *A. fruticòsa*), 3380.—The biennial forms often cult. in cool greenhouses. L. H. B.

ANÁNAS (modified from aboriginal S. Amer. name). Written also *Ananassa*. *Bromeliàceæ*. Stove herbs, allied to the Billbergias, and demanding the same general treatment. As ornamental subjects, grown mostly for the rosette of rigid lvs. and the strange often colored head of fleshy fls., which are 6-cleft, with 6 stamens and one style. The ripe head is composed of the thickened rachis, in which the fleshy berry is imbedded, and the fleshy persistent bracts; in the pineapple, the fls. are abortive. Prop. by the leafy crown or topknot, by strong suckers, or by small offsets from the base: these are treated as cuttings, being rooted in sand with bottom heat, or in the S. set directly in the field. Monogr. by Mez, DC., Monogr. Phaner. 9.

sativus, Schult. f. PINEAPPLE, which see for field culture. Fig. 83. Plant producing a single shaft 2–4 ft. high, and when 12–20 mos. old bearing a head or pineapple, on the top of which is a rosette of stiff lvs.: lvs. long and sword-shaped, stiff, more or less rough-edged. The same stalk does not bear a second time, but a new shoot may arise from the same root and bear another. Better results are usually secured by severing the sucker or crown, and growing a new plant. Amer. tropics. B.M. 1554. B.R. 1081.—There is a common cult. form (var. *variegàta* or *stratifòlia*), with striped lvs. Gn. 51, p. 57. *A. Porteànus*, Koch, is a form of *A. sativus*, with olive-green, sharp-spined lvs. with a yellow central band. *A. Cochinchinénsis*, Hort., is another form (introduced by Pitcher & Manda, 1891).

A. bracteàtus, Schult. f., is a showy species with red heads, all the bracts being elongated, spiny and prominent. Braz. B.M. 5025. Regarded by Mez as a form of *A. sativus*.—*A. macrodòntes*, E. Morr., like a Bromelia, has large toothed bracts. Braz.—*A. Mordilònus*, Hort., a form of *A. sativus* probably, has variegated spineless lvs. L. H. B.

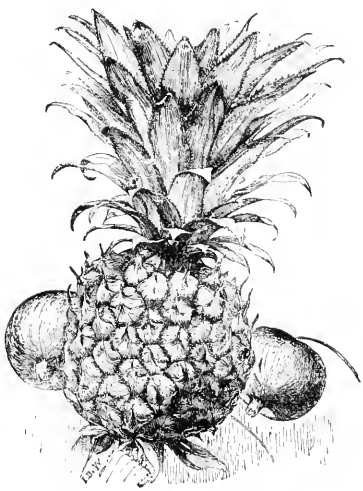
ANÁPHALIS (Greek name of a plant). *Compòsitæ*. EVERLASTING. Much like Antennaria, but differs in the pappus-bristles of the staminate fls. not being thickened (these are thickened upwards in that genus) and the st. leafy. Hardy border plant; useful for immortelles.

margaritàcea, Benth. & Hook. A foot or two high, with many corymbose heads, white: lvs. sessile, linear-lanceolate, long-pointed: involucre pearly white, hence the value of the plant as an everlasting. N. states.

ANARRHÍNUM (*snoutless*). *Scrophulariàceæ*. A dozen biennials and perennials of S. Eu. and N. Afr. Allied to Antirrhinum, but not cult. in this country. Fls. small, in spike-like racemes, white or blue.

ANASTÁTICA. See *Resurrection Plants*.

ANCHÙSA (*anchousa*, a paint for the skin). *Boraginàceæ*. ALKANET. Hardy plants, with fls. blue or purple, in panicled scorpioid racemes, the corolla trumpet-shaped and the throat closed by scales. Of easy cult. in sunny position. Prop. by seed generally.



83. Ananas sativus (pineapple).

A. *Fls. small, like forget-me-nots.*

Barrelièri, Vilm. Perennial: height 2 ft.: lvs. ovate-lanceolate, smaller and shorter than in *A. Itàlica*: fls. with a white tube and pink throat. May. Eu. and Asia Minor. B.M. 2349.—Valued for its earliness, and for cut fls. The least common of the three species.

Capénsis, Thunb. Biennial: height 1½ ft.: lvs. narrowly lanceolate and less hispid than in *A. Itàlica*: fls. red-margined, with a white throat; buds red; calyx inflated after the fl. has withered; divisions short, obtuse. June–Sept. Cape of Good Hope. B.M. 1822.—Fine for cut fls. Often winter-killed, but seeds itself freely.

AA. *Fls. large.*

Itálica, Retz. Perennial: height 3–5 ft.: lvs. largest of the three species here contrasted, ovate-lanceolate, rough, shining; radical ones sometimes 2 ft. long. Mediterranean. B.M. 2197. L.B.C. 14: 1383.—If not allowed to go to seed, will bloom continuously from June to Sept. Commonest and perhaps best species.

A. Agardhii, Lehm. Lvs. linear. Siberia. Rare.—*A. myosotidiflòra*, Lehm. Lvs. large; radical ones long-petiolate, cordate-reniform; cauline ones sessile, oval. Siberia, Caucasus.—*A. officinalis*, Linn. Lvs. lanceolate; radical ones clustered; fls. opening in pairs. June–Oct. Eu. B.M. 1897 is A. officinalis var. angustifolia.—*A. sempérvirens*, Linn. Lvs. broadly ovate; lower ones petiolate; racemes short, generally bracted at the base. Eu. Esteemed in France. J. B. KELLER and W. M.

ANDÌRA (Brazilian name). *Leguminòsæ*. Nearly 30 species of tropical Amer. trees, with conspicuous fls. in racemes. Two or three species are sometimes cult. in hothouses in the Old World.

ANDRÓMEDA (Greek mythological name). *Ericàceæ*. Low shrub, quite glabrous: lvs. small, evergreen, entire, short-petioled; fls. pedicelled, in terminal umbels; corolla globose-urceolate, with 10 included stamens: capsule splitting into 5 carpels, with numerous very small seeds. One species through the northern hemisphere; in America from Penn. northward, and Alaska. Low,

evergreen shrub, with delicate fls., growing best in peaty or sandy soil. Prop. by seeds, sown thinly soon after maturity, in pots or pans of sandy peat soil, placed in a coolframe. They germinate easily if sown in cut sphagnum, but must be pricked into boxes as soon as they can be handled. Cuttings from mature wood, placed in sand under glass in fall, and kept in a cool greenhouse during the winter, will root easily; also increased by layers. See, also, *Leucothoë*, *Chamædaphne*, *Pieris* and *Zenobia*.

polifòlia, Linn. (*A. rosmarinifòlia*, Pursh). One-half to 2 ft.: lvs. oblong-lanceolate or linear, ¾–1½in. long, whitish-glaucous beneath, with strongly revolute margins: fls. nodding, white or pink. June. L.B.C. 6: 546, 16: 1591, 18: 1714. — There are a number of forms, differing in the color and size of the fls, and shape of the lvs.

A. acuminàta, Ait. = Leucothoë populifòlia. — *A. arbòrea*, Linn. = Oxydendrum arboreum. — *A. axillàris*, Miehx. = Leucothoë Catesbæi. — *A. axillàris*, Lam. = L. axillaris. — *A. calyculàta*, Linn. = Chamædaphne calyculata. — *A. campanulàta*, Miq. = Enkianthus campanulatus. — *A. cándida*, Hort. = Zenobia pulverulenta. — *A. cassinæifòlia*, Vent. = Z. pulverulenta. — *A. Catesbæi*, Walt. = Leucothoë Catesbæi. — *A. cérnua*, Miq. = Enkianthus cernuus. — *A. deálbata*, Lindl. = Zenobia pulverulenta. — *A. fastigiàta*, Walt. = Cassiope fastigiata. — *A. ferrugínea*, Walt. = Lyonia ferruginea. — *A. floribúnda*, Bartr. = Zenobia pulverulenta. — *A. formòsa*, Walt. = Pieris formosa. — *A. glaúca*, Hort. = Zenobia pulverulenta. — *A. Japónica*, Thunb. = Pieris Japonica. — *A. ligustrina*, Muhlbg. = Lyonia ligustrina. — *A. Mariàna*, Linn. = Pieris Mariana. — *A. nítida*, Bartr. = Pieris nitida. — *A. ovalifòlia*, Wall. = Pieris ovalifolia. — *A. paniculàta*, Ait. = Lyonia ligustrina. — *A. parabolìca*, Buh. = L. ligustrina. — *A. populifòlia*, Lam. = Leucothoë populifolia. — *A. pulverulènta*, Bartr. = Zenobia pulverulenta. — *A. racemòsa*, Linn. = Leucothoë racemosa. — *A. speciòsa*, Miehx. = Zenobia pulverulenta. — *A. tetragona*, Linn. = Cassiope tetragona. — *A. tomentòsa*, Hort., not Dum. Cours. = Lyonia ligustrina pubescens.

ALFRED REHDER.

ANDROPÓGON (Greek-made name, referring to the bearded flowers). *Gramíneæ*. A polymorphous genus, spread over all parts of the world in the tropical and temperate zones. The species prefer dry places, especially plains. Lvs. usually long and narrow: spikes terminal and axillary; spikelets in pairs at each node of the jointed hairy branches, one sessile and perfect; the other with a pedicel and either staminate, empty, or reduced to a single scale: a straight or twisted awn present. Species, about 180. Includes many species of useful pasture grasses. Two or three species are grown occasionally for ornament. They are of easiest culture, either from seeds or division of clumps.

argénteus, DC. SILVER BEARD-GRASS. A stout, tall grass, 2–4 ft. high, with a distinct ring of white hairs at the nodes: panicles narrow, silver-bearded: lf.-blades long: spikelets covered with long white hairs at the base: awn 1 in. long. — A handsome ornamental grass. Probably a form of *A. saccharoídes*, Swartz, of Trop. Amer.

Halepénsis, Brot. JOHNSON GRASS. A stout perennial, with smooth, erect culms, 3–6 ft. high, and strong, creeping rootstocks: panicles variable, more or less drooping, exserted, rays mostly in whorls of 4, rarely 2–6; sessile spikelets variable; pedicellate spikelets staminate or neutral, much narrower than the sessile ones. S. Eu., S. Amer., Australia. Gn. 13, p. 305. — Abundantly grown in the southern states for hay, where it makes a very rapid growth. When once it has become established it is exceedingly difficult to eradicate, and hence it has become a very troublesome weed in some parts. Much admired in Eu. as an ornamental grass, and sometimes cult. in the N. for that purpose.

Schœnánthus, Linn. (*A. formòsus*, *A. citrátus*, Hort.). LEMON GRASS. A very handsome tropical grass, growing in fine clumps 5–6 ft. high; effective for borders and as single tawn specimens. S. Asia, Japan, and Trop. Africa. Gn. 10, p. 605; 12, p. 495. — Cult. in India and Ceylon. Yields a fragrant oil, called both oil of verbena and lemongrass oil. Used as a stimulant and antispasmodic for neuralgia and rheumatism, and also in the adulteration of attar of roses.

A. Nárdus, Linn. CITRONELLA GRASS. Cult in Ceylon. Yields the citronella oil, which is used for scenting soap and perfumery. Forty thousand pounds of oil distilled annually from this grass. S. Asia and N. Australia. Gn. 12, p. 495. — *A. Sorghum*, Brot. (Sorghum vulgare, Linn.). Includes all the varieties of cultivated Sorghum, of great economic value for sugar, brooms, brushes, fodder, alcoholic drinks. Seed prized for poultry. E. Ind. — *A. squarrósus*, Linn. Rhizomes fragrant. Used in India for thatching, weaving into mats, fans, brushes. Roots said to keep garments free from insects. Sold by druggists in Europe under the name of Radix anatheri. Introduced into Louisiana. India, W. Ind. Is. and Brazil.

P. B. KENNEDY.

ANDROSÁCE (Greek-made name). *Primulàceæ*. ROCK JASMINE. Small tufted plants cult. in the alpine garden, those known in Amer. being perennials. Fls. constricted at the throat, primula-like, in umbels, on short leafless scapes. Fl. in very early spring. Many species are known in European gardens, but alpine-gardening is little known in this country, and only those species which have been found to succeed, and are in the trade, need to be mentioned.

A well-drained soil, partial shade, free circulation of air, frequent waterings during our dry summer months, and protection from heavy fall and spring rains, will lead to success with these charming alpines. A heavy shading of evergreen boughs in winter will be found of great benefit. Close covering is not to be recommended, because it smothers the plants. A great many species have been tried in this country, with variable and not very encouraging results, but in a few instances, with extra care, plants have done well. The northern aspect of a steep rockery seems to be the most favorable position for them. Prop. by division, seeds or cuttings. Plants should be kept in pots until thoroughly established.

Cult. by J. B. KELLER.

lanuginòsa, Wall. Lvs. scattered, oblong-obovate, acute, 1 in. long, silky-hairy: fls, rose-purple with yellow eye, the mouth contracted with a crenated ring, in a dense umbel: plant 6–10 in. high, with many trailing shoots, making a good drapery for rocks. Himal. B.M. 4005. Gn. 49, 287.

sarmentòsa, Wall. Lvs. oblanceolate or spatulate, silky-hairy on the edges, in rosettes: plant producing many pink runners, which root freely: fls. in umbels of 10–20, pink with white eye. Himal. B.M. 6210. Gn. 54, p. 128.

cárnea, Linn. Lvs. very narrow and pointed: fls. a half dozen, flesh-color, with yellow eye. Switz.

Var. **eximea,** Hook. Lvs. less rigid, strongly recurved: fls. larger (⅔ in. across). Switz. B.M. 5906.

L.H.B.

ANDROSTÈPHIUM (Greek-made name, referring to the corona). *Liliàceæ*. Small genus of S. W. United States, with funnel-shaped, spreading-limbed, 6-lobed perianth, 6 stamens, and 3-angled ovary, and a corona or crown at the mouth: lvs. linear, radical: scape simple, leafless. Plant in a sunny place in sandy soil, placing the bulbs 4–6 ft deep; protect in winter. Prop. by division of the bulbs and by seeds.

violàceum, Torr. Slender, 6–10 in.: fl. blue, 1 in. long, 3–6 in loose umbel. Blooms in spring; pretty.

ANEILÈMA (Greek; *no involucre*). *Commelinàceæ*. Sixty tropical perennials, of which *A. bitòrum*, R. Br., and *A. Sinícum*, Lindl., are sometimes cult. in Old World hothouses. These species are blue-fld., diffuse or trailing plants.

ANÈMIA (Greek, *naked*; the panicles devoid of sporangia). *Schizæàceæ*. A genus of tropical ferns, with the lower pair of pinnæ elongate and bearing the sporangia in panicles at their extremities. Of the 40 species, two are found in the southern states, and a few are occasionally in cult.

L. M. UNDERWOOD.

Anemias are dwarf, compact ferns, suited for shelves, or for growing near the glass in warm pits or low houses. They prefer being grown in small pots to being planted out in the fernery. Their growth is too slow to make them popular decorative ferns for general purposes. Prop. by spores, which germinate freely; tufted kinds by division between Mar. 15 and Apr. 30. — Schneider, Book of Choice Ferns.

A. *Leaf 2–3-pinnate, with narrow divisions.*

adiantifòlia, Swz. Leaf 6–9 in. long on a stalk often twice as long, the ultimate divisions oblong or linear-cuneate, with the outer margin toothed. S. Fla. and tropics.

Anemone coronaria, an old garden favorite

AA. *Leaf only once pinnate with broad pinnæ.*

B. *Veins free.*

Mexicàna, Klotzsch. Leaf 6–9 in. long, with 4–6 pinnæ on either side, which are distinctly stalked, ovate-lanceolate and rounded on both sides at the base: panicles 3–4 in. long, dense. Tex. and Mex.

collìna, Raddi. Plants a foot high, on hairy stalks; lvs. with about 10 leaflets on each side, which are rounded at the outer ends and truncate at the upper side at the base: panicles about $1\frac{1}{2}$ in. long, dense. Braz. S. 1: 384.

BB. *Veins anastomosing (running together).*

Phyllitìdis, Swz. (*A. lanceolata,* Lodd. *A. longifolia,* Link. *Anemidictyon Phyllitidis,* Willd.). Leaf 4–12 in. long, with 4–12 pairs of sessile pinnæ, with a crenulate margin and a rounded or unequal base; veins forming long, narrow areolæ: panicle 3–9 in. long, dense. Cuba and Mex. to Braz. S. 1: 390. L. M. Underwood.

ANEMIDICTYON. See *Anemia.*

ANEMÒNE (Greek, *wind*). *Ranunculàceæ.* Anemone, or Anemony. Windflower. A genus of about 85 species, with many handsome garden forms; all hardy perennials; chiefly native of the north temperate and mountainous regions. Stems usually erect, with great variation in height. Basal leaves lobed, divided or dissected, those of the stem forming an involucre near to, or remote from, the flower. Sepals few or many, petal-like; no true petals. Stamens many, shorter than sepals. Carpels numerous; fruit a 1-seeded akene.

The plants thrive best in a fresh, rather rich, sandy loam, well drained; but most of the species will do well in any good garden soil. The tuberous species are suitable for hardy borders, while most of the others prefer a place in a rockery, and some are partial to shady places. *A. hortensis, coronaria, fulgens* and others will well repay the little indoor or greenhouse care they require for producing winter blossoms. They require essentially the same handling as tulips and hyacinths, and are usually classed with bulbous plants. Tubers placed in pots in Sept. or Oct. bring forth a beautiful show of bloom by Jan. or March. For this purpose they should be well drained, and not kept very wet or too warm before the growth is well started; they prefer more moisture at flowering time. Nearly all the species can be readily propagated by both root division and seed. The season for both out and indoor planting will directly influence the flowering season. Good seasons for outdoor planting are Sept., Oct., Nov., Dec., Feb. and March. As a rule, the tuberous Anemones will blossom at any time desired, being influenced by the time they are kept out of the ground. The bulbs may be ripened after flowering time by being taken from the ground to dry, or by covering the bed to keep out rains. *A. Japonica* is one of the finest of all fall-blooming herbs. Pritzel, Revision of Anemone, in Linnæa 15: 498 (1841). Britton, N. Amer. Anemone, in Ann. N. Y. Acad. Sci. 6: 217 (1891–92).

84. Anemone patens, var. Nuttalliana ($\times \frac{1}{3}$).

Alphabetical list of species described below (synonyms in italics): *A. acutipetala,* Hort., 6; *acutipetala,* Schl., 4; alpina, Linn., 6; *alpina,* Hort., 5; apennina, 13; blanda, 14; Canadensis, 23; Caroliniana, 11; coronaria, 7; *decapetala,* 11; deltoidea, 17; *dichotoma,* 23; fulgens, 8; Grayi, 19; Halleri, 2; hortensis, Linn., 9; *hortensis,* Thore., 8; Japonica, 21; multifida, 22; narcissiflora, 24; nemorosa, 15; *nemorosa,* var. *quinquefolia,* 16; occidentalis, 5; *Oregana,* 19; palmata, 10; patens, 3; *Paroniana,* 8; *Pennsylvanica,* 23; Pulsatilla, 4; quinquefolia, 16; ranunculoides, 18; *rubra,* 4; *stellata,* 9; *sulphurea,* 1; sylvestris, 12; *umbellata,* 24; vernalis, 1; Virginiana, 20. See supplementary list.

85. Tubers of Anemone coronaria

A. *Akenes with long styles, which may become feather like on ripening; fls. solitary.—Pulsatilla section.*

B. *Involucre bell-shaped, dissected into numerous linear equal lobes.*

1. **vernàlis,** Linn. (*Pulsatilla vernàlis,* Mill. *A. sulphùrea,* All.). Very shaggy, 6 in. high or less: lvs. pinnately parted, segments trifid: fls. purple without, whitish within, and smoothish; erect, on very short peduncles; sepals 6, rarely spreading. Apr. Cool, moist places. Eu. 1896. J. H. III. 32: 223. Gn. 25: 436.

2. **Hallèri,** All. Villous, 6 in. or less in height; simple: lvs. pinnately divided with segments 3–4 parted; the lesser divisions lanceolate-linear; involucre of long narrow segments, sessile: fls. large, erect, whitish purple; sepals 6; anthers yellow. Apr. Sunny places. Switzerland. 1889. L.B.C. 10: 940.

3. **pàtens,** Linn. Much like the first variety below, which is more common in Amer., but differs in its broader and shorter leaf-segments and smaller fls. Eu.

Var. **Nuttallìana,** Gray (*Pulsatilla hirsutíssima,* Brit.). Wild Patens, American Pasque Flower. Fig. 84. Villous, with long, silky hairs, 4–9 in. high: radical lvs. petioled, others sessile, all much divided into narrow, linear, acute lobes: fls. appearing before the root-lvs., bluish purple or whitish, erect, seldom nodding: akenes silky; styles plumose, becoming 2 in. long; peduncle elongates several inches after flowering. Apr. Low ground. N. central states and Siberia.

Var. **ochroleùca,** Sims. Fls. creamy white, appearing at same time as basal lvs. Mar.–Apr. J. H. III. 30: 343. B. M. 4994.

4. **Pulsatilla,** Linn. (*Pulsatilla vulgàris,* Mill. *A. acutipétala,* Schl.). Pasque Flower of Europe. Villous, hairy, rising $\frac{3}{4}$–1 ft.: basal lvs. finely thrice-pinnately divided, on slender petioles; involucre sessile, deeply cut into long narrow lobes: fls. blue to reddish purple, $1\frac{1}{2}$–$2\frac{1}{2}$ in across. Apr. Well-drained soil or stony places. Eu. Gn. 32: 623. L. B. C. 18: 1704. Var. **rùbra,** Hort. (*A. vèbra,* Lam.). Dwarfer: fls. always erect. Var. **variegàta,** Hort. Fls. pale, appearing in May.

BB. *Involucral leaves 3, on short petioles, sheathing the stem.*

5. **occidentàlis,** Wats. (*A. alpina,* Hook., not Linn.). Silky-hairy, $\frac{1}{2}$–$1\frac{1}{2}$ ft. high, simple: lvs. 2-parted, the divisions deeply pinnatifid into usually incised linear, acute lobes; involucre short-petioled; basal lvs. long-petioled: fls. solitary, white or purple, varying, 1–2 in. across; receptacle conic, sometimes much elongated: akenes pubescent: plumose styles reflexed; peduncle becoming much elongated after sepals fall. May. Calif. to Brit. Columbia. Int. 1892.

6. **alpina,** Linn. (*A. acutipétala,* Hort.). Closely allied to the above. Stem $^3/_4$–$1^1/_2$ ft. high, from thick, strong roots: lvs. large, finely divided, cut and serrated, smooth or hairy; lvs. of involucre similar: fls. few, in an umbel or solitary, 2–3 in. in diam., creamy white inside, purple outside, but varying much; anthers yellow. Mountain sides, Eu. May–June. L.B.C. 17: 1617. B.M. 2007 (var. major). Var. **sulphùrea,** Hort. Fls. a delicate sulfur yellow, larger, downy beneath: lvs. larger. Moist, rich soil. 1882. Gn. 35: 682.

AA. *Akenes woolly or smoothish, with short styles.* (*Anemone proper.*)

B. *Peduncle 1 (rarely 2); involucre mostly 3-leaved.*

C. *Head of fr. cylindric; akenes woolly.*

D. *Roots tuberous; involucre usually sessile.*

7. **coronària,** Linn. Poppy-flowered A. Figs. 85, 86, 87. One-half to 1 ft. high, from tuberous roots; lvs. cut into many fine lobes and lobules; involucral lvs. sessile, 3-4-parted, deeply cut; fls. $1^1/_2$–$2^1/_2$ in. across, poppy-like, of many colors and mixtures of red, blue, white, etc.; stamens blue. Early in spring to June. Meadows Mediterranean region. Vick's Mag. 11: 257. B.M. 841. Gn. 50: 1073; 16, p. 111. R.H. 1893: 232. Caen, Scarlet, The Bride, St. Brigid, Victoria Giant, etc., are some of the trade names given to the single forms. Var. **flore-pléno,** Hort. Fls. double, as shown in Fig. 87, by the pistils becoming petal-like, the stamens mostly remaining perfect; many colors, scarlet being the most common at present. F.S. 16: 1678. Var. **chrysanthemiflora,** Hort. A seedling variety produced in 1848, and introduced many years later. Fls. more completely doubled than the above variety, by the stamens all becoming petal-like. A dozen forms, beautiful, self-colored, as deep red, sky-blue and even pure white, have been fixed and named. Useful as cut fls. Gn. 30: 564. R.H. 1887: 36; 1897, pp. 418-19. R.B. 21: 260-1.

86. Anemone coronaria, single-fld. form ($\times 1_3$).

87. Anemone coronaria, double-fld. form ($\times 1_4$).

8. **fulgens,** Gay (*A. Pavoniàna,* var. *fúlgens,* DC. *A. hortènsis,* Thore.). Fig. 88. One ft. high, simple: basal lvs. 3-5-lobed, with rounded outline, followed later by deeply cut lvs.; sessile involucre several inches below the solitary fl.: fls. vivid scarlet, 2 in. across; stamens black. May and June. France. Sometimes called a variety of *A. hortensis,* Linn., from which it may have descended. Several garden forms, as annuata-grandiflora, multipetala, and Southern Star. Gn. 11: 65. Gt. 27: 66. R.B. 21: 262-3. R.H. 1877: 270.

9. **hortènsis,** Linn. (*A. stellàta,* Lam.). Broad-leaved Garden A. Fig. 89. St. simple, erect, 10 in. high: basal lvs. lobed and cut irregularly; involucre small, 3-5-lobed, usually 3 or more in. below the fl.; fls. red, rosy purple, or whitish, single, $1^1/_2$ in. across; stamens brownish violet. Rich, light soil. S. Eu. May.—This differs from *A. coronaria* in its coarse, broad lvs. and its elongated, rather narrow-pointed sepals. Garden names are given to the forms with different coloration. B.M. 123, from which Fig. 89 is taken.

10. **palmàta,** Linn. St. 6–9 in. high from tuberous root: basal lvs. leathery, 3-5-lobed, cordate, toothed; involucral lvs. 3-parted: fls. golden yellow, solitary or in 2's; sepals 10 or more. May–June. Deep, light soil, Mediterranean region. B.R. 200.—Three good varieties in the trade. Var. **flòre-pléno,** Hort., with double yellow or white fls. Var. **álbida,** Sims (var. *alba,* Hort.). Fls. white; basal lvs. lobed. B.M. 2079. L.B.C. 2: 175. Gn. 22: 364. Var. **lútea,** Lodd., like the last, but with yellow fls. L.B.C. 17: 1660.

11. **Caroliniàna,** Walt. (*A. decapétala,* Amer. authors, not Ard.). St. simple, slender, $^1/_2$–1 ft. high, arising from a large tuber: lvs. of involucre sessile, with 3 wedge-shaped clefts; basal lvs. thrice divided, and much lobed and parted, slender-petioled: solitary fl. erect, 1–$1^1/_2$ in. broad, creamy white or purple; sepals often numerous: akenes densely woolly. April–May. Open places. U. S.

DD. *Rootstock creeping: lvs. of involucre petioled.*

12. **sylvéstris,** Linn. St. 1–$1^1/_2$ ft., simple, or branched once at involucre, from a creeping rootstock: lvs. 3-4-parted, deeply cut at top, hairy beneath: involucre petioled; fls. solitary or in 2's, pure white, $1^1/_2$ in. across, nodding, sweet-scented; sepals 6. May-July. Wooded places, Eu. and Liberia. B.M. 54. Gn. 18, p. 561; 30, p. 173. L.B.C. 18: 1739. Var. **flòre-pléno,** Hort. Double Snowdrop A. Has large, white, double fls. G.C. III. 19: 739.

88. Anemone fulgens ($\times 1_4$).

89. Anemone hortensis. Reduced from an old cut, to show a little-improved form.

CC. *Head of fruit hemispherical; akenes silky-pubescent.*

D. *Roots tuberous.*

13. **Apennìna,** Linn. St. simple, slender, 4–9 in.: lvs. twice-divided and lobed, much toothed: fls. sky-blue, $1^1/_2$ in. across; sepals 10–12, elongated, obtuse; anthers white. Mar.–Apr. Woods, Italy. Gn. 46: 975.—This and a form with whitish fls., both well suited for shady nooks in clumps of shrubbery, etc.

14. **blánda,** Schott & Kotschy. St. 4–6 in. high, from a cylindrical rootstock: lvs. like *A. apennina,* but harder and smoother, and principal divisions sessile: fls. intense sky-blue, differing from above species in being larger, more finely rayed, styles black-pointed, and sepals smooth on the outside; opens in earliest spring or mild winter weather. From Taurus Mts. and Greece. Rocky places. Int. 1898. Gn. 14: 143; 46, p. 152.

Japanese Anemone, one of the best of the hardy fall-flowering herbs

DD. *Rootstock slender, creeping, cylindrical.*

15. **nemorósa**, Linn. WOOD A. St. simple, 3–8 in., nearly smooth: rootstock horizontal, 3–4 times the st. in diameter: lvs. of involucre petioled, 3–5-parted: basal lvs. appearing after the fl. st., 5-parted, divisions wedge-shaped, toothed: fls. white or purplish, solitary, 1 in. across: akenes pubescent; styles hooked. Apr.–May. Eu. and Siberia. Three or more horticultural varieties. Var. **álba**, Hort. (var. *flore-pleno*, Hort.). Fls. larger, pure white, and abundant. Int. 1883. Gn. 32: 618. D. 25. Var. **Robinsoniàna**, Hort. (var. *carulea*, Hort.). A robust form, 6–12 in., with broader and thicker lvs., and large fls., becoming blue. Sometimes given as a separate species. Mar.–Apr. Gn. 46, p. 153; 32: 618; p. 345. Var. **rósea**, Hort. (var. *rubra flore-pleno*, Hort.). Fls. a reddish purple; now much used.

16. **quinquefòlia**, Linn. (*A. nemorósa*, var. *quinquefólia*, Gray). This American species differs from *A. nemorosa* in having smaller fls., involucral lvs. less lobed, foliage paler, and much more slender st. and petioles. The common Windflower or Spring Anemone, formerly called *A. nemorosa*.

17. **deltoidea**, Dougl. St. simple, slender, 6–12 in. high, from a slender rootstock: lvs. trifoliate, basal ones petioled, others nearly sessile, coarsely crenated, often incised: fls. solitary, white, rather large: akenes several, densely pubescent; style very short. Spring. Pacific slope.

DDD. *Rootstock horizontal, fleshy or somewhat tuberous.*

18. **ranunculoides**, Linn. YELLOW WOOD A. St. 3–8 in., from elongated, somewhat tuberous rootstock: lvs. 3-5-parted, divisions deeply cut and serrated: fls. golden yellow, usually solitary, single or semi-double. Mar. and Apr. Rich, light soil in open places and woods. Eu. and Siberia. Gn. 35: 699. L.B.C. 6: 556.

19. **Grày i**, Behr. (*A. Oregàna*, Gray). St. slender, 3–12 in. high, from a fleshy, brittle rootstock; basal lvs. slender-petioled, 3-parted, coarsely serrate; involucral lvs petioled, trifoliate, the parts 2–3-lobed, much toothed. sepals blue or purplish: akenes pubescent, in a globose head. Moist, shady slopes. Oreg. and Wash. In gardens west of the Rockies. Int. 1892.

BB. *Peduncles 2–5 (mostly 3).*

C. *Fruits (akenes) woolly or very silky; secondary involucre present.*

20. **Virginiàna**, Linn. Plant hairy, 2–3 ft. high, stout, branching at the involucre: the petioled involucral lvs. 3-parted, the leaflets cleft and lobed; basal lvs. similar, broader than long, on long petioles: fl. peduncles naked (or the lateral ones 2-lvd.): fls. greenish or white, 1–1½ in. across: akenes woolly, in an oblong head; styles short, awl-shaped. June–Aug. Woods and meadows. U.S. and Canada. G.M. 33: 763.

21. **Japónica**, Sieb. & Zucc. Fig. 90. Stately, branching st., 2–3 ft. high: plant soft and downy, with short hairs: lvs. ternate, much lobed and toothed: fls. rosy purple or carmine; 1–3 whorls of sepals, 2–3 in. in diam., on long peduncles from leafy involucre; stamens yellow: akenes silky. A very useful species for mixed borders or for pot culture. Hardy in N. states. Sept. to late frosts. Rich soil, China and Japan. 1844. Gn. 30: 558. B. M. 4341. P. M. 14: 25. A. G. 19: 305. Gng. 1: 221; 3: 131. G.C.III. 16: 661. A.F. 12: 29. F.S. 2: 74. Var. **álba**, Hort. HONORINE JOBERT. THE BRIDE. WHIRLWIND, etc. Two or three whorls of large, white sepals: fls. 2–3 in. across, lasting until hard frosts. Vick's Mag. 14: 47. Gng. 5: 117. R.H. 1867: 11. Var. **hybrida**, Hort. (vars. *rosea* and *elegans*, Hort.). Radical lvs. 5-lobed, often cordate; lobes twice serrate: fls. somewhat paler, earlier; sepals rather broader. Said to be a hybrid of *A. Japonica* and *A. vitifolia*; produced in Royal Gardens, 1848. G.M.B. 1: 17. Var. **rùbra**, Hort. LADY ARDILAUN. Probably the same as the type, but having lvs. and fls. with a waxy gloss: plant 4–5 ft. high.

22. **multífida**, Poir. Plant silky-hairy, somewhat branched, ½–1½ ft. high, from a branched, upright rootstock: main involucre 2–3-lvd., others 2-lvd. or naked, short petioles, similar to the root lvs., 2–3 times 3-parted and cleft, divisions linear: fls. ½–1 in. across, red, varying to white or yellow: akenes very woolly. Early summer. Rocks and uplands. Middle states to Hudson Bay.

CC. *Fruits (akenes) glabrous at first; fls. white, somewhat umbellate.*

23. **Canadensis**, Linn. (*A. Pennsylvánica*, Linn. *A. dichótoma*, Am. Auth. & Michx., not Linn.). Hairy, stout, 1–2 ft. high, branching at or above the involucre: the 3 lvs. of main involucre sessile, 3-cleft; upper involucres each 2-lvd.; basal lvs. broader than long, much divided, cleft and toothed; petioles long: fls. white, 1–2 in. across: akenes wing-margined, naked, becoming pubescent, grouped into a spherical head. Summer. In shaded woods and open meadows. N. Amer. Gng. 2: 21.

24. **narcissifòra**, Linn. (*A. umbellàta*, Lam.). St. erect, rather stout, ½–1½ ft. high: lvs. of involucre sessile; basal lvs. petioled, 3–5-parted, divisions deeply cut: fls. white, ½–1 in. across, several in an umbel; anthers yellow: akenes smooth, with short style. May–July. Mountainous regions. Northern hemisphere. Gn. 30, p. 173. B.M. 1120.

90. Anemone Japonica.

A. álba, Juss. Allied to *A. sylvestris*, if not the same. L.B.C. 4: 322. B.M. 2167.—*A. cylíndrica*, Gray. A tall native species, used for beauty of foliage and fruit.—*A. decapetala*, Ard. (*A. trilobata*, Juss. *A. heterophylla*, Nutt.). Native and cultivated in S. states. 1891.—*A. Faunini*, Haw. Fls. pure white, 2–3 in. across: 5 ft. high: lvs. 1 ft. across. B.M. 6958. Gn. 34: 664.—*A. parvifòra*, Michx. Pretty white fls. Native of N. states and Canada.—*A. polyanthus*, Don. Allied to *A. narcissiflora*. B.M. 6840. J.H. III. 32: 259.—*A. pratènsis*, Linn. Allied to *A. Pulsatilla*. L.B.C. 9: 900.—*A. pratènsis*, var. *obsolèta*, Sims. Fls. pale: leaflets terminated with a sort of bristle. B.M. 1863.—*A. sphenophýlla*, Poepp. Fls. blue. S.W. U.S.—*A. trifòlia*, Linn. Lvs. beautifully regular: fls. white, 1 in. across. Two blue vars. B.M. 6846.—*A. vitifòlia*, Ham. Allied to *A. Japonica*. Has cordate 5–7-parted lvs. B.M. 3376.

K. C. DAVIS.

ANEMONÉLLA. See *Syndesmon*.

ANEMONÓPSIS (Anemone-like). *Ranunculàceæ*. A monotypic genus from Japan, now much planted in American gardens. A beautiful hardy plant for border purposes. Perennial herb, with erect stems; radical and stem lvs. rather large, ternately compound and

much incised, similar to Actæa; sepals many (often only 9), regular, petal-like, deciduous; petals many (often 12), short, sessile, with nectariferous impression at the base; carpels few (3–4), forming many-seeded follicles. In general appearance similar to the Japanese Anemones, but smaller in all its parts, and with numerous drooping fls., about 1½ in. across, of pale purple color. Thrives well in rich, deep loam, in well-drained situations in partial shade. Prop. by division or seed, in late fall or early spring.

macrophylla, Sieb. & Zucc. (*A. Californica*, Hort.). The only known species. The petals, instead of spreading, form a half-closed bud-like cone within the sepals.

K. C. Davis.

ANEMOPÆGMA. Consult *Bignonia*.

ANÈTHUM. See *Dill* and *Peucedanum*; also *Fennel*.

ANGÉLICA (supposed to have angelic healing virtues). *Umbellíferæ*. A large genus in temperate regions, widely distributed. A number of them are native to N. Amer. See also *Archangelica*.

Curtisii, Buckley. Stout perennial, 2–5 ft., glabrous; lvs. 2-ternate, with quinate divisions, the leaflets thin, ovate-lanceolate, irregularly sharp-toothed. Pa. to N. C. —Grown for the subtropical effect of its finely cut, ample foliage. Int. by H. P. Kelsey, 1891.

hirsuta, Muhl. (*Archangélica hirsùta*, Torr. & Gray). Pubescent above: lvs. twice pinnately or ternately divided, the leaflets thickish and serrate. E. states. Int. 1892 by H. P. Kelsey.

ANGELÒNIA (South American name). *Scrophulariàceæ*. Perennial herbs or sub-shrubs, with pretty, irregular 2-lipped axillary fls., in a long, leafy terminal raceme: lvs. opposite, long: branches 4-sided. Grown as pot plants in warm glass-houses, and prop. by seeds or softwood cuttings.

salicariæfòlia, Humb. & Bonpl. Three ft. or less: lvs. lanceolate to ovate-lanceolate, sessile, toothed, closely pubescent: fls. deep blue. S. Amer. B.M. 2478. P.M. 5:75. B.R. 415.

Gárdneri, Hook. Lvs. linear-lanceolate, more strongly toothed throughout their length: fl. purple, white-centered, handsome: plant pubescent-glandular and aromatic. S. Amer. B.M. 3754.—The plant sold in this country as *A. grandiflora* introduced by Benary in 1897 (a good annual), however, is represented as an entire-lvd. pot plant: see the picture in Gt. 46, p. 612; G.C. III. 22:307; Gn. 52, p. 461; R.B. 23:272.

L. H. B.

ANGIÓPTERIS (Greek, *vessel-fern*). *Marattiàceæ*. An Old World genus of coarse greenhouse ferns, with twice- or thrice-pinnate lvs., and the sporangia arranged in boat-shaped marginal conceptacles. In cultivation, requires plenty of room and abundant drainage. The only recognized species is

evécta, Hoffm. Growing from an erect caudex, 2–6 ft. high: lvs. 6–15 ft. long, mostly bipinnate, with swollen rachises; leaflets 4–12 in. long, ½–1½ in. wide, the margin entire or slightly toothed. India and Jap. to Madagascar and Queensland. S. 1:399.—Known under various names in cultivation, as *A. longifolia*, etc. The trade names, which appear to indicate species, may be regarded as varieties.

L. M. Underwood.

Angiopteris grows wild in swampy places, and is of robust habit. If grown in pots, the pots may stand in 2 or 3 in. of water. Although spores are freely produced, no seedlings are on record. Easily prop. by the fleshy scales at the base of each frond. Each scale contains at least two dormant buds, and should not be divided. They may be laid in sand, covered with sphagnum, and kept in a close case for 3–5 months. They start quicker in early spring.—Schneider, Book of Choice Ferns.

ANGÓPHORA (*vessel-bearing*; Greek, in allusion to shape of fruit). *Myrtàceæ*. Five or six Australian trees or shrubs, sometimes cult. in glass houses in the Old World, but not known to the trade in this country.

ANGRÆCUM (Malayan name). *Orchidàceæ*, tribe *Vandeæ*. Epiphytes. Lvs. variably distichous, coriaceous: racemes few- to many-flowered, produced from the axils of the lvs.: labellum exserted into a conspicuous spur, sometimes many inches long. Trop. and S. Afr., Madagascar and Jap. With exception of *A. falcatum*, the species of this genus require high temperatures in order to develop satisfactorily. For culture, see *Orchids*. Prop. by removing upper portion and planting separately. It should include a few roots.

Angraecums are valued for their winter-flowering and lasting qualities. The compost found most suitable is fresh-growing sphagnum moss, no earthy matter being desirable, as most of the roots are seen striking out into the atmosphere for their needs, and do not take kindly to confinement in pots. Moisture is essential at all times, as Angraecums do not have bulbs to fall back on for their sustenance during rest or blooming, in which respect they resemble the Aërides, Vandas and Saccolabiums. The moss must not be allowed to become decayed, but kept living by renewal when seen to be necessary, usually in springtime. Some of the favorite species are *A. Ellisii*, *superbum*, *sesquipedale*, *Humblotii* and *falcatum*.

Cult. by E. O. Orpet.

Alphabetical list of American favorites: A. articulatum, 6; citratum, 9; distichum, 4; *eburneum*, 12; Ellisii, 7; falcatum, 3; Humblotii, 1; *A. Leonis*, 1; modestum, 8; pertusum, 11; *Sanderianum*, 8; Scottianum, 5; sesquipedale, 2; superbum, 12; *virens*, 12.

A. *Pedicels winged.*

1. **Humblotii**, Reichb. f. (*A. Leònis*, Hort. *Aeránthus Leònis*, Reichb. f.). Lvs. sword-shaped, equitant, about 8 in. long: fls. few, white; spur longer than winged pedicel; petals and sepals lanceolate; labellum rotund. Comoro Isls.

AA. *Pedicels not winged.*

B. *Fls. rarely more than 6.*

2. **sesquipedàle**, Thouars (*Aeránthes sesquipedàlis*, Lindl.). Lvs. coriaceous, oblong, about 1 ft. in length, 2 in. wide, bluntly bilobed at the summits, dark green: fls. fleshy, 7 in. across, ivory-white; petals and sepals similar; labellum ovate, serrate in part, acuminate; spur nearly 1 ft. long. Madagascar, in low, hot districts. A.G. 1892:217. A.F. 7:831. Gn. 2, p. 5. F.S. 14:1443. B.M. 5113.—Noblest of Angraecums.

3. **falcàtum**, Lindl. Lvs. linear-lanceolate, about 2 in. long: fls. whitish, about ½ in. across; sepals and petals linear, acute or nearly so; labellum trilobed; spur as long as pedicel. China.—One of the first brought into cultivation.

4. **distichum**, Lindl. Plants rarely exceeding 5 in. in height: lvs. short, those below clasping those above at base: fls. inconspicuous, white, borne singly. Sierra Leone.—Not worth cultivating.

5. **Scottiànum**, Reichb. f. Lvs. terete: peduncles slender; fls. inverted, pale yellow. Comoro Isls.

BB. *Fls. numerous.*

C. *Color white or yellowish.*

6. **articulàtum**, Reichb. f. Dwarf: lvs. oblong-cuneate, 4–5 in. long, unevenly bilobed: fls. white, in pendent racemes. Madagascar. R. 55.—A pretty species, difficult to grow.

7. **Ellisii**, Reichb. f. St. stout: lvs. oblong: peduncles pendulous; fls. white. Madagascar. Often confused with *A. articulatum*, but distinguished from it by its orange-colored spurs. L. 92.

8. **modèstum**, Hook. f. (*A. Sanderiànum*, Reichb. f.). Dwarf: lvs. elliptical, coriaceous: fls. whitish, in pendent racemes. Madagascar. R.H. 1888:516. R.B. 15:217.

9. **citrátum**, Thouars. Lvs. oblong-lanceolate, 4–5 in. long, 1 in. wide: racemes of yellowish fls. Madagascar, in vicinity of swamps. B.M. 5624. L. 238. I.H. 33:592.

10. **pertùsum**, Lindl. Lvs. ligulate: peduncles about 6 in. long; fls. small, white. Bourbon. B.M. 4782.

CC. *Color of fls. green.*

12. **supérbum**, Thouars (*A. ebúrneum*, Lindl.). Lvs. coriaceous, striated, 2 in. wide, over 1 ft. long, strap-shaped, light green, unequal at the summits: peduncle

from near the base of the st.; fls. large, green and white, placed alternately back to back; sepals and petals spreading, green; labellum whitish, round, thickish; spur green. Valuable; grows to enormous proportions. Madagascar. B.M. 4761. B.R. 1522. L. 236. Var. **virens**, Hort. (*A. virens*, Lindl.). Fls. smaller; labellum tinged with green. B.M. 5170. OAKES AMES.

ANGULÒA (dedicated to Don Francisco de Angulo). *Orchidàceæ*, tribe *Vándeæ*. Pseudobulbs rather tall (when old), spinose at the summits with the remnants of leaf veins; leaf-blades 1–2 ft. long, prominently nerved, as in Acineta, Stanhopea and Lycaste; fls. large, subglobular, on erect scapes; habit similar to Lycaste, which is a member of the same sub-tribe. The Anguloas grow under shade of trees in leaf-mold. Some growers find that they do well when placed under vines. They are coolhouse orchids, but require a moderate rise in temperature during the growing season. OAKES AMES.

Anguloa is a very interesting genus of cool orchids that thrive well in an ordinary greenhouse temperature, in which a minimum of 50° can be maintained. They are natives of the Andes of Colombia and Peru. The popular name of "Boat Orchid" somewhat suggests their shape and general appearance, the lip, being delicately hinged at its base, allowing this organ to oscillate when shaken. *A. Clowesii* is the best known as well as the most decorative species, its color being clear yellow. *A. Ruckeri* is similar in structure, but the fls. are chocolate-brown, with a decided aromatic fragrance, resembling Anise. There is also a white variety of *A. Clowesii*, but it is very rare in cultivation, as are all of the white forms of well known orchids, this making them very valuable commercially. *A. uniflora* is also a pretty plant, with white flowers, spotted with pink. Pot culture is best, as they require similar treatment to *Lycaste Skinneri*. E. O. ORPET.

uniflòra, Ruiz & Pavon. (*A. virginàlis*, Hort.). Pseudobulbs about 6 in. high (sometimes considerably higher); leaf-blades $1\frac{1}{2}$–2 ft. long, lanceolate; fls. whitish, sometimes spotted within, or the labellum streaked with rose. Colombia. G. C. III. 19: 423. A. F. 6: 607.—There is a white-fld. var.

Clòwesii, Lindl. Larger in every way than the above: fls. lemon-yellow, labellum tending toward white, marbled with orange. Colombia.

Rúckeri, Lindl. Smaller than *A. Clowesii*: fls. yellow, spotted with crimson. A variety has been figured with the crimson or red color predominant (var. *sanguínea*, A.F. 6: 607). Colombia.

eburnea, Nicholson. Similar to *A. Clowesii*, but sepals and petals pure white and lip spotted pink. New Granada. OAKES AMES.

ANHALÒNIUM (name of no significance). *Cactàceæ*. Top-shaped succulent desert plants, mostly buried in the ground, the flat aërial portion covered with angular tubercles bearing no spines. A genus of 4 or 5 species, strictly Mexican, except that a single species (*A. Engelmanni*) crosses the Rio Grande into Texas. It is referred to Mamillaria by some. For *A. Williamsii* and *A. Lewinii*, see under *Echinocactus*, section *Lophophora*. For culture, see *Cactus*.

A. *Upper surface of tubercle with a broad and deep wool bearing longitudinal groove, which widens below.*

Engelmanni, Lem. (*A. fissurátum*, Engelm.). LIVING ROCK. The flat tubercle-covered top 2–5 in. across, tapering below into a thick root; tubercles imbricated and appressed, triangular in outline, $\frac{1}{2}$–1 in. long and about as wide at base, the upper surface variously fissured, even to the edges, presenting an irregular warty appearance; fls. central, about 1 in. long and broad, shading from whitish to rose. On limestone hills in the "Great Bend" region of the Rio Grande in Texas, and extending into Mexico. I.H. 16, p. 73, and fig.

Kotchúheyi, Lem. (*A. subcàtum*, Salm-Dyck). This appears as a trade name, but the form is very uncertain, as no type seems to be in existence. According to the description, it is very much like the preceding species, except that the upper surface of the tubercle is not irregularly fissured, but is smooth, at least at the edges, except for the central furrow.

B. *Upper surface of tubercle not grooved.*

prismáticum, Lem. The flat top 3–8 in. across; tubercles imbricate, but squarrose-spreading, sharply triangular-pyramidal and very acute, with a sharp, cartilaginous tip, which usually disappears with age and leaves the older tubercles blunt or retuse, $\frac{3}{4}$–1 in. long and about as wide at base, the upper surface almost plane and smooth, except that it is more or less pulverulent, and often bears a small tomentose tuft just behind the claw-like tip; fls. rose color. Mts. of Mex.—Resembles an Aloe. JOHN M. COULTER.

ANIGOZÁNTHUS (Greek, *exposed-flower*). *Hæmodoràceæ*. Eight or 10 species of Australian greenhouse or half-hardy perennials, with greenish, yellow or purple fls. and sword-like lvs., cult. in Europe, but unknown to the Amer. trade.

ANISACÁNTHUS (Greek, *unequal acanthus*). *Acanthàceæ*. A genus of six species of Mexican and American shrubs, with mostly lanceolate, entire, petioled lvs., and loosely spicate or scattered red fls. an inch or more long; corolla lobes 4; stamens 2, equaling or exceeding the corolla lobes.

Wrightii, Gray. Height, 2–4 ft.; lvs. 1–2 in. long, oblong- or ovate-lanceolate, acute or acuminate. S. and W. Tex.—Once sold by John Saul, Washington, DC.

91. Informal disposition of annuals,—a mass against a background. (See Annuals, p. 68)

ANISE. *Umbellíferæ*. An aromatic condimental and medicinal herb (*Pimpinélla Anísum*, Linn.) of the Orient. It is an annual, and is easily grown from seeds in any warm and mellow soil. The seeds are commonly sown where the plants are to stand. The seeds are used in medicine and in cookery, and for flavoring liquors. They yield a highly perfumed essential oil. They are mostly grown in Mediterranean countries. The leaves are also used as seasoning and garnishing. The plant reaches a height of 2 ft., bears twice-pinnate lvs. and small yellowish white fls. in large, loose umbels. The seeds are oblong and curved, ribbed on the convex side, grayish,

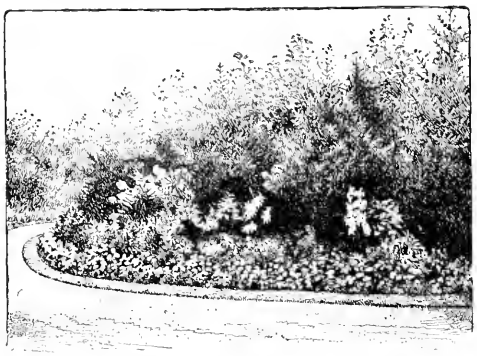
the size of caraway seed. In common with all umbelliferous seed, Anise seed does not retain its viability long, the normal longevity being 1 to 3 years.

ANNUALS. Plants which, in cultivation, are preferably grown from seeds each year are commonly classed as Annuals. More strictly, Annuals are plants which normally live but a single season. Among Annuals are found a number of the most showy flowers. As a rule, they are easily grown, producing quick results and affording a variety of brilliant colors. The class is, therefore, one of the greatest value. Some of the Annuals last only a few weeks in bloom, others continue throughout the summer. There are trailers and climbers, dwarfs and tall growers. By a judicious selection and arrangement of kinds, the handsomest effects may be produced. Many of the showy kinds are adapted to mass effects, while the dwarf-growing sorts make fine flowering edgings for beds or walks. With the latter, handsome ribbon-beds are possible, but this requires care in the selection of kinds, and as the use of the trimming shears is almost precluded it is best to limit oneself to simple designs. Annuals are well adapted to the covering of bare spots of ground in the border. Annuals, like other flowers, show off best when seen against a background of foliage. See Figs. 91, 92. The tall and leafy kinds make excellent covers for unsightly objects; *see Screens*. For climbing and twining kinds, see *Vines*. See, also, *Everlastings* and *Grasses*.

In the case of others than the continuous bloomers, a succession of sowings or plantings is desirable to provide for a continuous display; then as a kind begins to fail its place may be filled with young plants of the same or other species. The usual method of securing succession is to sow the seeds in flats, or beds, and transplant the seedlings first to pots. The potted plants may be set out at any time, with but little check to growth.

Most Annuals prefer an open, sunny situation, but pansies, forget-me-nots, and some others, thrive where they get the full sunshine for only half the day. In all cases the best results are obtained only when the soil is well enriched and thoroughly prepared previous to sowing or planting; and it is far better to make this preparation a fortnight or more in advance. A considerable proportion of humus in the soil is desirable, rendering it less subject to baking and drying out. Cow-manure, stable-manure or leaf-mold, worked in liberally, will supply this. Beds should be spaded thoroughly and at least a foot deep. If the surface is then again worked over to half this depth, better results will be obtainable. The soil should not be disturbed, however, unless it pulverizes readily. For the reception of seeds, the surface should be mellow and smooth. The seeds are sown in drills or concentric circles, according to the method of planting decided upon. Taller growing kinds are sown toward the center or back of the bed. Only the best seeds should be purchased, and it is generally best to get the colors in separate packets. In the open ground, seeds may be covered to a depth of four or five times their own thickness, but when sown indoors in trays or pots, the rule is to cover them to about their own thickness. The position of each row or kind should be marked, so that when weeds and flowers spring up there will be no trouble in separating the sheep from the goats. After covering, the soil should be pressed firmly over the seed with a board or hoe, or the feet. In soils which are inclined to bake, a sprinkling of sand or fine litter over the surface after sowing will remedy this evil. Evergreen boughs placed over the beds until the seedlings have appeared will afford useful shelter from beating rains. It is desirable to sow the seeds thickly. When up, the plants may be thinned to their proper distances. Particular care should be given to this matter, and to keeping down weeds, or the plants may become weak, spindling and valueless. No seed pods should be allowed to form, else the vitality of the plants will be exhausted. The flowers may be freely gathered with advantage to the flowering.

It is customary to divide Annuals into three classes: (1) Hardy Annuals are those which are sown directly in the open ground where they are to grow. They are vitally strong, developing without artificial heat, and may be sown from February to May, according to the season and latitude. Some of them, as sweet peas, may be sown even in the fall. For this class, a well prepared border on the south side of a fence or wall, or other sheltered place, is usually preferred for early sowings. From here the seedlings are transplanted later where they are to grow. Some sorts, however, do not bear transplanting well, consequently must be sown in the places they are to occupy. Among such are poppies, eschscholtzia, bartonia, Venus' looking-glass, lupine, malope, and the dwarf convolvulus. (2) Half-hardy Annuals are usually sown in February or March in the window or a warm frame. The season is usually not long enough to enable them to reach full development in the open. In the early stages of growth, they need protection and warmth. Such kinds are sometimes sown in the fall and wintered over in a coldframe. When once established, they are hardy with slight protection. Pansies and some other kinds are grown to their greatest perfection only in this way. (3) Tender Annuals require still more warmth, and are started from January to May in the greenhouse or other suitable place. They commonly need a temperature of from 60° to 70°. The danger with early grown seedlings, especially those started in the window, is crowding and want of light. As soon as crowding begins, the plants should be thinned out or transplanted to other trays, or into pots, and reset from time to time, as they need; frequent transplanting is usually an advantage. The last transplanting is preferably into small pots, as then the seedlings may be readily set out in the open ground at the proper time, with little or no check to growth.



92. Annuals filling the formal space between a drive and a tree-group.

Some of the staple or general-purpose types of Annuals in the North are the following: Petunias, phloxes, pinks or dianthuses, larkspurs or delphiniums, calliopsis or coreopsis, pot marigolds or calendula, bachelor's buttons or *Centaurea Cyanus*, clarkias, zinnias, marigolds or tagetes, collinsias, gilias, California poppies or eschscholtzias, verbenas, poppies, China asters, sweet peas, nemophilas, portulacas, silenes, candytufts or iberis, alyssum, stocks or matthiolas, morning-glories, nasturtiums or tropæolums. Other species are mostly of special or particular use, not general-use types. In the South, and occasionally at the North, some of the Annuals come up voluntarily year after year from self-sown seeds. Petunias, phloxes and morning-glories are examples.

For further suggestions, see *Seedage*. For an annotated list of Annuals suited for northern climates, see Bull. 161, Cornell Exp. Sta. ERNEST WALKER.

ANŒCTOCHÍLUS (Greek, *open lip*). *Orchidàceæ*, tribe *Neottieæ*. A genus cultivated for the beautifully reticulated lvs., which are oval or ovate, membranaceous and diversely colored. Fls. small, not ornamental. The known species belong to India and the Malay Archipelago. Although many methods have been adopted for the successful cultivation of the best species and varieties, failure has been the general rule, so that at the present time few Amer. collections contain even a single specimen. "For a time—it may be two, or even five years—they will grow and remain in health, and then suddenly they go wrong, the plants perishing one after the other, in spite of all one can do."—W. Watson.

Búlleni, Low. Lvs. about 2 in. long, bronze-green, with 3 longitudinal bands of copper-red. Borneo.

regàlis, Blume. One of the most attractive species of the group: lvs. oval, large, bronze-green netted, veined with gold, the surface of the lvs. like velvet. Java. B.M. 4123. F.S. 2: 79 as *A. sólidens*.—Several good varieties exist.

Roxburghii, Lindl. Lvs. ovate, median line of pale green, reticulated and veined with gold. Java and Ind.

Many species are described and figured in foreign publications, but they are all fanciers' plants. Other names which appear in the Amer. trade are: *A. Dayana*=?—*A. Dawsoniánus* (*Dawsonianus*). Hæmaria=*A. Lówii*, Hort.=Dossinia.—*A. Petola*, Hort.=Macodes.—*A. Veitchiánus*, Hort.=Macodes.

OAKES AMES.

ANOMATHÈCA. See *Lapeirousia*.

ANÒNA (aboriginal name). *Annonàceæ*. CUSTARD-APPLE. Tropical trees and shrubs, cult. for their large, fleshy fruits, and for ornament. Fls. perfect, solitary, terminal or opposite the lvs.: petals typically 6, but half of them sometimes reduced to small scales or even wanting: pistils many, each with one erect ovule, united into a fleshy fruit-like body or syncarpium. Small trees or shrubs, over 50 in number, of Tropical America, and a few in Africa and Asia. Some of the species have been introduced into southern Florida, but they are generally imperfectly known, both to horticulturists and botanists. Aside from the species described below, various other Anonas have been introduced into southern Florida, but their botanical status is unknown and some of them are probably forms of old species. Amongst these names are *A. Mexicana*, which was a catalogue name used by Loddiges, the species never having been fully described; *A. Africana*, a very obscure species founded by Linnæus upon an American specimen, with lanceolate pubescent lvs.; *A. trilobata* is undoubtedly *Asimina triloba*; *A. aurantiaca*, *A. macrocarpa*, *A. maritima*, *A. reniformis*, and *A. suavissima* are either horticultural names, or belong to other genera; the Beribá, introduced by Reasoner Bros., from Brazil, is evidently a Rollinia, possibly *R. orthopetala*. For *A. longifolia*, see *Duguetia*, and for *A. muscosa*, see *Rollinia*. Some of the species are imperfectly evergreen. See *Artabotrys*.

Anonas are of easy culture, requiring no special treatment in frostless countries. They propagate readily by seeds, and are usually thus grown; also, by ripened cuttings under glass. In the U. S. they are sometimes grown under glass as ornamental subjects. They should then be kept fairly dry in winter, for at that time they assume a semi-dormant condition. They thrive best in heavy loam.

A. *Petals cordate-ovate or obovate, the inner ones conspicuous.*

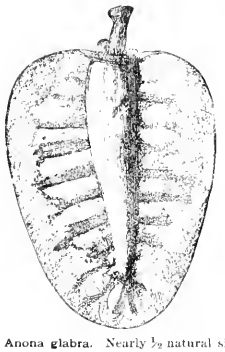
B. *Exterior petals plainly acute, inner ones obtuse.*

C. *Fruit bearing weak spines.*

muricàta, Linn. (*A. Asiática*, Linn.). SOUR-SOP. GUANABENA. CORRESOL. SCHRSAAK. SUSAKKA. Small tree, the size of a peach tree, evergreen, the young growth scurfy-pubescent: exterior petals scarcely exceeding the interior ones, 1–2 in. long, and yellowish or greenish, the inner ones yellow or red: lvs. elliptic and pointed, varnished above and rusty beneath, but becoming glabrous: fr. very large (6–8 in. long and weighing from 1–5 lbs.), oblong or conical and blunt, dark green, the skin rough and spiny; pulp soft, white and juicy, subacid, with a turpentine-like flavor. West Indies, where it is a popular fruit.—It is grown with especial excellence in Porto Rico, and is common in the markets of Key West, whither it is shipped from the islands to the southward. A favorite drink is made from the juice. It is one of the tenderest trees of the genus, and thrives only in extreme southern Florida and California. Introduced in the Old World.

CC. *Fruit nearly or quite smooth (or in A. pyriformis undescribed).*

glàbra, Linn. (*A. buricifólia*, Dunal). POND-APPLE. MAMON. Fig. 93. Small nearly evergreen tree, with smooth growth: exterior petals somewhat exceeding the



93. **Anona glabra.** Nearly $\frac{1}{2}$ natural size.

interior ones, greenish: lvs. oblong-ovate or long-ovate, pointed, green on both sides and glossy above: fr. the size and shape of a Bellflower apple or an ox's heart, yellow or brownish yellow, smooth, the stem pulling out of the fruit at maturity and leaving a very deep cavity; pulp cream-colored and very fragrant, fair in quality. Native in swamps, both salt and fresh, in southern Florida, and on the Indian River; also, in the West Indies. B.R. 1328. SS. 1: 17, 18.—The fruit, although acceptable to many people, is not generally prized.

pyriformis, Boijer. Climbing, glabrous: petals of the two series nearly equal, oblong-spatulate or obovate (about 2 in. long), flat, the outer ones hooded or cucullate at the top; sepals joined half their length: lvs. nearly oblong (3–6 in. long), obtuse or acutish, thick and rigid, somewhat shining and glaucous. Mauritius.—Said to have been introduced into southern Florida recently, but it is imperfectly known.

BB. *Exterior petals obtuse or nearly so.*

palustris, Linn. ALLIGATOR-APPLE. CORK-WOOD. MONKEY-APPLE. BUNYA. Tree, 10–15 ft. high, the young growth smooth: exterior petals ovate, exceeding the oblong inner ones, a half-inch or more long, and yellow, with a red spot at the base within, the interior red inside: lvs. ovate-elliptic or oblong, with a short, narrow point (or occasionally bluntish), smooth on both sides, rather thick, and more or less evergreen: fr. 2 in. in diam., yellow, and somewhat roughened or scaly. Cuba to Rio Janeiro; also, in Africa. B.M. 4226.—Introduced in southern Florida, but imperfectly known in cultivation. Unless improved by cultivation, the fruit is probably unworthy of cultivation.

BBB. *Exterior and interior petals all acute.*

paludósa, Aubl. Shrub, with rusty-villous branches: outer petals acute, twice longer than the canescent inner ones: lvs. oblong-acute, rounded at the base, sparsely pubescent above and tomentose beneath: fr. ovate and tuberculate, pubescent when young. Guiana.—Introduced into southern Florida, where it is yet very little known.

AA. *Petals (exterior) linear or oblong, the inner ones minute (or conspicuous in A. muricata).*

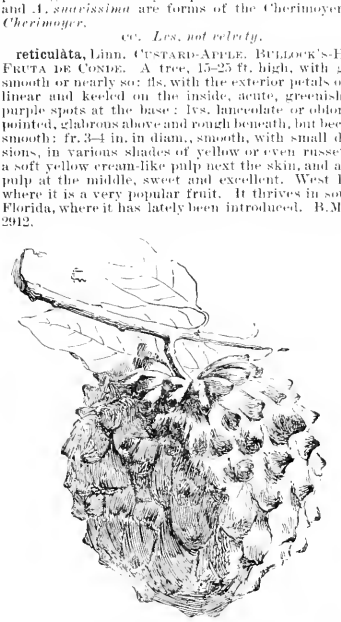
B. *Fruit smooth or very nearly so (in A. amplexicaulis and scrobiculata).*

C. *Lvs. velvety beneath.*

Cherimòlia, Miller (*A. tripétala*, Aiton). CHERIMOYER, or CHERIMOYA. JAMAICA-APPLE. Tree, 15–20 ft. high, with young growth scurfy-pubescent: fls. opposite the lvs., greenish, and fragrant, the exterior petals oblong-linear and keeled on the inner side, velvety; lvs. ovate or oblong (about 3 in. long), obtuse or scarcely acute, dark green, and sparsely hairy above and velvety beneath: fr. very large (from the size of a large apple to 8 in. or more in diam.), spherical or slightly flattened at the ends, nearly smooth, brownish yellow, sometimes with a red cheek, the flesh soft and rich. Peru and adjacent regions northward, but naturalized in Central America and Mexico, the West Indies and parts of the Old World. B.M. 2011.—It is a well-known fruit of the tropics, and it thrives upon the Florida keys and the adjacent coasts. It is also grown to a limited extent in southern California. Fruit will stand transportation if picked green. Possibly the plants sold as *A. macrocárpa* and *A. suavíssima* are forms of the Cherimoyer. *See Cherimoyer.*

CC. *Lvs. not velvety.*

reticulàta, Linn. CUSTARD-APPLE. BULLOCK'S-HEART. FRUTA DE CONDE. A tree, 15–25 ft. high, with growth smooth or nearly so: fls. with the exterior petals oblong-linear and keeled on the inside, acute, greenish, with purple spots at the base: lvs. lanceolate or oblong and pointed, glabrous above and rough beneath, but becoming smooth: fr. 3–4 in. in diam., smooth, with small depressions, in various shades of yellow or even russet, with a soft yellow cream-like pulp next the skin, and a white pulp at the middle, sweet and excellent. West Indies, where it is a very popular fruit. It thrives in southern Florida, where it has lately been introduced. B.M. 2011, 2912.



94. Anona squamosa, grown in Bermuda (× $\frac{1}{2}$).

amplexicaùlis, Lam. Erect shrub, glabrous: outer petals oblong and obtuse (1½ in. long), the inner very much shorter and lanceolate and pointed: lvs. oblong or ovate, obtuse or acute (4–6 in. long), thick and rigid, glaucous and somewhat shining, deeply cordate-clasping at the base. Mauritius and Madagascar.—Said to have been lately introduced into southern Florida. Little known.

BB. *Fruit tuberculate.*

squamòsa, Linn. (*A. cinérea*, Dunal). SWEET-SOP. SUGAR-APPLE. Fig. 94. Diffuse small tree, or a shrub, 10–20 ft. high: fls. with the outer petals oblong-linear and blunt, keeled on the inner side, greenish: lvs. thin, oblong-ovate, very sparsely hairy on both sides, but often becoming smooth, glaucous: fr. egg-shaped, or of the form of a short pine cone, 3–4 in. in diam., yellowish green, and tuberculate (each carpel forming a protuberance); the pulp creamy yellow and custard-like, very sweet. West Indies to Brazil. B.M. 3095.—Much prized in the tropics, and considerably grown on the Florida keys, and extending north, with some protection, nearly to the middle of the state; also cultivated in California. Introduced in the Old World. Lvs., green frs., and seeds said to be used for destroying vermin. L. H. B.

ANSÉLLIA (John Ansell, African explorer). *Orchidàceæ*, tribe *Vándeæ*. Inflorescence terminal: stems tufted, jointed, nodes conspicuous: lvs. lanceolate, alternate toward the summit of the stems, visibly nerved, about 6 in. long. The species require high temperatures for successful development. Epiphytes. For further culture, see *Orchids*.

Africàna, Lindl. Plants 2 ft. or more high: stems cylindrical: fls. numerous (40–80), yellowish, verging on green, marked with curiously oblong, brown-purple spots; labellum yellow, 3-lobed. Sierra Leone. B.M. 4965.—This is undoubtedly the type, all other forms so far known being departures from it of horticultural merit only.

gigantèa, Reichb. f. (*Cymbidium Sándersoni*, Harv.). Habit as above. Sepals and petals sparingly, if at all, spotted. Natal! OAKES AMES.

ANSÒNIA. *See Amsonia.*

ANTENNÀRIA (pappus likened to *antennæ*). *Compósitæ*. EVERLASTING. CAT'S-EAR. Small, white-woolly perennial herbs, with spatulate or obovate root-lvs., and mostly leafless scapes, bearing small gray or white heads which remain stiff and dry. They are interesting for rockwork and the edges of borders, and for this purpose have been sparingly introduced in the last few years. They are perfectly hardy, and thrive in poor soil. The fls. are often cut before fully mature and dried (and often dyed) as everlastings. Several species grow wild. Prop. mostly by division of the mats; also by seeds. Allied to Anaphalis and Gnaphalium. Dioecious. *See Everlastings.*

A. *Pappus of sterile fls. not thickened at the tip, minutely roughened.*

dimórpha, Torr. & Gray. Tufted with spatulate lvs. and a sparsely-leaved fl.-st. an inch or less high, from a stout, much-branched caudex. Neb. west.

AA. *Pappus of sterile fls. thickened at the top.*

B. *Not spreading by stolons.*

Geyèri, Gray. Stout, thick-woolly, from a woody base: fl.-st. 3 in. or more high, very leafy to the top: pistillate heads narrow: involucre with rose-purple or ivory-white tips to the inner scales. Cal. N.

BB. *Spreading by stolons.*

C. *Heads solitary or in a cymose cluster.*

dioica, Linn. Basal lvs. 1½ in. or less long, 1-nerved or only indistinctly 3-nerved: st. 2–12 in.: involucral bracts all light green or light brown, with white or pinkish tips. N. states and Eu.—The plant in the trade as *A. tomentósum* is probably a form of this species. Also in cult. under the proper name, *A. dióica*.

alpina, Gaertn. Plant 1–4 in.: involucral bracts in fertile heads, dark brownish green, acute. Canada, Rocky Mts., Sierra Nevadas.

plantaginifòlia, Rich. Basal lvs. 1½ in. or more long, distinctly 3-nerved: st. 6–18 in. high. Stoloniferous, making broad patches. Common in fields and old pastures. Perhaps not in cult.

CC. *Heads loosely panicled.*

racemòsa, Hook. Light-woolly, 6–20 in. high, the sts. sparsely leafy, the heads mostly on slender peduncles: involucre brownish. Rocky Mts. L. H. B.

ANTHEMIS (Greek name of the chamomile). *Compósitæ.* CHAMOMILÆ. Pyrethrum-like heavy-scented plants, annual, biennial or perennial, members of a large, Old World temperate-region genus. Heads many-flowered, the disk yellow, the rays white and yellow and (in the common cult. species) pistillate, the receptacle conical and chaffy, the akenes terete or ribbed, and either naked or bearing a minute crown: lvs. pinnately dissected. Two or three of the species are weeds. Others are excellent border plants. The true chamomile is a medicinal plant. The hardy perennial species, which alone are grown in this country, are easily handled in the border, where they bloom from midsummer till frost. They thrive in almost any soil, but need full exposure to sun. Prop. by seeds or division of the clumps, usually the latter.

A. *Rays normally yellow.*

tinctória, Linn. GOLDEN MARGUERITE. Of bushy habit, 2–3 ft., with angular st. and pinnately divided, and again pinnatifid or cut-toothed lvs., and large, daisy-like, golden yellow fls. (1–2 in. across). *A. Kharegyi,* Hort. (or var. *Kharegyi,* Hort.), has finer-cut foliage and deeper yellow fls. There is also a pale-rayed var. Gn. 52: 1149.—An excellent hardy border plant, and useful at the same time for cut fls.

AA. *Rays white.*

B. *Perennial; cultivated.*

nóbilis, Linn. CHAMOMILE. Half-spreading and much-branched, downy, the lvs. very finely dissected: pappus wanting, chaff of the receptacle blunt.—A pleasant-scented herb, sometimes escaped from cult. It yields the medicinal chamomile fls. of commerce. For medicinal purposes, the heads (the single preferred) are cut as soon as fully expanded, and dried. Cult. also as a hardy **border** plant; often double.

BB. *Biennial or annual; weeds.*

arvénsis, Linn. Pubescent, not ill-scented; lvs. rather coarsely 1–2 pinnately parted: pappus a minute border: heads 1 in. or more across: rays pistillate.—Not common.

Cótula, DC. MAY-WEED. A common weed along roadsides, ill-scented, growing a foot or two high, with finely dissected lvs., neutral rays, and many aster-like fls. 1 in. across.

A. Aizoon, Griseb.=Achillea ageratifolia.—*A. Arábica,* Linn.=Chadanthus.—*A. coronária,* Hort.=Chrysanthemum coronarium.

L. H. B.

ANTHER. See *Flower.*

ANTHÉRICUM (Greek, *flower hedge*). Includes *Phalangium. Liliàceæ.* Herbs, with tuber-like rhizomes, and racemes of rather small, white, deep-cut fls.: perianth rotate; anthers attached between their basal lobes, and the locules many-ovuled—in these characters differing from Paradisea. Grown in borders, where the roots should have a cover of leaves or litter in winter; also in pots and under benches in coolhouses. Useful for lawn vases. Prop. naturally by stolons; increased also by division and seeds. Of easiest culture. Give plenty of water when in bloom. *A. Liliastrum,* St. Bruno's Lily, will be found under Paradisea. *A. picturatum, variegatum* and *rittatum* will be found under Chlorophytum. *A. Californicum* of some catalogues perhaps belongs to Chlorophytum.

Liliágo, Linn. ST. BERNARD'S LILY. Fig. 95. Stem simple, 2–3 ft. high, bearing an open raceme of open-spreading fls. 1 in. or less across, the segments linear-oblong: lvs. long and narrow. S. Eu. and N. Afr. B.M. 914. Var. **màjor,** Sims, is larger in all its parts. B.M. 1635.

ramósum, Linn. (*A. graminifólium,* Hort.). Stem branched: fls. somewhat smaller. Eu. B.M. 1055.

L. H. B.

ANTHOLÝZA (name from the Greek, of no particular application). *Iridàceæ.* About 20 Cape and Trop. African cormous plants, with linear or sword-shaped lvs. and bright fls. in 2-sided spikes. Perianth long-tubular, curved, dilated above, the uppermost segments largest: stamens 3: style branched: ovary 3-loculed. Cult. the same as gladioli, being taken up in the fall. The tubers are often started in a frame or in the house before planting in the open. See Baker, Irideæ.

A. *Perianth red, segments very unequal.*

Cunónia, Linn. Corm small: st. simple, 1–1½ ft.: lvs. about 4, linear, 1 ft. or less long: fls. 4–6, in a lax spike, bright red, an inch long, the stamens reaching to the tip of the upper segment. Cape. L.B.C. 20: 1971.

95. Stolon of Anthericum Liliago.

Cáffra, Banks. Corm large: st. 2 ft. or less: lvs. narrow-linear, 1 ft.: fls. 12–20, in a lax spike, bright red, 1–1¼ in. long, stamens not quite reaching tip of upper segment. Cape.—Has been hybridized with gladiolus.

AA. *Perianth red and yellow, segments less unequal.*

Æthiópica, Linn. Corm large: st. branched, 3–4 ft.: lvs. several, sword-shaped, 1 in. broad and 1–1½ ft. long: spike 6–9 in. long, rather dense: fls. 1½–2 in. long, red and yellow; stamens reaching to the tip of the upper segment. Cape. B.M. 561.

Var. **minor,** Lindl. (*A. bicolor,* Gasp.). Dwarf: lvs. narrow: fls. red at top, pale yellow below.

Var. **vittigera,** Baker (var. *ringens,* Nichols.). Tall as the type: fls. bright yellow, striped red. B.M. 1172.

Var. **immarginàta,** Baker. Fls. red, with dull yellow.

L. H. B.

ANTHOXÁNTHUM (*yellow-flower,* from the Greek). *Gramineæ. A. odorátum,* Linn., of the temperate parts of the Old World, is the Sweet Vernal Grass. It is a perennial, of low growth, very early bloom, and sweet odor when mown. It is used in mixtures of pasture grasses, and is also spontaneous in the E. states in pastures, meadows, and along roads. *A. Puélii,* Lec. & Lamotte, is an annual species, of smaller size, sometimes used in forage mixtures.

96. Anthurium Scherzerianum.

ANTHÚRIUM (Greek, *tail-flower*). *Aróideæ.* Tropical herbs, of 200 or more species, cult. mostly in stoves, grown for the showy spathes and spadices or for foliage. Spathe usually spreading or even reflexed, only rarely partially enclosing the spadix. Differs from Alocasia and allied genera in technical characters. Monogr. by Engler in DeCandolle's Monographiæ Phanerogamarum, Vol. 2 (1879).

Propagation is effected by suckers or cuttings of the rhizome inserted in small pots containing a mixture of peat fiber, chopped sphagnum moss and silver sand in

equal proportions, and plunged in a propagating box in a temperature of 75° to 80°, with bottom heat. About the end of January is the most suitable time to take the cuttings. Anthuriums may also be propagated by seeds sown in a mixture of very fine fibrous peat and chopped sphagnum moss in 4-inch pots. The seeds should be lightly covered with sphagnum and the pots placed either in a propagating case or under bell glasses, where a temperature of 80° can be maintained. A constant humid atmosphere is very necessary to induce the seeds to germinate. The compost in which Anthuriums thrive best is a mixture of one third fern root, or the fiber of peat with the dust shaken out, one-third sphagnum moss and one-third broken crocks and charcoal. The pots must be well drained, and the plants should be coned up 2 or 3 inches above the rim of the pots, and finished off with a surfacing of live sphagnum moss.

Established plants will only need repotting once in 2 or 3 years, but should have a fresh top dressing every year; the best time to overhaul them is about the end of January, or before active growth commences. They should be given a shaded position, free from draughts of cold air, and ordinary stove temperature.

Like most evergreen aroids, they require a copious supply of water at the roots and a humid atmosphere during the spring and summer months, and at no season of the year must the plants be allowed to become dry. Care must also be taken not to mar the leaves by hard spraying. The temperature during winter should not fall below 55°. Cult. by EDWARD J. CANNING.

Anthuriums such as *A. Andraeanum*, *A. ornatum*, and their numerous hybrid progeny, require at all times a high and humid atmosphere. Under those conditions and in a good rooting medium, they ought to be continually in flower. A bloom is produced from the axil of each leaf, and immediately beneath this leaf a new root is produced, thick and succulent at first, becoming tough with age, and, if not allowed to bury itself among the compost in which the plant grows, it eventually hardens and is of no help in the sustenance of the plant. Therefore, the growing point of the specimens should not be allowed to get too high, or the flowers will be few and poor. When the plant forms stems above the pot, the compost should either be built up around the stem, to catch the roots, or the plant may be cut over, rooted afresh in sand, and given a new start in a pot. The two ornamental-leaved species, *A. Veitchii* and *A. Warocqueanum*, should be treated in the same manner. When cut down, we may look for the old stocks to send out small growths, which in course of time may be taken off and put in small pots. All of the above are such free-rooting kinds that they may, with the addition of some rotted manure, be grown in sphagnum moss. A good mixture is as follows: Sphagnum, chopped not too fine, one part; fern or kalmia roots, chopped up and the fine substance removed, one part; another part to be made up equally of sand and rotted manure. With well-drained pots, this forms an admirable rooting substance. Most of the other

97. Anthurium Andraeanum.

species and their forms, including *A. Scherzerianum* and *A. crystallinum*, will thrive better in material mainly composed of rough, fibrous loam and peat with the fine material sifted from it. This rough, fibrous material should be mixed with a small quantity each of sphagnum, charcoal and sand. Good drainage, and less water than is needed for the Andreanum section, will be necessary. *A. Scherzerianum*, although thriving well in the hottest house, will succeed in an intermediate house. Seeds are obtained by pollinating the flowers, the stigmas of which become mature long before the anthers. The seeds

98. Anthurium Veitchii.
Young leaf, not yet showing the arched depressions.

should be sown on the surface of a pan of chopped moss and sand covered with glass; they sometimes show signs of germinating almost before being gathered, so that it is dangerous to keep them any length of time before sowing. To prevent damping, the seedlings should be pricked off round the edge of a 3-inch pot as soon as the first leaf is large enough to handle. Seeds of such kinds as crystallinum and regale will germinate well on the moss of nepenthes baskets. Cult. by G. W. OLIVER.

A. *Lvs. plain green; grown mostly for the showy "flowers."*

Scherzerianum, Schott. Fig. 96. A foot or two high, evergreen: lvs. long-lanceolate (the blade 1 ft. or more long and petiole of nearly equal length), thick, usually somewhat revolute, with a strong vein parallel with each edge and close to it, and many cross-veins; scape long and slender (1–2 ft.), red; spathe ovate-oblong, 3–4 in. long, spreading or deflexed, intense red (sometimes double, I.H. 37: 67): spadix slender, often curled, yellow. Central Amer. B.M. 5319. R.B. 22: 121. A.F. 6: 569 (in variety).—An old favorite. Runs into many forms: Spathe white, vars. *álbum*, *álbum magníficum*, *láctеum*, *máximum álbum*, *Williamsii*, *Verránеum*; spathe parti-colored, vars. *Andegavénsis* (scarlet on the back, white and scarlet spotted above), *mutábile* (white-bordered), *nebulósum* (double, white spotted rose), *Rothschildiánum* (scarlet mottled white, Gn. 30: 570), *Warocquеánum* (not *A. Warocquеánum*) (white spotted red); spathe very large, vars. *gigantéum*, *máximum*, *Wárdii*, *Woodbridgei*. Very dwarf is var. *pygmæum*; rose-salmon spathe and orange spadix is var. *Parisiénse*; sharp pointed lvs. and spathes is var. *Bécautii*.

Spathiphyllum, N. E. Brown. Two ft. or less, stemless or nearly so: leaf-blade 2 ft. or less, narrow-lanceolate, attenuate in a straight line from the middle to the base, acuminate, bright green above and grayish beneath, with prominent midrib: spathe 2 in. or less long and a half or more as wide, erect, boat-shaped, pale green or whitish: spadix 1 in. long and very blunt, pale yellow. Trop. Amer.

Andræanum, Lind. Fig. 97. Low species, with leaf-blades drooping like an Alocasia and cordate ovate-lanceolate: spathe cordate-ovate, thick in texture, 6–10 in. long, orange-red, widely open-spreading: spadix 3–4 in. long, yellowish, with white band marking the zone in which the stigmas are receptive. Colombia. B.M. 6616. A.F. 6:569; 10:1065. Gt. 38:1293. I.H. 24:271, 37:105. —Beautiful and popular. Runs into many varieties, some with very large spathes and others with white ones. Also hybridized with other species.

AA. *Lvs. prominently marked with white or colors, or with deep bands of green: cult. mostly for foliage.*

B. *Markings green or greenish.*

Veitchii, Mast. Fig. 98. Tall and robust species (st. 2–3 ft.): lf.-blades pendent, like a fine Alocasia, often 3–4 ft. long, cordate or cared at base, metallic green, but marked by deep-sunk nerves, which arch off the midrib: spathe 1 ft. long, horizontal, green: spadix 6–8 in. long, straw-color. Colombia. G.C.H. 6:773. B.M. 6968. Mn. 8:187.—Striking.

BB. *Markings white or essentially so.*

Warocqueànum, Moore. Fig. 99. Very vigorous: lvs. oblong-lanceolate, long-tapering, hanging, 2–4 ft. long, deep velvety green, with rib and principal veins of a prominently lighter shade, making handsome contrasts. Colombia.—A handsome and striking foliage plant.

magníficum, Lind. Leaf-blade deep cordate, oval, 2 ft. long, upper surface olive-green with white nerves: petiole 4-angled: spathe small, oblong, green: spadix green, cylindrical. Colombia.

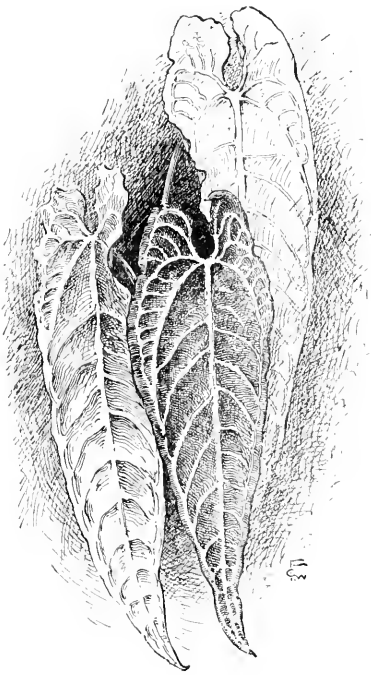
crystallínum, Lind. & André. Like *A. magníficum:* differs in petiole terete or only very imperfectly angled, sinus of blade smaller, veins wide-banded and whiter and very regular: leaf-blade ovate-cordate, short, deep, velvety green, with the midrib and two consecutive bands crystal white: spathe linear-oblong, acuminate, green. Peru. I.H. 20:128. G.C.H. 24:417 (var. *illustre*).

regàle, Lind. Leaf-blade cordate-oblong, long-cuspidate, 3 ft. or less, at first tinged rose, but becoming dull green and marked with white veins; petiole nearly terete: spathe broad-lanceolate, greenish. Peru.

Various horticultural forms and hybrids are in cult. in this country: *A. amábile.* Lvs. soft rose: crystallínum × magníficum.—*A. cárneum* is a hybrid of Andræanum and ornatum.—*A. Chantrièri.* Lvs. triangular, with wide-spreading basal lobes: spathe ivory-white, erect: nymphæfólium × subsignatum.—*A. Clarkiànum.* Lvs. large and broad: spathe resembling that of Andræanum but salmon-rose.—*A. Ferrierénse.* Lvs. large, cordate: spathe cordate, brilliant red: ornatum × Andræanum.—*A. floribúndum,* Linden and André = Spathiphyllum floribundum.—*A. Fráhelii.* Lvs. large and cordate: spathe deep carmine: Andræanum × ornatum.—*A. grándе* = magníficum.—*A. hýbridum.* Lvs. large, lobed at base, obtuse, green.—*A. musáicum.*—*A. ornátum.* Lvs. oval or oblong, cordate: spathe linear-oblong, white, purple-tinted.—*A. Reynoldsiànum,* various forms: Ferrierense × Andræanum *l*—*A. Siebrechtiànum.* Lvs. much as in magníficum, rich, velvety green, with thick margins: spathe light green shading to cream: spadix large, crimson.—*A. triúmphans.* Lvs. long-heart-shaped, bright green with lighter veins: spathe narrow, green: spadix greenish white.

A. acútum, N. E. Brown. Lvs. 8–10 in. long, triangular and long-acuminate, green: spathe reflexed, green: spadix deep green. Braz.—*A. Allendórfii:* Andræanum × Grussoni.—*A. Bákeri,* Hook. Lvs. elliptic-lanceolate or linear, green: spathe small, reflexed, green: spadix 3 in. long, yellowish green, becoming longer and red and drooping in fruit,—the chief merit of the plant. Costa Rica. B.M. 6261.—*A. Bogoténse,* Schott. Lvs. with a very broad halberd-shaped base and a long-acuminate middle lobe, dark green. Gt. 46, p. 525.—*A. brevipálmum,* N. E. Brown. Lvs. oval-acuminate, cordate, 8–10 in., paper-like, green: spathe lanceolate, purplish: spadix purplish brown.—*A. Chamberlaini,* Masters. Lvs. 4 ft. long, broadly cordate-ovate and narrowly long-pointed, green: spathe erect, boat-shaped, 8–9 in. long, purplish outside, crimson inside, partially inclosing the purplish spadix. Venezuela. G.C. III. 3:465. I.H. 35:62. B.M. 7297.—*A. Glazióvii,* Hook. Leaf-blade obovate-oblong, not hanging, tapering to petiole, green and strongly light veined: spathe linear-oblong, often twisted, purple (as is also the spadix). Braz. B.M. 6853.—*A. insígne,* Masters. G.C. II. 6:365.

Philodendron tripartitum.—*A. Kalbreyeri,* Hort. Climbing. lvs. 9-parted. New Granada. G.C.H. 46:117.—*A. magnifolium,* Koch. Spathe white: spadix purple. Venezuela.—*A. purpureum,* N. E. Brown. Lvs. oblong-lanceolate, thick, green: spathe and spadix purple. Braz.—*A. signátum,* Koch. Lvs. 3-lobed, deep green. Venezuela.—*A. splendidum,* Bull. Lvs. ovate-cordate, short-pointed or blunt, the basal sinus narrow, bullate and mottled green, 1 ft. or less long: spathe lanceolate, white: spadix green, becoming yellow and brick red: peduncles winged. S. Amer. G.C. 1883, 1:281. B.M. 6878. Gt. 35:145, 146. I.H. 31:510. —*A. trifidum,* Oliver. B.M. 6339 = signatum. L. H. B.



99. Anthurium Warocqueanum.

ANTHÝLLIS (Greek, meaning *downy flowers*). Kidney Vetch. *Leguminósæ.* Perennial herbs, or somewhat shrubby, prized for their spikes or heads of yellow, purple or white fls. and usually silky pinnate foliage; also for forage. In the Old World, prized mostly for rockwork. The cult. is the easiest, as the plants thrive even in poor soil. Prop. by seeds or division, or, rarely, by soft cuttings. Not generally known in U. S.

Vulnerària, Linn. Sand Clover. Woundwort. A foot high: lfts. 5 or more: fls. normally yellow, but there are red and white varieties. Eu.—A deep-rooted, clover-like, hardy plant, excellent for sandy and light lands. Useful for forage, and, for that purpose, occasionally grown in this country. Requires 20 lbs. of seed to the acre.

montàna, Linn. A foot or less high, silky-hoary: lfts. numerous: fls. purple. Herbaceous. Eu. L.B.C. 6: 578.

Barba-Jòvis, Linn. JUPITER'S BEARD. Glasshouse silky evergreen, 3–8, or even 12 ft. high, with several to many pairs of narrow, pointed lfts.; fls. straw-colored or whitish, in clover-like heads. S. Eu. B.M. 1927.—In frostless countries, endures sea-winds and salt spray.

L. H. B.

ANTIÀRIS toxicària, Lesch. *Urticàceæ.* UPAS TREE of Java. The juice and gum are virulently poisonous, and it was once supposed that no life could exist in the neighborhood of the tree, but this is false. The tree has been grown in botanic gardens. See Hooker, in Companion to Botanical Magazine, Gn. 12, p. 407.

ANTIDÉSMA (Greek, *for* and *band*, the bark of *A. Bunius* being used for cordage). *Euphorbiàceæ.* Tropical trees or shrubs, with simple, entire lvs. and inconspicuous unisexual fls., in spikes: fr. a 1-seeded little drupe

Bunius, Spreng. A tree with dark green foliage and small, round berries of a subacid taste, much used for preserves: the bark yields a fiber. Adapted to S. Calif. and S. Fla. Malay.—Cult. in S. Calif.

ANTÍGONON (name from the Greek). *Polygonàceæ.* Tropical tendril-climbers: sepals 5, colored and petal-like, the 2 interior ones narrower; stamens 8; styles 3, and ovary 3-angled: lvs. alternate and entire: fls. in racemes, which end in branching tendrils.

léptopus, Hook. & Arn. MOUNTAIN ROSE. ROSA DE MONTANA. SAN MIGUELITO. Probably the only species cult. in this country. Stem slender and tall, glabrous, or nearly so: lvs. cordate and acuminate, or hastate-ovate, 3–5 in. long: fls. 6–15 in the raceme, handsome rose-pink. Mex. B.M. 5846. G.C. III. 17: 797.—One of the handsomest summer-blooming greenhouse climbers, requiring abundance of light; usually grown from seeds, but also from cuttings. In the S. it blooms freely in the open, preferring sunny and hot places; protect the root well in winter, or plant deep. It is tuberous-rooted. Give plenty of water when in fl., but keep dry when at rest.

100. Young spike of a dwarf form of Antirrhinum majus (× 1/3).

Guatemalénse, Meissn. (*A. insigne,* Mast.). Pubescent: lvs. broader: fls. more numerous, the sepals nearly twice longer (1 in. long) than in the last. Guatemala. G.C. II. 7: 789.

L. H. B.

ANTIRRHÍNUM (Greek, *snout-flower*). *Scrophulariàceæ.* SNAPDRAGON. Over 60 species of herbs, natives to the Old and New World, in warm temperate regions. Lvs. usually opposite below and generally entire, never compound: corolla saccate or gibbous at base, but not spurred, personate or closed at the throat: stamens 4. Closely allied to Linaria, from which it differs in the spurless fls.

Snapdragons are flowered either in the open or under glass. The common varieties are forms of *A. majus,* and are perennial, although the first crop of bloom is usually the only one which is desired. Most of the varieties of this species are hardy in the N. if well covered during winter. Seeds sown very early in the spring, especially under frames, and transplanted, produce blooming plants the same season. It is usual, however, if early bloom is desired, to sow the seeds in Aug. or Sept., and cover

101. Antirrhinum maurandioides, in bud (× 1/2).

the plants with a mulch on the approach of cold weather. These fall-sown plants may be transplanted into pots (or grown in them from the first) and flowered in the house. For forcing in this way, Snapdragons are very satisfactory. The temperature and treatment required for geraniums and carnations suit them well. Dwarf vars. are used for edgings.

A. *Common Snapdragons, strictly erect.*

majus, Linn. COMMON OR LARGE SNAPDRAGON. Fig. 100. Perennial, or practically a biennial under cult.: 1–3 ft., not downy except in the fl.-cluster: lvs. oblong or lanceolate, entire, sometimes variegated: fls. large, long-tubular, with spreading, very irregular lobes, in an elongated terminal spike or raceme. In many colors and varieties (ranging from red and purple to white), in forms both tall and dwarf. Mediterranean region; sometimes running wild about gardens. A.F. 9: 909; 13: 949. I.H. 41: 22. A.G. 17: 379. F.E. 7: 711.—There are double forms. Some of the varietal names used by horticulturists are *álbum, bicolor, coccíneum, variegàtum.*

Orónтium, Linn. SMALL SNAPDRAGON. A low, slender annual, with linear lvs. and small fls. purple or white (½ in. long) in the axils. An occasional weed in cult. grounds, 6 in. or less high; not cult.

AA. *Native species, producing tendril-like branches in the inflorescence.*

Orcuttiànum, Gray. Slender, 2–4 ft., glabrous: corolla ⅓ in. long, white or violet, lower lip not much larger than the upper: lower lvs. spatulate-lanceolate, the upper linear. Annual. Lower and S. Calif. Int. by Orcutt in 1891.

AAA. *Climbing vine.*

maurandioides, Gray (*Maurandia antirrhiniflòra,* Willd.). Fig. 101. Climbing 2–5 ft. by means of the coiling petioles and peduncles: lvs. 3-lobed, halberd-shape: fls. axillary, 1 in. or more long, violet or purple, handsome. Tex. to Calif. B.M. 1643.—Attractive plant for the window, cool greenhouse or conservatory. Suitable for baskets.

L. H. B.

ANTRÒPHYUM (Greek, *growing in caverns*). *Polypodiàceæ.* A genus of inconspicuous, simple-leaved ferns rarely found in cultivation. Require high temp.

APÈRA (Greek, *undivided*). *Graminèæ.* One or two European and Asian grasses of the tribe *Agrostidèæ. A. arundinàcea,* Hook., is a tender grass from New Zealand, of erect habit and exceedingly long, pendulous panicles, grown under glass; but it really belongs to the genus Stipa. G.C. III. 22: 283. Likely to come into American trade.

APHANÁNTHE (Greek, *aphanes,* inconspicuous, and *anthe,* flower). *Urticàceæ.* Trees or shrubs: lvs. alternate, petiolate, serrate: fls. monoecious, inconspicuous; staminate in corymbs; pistillate single, axillary:

A commercial barrel of Ben Davis Apples

fr. a drupe. Three species in Jap. and Austral. Prop. by seeds or perhaps in the same way as Celtis, and also by grafting on Celtis.

áspera, Planch. Small tree: lvs. ovate, oblique, acuminate, serrate, $2\frac{1}{2}$–4 in. long, rough to the touch: fls. greenish, with the lvs.: drupe globular, black, slender-stalked. Jap.—Not hardy N., with slender branches, not much different in appearance from *Celtis occidentalis*. Little known in this country. ALFRED REHDER.

APHELÁNDRA (Greek-made name). *Acanthàcea*. Nearly 70 species of evergreen tropical American shrubs, grown in hothouses for the fine foliage and showy 4-sided terminal spikes of red or yellow gaudy-bracted fls. Of easy culture, if given plenty of diffused light in the growing season, and plants are not allowed to become tall and leggy. It is well to grow new plants frequently. Prop. by seeds when obtainable, or by cuttings of partially ripened wood at any season. They bloom in autumn, but can readily be brought into flower at other seasons. When done blooming, the plants should be rested in an intermediate temperature, kept rather dry, but not allowed to wilt or shrivel. Require treatment of Justicias, and thrive along with Allamandas and Poinsettias.

L. H. B.

All Aphelandras like a stovehouse temperature and a light leaf-mold, with a liberal proportion of sand. They should not be kept very wet in winter. They propagate readily from cuttings and seeds. The leading trade names are *A. aurantiaca*, *chrysops*, *Fascinator*, *Rœzlii*. *A. chrysops* is one of the handsomest of the group.

H. A. SIEBRECHT.

A. *Fls. in shades of yellow.*

Chamissoniàna, Nees. (*A. punctàta*, Bull). Lvs. oblong-lanceolate or elliptic-lanceolate, acuminate, the center banded with white, and white dots running off towards the margin, the midrib green: fls. and spiny bracts bright yellow. S. Amer. I.H. 29: 457. B.M. 6627.

squarròsa, Nees. (*A. Lèopoldi*, Hort. *A. chrysops*, Hort.). Lvs. large, ovate to ovate-elliptic, acuminate, dark green above (pale below), with white rib and main veins: fls. bright yellow and much exserted beyond the yellow crenate-dentate bracts. Braz. *A. squarròsa* itself is probably not in cult., the showy plant in the trade (and described above) being called *A. squarròsa* var. *Lèopoldi* by Van Houtte (F.S. 9: 889).—One of the most showy.

Blanchetiàna, Hook. f. (*A. amœna*, Bull). St. thick and stout: lvs. ovate-acuminate, with many pairs of conspicuous nerves, green, the midrib, and often the main veins, white: fls. dark yellow, exceeding the long, entire, cusp-pointed red scales: spike sessile. Braz. B.M. 7179.—Known in the trade as *A. amœna*, having been described under that name before it had flowered in cult.

AA. *Fls. orange, verging to scarlet.*

aurantiaca, Lindl. Lvs. ovate-elliptic, deep green above, light green below, strongly veined, but not particolored, slightly wavy edged: fls. orange, with a tinge of scarlet, the spreading limb overhanging the greenish sharp-toothed scales. Mex. B.M. 4224. B.R. 31: 12.

Var. **Rœzlii,** Nicholson (*A. Rœzlei*, Carr.). Fls. with more scarlet: lvs. twisted, with silvery hue between the veins. Mex.—Showy and good. Not so tall as *A. aurantiaca*.

AAA. *Fls. red.*

Fascinàtor, Lind. & André. Lvs. ovate to ovate-elliptic, the rib and veins widely margined with interlocking bands of white, the under surface purple: fls. large, brilliant vermilion, obscuring the inconspicuous bracts. New Granada. I.H. 21: 164.—Very showy and desirable.

A. atròvirens, N. E. Brown. Dwarf: lvs. very dark green above and purplish beneath: fls. yellow, 1 in. long. Braz. I.H. 31: 527.—*A. cristàta*, R. Br. Lvs. ovate-elliptic, green: fls. dark red, very long and curving, 2–3 in. Long known. W. Ind. B.M. 1578.—*A. Lebaniàna*, Linden. Dwarf: lvs. ovate and long-acuminate, with a white rib, green below: fls. deep yellow, small, scarcely exserted beyond the red bracts. Braz.? B.M. 5463.—*A. Macediàna*, Lind. & Rod. Said to be a form of A. atrovirens. Lvs. with white rib and main veins. Braz. I.H. 33: 583.—*A. Margaritæ*, Hort. Lvs. elliptic-acuminate, barred with white, purple below: fls. yellow, the bracts strong-toothed. Once catalogued by John Saul. Braz. G.C. III. 2: 585.—*A. nitàta*, Hook. Compact: lvs. ovate, thick, shining green above, dark purple beneath: fls. vermilion-scarlet, large, the bracts not showy. New Granada. B.M. 5741. Gn. 48: 1027.—*A. orientàlis*, offered in America, is possibly a form of some well known species.

L. H. B.

APÌCRA (*not bitter*, from the Greek). *Liliàcea*, tribe *Aloìneæ*. Shortly caulescent small succulents: lvs. spirally arranged or crowded along the stem: fls. greenish, often striped with white, straight, tubular or prismatic, with short, flat or spreading white limb surpassing the stamens. Cape region. Agave house or cactus house; suitable for rockeries during the summer. Prop. like Aloe. Monogr. by Baker. G.C. II. 11: 717 (1879); Journ. Linn. Soc. Bot. 18: 216.

A. *Lvs. as broad as long, acuminate, horizontal.*

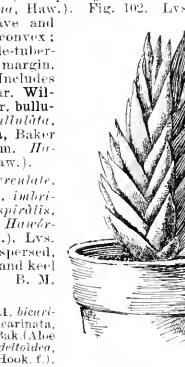
foliolòsa, Willd. (*Aloe foliolòsa*, Haw. *Haworthia foliolòsa*, Haw.). Lvs. densely crowded, thin-margined, very acuminate, smooth, serrulate: fls. smooth. Cape. B.M. 1352.

AA. *Lvs. more elongated, thick, acute, erect or ascending, except in age.*

B. *Fls. smooth.*

áspera, Willd. (*Aloe áspera*, Haw. *Haworthia áspera*, Haw.). Lvs. small, crowded, finely tuberculate, roughened on the back and margin, only the uppermost erect. Cape.

pentágona, Willd. (*Aloe pentágona*, Haw., not Jacq. *Haworthia pentágona*, Haw.). Fig. 102. Lvs. larger, from slightly concave and angled becoming biconvex; 5-ranked; finely pale-tuberculate on back and margin. Cape. B.M. 1338.—Includes several forms: Var. **Wildenòwii,** Baker; var. **bullulàta,** Willd. (*Aloe bullulàta*, Jacq.); var. **spirélla,** Baker (*Aloe spirélla*, Salm. *Haworthia spirélla*, Haw.).



102. Apicra pentagona.

BB. *Fls. rough-tuberculate.*

spiràlis, Bak. (*A. imbricàta*, Willd. *Aloe spiràlis*, Linn., not Haw. *Haworthia imbricàta*, Haw.). Lvs. small, irregularly dispersed, smooth, the margin and keel denticulate. Cape. B. M. 1455.

Other species are: *A. bicarinàta*, Haw. (Aloe bicarinata, Spreng.); *A. congèsta*, Bak. (Aloe congesta, Salm.); *A. deltoìdea*, Bak. (Aloe deltoidea, Hook. f.). B.M. 6071.

WILLIAM TRELEASE.

ÁPIOS (*pear*, from the Greek, alluding to the shape of the tubers). *Leguminòsæ*. Perhaps half a dozen species in N. Amer. and Asia, of twining, tuberous-rooted pinnate-leaved herbs. Fls. in dense, short racemes: pod linear and flat, several-seeded. A light soil and sunny place are essential to free growth. Under these conditions, the plant covers a trellis or other support in a comparatively short time.

tuberòsa, Mönch. GROUNDNUT. WILD BEAN. Four to 8 ft., climbing over bushes: root bearing strings of edible tubers, 1–2 in. long: leaflets 5–7, ovate-lanceolate: fls. fragrant, chocolate-brown, the standard very broad and turned back, the keel long, incurved and of scythe-shape. July–Aug. G.W.F. 44.—Common in low grounds. The fruit often fails to mature. Prop. by the tubers, 2 to 4 of which should be planted together at a depth of 3 or 4 inches; also, by seeds. Grows well in the wild border, in any loose, rich soil. Likely to become a weed in rockeries.

A. Fórtunei, Maxim., is occasionally cult. in Japan for its small, ovate, edible tubers. A.G. 1892: 77.—*A. Pricèana*, Robinson, native to Kentucky, may be expected to appear in the trade. The root is a single large tuber, becoming 6 or 7 in. in diam.: fls. greenish white, tinged with rose-purple or magenta. A vigorous climber, first described in 1898 (Bot. Gaz. 25: 451, with illustration).

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

APIUM. See *Celery*.

APLECTRUM (Greek, *with no spur*). *Orchidàcea*. A small orchid, with smallish dull-colored fls. in a raceme, on a leafless scape, which springs from a large corm-like tuber. Single species, in woods in the N. states.

hyemàle, Nutt. PUTTY ROOT. ADAM-AND-EVE. Fig. 103. Sends up a pointed green lf. 2–6 in. long, which lasts through the winter, and in spring a stalk about a foot high, bearing a raceme of rather large greenish brown fls., which are succeeded by hanging, oblong-pointed pods (Fig. 103). Hardy. May be grown in rich, loamy borders. Interesting, but not showy.

103. Fruit of Aplectrum hyemale. Nearly natural size.

APLOPÁPPUS (Greek, *simple pappus*). Syn., *Haplopappus*. *Compósitæ*. About 115 species, mostly from California and Chili. Fls. yellow, in summer and autumn. The only species known to be in American trade is

lanuginòsus, Gray. Hardy alpine herb, woolly, 4 in. high, from creeping rootstocks: lvs. soft, narrowly spatulate, or upper linear, 1–2 in. long: rays 15–20. Mts. of Wash. and Mont. Int. 1889, by F. H. Horsford.

A. ericoides, Hook. & Arn. Shrub, 2–5 ft. high: lvs. very numerous, filiform, those of the dense fascicles 2 or 3 lines long: fls very numerous. G.C. III. 20: 301.

APÓCYNUM (Greek for *dog-bane*). *Apocynàcea*. DOG-BANE. INDIAN HEMP. Tough perennial herbs, chiefly of N. Temp. zone, with oblong or ovate opposite lvs., milkweed-like fls. in small cymes, and slender follicles or pods. About 25 species, 3 or 4 native to N. Amer.

androsæmifòlium, Linn. Three ft. or less high, usually glabrous, the branches spreading: lobes of corolla revolute and tube of corolla longer than the calyx: lvs. oval or ovate, short-petioled: cymes loose: fls. bell-like, white or pink. N. states: common. B.M. 280. D. 189.—Sold by dealers in native plants. Useful for the hardy border.

cannàbinum, Linn. Branches erect or nearly so: lobes of corolla nearly erect, the tube not longer than calyx: lvs. ovate to lance-oblong, short-petioled: cymes dense: fls. greenish white. N. states: common.—Not known to be in the trade, but apt to be confounded with the above.

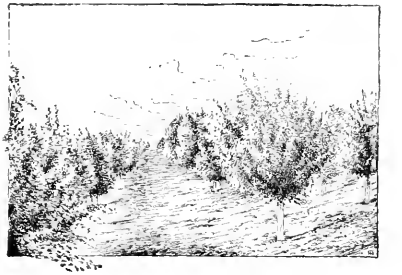
APONOGÈTON (Greek name, referring to its habitat in the water). *Naiadàcea*. About 20 tropical or subtropical water plants. Fls. in twin terminal spikes, wholly naked, but subtended by a double row of petal-like bracts.

distàchyum, Thunb. CAPE POND-WEED. WATER HAWTHORN (from the fragrance). Forked spikes 4–8 in. long, with several pairs of pure white bracts, borne on the emersed ends of long scapes: fls. very fragrant, with purple anthers: lvs. with very long petioles, the blade floating, oblong-lanceolate, round-based, parallel-veined, 3–6 in. long. Cape of Good Hope. B.M. 1293. F.R. 1: 463. P.G. 4: 106.—A charming and interesting plant. In a protected pool, especially if it can be covered in winter, the plant is hardy in the N., blooming nearly all summer. Removed to tubs in the fall, it blooms nearly all winter; or it can be grown permanently in tubs or deep pans in the house. Requires about 2 ft. of water, or out-of-doors it may have twice that depth. Prop. chiefly by seeds, but fls. should be pollinated and kept above water at least 24 hours afterwards, and seeds not be allowed to become dry. Var. **Lagrángei**, Hort. (*A. Lagrángei*, Hort.), is a rare and beautiful variety, with violet bracts and lvs. violet beneath. It props. slowly. R.H. 1895: 380.

L. H. B.

APPLE. *Rosàcea*. The Apple is native to southwestern Asia and adjacent Europe. It has been cultivated from time immemorial. Charred remains of the fruit are found in the prehistoric lake dwellings of Switzerland. Now widely cultivated and immensely variable, it is grown in every temperate climate, and is the most important commercial pomological fruit.

The Apple has come from two original stems. All the common Apples are modifications of *Pyrus Malus* (see *Pyrus*), a low round-headed tree, with thick and fuzzy, irregularly dentate, short-stemmed leaves and fairly compact clusters of woollystemmed flowers. The crab-apples are derived from *Pyrus baccata*, commonly known as the Siberian crab. This species is probably of more northern or eastern origin than the other. It is of smoother and more wiry growth, with narrower and thinner essentially glabrous long-stemmed leaves, and more open clusters of glabrous-stemmed flowers. The fruit is small and hard, and the calyx-lobes fall at maturity, leaving the eye or basin of the fruit smooth and plain. Hybrids between these species have given the race of large-fruited



104. A ten-year-old Nebraska Apple orchard.
The trunks are protected from the sun by board jackets.

crab-apples, of which the Transcendent and Hyslop are examples. This race is known to botanists as *Pyrus prunifolia*. Certain Apples are native to North America. Two species, *Pyrus Ioensis* and *P. coronaria*, are of interest to the pomologist. The former is the prairie-states crab, and is the more promising. In characters of growth, leaves and flowers, it bears a striking resemblance to forms of *Pyrus Malus*. The fruit is spherical or spherical-oblong, short-stemmed, very hard, and remains green-colored. The fruit of the eastern-states crab, *Pyrus coronaria*, is distinctly flattened endwise, and is long-stemmed. The leaves are deep-cut and often three-lobed. There are no improved varieties of this eastern species, and no authentic hybrids between it and the common Apples. The fruit is sometimes used by settlers, but it has little comestible value. *Pyrus Ioensis* has produced a number of promising hybrids with the common Apple, and this mongrel race is known as *Pyrus Soulardi*. The Soulard crab is the best known of these. Its value lies only in its extreme hardiness. The pomological value of the native crabs is prospective. For a completer account of the native Apples, see Bailey "Evolution of our Native Fruits."

The most perfect Apple region of this country—considering productiveness, quality, long-keeping attributes, longevity of tree—is that which begins with Nova Scotia and extends to the west and southwest to Lake Michigan. Other important regions are the Piedmont country of Virginia and the highlands of adjacent states, the Plains regions, the Ozark and Arkansas region, and the Pacific

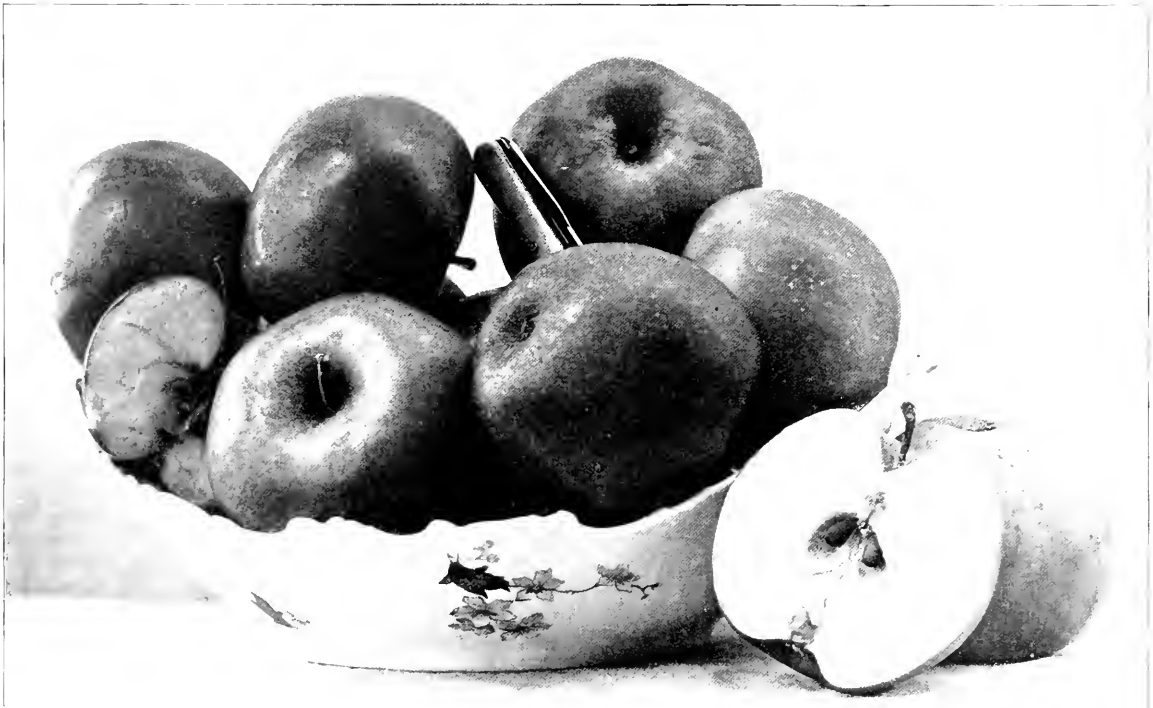


Plate I. Leading varieties of commercial Apples

On table at right, Ben Davis; in tray at right, Baldwin; at left, Rhode Island Greening

region, the last comprising the foothills in California and the country to the northward. All parts of the United States north of Florida and the Gulf borders, and excluding the warm-temperate parts of the Southwest and the Pacific coast, are adapted to the Apple in greater or lesser degree. North America is the leading Apple-growing country of the world. A full crop for the United States and Canada, of all kinds and grades, is probably not less than 100,000,000 barrels. The Apple is a cosmopolitan fruit; and since it thrives almost anywhere, it is commonly neglected. The plants which are most difficult to cultivate are the ones which are best cultivated.

The Apple was early introduced into this country. In the early days it was prized chiefly for cider. It is an ancient and common notion that any Apple is good enough for cider; and this is one reason for the neglect in which the Apple plantation is commonly allowed to stand. The best results in Apple-growing are to be expected when the land is tilled. The reasons for tilling the orchard are those which apply to other crops,—to make plant-food available, to extend the area in which the roots can grow, to conserve moisture. It is especially important, in our hot and sunny country, that the roots extend deep enough to escape the disastrous effects of drought. The ideal treatment of orchard land is to fit the ground deep before the trees are planted, to plow deep for a year or two or three in order to force the roots down and to thoroughly ameliorate the soil, and to practice shallow tillage in order to conserve moisture. (See *Tillage*.) Since trees make

105. A good New York Apple orchard at 25 years.

most of their growth early in the season, the tillage should be begun as soon as the land is fit in spring; and it may be discontinued by midsummer or August. This cessation of the tillage allows of the growing of some cover crop or catch crop (see *Cover-crops*) late in the season, in order to secure humus and to improve the physical texture of the soil. If the land is well handled in the first few years, it will not be necessary to turn a furrow in the orchard thereafter, but merely to loosen the surface in the spring with a spading harrow, spring-tooth harrow, or other tool, in order to re-establish the surface mulch. The only reasons for turning a furrow will occur when the land is so hard that the surface tools cannot mellow the surface, or when it is desirable to turn under a green-manure crop. Even hard lands may be got in such condition, by means of tillage and green-manures, that they may be worked up with harrow tools when the orchard comes into bearing. Plowing the orchard, therefore, has two legitimate objects; to mellow and ameliorate the land to a considerable depth, so that the roots may forage deep; to turn under a cover crop. The former purpose should not be necessary after the first few plowings. An incidental object of plowing is to facilitate the making of the annual surface mulch; and this mulch is to save the moisture.

The Apple thrives in a variety of soils, but it is most productive and longest-lived on land which has a considerable original admixture of clay: that is, in a clay loam. Lands which yield good crops of wheat and corn may be expected to be good Apple lands, if other conditions are right. Rolling, inclined, or somewhat elevated lands are generally considered to be most desirable. Their value lies in the better drainage of water and air. The trees may be set in either fall or spring. Forty feet apart each way is the standard distance for Apple trees; but some varieties, as the Wagener and the crabs, may be set closer. In the South and on the Plains, trees may be set closer, as they do not attain such great size as in the northeastern states. In general, it is best to devote the land to Apples alone; but persons who are willing to give the plantation the best of care may plant other trees between the Apples, as fillers. The more diverse the kinds of trees which are planted together, the more difficult it is to give the proper care to each. Some of the shorter-lived varieties of Apples make excellent fillers in the Apple orchard: and in special cases dwarf Apples may be used.

106. Apple badly attacked by the scab.

It should be the general purpose to till the Apple orchard throughout its life; but whenever the trees seem to be growing too rapidly, the plantation may be seeded down for a time. That is, tillage is the general practice; seeding down is the special practice. For the first few years, annual crops may be grown in the Apple orchard; but every year a more generous open space should be left about the trees. Till as often as the land becomes crusted or baked. On strong soils which are well handled, it is rarely necessary to apply concentrated fertilizers until the trees are old enough to bear. What fertilizers are then needed, and how much to apply, are to be determined by the behavior of the trees. If the trees are making insufficient growth, and the foliage lacks color, one or all of three things may be the trouble: the trees may need water; they may be suffering from insects or disease; they may lack nitrogen. If it is thought that they lack nitrogen, this material may be supplied in the form of nitrate of soda, sulfate of ammonia, or the unburned animal substances, as blood and tankage. Two to three hundred pounds to the acre of the nitrate of soda or sulfate of ammonia are liberal applications on well-tilled lands. If the trees are making vigorous growth, the probability is that they are not in need of more nitrogen. Potash and phosphoric acid may then be applied. Three hundred pounds of muriate of potash, or other concentrated material, should be sufficient for an acre, under ordinary conditions. As a rule, all orchards in full bearing should have a liberal annual application of fertilizing materials. In the East, Apple trees should be in profitable bearing at 10 years from planting, and should continue in that condition for 30 years.

The two staple enemies of the Apple are the apple-worm (the larva of the codlin-moth), and the apple-scab (Fig. 106). These are readily held in check by spraying,—with arsenical poisons for the worm, and with Bordeaux mixture for the scab. (See *Spraying*.) Spraying for the worm should be performed as soon as the last

107. Ready for the first general spraying.

petals fall; for the scab as soon as the buds are well burst (Fig. 107). In badly infected regions and on very susceptible varieties, it may be necessary to spray first for the scab before the buds swell. Since there are insects (as canker-worms, case-bearers, bud-moth) which appear

before the flowers open, it is advisable to add Paris green or other arsenical poison to the Bordeaux mixture at the early spraying. The number of times to spray depends

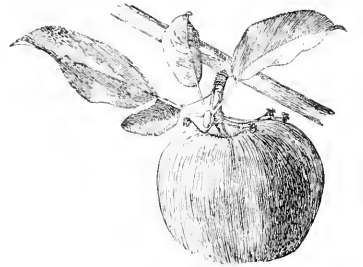
108. Spur and fruit-bud of Apple.

109. One Apple sets in a cluster.

upon the thoroughness of the work, the pests to be combatted, and the season; but it is a good rule to expect to spray with the combined Bordeaux and Paris green mixture when the buds burst, and again when the petals have fallen. In the Plains country, less spraying may be necessary for the fungous diseases.

The Apple commonly bears on spurs. The fruit-bud is distinguished by its greater size (usually somewhat thicker than its branch), its greater width in proportion to its length, and more conspicuous pubescence. It is also distinguished by its position. A fruit-bud is shown in Fig. 108. A fruit-scar is shown near the base of the branch. If this fruit was borne in 1898, the side branch grew in 1899, from a bud which came into existence in 1898. If we go back to the spring of 1898, the matter can be made plain. A cluster of flowers appeared. One flower set a fruit (Fig. 109). This Apple is at the end of the branchlet or spur. The spur cannot increase in length in the same axis. Therefore, a bud appears on the side (Fig. 110). The fruit absorbs the energies of the spur. There is little nonrishment left for the bud. The bud awaits its opportunity; the following year it grows into a branchlet and makes a fruit-bud at its end (Fig. 108); and thereby there arises an alternation in fruit-bearing.

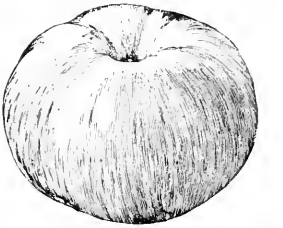
The Apple is budded or root-grafted upon common Apple seedlings. These seedlings are usually grown from



110. Showing the side bud which is to continue the spur the following year.

seeds obtained from cider mills. In the East, budded trees are preferred. In the West, root-grafted trees are preferred, largely because own-rooted trees of known hardiness can be secured. (See *Grafting*.) In Russia, seedlings of *Pyrus baccata* are used as stocks. They prevent root-killing, and give earlier fruit-bearing. Apples are dwarfed by working them on various kinds of Paradise and Doucin stocks. These stocks are merely naturally dwarf forms of the common apple, and which, in some remote time, have originated from seeds. Dwarf Apples are much grown in Europe, where small-area cultivation and wall-training are common, but they are little known in America. Apple trees are usually planted when two or three years old.

The varieties of Apple trees actually on sale in North America in any year are not far from 1,000 kinds. Each great geographical area has varieties which are particularly adapted to it. In the northern Mississippi valley, there are few of the eastern-states Apples which thrive. Varieties have been introduced from Russia with the expectation that they will be adapted to the region; but more is to be expected of their progeny than of themselves. Varieties of local origin, coming from various stem types, are now providing that country with satisfactory Apples. In the selection of varieties, one should be guided by this adaptation to the region, and by the purpose for which the fruit is designed to be grown. Consult the recommended lists of the state horticultural societies; ask persons who have had experience in the given region; write to the experiment station; enquire at the markets. The leading commercial varieties in North America are Albemarle Pippin, American Golden Russet, Astrachan, Baldwin, Ben Davis, Blue Pearmain, Duchess of Oldenburg, Fameuse, Gillflower, Gravenstein, Janet, King, Lawver, Maiden's Blush, Missouri Pippin, Newtown Pippin, Northern Spy, Peck's Pleasant, Pennock, Rhode Island Greening, Rome Beauty, Shockley, Twenty Ounce, Wealthy, Willow Twig, Wolf River, York Imperial. See Plate I. Baldwin and Ben Davis, the former of inferior quality and the latter of worse, hold the supremacy in American market Apples. The Apples of the eastern and central country tend toward flattened or oblate shape (Fig. 111). The typical form of the so-called long or conical American Apple may be seen in Fig. 110. The Apples of Europe are often distinctly attenuated and ribbed at the apex (Fig. 112); and this form is also accented in the regions beyond the Rockies.



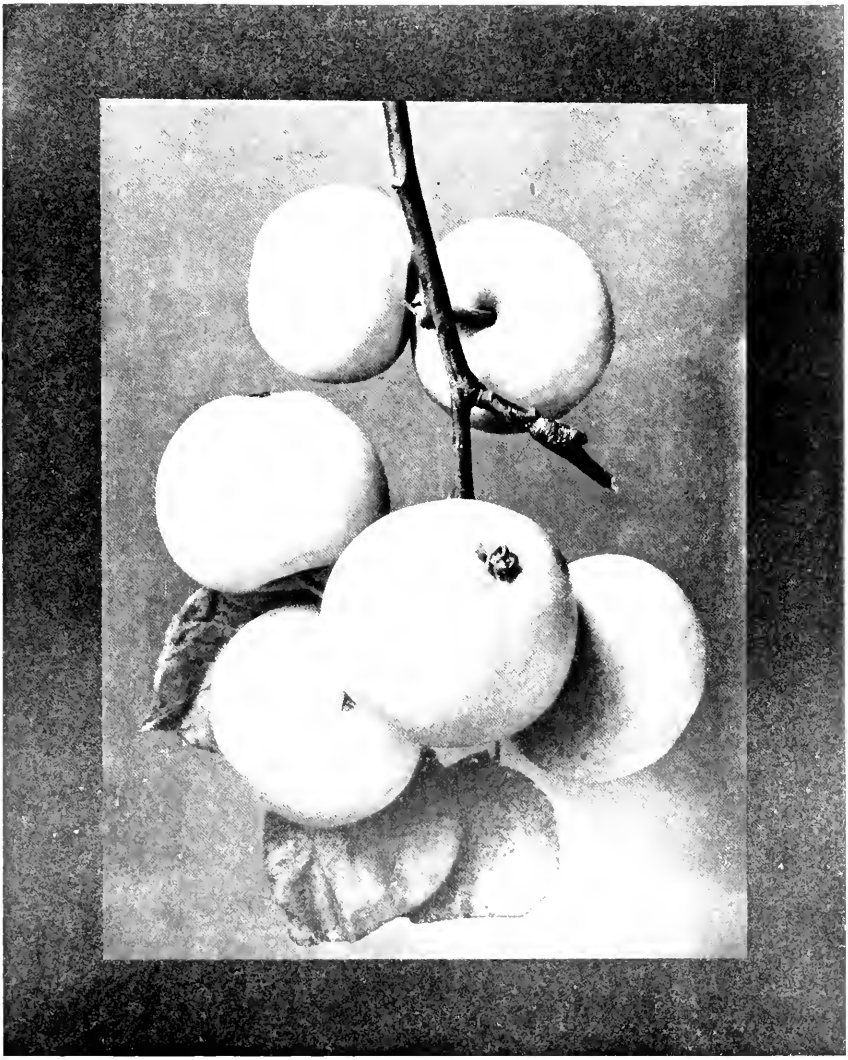
111. The flat or oblate American apple.

112. An Irish apple.

Three books devoted wholly to the apple have appeared in North America: Warder, Apples, 1867 (the best); Todd, Apple Culturist, 1871; Bailey, Field Notes on Apple Culture, 1886. Consult, also, Vol. 25, Nebraska State Horticultural Society, 1894; The Apple, a report of the Kansas State Horticultural Society, 1898. Nearly all the fruit manuals devote space to the apple.

L. H. B.

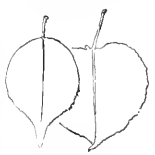
APPLESEED, JOHNNY. An interesting and eccentric character, who sowed apple seeds in the wilds of Ohio and Indiana between 1801 and 1847. His real name was Jonathan Chapman. He was born in Boston in 1775, and died in 1847. For 46 years he walked barefoot through the wilderness, and was never harmed by snakes, wild animals, or Indians. He was often clad in a coffee-sack, in which he made holes for the arms and legs. He would never kill any creature, and considered pruning and grafting wicked. Swedenborg and the



Yellow Transparent, one of the popular summer Apples

New Testament he read aloud in many frontier log cabins. He had many peculiarities, but was always welcomed and respected everywhere. In the war of 1812 he saved many lives by warning the settlers of Hull's surrender and the approach of the Indians. He lived to see trees bearing fruit over a territory of 100,000 acres. The story of this self-sacrificing and useful man is told by W. D. Haley in Harper's, 43: 830–836 (1871). W. M.

APRICOT. *Rosdceæ.* The Apricot is a fruit somewhat intermediate between the peach and the plum. The tree is a round-headed, spreading grower, with dark, somewhat peach-like bark, and very broad or almost circular leaves. The fruit, which generally ripens in advance of both the peach and plum, is peach-like in shape and color, with a smoother skin, rich, yellow flesh and large, flat, smooth stone. The flesh is commonly less juicy than that of the peach, and, as a rule, perhaps, of higher quality. The Apricots are of three species, all probably native of China or Japan. The common Apricot of Europe and America is *Prunus Armeniaca:* fr. variable, but smooth at maturity, red or yellow, the sweet and firm flesh free, or very nearly so, from the large, smooth, flat stone: tree with a round, spreading top, and a reddish, cherry-like or peach-like bark: lvs. (Fig. 113, right) ovate or round-ovate, with a short point and, sometimes a heart-shaped base, thin and bright green, smooth, or very nearly so below, as are the gland-bearing stalks, the margins rather obtusely and mostly finely serrate: fls. pink-white and borne singly, sessile or very nearly so, preceding the leaves (Fig. 116). The Russian Apricot is a hardy but smaller-fruited race of this species. The Japanese Apricot, in Japan grown for flowers rather than for fruit, is *Prunus Mume:* fr. small, yellowish or greenish, the flesh rather hard and dry, and adhering tightly to the pitted stone: tree like the common Apricot, but with a grayer or greener bark and duller foliage: lvs. grayish green, generally narrower (Fig. 113, left) and long-pointed, more or less hairy along the veins below and on the shorter mostly glandless stalk, thick in texture and prominently netted beneath: fls. fragrant, borne singly or in 2's, and sessile (without stalks). Only recently introduced into this country, chiefly under the name of Bungoume plum. The third species is the purple or black Apricot, *Prunus dasycarpa,* which is little cultivated: fr. globular and somewhat plum-like, with a distinct stem, pubescent or fuzzy even at maturity, dull dark purple, the sourish, soft flesh clinging to the plum-like fuzzy stone: tree round-headed, with much the habit of the common Apricot, with lvs. ovate and more or less tapering at both ends, thin, dull green, on slender and pubescent mostly glandless stalks, finely appressed-serrate, and hairy on the veins below: fls. large and plum-like, blush, solitary or in 2's, on pubescent stalks a half-inch or more long, and appearing in advance of the leaves. See *Prunus* for related species. The Apricot-plum, *Prunus Simonii,* is discussed under Plum.



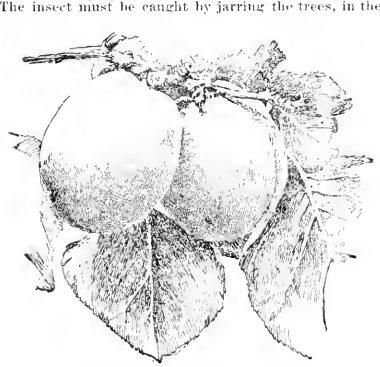
113. Apricot leaves.

P. Mume on left; P. Armeniaca on right.

The Apricot is as hardy as the peach, and it thrives in the same localities and under the same general cultivation and treatment, but demands rather strong soil. It is grown commercially in New York and other eastern states. There are three chief reasons why the Apricot has remained in comparative obscurity in the East: Ignorance of the fruit; loss of crop by spring frosts, because of the very early season of blooming of the Apricot; the fondness of the curculio for the fruit. To these may be added the fact that we have not yet arrived at an understanding of the best stocks upon which to bud the Apricot; but this difficulty may be expected to disappear as soon as greater attention is given to the fruit and our nurserymen begin to propagate it extensively. Aside from the above difficulties, there are probably no reasons why Apricots should not be grown in the East as easily as plums or peaches. The varieties of Apricots which are chiefly prized in the eastern states are Harris, Early Moorpark, and St. Ambroise for early; Turkish or Ivoman (Fig. 114), Montgamet, Royal and Moorpark for mid-season and late. Of the Russian race, the best known are Alexander, Gibb, Budd, Alexis, Nicholas, and Catherine.

The ideal soil for the Apricot seems to be one which is deep and dry, and of a loamy or gravelly character. The rolling loamy lands which are well adapted to apples seem to be well suited to the Apricot, if the exposure and location are right. The Apricot seems to be particularly impatient of wet feet, and many of the failures are due to retentive subsoils. Particular attention should be given to the location and exposure of the Apricot orchard. In the East, the best results are obtained if the plantation stands upon elevated land near a large body of water, for there the spring frosts are not so serious as elsewhere. Generally, a somewhat backward exposure, if it can be obtained, is desirable, in order to retard blooming. Apricots will be sure to fail in frosty localities. The Apricot should always be given clean culture. For the first two or three years some hoed crop may be grown between the trees, but after that the trees should be allowed the entire land, particularly if set less than 20 feet apart. Cultivation should be stopped late in summer or early in the fall, in order to allow the wood to mature thoroughly. The trees are pruned in essentially the same way as plums. The fruit-buds are borne both upon spurs (two are shown in Fig. 115), and also on the wood of the last season's growth, on either side of the leaf-bud, as shown in the twin and triplet buds above *a* in Fig. 115. Each bud contains a single naked flower (Fig. 116). As the fruit begins to swell, the calyx-ring is forced off over the top (Fig. 117); and the injury from curculio may then be expected.

When grown under the best conditions, the Apricot may be considered to be nearly or quite as productive as the peach. Like other fruit trees, it bears in alternate years, unless the crops are very heavily thinned; but it can never be recommended for general or indiscriminate planting. Only the best fruit-growers can succeed with it. Apricots are to be considered as a dessert or fancy fruit, and, therefore, should be neatly packed in small and tasty packages. The most serious enemy of the Apricot is the curculio, the same insect which attacks the plum and peach. It seems to have a particular fondness for the Apricot, and as the fruit sets very early the crop may be expected to be destroyed unless the most vigilant means are employed of fighting the insect. Spraying with arsenical poisons is uncertain. The insect must be caught by jarring the trees, in the same manner as on plums and peaches, but the work must be even more thoroughly done than upon those fruits. The jarring should begin as soon as the blossoms fall, and continue as long as the insects are numerous enough to do serious damage. It will usually be



114. Apricot, the Roman (× ⅓).

necessary to catch the insects for three to six weeks, two or three times a week, or, perhaps, even every day. The work must be done early in the morning, while the curculio is indisposed to fly. The operation consists in knocking the insects from the tree by a quick jar or shake, catching them upon a white sheet or in a canvas hopper. The catcher most commonly used in western New York is a strong cloth hopper mounted upon a wheelbarrow-like frame, and running upon two wheels. The hopper converges into a tin box, into which the curculios roll as they fall upon the sheet. One man wheels the device, by barrow-like handles, under the tree, then drops the handles and jars the tree; or sometimes two men go with a machine, one wheeling it and the other jarring the trees. This device is used extensively by practical fruit-growers for catching the curculio on the various stone fruits.

115. Fruit-buds of the Apricot.

Borne beside the leaf-bud, as on the peach, and also on spurs.

It is not yet certain what are the best stocks for Apricots in the East, in commercial orchards. It is probable that no one stock is best under all circumstances. The Apricot root itself seems to be impatient of our cold and wet soils, which are drenched by the drainage of winter. It needs a very deep and rich soil, but it is doubtful if it is safe for the East. The common plum (not myrobalan) is an excellent stock for plum soils, and the Apricot does well either nursery-budded or top-worked upon it. Peach is probably the commonest stock, and, for peach soils, it is probably the best that can be used. If the Apricot thrives upon various stocks, it is thereby adapted to many soils.

The Apricot is often trained on walls, where the fruit reaches the highest perfection. Care should be taken that the wall does not face to the east or the south, or the early-forced flowers may be caught by frost. An overhanging cornice will aid greatly in protecting from frost.

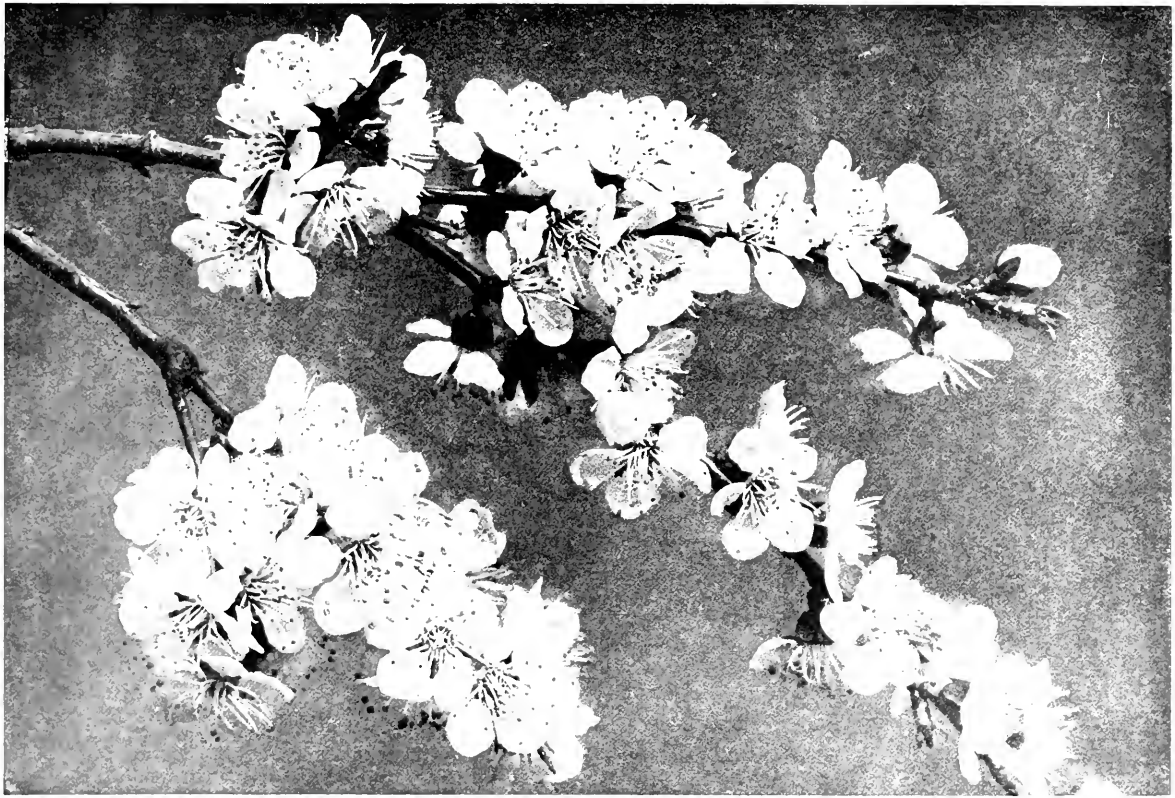
L. H. B.

The Apricot in California. —The Apricot is one of the leading commercial fruits of California. It was introduced by the Mission Fathers, for Vancouver found it at the Santa Clara Mission in 1792. However, there is no relation between this early introduction and the expansion which quickly followed the American occupation, because the Mission Fathers had only seedling fruits, while the early American planters, shortly before the gold discovery, introduced the best French and English varieties, and were delighted to find that these sorts, usually given some protection in the Old World, grew with surprising thrift of tree and size of fruit in valley situations in California in the open air. Upon these facts the Apricot rose to wide popularity. The acreage has steadily increased during the last fifty years, and with particularly swift rate during the last twenty years, until the number of trees at the present date (1899) is about three millions, occupying upwards of forty thousand acres of land. This notable increase, and the present prospect of much greater extension, is based upon the demand which has arisen for the fruit in its fresh, canned, dried and crystallized forms, in all the regions of the United States, in England and on the Continent, where, by reason of its superior size and acceptable manner of curing, it has achieved notable popularity. The year 1897 was the greatest thus far in amount of dried product realized, viz.: 30,000,000 pounds. The year 1895 was greatest in amount of canned product, which reached upwards of 360,000 cases, each containing two dozen 2½-pound cans. The shipment of fresh Apricots out of California during the summer of 1897 was 177 carloads.

The chief part of the Apricot crop of California is grown in the interior valleys. In the low places in these valleys, however, the fruit is apt to be injured and sometimes almost wholly destroyed by spring frosts, although the trees make excellent growth. In foothill situations adjacent to these valleys, there is also serious danger of frost above an elevation of about fifteen hundred feet above sea-level, and the tree is rarely planted for commercial purposes. In southern California the Apricot succeeds both in the coast and interior valleys. But along the coast northward, excepting the very important producing regions of the Alameda and Santa Clara valleys, eastward and southward from the Bay of San Francisco, the Apricot is but little grown owing to frost troubles. In respect to these, the Apricot is somewhat less subject to harm than the almond, but it is less hardy than the peach, and has, therefore, a much narrower range of adaptation. The average date of the blooming of Apricot varieties is about two weeks later than that of the almonds. The Apricot is adapted to a wide range of soils, because to the rather heavy, moist loams which its own root tolerates, it adds the lighter tastes of the peach root, upon which it is very largely propagated. However, attempts to carry the Apricot upon heavier, moister soils by working it upon the plum root have not been very successful, owing to the dwarfing of the tree; and the movement toward the light, dry loams, by working upon the almond root, has failed because the attachment is insecure, and the trees are very apt to be snapped off at the joining, even though they may attain bearing age before the mishap occurs. The Apricot root itself is a favorite morsel with rodents, and is for that reason not largely used. Our mainstay for the Apricot, then, is the peach root, and the soils which this root enjoys in localities sufficiently frost-free are, therefore, to a great extent the measure of our Apricot area.

Apricot trees are produced by budding on peach or Apricot seedlings during their first summer's growth in the nursery row, from pits planted when the ground is moist and warm, at any time during the preceding winter. When there is a great demand for trees, planting in orchard is sometimes done with dormant buds, but ordinarily the trees are allowed to make one summer's growth in the nursery. The trees branch during the first year's growth from the bud, and usually come to the planter with a good choice of low-starting branches, from which to shape the low-headed tree which is universally preferred. The method of securing such a tree is identical with that already described for the almond, but the treatment of the tree after reaching bearing age, in its third year, is very different from the after treatment of the almond. The Apricot is a rampant grower and most profuse bearer. Unless kept continually in check it will quickly rush out of reach, and will destroy its low shoots and spurs by the dense shade of its thick, beautiful foliage. There is continually necessary, then, a certain degree of thinning of the surplus shoots and shortening of the new growth to continue the system of low branching, to relieve the tree from an excess of bearing wood, and to avoid small fruit and exhaustion of the tree, resulting in alternate years of bearing. In the coast regions, where the tree makes moderate wood growth, it can be kept in good form and bearing by regular winter pruning. In warmer regions, where the tendency is to exuberant wood growth, the main pruning is done in the summer, immediately after the fruit is gathered. This has a tendency to check wood growth and promote fruit bearing, and where the main cutting is done in the summer, winter pruning is reduced to thinning out shoots, to prevent the tree from becoming too dense and to lessen the work of hand-thinning of the fruit later on. In addition, however, to the most intelligent pruning, much fruit must be removed by hand when there is a heavy set of it, in order to bring the fruit to a size

116. Flowers of the Apricot.



Flowers of the common Apricot

satisfactory to shippers or canners, and to reach the highest grades, if drying is practiced. California Apricot orchards are all grown with clean tillage, for the main purpose of moisture conservation. In regions of good rainfall and sufficiently retentive loams no irrigation is required; good tillage will suffice for the production of large fruit and perfection of fruit-buds for the following year. As the trees are becoming older and bearing larger crops the demand for moisture increases, and the use of irrigation water is growing. In most places, however, one irrigation is sufficient, and that is given after fruit gathering, to carry the tree through the last half of its season's work. In the regularly irrigated regions of the state, water is periodically applied through the growing season, in such amount and at such intervals as the local climate and soils require.

117. Young Apricots shedding the ring.

Though probably all the good varieties of the Apricot in the world have been introduced into California during the last half century, and scores of selected seedlings of local origin have been widely tested, the varieties which have survived the tests and are now widely grown are comparatively few in number. Most of the rejected varieties met this fate because of shy bearing, and those which now constitute the bulk of the crop are very regular and full bearers under rational treatment. A local seedling, the Pringle, was for many years chiefly grown for the earliest ripening, but this has recently been largely superseded by another local seedling, the Newcastle, which is of superior size and about as early. The European varieties, Large Early and Early Golden, are fine in a few localities where they bear well, and do better in southern California than elsewhere. The universal favorite is the Royal; probably three-fourths of all the trees in the state are of this variety, though recently the area of the Blenheim has been increasing largely. The Hemskirk stands next to the Blenheim in popularity. The Peach is largely grown in the Sacramento valley. The best Apricot grown in California is the Moorpark; in size and lusciousness, when well ripened, it heads the list. It is, however, rather shy in bearing, and is forsaken for this fault in most regions. It shows the best behavior in the Santa Clara valley, and is there retained, in spite of frequent lapses, because of the high prices which it commands at the canneries. About a dozen other varieties are carried in small number by the nurserymen to meet limited local demands.

Apricots for canning and drying are graded according to size: Extra, not less than $2^1/_4$ inches in diameter; No. 1, 2 inches; No. 2, $1^1/_2$ inches; No. 3, 1 inch. The first three grades must be sound, clean and free from blemish, and No. 3 must be of good merchantable quality. The shippers and canners require well-colored but only firm-ripe fruit, because both the long rail transportation and the canning process require it; soft-ripe fruit will neither can nor carry. For drying, riper fruit is used, and yet over-ripeness has to be guarded against to avoid too dark color. For canning, the fruit must be carefully hand-picked; for drying, much is shaken from the trees. The drying process consists in cutting the fruit in halves longitudinally, dropping out the pits and placing the halves cavity uppermost upon light wooden trays. Breaking or tearing the fruit open will not do; it must show clean-cut edges. When the trays are covered they are placed in a tight compartment, usually called a "sulfur box," though it may be of considerable size, and the fruit is exposed to the fumes of slowly burning sulfur, to ensure its drying to the light golden color which is most acceptable to the trade. The production of the right color is the end in view, and different dryers regulate the amount of sulfur and the length of exposure according to the condition of their fruit and their judgment of what it needs. The exposure varies from half an hour to two or three hours, according to circumstances. After sulfuring, the trays are taken to open ground, and the fruit is cured in the sun. Only a very small fraction of the California product of evaporated Apricots is cured in an evaporator. It requires about six pounds of fresh Apricots to make one pound of cured fruit.

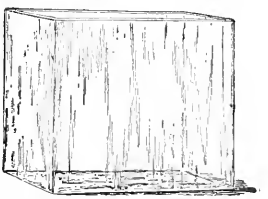
118. A museum-jar Aquarium.
More animal life would make a better equilibrium.

A moderate estimate of the yield of Apricots might be placed at seven and one-half tons to the acre: extreme yields are far away from this both ways.

The Apricot is, as a rule, a very healthy tree in California. It is, however, subject to injury by scale insects of the lecanium group in some parts of the state. During recent years there has been increasing injury by a shot-hole fungus, which perforates the leaves and makes ugly pustules upon the fruit. Such fruit is unfit for canning except the fruit be peeled, which is little done as yet. It also makes low-grade dried product. This fungus can be repressed by fungicides of the copper class.

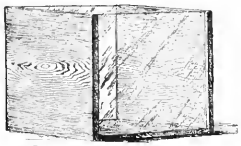
EDWARD J. WICKSON.

AQUARIUM. An Aquarium, to be in a healthy condition, should contain living plants—oxygenators—which are as necessary as food, as fish cannot live on food only. The Aquarium must be kept clean. The sediment should be removed from the bottom with a dip tube twice a week, and the inner side of the glass cleaned with a wiper once a week. Encourage the growth of the plants at all seasons; admit plenty of light, but no direct sunshine. There should also be a few tadpoles and snails in the Aquarium. These are very essential, as they are scavengers, and devour the confervoid growth that frequently accumulates on the plants. In fall, give a thorough cleaning and rearrangement of the Aquarium, so that all are in the best condition possible before winter sets in. In March it should be carefully looked over, and undesirable plants removed or transplanted. Additions may be made, or any change if necessary. Following are some of the best plants to place in the Aquarium, all of which can be easily and cheaply procured from dealers who make a specialty of aquatics: *Cabomba viridifolia* (*C. Caroliniana*), the Fanwort (sometimes called Washington Fish Grass, being found in quantities in D.C. and southward), is



119. A rectangular glass Aquarium.

a most beautiful and interesting plant of a light green color. The leaf is fan-shaped, composed of filaments or ribs, much like a skeletonized leaf. *Ludwigia Mulertii* is also a beautiful plant, as well as a valuable oxygenator, having dark green, glossy foliage, the under side of the leaf bright red. *Vallisneria spiralis* is the well known eel grass: Lvs. strap-like: root creeping and spreading: fls. strictly dioecious: a very interesting plant in large Aquariums. *Sagittaria natans* somewhat resembles Vallisneria, but the lvs. are wider and not so long, of a bright green color, and it makes better growth in winter, which is very desirable. *Myriophyllum verticillatum*: lvs. pinnately parted into capillary divisions; foliage and stem of a bronzy green color. This, with *M. heterophyllum*, as well as Cabomba, are sold by dealers in bunches, but established plants are preferable for stocking the Aquarium. The above plants are wholly submerged, growing under the surface of the water, and are of the most importance in the Aquarium. Another submerged plant that does not require planting, and is sometimes used, is *Stratiotes aloides*, the water soldier or water aloe. The young plants are very pretty, but the large plants are stiff and the edges of the lvs. are dangerous, being armed with spines. Numerous floating plants are adapted to the Aquarium, but too many must not be in evidence, or the fish may become suffocated. The Azollas are very pretty, and the fish will occasionally eat the plants. The Salvinia is another small plant often seen in the aquarium, but under favorable conditions it grows very rapidly, and forms a complete mat, which must be avoided. The European and American frog's-bits (*Limnobium Spongia*, *Hydrocharis Morsus-ranæ*) are very attractive plants, their long, silky roots reaching down in the water. The water hyacinth, *Eichhornia crassipes*, var. *major*, in a small state is a curious and pretty plant, but does not continue long in a good condition, generally resulting from too much shade and unnatural conditions of atmosphere. This plant is of benefit to the Aquarium in the breeding season, as the roots are receptacles for fish spawn. The water lettuce (*Pistia Stratiotes*) is another very attractive plant, but it should be avoided except where the water is kept warm.



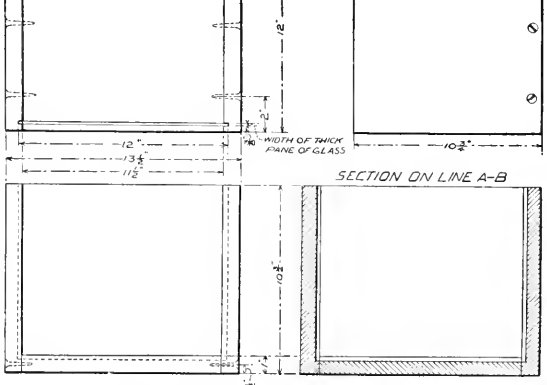
120. Permanent Aquarium made of wood and glass.

WILLIAM TRICKER.

Aquariums are rapidly increasing in popularity for home use, and are of great service in nature study. The following points, together with the illustrations, are taken from Life in an Aquarium, Teachers' Leaflet No. 11, published by the College of Agriculture, Cornell University, Ithaca, N. Y.: A permanent Aquarium need not be an expensive affair. The rectangular ones are best if large fishes are to be kept, but they are not essential. A simple home-made Aquarium of glass and wood is described in Jackman's Nature Study, as follows (the dimensions being slightly altered): "Use an inch board 11½ inches wide and 12 inches long for the bottom, and two boards of the same thickness and length, 10¾ inches high, for the ends. Three-eighths of an inch from the edge on either side, with a saw, make a groove ¼ inch deep and wide enough to receive loosely double-strength glass. Groove the end boards and fasten them to the bottom with screws, so that the grooves will exactly match. Partially fill the grooves with soft putty, or, better, Aquarium cement, and press into each side a pane of glass. By making the bottom board 11½ inches long, an ordinary 10 x 12 window pane will be the proper size. When the glass is pressed to the bottom of the groove, draw the two ends in at the top until the glass is held firmly and then fasten them in place by narrow strips of wood, one on each side of the tank, placed on top of the glass and screwed to the end pieces. These strips also protect the hands from injury while working with the specimens in the Aquarium. Before filling with water, the inner surface of the bottom and ends should be well rubbed with oil or paraffine and the grooves inside the glass well packed with putty." After the box is made it would be well to let it stand in water for a day or two. The wooden sides will swell and tighten the joints, and leakage will be less probable.

AQUATICS. America is the most highly favored country in the world for the cultivation of Aquatic plants. Collections can easily be made to furnish a display of flowers from April to October in the open without artificial heat.

All Aquatics require a rich soil, and this without limit, a depth of water from 1 to 3 feet, and ample space to spread their succulent leaves. In a natural pond, where there is an accumulation of humus overlaying a clayey subsoil, nothing more is wanted, but on a sandy or gravelly bottom it is necessary to place a layer of rich soil 12 to 18 inches deep. In artificial ponds, built of masonry (Fig. 122), a layer of rich soil is necessary if the plants are to be planted out, as is best for Nelumbiums. The soil best suited for Aquatics is a turfy loam, inclining to heavy, and thoroughly rotted cow-manure, two parts of the former to one of the latter, and, where possible, it should be composted some time before using, and turned over two or three times to thoroughly incorporate the manure. When cow-manure can not be obtained, other thoroughly rotted manure may be used. The next best fertilizer is pulverized sheep manure, but, this being less bulky and stronger in proportion, should not be used as freely as other manures; one part sheep manure to



121. Working drawings for making box shown in Fig. 120.

A good example of water-gardening, with water-lilies and Japanese Iris See Aquatics

nine of soil is sufficient. Chemical manures, ground bone, horn shavings, etc., should not be used unless in extreme cases, and then very cautiously.

Depth of Water.—In natural ponds, water-lilies are found growing in water from a few inches to 4 and 6 feet deep, but in artificial ponds a depth of 12 to 18 inches will be found sufficient for most Nymphæas, and 18 to 24 inches is a good depth for Victorias. In constructing an artificial pond, a depth of 2 to $2\frac{1}{2}$ feet is ample. Water to the depth of 12 inches above the crowns of the plants is sufficient, and a box containing the soil may be 12 inches deep. Thus a pond 2 feet in depth is deep enough, and will allow a man, with hip boots on, to walk between the plants with ease. For a small pond, less than 12 feet over, a plank laid across will suffice for all operations.

Protection.—Where severe frosts are prevalent in winter, and ice 12 to 18 inches in thickness is found, there will be danger of the roots freezing. In such cases, an additional depth of 6 inches will be a great advantage, and a protection of bracken, salt hay, green manure, leaves, or any other non-conducting materials should be used to protect the masonry, in severe weather, against expansion and breakage.

Planting.—All hardy Nymphæas may be planted any time between the 1st of April and the 1st of September. Those planted early, other things being equal, will give good results the same season, while those planted late will get well established before winter, and will be in excellent condition to start at nature's summons early the following spring. The hardy Nymphæas differ considerably as to rootstocks. Those of the native varieties are long and of a spongy, soft texture, and rambling in growth, while the European species have a much larger and very firm rootstock, and grow more compact. In planting, all that is necessary is to press the rootstock firmly into the soil, and if there is any danger of the root rising to the surface, place a brick or any weight upon it, to keep it in position until anchored by its own roots. Tender Nymphæas should not be planted until the latter end of May or beginning of June, according to location. They should not be planted out before Coleus, Alternanthera, and other tender bedding plants. They require to be started indoors, and will be grown in pots, which are much handier to plant than roots of the hardy varieties, and can be planted under the water with ease and facility. Nelumbiums should not be planted until about the 1st of May. Southward the season is earlier. The existing conditions should be such that tubers shall start at once into active growth. They should be already "started" before setting out. The tubers should be laid horizontally in a slightly excavated trench and covered with 2 or 3 inches of soil, using a weight, if necessary, to keep the tubers in position. Plants, established in pots or pans, are very convenient for planting, and may be purchased when tubers can no longer be procured, and can be planted a month later in the season with good results.

The *Victoria Regia* has always been an aristocrat among water-lilies, and few cultivators could indulge in such a horticultural luxury. To grow it satisfactorily, a large surface space with a greater depth of water is necessary than for other aquatics, and a higher temperature is needed at the early stages. It can be cultivated in the open air, but artificial heat must usually be applied and protection afforded, so as to maintain a temperature of 85° F. This applies more particularly to the varieties *V. Regia* and *V. Randi*. In 1898 the introducer of *V. Trickeri* brought the Victoria within easy reach and culture of all lovers of aquatic plants. *V. Trickeri* is entirely distinct from other known varieties, and can be grown in the open alongside of *Nymphæa Zanzibarensis* and *N. Devoniensis*, and under precisely the same conditions. When planted out about the middle of June, the plants grow rapidly, and will develop their gigantic leafage and magnificent flowers in August, and continue to do so until destroyed by frost.

122. Lawn pond of aquatics, with mason-work margin.

123. Tub of water-lilies.

Enemies.—Aquatics, like other plants, have their enemies in the line of insect pests, though in a less degree than most plants. Aphides are sometimes troublesome, or at least very unsightly. These, however, have their enemies, especially the coccinella (lady-bird), insectivorous birds, etc. Where these do not keep them down, a weak application of kerosene emulsion will make a clearance. Another method of getting rid of these pests, especially in a small artificial pond, where an overflow is (or should be) provided, is to take the hose with a spray, using a little force, and drive the insects off the plants, and, as they readily float on the water, the action with the hose will drive them out at the overflow pipe. Recently an insect pest that has its home in Florida has migrated northward, causing some annoyance. The larva of the moth (*Hydrocampa proprialis*) eats the leaf, and also cuts out pieces of the same, which it uses for protection, thereby greatly disfiguring the plant, and at the same time making it difficult to get at the enemy. The best remedy for this and the Nelumbium moth, which is very much like it, is a lamp trap. Any ordinary lamp placed near the plants at night, and standing in a shallow vessel containing kerosene, will attract the insects, which, on striking the lamp, fall into the kerosene and are no further trouble. Muskrats are more or less troublesome, especially where Nelumbiums are grown. They will eat the tubers in winter and early spring, and will make sad havoc with banks. They will also eat the roots of some Nymphæas. The best remedy for these is the steel trap. A sporadic disease has also made its appearance. The leaves are affected with spots, which, under a damp, warm atmosphere, spread rapidly. Such climatic conditions, followed by bright sunshine, cause the affected leaves to shrivel up. This greatly weakens and checks the plants. This disease yields readily to a weak solution of Bordeaux mixture. The same remedy is also very valuable in ridding the pond of all confervoid growth.

Tub Culture should be resorted to only from lack of space, or when no other method can be adopted (Fig. 123). For this system of culture, Nymphæas should be selected that are moderate growers, yet free-flowering, and other miscellaneous aquatic plants. The tubs should hold from 4 to 12 cubic feet of soil for Nymphæas, according

to the variety, some being moderate growers, others vigorous and robust.

WILLIAM TRICKER.

[The best book on the American culture of Aquatics is The Water Garden, by Wm. Tricker, N. Y. 1897, pp. 120, to which the reader is referred for extensive cultural directions and for lists of Aquatic plants. For botanical descriptions of the various kinds of Aquatics, with brief, special cultural directions, the reader may consult the CYCLOPEDIA OF AMERICAN HORTICULTURE, under the various genera, as *Nymphæa*, *Nelumbium*, and *Victoria*. —L. H. B.]

AQUILÈGIA (from *aquilegus*, water-drawer, not from *aquila*, eagle). *Ranunculàcea*. COLUMBINE. Hardy perennial herbs of the northern hemisphere; mostly with paniculate branches, terminated by showy flowers, and 1–3 ternately-compound leaves, commonly glaucous; the

124. Aquilegia Canadensis.

leaflets roundish and obtusely lobed: fls. large, showy, usually in spring or early summer; sepals 5, regular, petaloid; petals concave, produced backward between the sepals, forming a hollow spur; stamens numerous: fr. of about 5 many-seeded follicles. About 30 distinct species. The Columbines are among the most beautiful and popular of all hardy plants. Seeds sown in pans, in coldframes in March, or open air in April, occasionally bloom the first season, but generally the second. The different species should be some distance apart, if possible, if pure seed is desired, as the most diverse species hybridize directly. They may be propagated by division, but better by seeds. Absolutely pure seed is hard to obtain, except from the plants in the wild state; and some of the mixed forms are quite inferior to the true species from which they have come. *A. cærulea*, *glandulosa*, and *vulgaris* are likely to flower only two or three years, and should be treated as biennials; but *A. vulgaris* may be kept active for a longer period by transplanting. A. Gray, Syn. Flora of N. A., Vol. I, Part 1, Fasc. 1, pp. 42–45. J. G. Baker, A Synopsis of the Aquilegia, in Gard. Chron. II. 10:19, 76, 111, 203 (1878). K. C. DAVIS.

A light, sandy soil, moist, with good drainage, sheltered, but exposed to sun, is what they prefer. Some of the stronger species, when of nearly full-flowering size, may be transplanted into heavier garden soil, even heavy clay, and made to succeed; but for the rearing of young seedlings, a light, sandy loam is essential. The seed of most Columbines is rather slow in germinating, and it is necessary to keep the soil moist on top of the ground until the young plants are up. A coldframe, with medium heavy cotton covering, is a good place to grow the plants. The cotton retains sufficient moisture to keep the soil moist on top, and still admits sufficient circulation of air to prevent damping-off of the young seedlings. When large enough, the seedlings may be pricked out into another frame for a time, or, by shading for a few days until they get a start, they may be set into the permanent border, or wherever they are to be placed.

F. H. HORSFORD.

The following is an alphabetical list of the species described below: A. alpina, 16; *atrata*, 9; *atropurpurea*, Mnq., 6; *atropurpurea*, Willd., 4; *bicolor*, 10; *blanda*, 9; Buergeriana, 6; cærulea, 15; *caerulea*, var. *flavescens*, 5; *Californica*, 11; Canadensis, 5; *Canadensis*, var. *aurea*, 13; *Canadensis*, var. *formosa*, 11; caryophylloides, 19; chrysantha, 13; flabellata, 7; *flavescens*, 5; *flaviflora*, 5; formosa, 11; *Garneriana*, 10; glandulosa, 17; Jonesii, 1; lactiflora, 3; leptoceras, Fisch. & Mey., 8; *leptoceras*, Nutt., 15; *leptoceras*, var. *chrysantha*, 13; longissima, 14; *macrantha*, 15; *Olympica*, 9; oxysepala, 2; Sibirica, 10; Skinneri, 12; *Skinneri*, var. *hybrida*, 13; *speciosa*, 10; *stellata*, 9; Stuarti, 18; *truncata*, 11; viridiflora, 4; vulgaris, 9; *Wittmanniana*, 9.

A. *Sepals not more than ½ or ¾ in. long: expanded fls. 1 or 1½ in. in diam.*

B. *Limb of petal shorter than the sepal.*

1. **Jonesii**, Perry. True st. very short or almost wanting, soft pubescent: tufted root-lvs. 1–2 in. high from the stout, ascending branches of the rootstock, biternately divided; partial-petioles very short or none; leaflets very crowded: fls. blue; sepals oblong-obtuse, equaling the spurs and twice the length of the petal-limbs and head of stamens: follicles glabrous, large, nearly 1 in. long; styles half as long; peduncles lengthening to about 3 in. in fr. July. Wyom. and Mont. G.F. 9:365.

2. **oxysépala**, Traut. & Mey. Plant 2½ ft., slightly pubescent above: radical lvs. long-petioled, secondary divisions sessile: sepals blue, ovate-lanceolate, much exceeding in length the petal limbs, which are 6 lines long, white, rounded-truncate; stamens not protruding beyond the petal limb: spur knobbed, bent inward, shorter than petal-limb: follicles pubescent, with styles their own length. June. Siberia.—In 1898 F. H. Horsford said: "The first to bloom with me, and one of the most attractive in the list. It is one of the most dwarfed; fls. large, blue, yellow and white: it comes so much before the others that its capsules, as a rule, all fertilize before any of the other species come into flower." Only recently introduced.

3. **lactiflòra**, Kar. & Kir. St. 1½ ft. high, glabrous in the lower part: partial-petioles of root-lvs. 1½–2 in. long; lfts. sessile or short-stalked, 1 in. long, many lobes reaching half way down; st.-lvs. petioled and compound: fls. about 3 to a st.: sepals nearly white or tinged with blue, over ½ in. long, narrow; petal-limb half as long as sepal; spur ¼ in., slender, nearly straight, not knobbed at tip; stamens equal in length to the limb. June. Altai Mts., Siberia.—A desirable species, but not much used.

BB. *Limb of petal about equal to sepal.*

4. **viridiflòra**, Pallas. St. 1–1½ ft. high, finely pubescent throughout, several-fld.: the partial-petioles of root-lvs. 1–2 in. long; lfts. sessile or the end one shortly stalked,

lobes rather narrow and deep; lower st.-lvs. petioled, biternate: sepals oblong, obtuse, ascending, greenish, equaling the broad, greenish petal-limb, but not reaching the head of stamens; spur straight, slender, $\frac{1}{2}$in. long, not knobbed; pubescent follicles as short as their styles. Summer. E. Siberia.—Not so much used as the following variety:

Var. **atropurpùrea**, Vilm. (*A. atropurpùrea*, Willd.). Limbs of the petals deep blue or lilac-purple, and the sepals and spur somewhat tinged with the same hue. B.R. 922.

5. **Canadénsis**, Linn. Common Columbine of America. Fig. 124. Height 1–2 ft.; primary divisions of petioles of root-lvs. 1–2 in., having 3 divisions; 2 or 3 of the st.-lvs. petioled, biternate: fls. several to a st.; sepals yellowish or tinted on the back with red, about $\frac{1}{2}$in. long, not reflexing; limb of petals a little shorter, yellowish, truncate; spur $\frac{3}{4}$in. long, nearly straight, knobbed at the end, bright red throughout; stamens much protruding: follicles $\frac{3}{4}$in. long, with styles half as long. May–July. Stony banks, etc., east of Rocky Mts. Int. 1890. B.M. 246. L.B.C. 9: 888. Mn. 5: 21. R.H. 1896, p. 109. G.W.F. 1. There are some beautiful hybrids of this and the blue species. Var. **nàna**, Hort. Plant 1 ft. high or less: fls. like the type.

Var. **flavéscens**, Hook. A pale-lvd. yellow-fld. variety. Very pretty. Int. 1889. This has often been called *A. flavescens*, Wats.: *A. caerulea*, var. *flavescens*, Lawson; and *A. flaviflora*, Tenney; *A. Canadensis*, var. *flaviflora*, Brit. B.M. 6552 B.

6. **Buergeriàna**, Sieb. & Zucc. (*A. atropurpùrea*, Miq.). More slender than *A. vulgaris*: 1 ft. high, finely pubescent toward the top; branched to form several heads, bearing 2–3-petioled, biternate lvs.; partial-petioles of basal lvs. $\frac{1}{2}$–1 in. long, with 3 sessile divisions: fls. yellow, tinted with purple, 1–$1\frac{1}{2}$ in. in diam.; sepals $\frac{3}{4}$in. long, acute, spreading; spurs erect, nearly straight, as long as the limb of petals, and about equalling the sepal; head of stamens equal to limb in length: follicles pubescent, $\frac{3}{4}$in. long, style half as long. Early. Japan.—Brought from St. Petersburg, 1892.

AA. *Sepals about 1 in. long: expanded fl. about 2 in. in diameter.*

B. *Spurs shorter than the petal-limb, and incurved.*

7. **flabellàta**, Sieb. & Zucc. Stem 1–$1\frac{1}{2}$ ft., few-fld.; partial-petioles of root-lvs. 1 in. or more, lfts. nearly sessile; st.-lvs. large and petioled: fls. bright lilac, or pale purple or white; sepals 1 in. long, obtuse; limb of petal half as long, often white in the lilac-fld. form; spur shorter than the limb, slender toward the end, much incurved; stamens not protruding beyond the petal-limbs: follicles glabrous. Summer. Japan. R.H. 1896, p. 109. Var. **nàna-àlba**, Hort. (var. *flore-alba*, Hort.). Fls. pure white: plant dwarfish. R.B. 15: 157.

BB. *Spur at least as long as petal-limb.*

c. *Stamens short, not much protruding.*

8. **leptocèras**, Fisch. & Mey. Stem several-fld., about 1 ft. high: partial-petioles of root-lvs. over 1 in., lfts. sessile; st.-lvs. petioled, biternate: fls. violet, with the tips of the sepals greenish, and tips of the short petal-limb yellow; spur slender, slightly curved, $\frac{1}{2}$in. long, not knobbed; stamens protruding a little beyond the limbs of petals: follicles slender, glabrous, nearly 1 in. long. Summer. E. Siberia. B.R. 33: 64. F.S. 3: 296.—Little used in America.

9. **vulgàris**, Linn. (*A. stellàta*, Hort. *A. atràta*, Koch). Common C. of Europe. Stems $1\frac{1}{2}$–2 ft. high, many-fld., finely pubescent throughout: root-lvs. with 3 partial-petioles $1\frac{1}{2}$–2 in. long, secondary branches certain, ultimate leaf-lobes shallow and roundish, texture firm; lower st.-lvs. petioled and biternate: fls. violet, furnished with a claw, acute, 1 in. long, half as wide; petal-limb $\frac{3}{4}$in. long, equaling the head of stamens; spur about same length, stout, much incurved, knobbed: follicles densely pubescent, 1 in. long, style half as long. Summer. Eu., Sib., and naturalized in Am. Gn. 12, p. 288. Var. **flòre-plèno**, Hort. Fls. much doubled, ranging from pure white to deep blue. Here belong many horticultural varieties with personal names. Var. **Verværeàna**, Hort. (var. *foliis-aureis*, Hort. Var. *atrocoerùlea*, Hort.). Lvs. with yellow variegated lines.

Var. **nivea**, Baumg. (var. *àlba*, Hort.). Munstead's White C. Often 2–3 ft. high: a great profusion of large, pure white fls. for several weeks in early spring.

Var. **Olympica**, Baker (*A. Olympica*, Boiss. *A. Wittmanniàna*, Hort. *A. blànda*, Lem.). A fine variety, with several large flowers; sepals light lilac or bright purple, 1 in. or more in length; petal-limb white. I.H. 4: 146. R.H. 1896, p. 108.

Var. **hybrida**, Sims. Much like the last variety, but with stout, lilac-purple spurs as long as the sepals, only slightly incurved. Probably a hybrid of *A. vulgaris* and *A. Canadensis*. B.M. 1221.

10. **Sibírica**, Lam. (*A. bícolor*, Ehrh. *A. Garnà riàna*, Sweet. *A. speciòsa*, DC.). Stem $1\frac{1}{2}$–2 ft. high, many-fld.; often nearly glabrous throughout: partial-petioles of root-lvs. 1–2 in., sometimes showing 3 distinct branches; terminal lfts. 1 in. or more broad, lobes rather shallow and rounded; lower st.-lvs. petioled and biternate: fls. pale or bright lilac-blue; oblong sepals fully 1 in. long, spreading or reflexed a little; petal-limb half as long, equaling the head of stamens, and often white; spur rather stout, $\frac{1}{2}$in. or more, very much incurved, or even coiled: follicles glabrous, 1 in. long, style $\frac{1}{2}$in. Summer. E. Siberia. S.B.F.G. II. 1: 90. Var. **flore-pleno**, Hort. (*A. bícolor*, var. *flore-pleno*, Hort.). Fls. much doubled by the multiplication of both the limbs and the spurs.

Var. **spectábilis**, Baker (*A. spectábilis*, Lem.). A large, bright lilac-fld. var.; petal-limbs tipped yellow. Amurland. I.H. 11: 403.

cc. *Stamens long, protruding far beyond the petal-limb.*

11. **formòsa**, Tesch. (*A. Canadénsis*, var. *formòsa*, Wats.). Habit as in *A. Canadensis*; root-lvs. and st.-lvs. like that species, but fls. brick red and yellow, or wholly yellow, and sepals larger, quite twice as long as petal-limb; spurs more spreading, somewhat more slender, and often shorter. May–Aug. Sitka to Calif. and E. to the Rockies. Int. 1881. B.M. 6552. F.S. 8: 795. Gt. 32: 372. R.H. 1896, p. 108. G.C. 1854: 836. Var. **hybrida**, Hort. (*A. Californica*, var. *hybrida*, Hort.). Fls. large, with scarlet sepals and yellow petals; spurs spreading, long and slender. A supposed hybrid with *A. chrysantha*. F.M. 1877: 278. Vick's 1: 33 f. 2. Var. **rùbra plèno**, Hort. (var. *flore-pleno*, Hort.). Fls. as in var. *hybrida*, but several whorls of petal-limbs. Var. **nàna àlba**, Hort. Fls. pale, often nearly white; plant not exceeding 1 ft.

Var. **truncàta**, Baker (*A. truncàta*, Fisch. *A. Californica*, Lindl.). Fls. with short, thick spurs and very small sepals and a small petal-limb. Int. 1881. F.S. 12: 1188 (as *A. eximia*, Hort.).

12. **Skinneri**, Hook. Stem 1–2 ft. high, many-fld., glabrous: root-lvs. long-petioled, with both primary and secondary divisions long; lfts. cordate, 3-parted; several st.-lvs. petioled and biternate: sepals green, keeled, lanceolate, acute, never much spreading, $\frac{3}{4}$–1 in. long; petal-limb greenish orange, half as long as sepal; spur bright red, tapering rapidly, over 1 in. long; stamens protruding far beyond the limb; styles 3: fr., at least when young, bearing broad, membranous, curled wings. After flowering, the peduncles become erect. July–Sept. Mts. of Nor. Mex. B.M. 3949. P.M. 10: 190. B.H. 4: 4. F.S. 1: 17. Vick's 1: 33 f. 5 (poor).—A handsome plant, requiring a light soil in a sunny border. Var. **flore-pleno**, Hort. Fls. double. Gt. 34: 57. Very fine.

BBB. *Spurs very long, several times the length of petal-limb.*

13. **chrysántha**, Gray (*A. leptocèras*, var. *chrysántha*, Hook.). Fig. 125. Height 3–4 ft.: root-lvs. with twice 3-branched petioles, lfts. biternate; st.-lvs. several, petioled: fls. many on the plant, 2–3 in. across; sepals pale yellow, tinted claret, spreading horizontally; petal-limb deep yellow, shorter than the sepals, and nearly as long as the head of stamens; spur rather straight, very slender, divergent, about 2 in. long, descending when fl. is mature: follicles glabrous, 1 in. long; style half as long. May-Aug. N. Mex. and Ariz. Gn. 16: 198. B.M.

6073. Gn. 51, p. 385. R.H. 1896: 108. F.R. 2: 169. Gt. 33: 84. G.C. 1873: 1501. F.M. 1873: 88. Vick's 1: 33 f. 3. F.S. 20: 2108. Var. **flavéscens**, Hort. (*A. aúrea*, Junk. *A. Canadénsis*, var. *aúrea*, Roezl.). Fls. yellow, tinged with red; spurs incurved, and shorter than in the type. Gt. 21: 734. Var. **alba-plena**, Hort. (var. *grandiflora álba*, Hort.). Fls. very pale yellow or nearly white, with two or more whorls of petal-limbs. Int. 1889. Vick's 12: 311. Var. **nána**, Hort. (*A. leptocèras*, var. *lútea*, Hort.). Like the type, but plant always small, not exceeding $1\frac{1}{2}$ ft. Var. **Jaeschkani**, Hort. About the same height as last: fls. large, yellow, with red spurs. Thought to be a hybrid of *A. chrysántha* × *Skinneri*, hence sometimes called *A. Skinneri*, var. *hybrida*, Hort.

14. **longissima**, Gray. Tall, somewhat pubescent with silky hairs, or smoothish: root-lvs. biternate, even in the petioles; lfts. deeply lobed and cut, green above, glaucous beneath; st.-lvs. similar, petioled: fls. pale yellow, sepals lanceolate, broadly spreading, 1 in. or more, the spatulate petals a little shorter, about equaling the head of stamens; spur with a narrow orifice, 4 in. long or more, always hanging. Distinguished from *A. chrysántha* by its longer spur with contracted orifice, by the narrow petals, and by the late season of flowering. Late July to Oct. 1. Ravines S.W. Texas into Mex. G.F. 1: 31. — The seed must be obtained from wild plants, as those cult. usually fail to produce seed; hence not much used.

AAA. *Sepals $1\frac{3}{4}$–$1\frac{1}{2}$ or even 2 in. long: expanded fls. $2\frac{1}{2}$–3 in. in diam.: stamens not protruding.*

B. *Spurs long and not incurved.*

15. **cærúlea**, James (*A. leptocèras*, Nutt. *A. macrántha*, Hook. & Arn.). Stem 1–$1\frac{1}{2}$ ft., finely pubescent above, bearing several fls.; lower st.-lvs. large and biternate; basal-lvs. with long 3-branched petioles: lfts. 3-lobed on secondary stalks: fls. 2 in. across, whitish, but variously tinted with light blue and yellow; sepals often blue, oblong, obtuse, twice as long as the petal-limb; spurs long, slender, knobbed at the end, rather straight, but curving outward; head of stamens equaling the petals: follicles pubescent, 1 in. long; style $\frac{1}{3}$ in. Apr.–July. Lower mt. regions, Montana to N. Mex. B.M. 4407. Gn. 16: 198. Mn. 6: 61. Vick's 1: 33 f. 4. B.M. 5477. F.S. 5: 531. Var. **álba**, Hort. Fls. of same size but entirely white. Int. 1883. Var. **hýbrida**, Hort. Sepals some shade of blue or pink, or mixed, and petals nearly white or yellow. The true form of this is probably *A. cærúlea* × *A. chrysántha*. Gn. 51, p. 385. R.H. 1896: 108. A.G. 15: 315. Gn. 16: 198. I.H. 43: 61 (1896). Var. **flóre-plèno**, Hort. Fls. longer and very showy, more or less doubled toward the center.

BB. *Spurs incurved and hardly longer than petal-limbs.*

16. **alpina**, Linn. (incl. var. *supérba*, Hort.). Fig. 126. Stem nearly 1 ft. high, finely pubescent upwards, 2–5-fld., bearing petioled, biternate lvs.; partial-petioles of basal-lvs. 1–2 in. long, with 3 nearly sessile divisions, deeply lobed: expanded fl. $1\frac{1}{2}$–2 in. across, blue, rarely pale or white; sepals $1\frac{1}{4}$ in. long, half as broad, acute; petal-limb half as long as sepals, often white; spur stout, incurved, same length as the limb; head of stamens not protruding; follicles pubescent, 1 in. long; style much shorter. May–June. Switzerland. L.B.C. 7: 657. Gn. 9: 17.

17. **glandulósa**, Fisch. Fig. 127. Stem 1–$1\frac{1}{2}$ ft. high,

125. Aquilegia chrysantha (× $\frac{1}{4}$).

126. Aquilegia alpina (× $\frac{1}{4}$).

127. Aquilegia glandulosa (× $\frac{1}{4}$).

glandular pubescent in the upper half, 1–3 fld.: partial-petioles of root-lvs. 1–2 in. long, each with 3 distinct divisions; lft.-segments narrow and deep; st.-lvs. few, bract-like: fls. large, nodding; sepals bright lilac-blue, ovate, acute, about $1\frac{1}{2}$ in. long and half as broad; petal-limb same color, but tipped and bordered with creamy white, less than half the length of the sepals, very broad; spur very short, $\frac{1}{4}$ in., stout, much incurved; stamens not protruding: follicles 1 in. long, 6–10 in number, densely hairy, with short, falcate style. Allied to *A. alpina*, but a taller plant, with shorter spurs, larger fls., and a greater number of follicles. May–June. Altai Mts. of Siberia. B. 5: 219. F.W. 1871: 353. Gn. 15: 174; 45, p. 193. Gt. 289 f. 1. — One of the handsomest.

Var. **jucúnda**, Fisch. & Lall. Fls. rather smaller than in the type; petal-limb white, more truncate at the tip; stamens as long as limb. B.R. 33: 19. F.S. 5: 535. — A fine variety, with some tendency to double.

18. **Stuárti**, Hort. A recorded hybrid of *A. glandulósa* × *A. vulgáris*, var. *Olympica*. Fls. very large and beautiful. It very much resembles the latter in form of sepals and petals, and the former in shape of spurs and coloration. May–June. Int. 1891. Gn. 34: 670.

19. **caryophylloides** is a garden name given to some very mixed forms, with a great variety of colors. Special characters seem not to be well fixed.

K. C. Davis.

ARABIS (*Arabia*). *Cruciferæ*. Rock-cress. Small perennial or annual herbs, with white or purple fls., grown mostly in rockwork. Fls. mostly in terminal spikes or racemes, small, but often many, or appearing for a considerable period of time; siliques long, linear, flat; stigma 2-lobed. In temperate regions, several native to this country. Usually prop. by division; also by seeds and cuttings. Hardy, requiring plenty of sun, and thriving even in poor soil. The following four species are perennials:

A. *Fls. purple or rose.*

muràlis, Bertol. (*A. rósea*, DC.). A foot high, with a rather dense raceme of pretty fls.; lvs. oblong, sessile (the radical ones with a long, narrow base), prominently and distantly blunt-toothed, sparsely pubescent. Spring and summer. Italy. B.M. 3246.

AA. *Fls. white.*

serpyllifòlia, Vill. (*A. nivàlis*, Guss.). Tufted, 2–6 in.; radical lvs. entire or few-toothed, the st. lvs. small and sessile, not clasping; fls. in a short cluster, the calyx as long as the peduncle, the limb of the petals linear-oblong and erect. Eu.

álbida, Stev. (*A. Caucásica*, Willd.). A few inches high, pubescent; lower lvs. narrow at the base, the upper auriculate-clasping, all angle-toothed near the top; fls. in a loose raceme, the calyx shorter than the pedicel, the petal-limb oval and obtuse. Eu. B.M. 2046. Also a variegated var. (Gt. 45: 108).—Blooms early, is fragrant, and is well adapted for rockwork and edgings, and for covering steep banks.

alpìna, Linn. Fls. smaller than in the last, plant only slightly pubescent and hairy; lvs. somewhat clasping but not auriculate, small-toothed nearly or quite the entire length, the cauline ones pointed. Eu. B.M. 226.—Blooms very early, and is one of the best rock plants. There is a dwarf form (*nana compacta*, Gt. 44: 203); also a variegated variety.

A. arenòsa, Scop. Fls. rose varying to white; lvs. pinnatifid, those on the st. deep-toothed. Eu.—*A. blepharóphylla*, Hook. & Arn. Fls. large, rose-purple; lvs. sharp-toothed, sessile or clasping, the margins hairy. Calif. B.M. 6087.—*A. lùcida*, Linn. f. Fls. white; lvs. shining, obovate, clasping. There is a variegated form. Eu.—*A. mollis*, Stev. Fls. white; lvs. pubescent, large-toothed, the lower ones rounded and long-stalked. Eu.—*A. petræ*a, Lam. Fls. white; lvs. toothed, the radical ones often parted, the st. lvs. oblong-linear. Eu.—*A. præcox*, Wald. & Kit.=*A. procurrens*.—*A. procurrens*, Wald. & Kit. Fls. white; lvs. ciliate, those on the st. entire and sessile, the others stalked; stoloniferous. A variegated var. Eu.—*A. verna*, R. Br. Annual, hairy; fls. large, purple; lvs. oblong-ovate to round-oblong, the upper ones clasping, rather coarse-toothed. Eu. B.M. 3331.

L. H. B.

ARÁCEÆ. See *Aroidea*.

ÁRACHIS (Greek, *without a ruchis*). *Leguminòsæ*. Peanut. Goober. Sometimes grown in the economic house of botanical gardens. The genus has seven species, of which six are Brazilian. Fls. 5-7, yellow, in a dense, axillary, sessile spike. As a hothouse annual, the seeds of the Goober may be sown in heat, and the plants potted in sandy loam. For outdoor culture, see *Peanut*, by which name the plant is commonly known.

hypogœa, Linn. One ft. or less high; lvs. abruptly pinnate, with two pairs of leaflets and no tendril. Mu. 7:105. Procumbent.

ARÁLIA, including *Dimorphánthus* (derivation obscure). *Araliàceæ*. Perennial herbs or shrubs: lvs. alternate, deciduous, large, decompound: fls. small, whitish, in umbels, usually forming large panicles; petals and stamens 5; berry, or rather drupe, 2–5-seeded, black or dark purple, globular, small. Some of the Aralias are hardy outdoor deciduous herbs and bushes; others are fine stove plants, botanically unlike the true Aralias as defined above. Alfred Rehder.

There are about 35 kinds of tender Aralias in cult. Some of them are of robust growth, and make handsome specimens for greenhouse and hothouse decoration when grown to a height of 10 or 12 ft.; others of more delicate and slender growth, such as *A. Chabrieri* (really an Elæodendron), *A. coucinna* (see *Delarbrea*), *A. elegantissima* and *A. Veitchii*, var. *gracillima*, are most beautiful as smaller plants, say from 1–3 ft. in height. These small plants are very beautiful as table pieces, and are not surpassed in delicate grace and symmetry by any plants; *A. Veitchii*, var. *gracillima*, is one of the very finest of the dwarfer-growing kinds. The more robust sorts are usually prop. by cuttings, in the usual manner, or by root cuttings, as Bouvardias are. The more delicate varieties, as *A. Chabrieri*, *elegantissima*, etc., do best when grafted on stronger-growing varieties, like *A. Guilfoylei*, *A. reticulata* (which is an Oreopanax), etc. The slender-growing sorts require light, rich soil, made of equal parts of sandy loam and peat or leaf-mold. They require plenty of water and a moist atmosphere. They are much subject to attacks of scale, which may be removed or prevented by frequent careful sponging with a weak solution of seal-oil soap, fir-tree oil, or other like insecticide.

Cult. by Robert Craig.

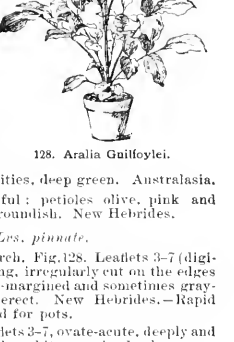
The glasshouse species are much confused, largely because some kinds receive trade and provisional names before the fls. and frs. are known. See *Acanthopanax* for *A. Maximowiczii*, *pentaphylla*, and *ricinifolia*; *Delarbrea* for *A. coucinna* and *A. spectabilis*; *Elæodendron* for *A. Chabrierii*; *Fatsia* for *A. Japonica*, *papyrifera*, and *Sieboldii*; *Oreopanax* for *A. reticulata*; *Polyscias* for *A. latifolia*; *Sciadophyllum* for *A. Amboinense*. Other related genera are Heptapleurum, Monopanax, Oreopanax, Panax, Pseudopanax.

A. *Tender evergreen Aralias, grown only under glass. (By some regarded as belonging to other genera.)*

B. *Lvs. digitate.*

Kerchoveàna, Hort. Lvs. the shape of a Ricinus, the 7–11 leaflets elliptic-lanceolate or oblong-lanceolate, with undulate and serrate margins and a pale midrib. S. Sea Islands. Certificated in Eng. in 1881 (Gn. 19, p. 457). R.H. 1891, p. 225.—Slender-stemmed, of beautiful habit.

Veìtchii, Hort. Leaflets 9–11, very narrow or almost filiform, undulate, shining green above and red beneath. New Caledonia.—One of the best and handsomest species. Var. **gracillima**, Hort. (*A. gracillima*, Linden, R.H. 1867, p. 38). Leaflets still narrower, with a white rib. R.H. 1891, p. 226. Gn. 39, p. 565. Very desirable. Originally described as *A. gracillima* (*thin-lined*), which name has been mistaken for *gracillima* (*very graceful*).



128. Aralia Guilfoylei.

elegantissima, Veitch. Petioles mottled with white; leaflets 7–11, filiform and pendulous. New Hebrides.—Excellent.

leptophýlla, Hort. Slender plant: leaflets filiform and drooping, broadened at the extremities, deep green. Australasia.

Regìna, Hort. Graceful; petioles olive, pink and brown; lfts. drooping, roundish. New Hebrides.

BB. *Lvs. pinnate.*

Guilfoylei, Cogn. & March. Fig. 128. Leaflets 3–7 (digitate-like), ovate or oblong, irregularly cut on the edges or obscurely lobed, white-margined and sometimes gray-splashed; st. spotted, erect. New Hebrides.—Rapid grower, showy, and good for pots.

monstrósa, Hort. Leaflets 3–7, ovate-acute, deeply and often oddly cut, broadly white-margined, also gray-spotted; lvs. drooping. S. Sea Isl. R.H. 1891, p. 225. Gn. 39, p. 565.

filicifòlia, Moore. Stem erect, purplish, white-spotted; lvs. fern-like (whence the name); leaflets 3–7 pairs, lance-oblong and acuminate, long, deeply noteh-toothed.

deep green and purple ribbed. Polynesia. I.H. 23:240. R.H. 1891, p. 224. Gn. 39, p. 565. A.G. 19:374.—One of the best.

4. *Chabrièri*, Hort.; see Elæodendron.—*A. crassifólia*, Soland.; see Pseudopanax.—*A. longipes*, Hort. Lvs. digitate, the lfts. oblong-lanceolate, acuminate, wavy. N. Austral.—*A. nóbilis*, Hort. "A theophrasta-like plant, with closely packed, bold foliage, the lvs. oblong obovate-acuminate, undulate at the margins." Once offered by Saul.—*A. Osyana*, Hort. Like *A. leptophylla*, but leaflets deeply bifid, and nerves and veins brown. S.S. Isl.—*A. quercifolia*, Hort. Leaflets 3, sinuate; lvs. opposite. New Britain.—*A. rotunda*, Hort. Leaf of a single orbicular-cordate leaflet or sometimes 3-foliolate, white-toothed. Polynesia.—*A. spectábilis*, Hort.=A. filicifolia.—*A. splendidissima*, Hort. Lvs. pinnate, the leaflets shiny green. New Caledonia.—*A. ternáta*, Hort. Lvs. opposite, ternate or 3-lobed, the leaflets oblong-lanceolate and sinuate.—*A. Victóriæ*, Hort. See Panax. Some of the above probably belong to Oreopanax and other genera.

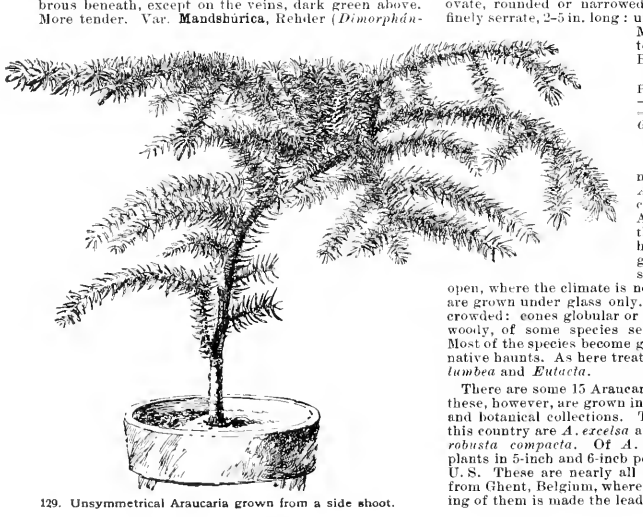
L. H. B.

aa. *Hardy or true Aralias.*

b. *Prickly shrubs or rarely low trees: lvs. bipinnate, 2–3 ft. long: umbels numerous, in a large, broad, compound panicle: styles distinct.*

spinósa, Linn. Angelica Tree. Hercules' Club. Devil's Walking-stick. Stems very prickly, 40 ft. high: lvs. $1\frac{1}{2}$–$2\frac{1}{2}$ ft. long, usually prickly above; lfts. ovate, serrate, 2–$3\frac{1}{2}$ in. long, glaucous and nearly glabrous beneath, mostly distinctly petioled; veins curving upward before the margin. Aug. S. states north to Tenn. S.S. 5:211. *Gn.* 50, p. 126.—The stout, armed stems, the large lvs., and the enormous clusters of fls. give this species a very distinct subtropical appearance. Not quite hardy north.

Chinénsis, Linn. (*A. Japónica*, Hort. *A. Mandshúrica*, Hort.). Chinese Angelica Tree. Stems less prickly, 40 ft.: lvs. 2–4 ft. long, usually without prickles; lfts. ovate or broad ovate, coarsely serrate or dentate, usually pubescent beneath, nearly sessile, $3\frac{1}{2}$–6 in. long; veins dividing before the margin and ending in the points of the teeth. Aug., Sept. China, Japan.—In general appearance very much like the former species, but hardier. Nearly hardy north. Grows well also in somewhat dry, rocky or clayey soil. Var. **elàta,** Dipp. (*Dimorphánthus elátus*, Miq.). St. with few prickles: lfts. pubescent beneath. The hardiest and most common form in cult. Var. **canéscens,** Dipp. (*A. canéscens*, Sieb. & Zucc.). Lvs. often prickly above; lfts. glabrous beneath, except on the veins, dark green above. More tender. Var. **Mandshúrica,** Rehder (*Dimorphánthus Mandshúricus*, Maxim.). St. prickly: lfts. pubescent only on the veins beneath, more sharply and densely serrate than the foregoing var., and hardier. There is also a form with variegated lvs. (I.H. 33:609).



129. Unsymmetrical Araucaria grown from a side shoot.

bb. *Unarmed herbs: styles united at the base.*

c. *Umbels numerous, in elongated puberulous panicles: 3–10 ft. high.*

racemósa, Linn. Spikenard. Height 3–6 ft.: glabrous, or slightly pubescent: lvs. quinately or ternately decompound; leaflets cordate, roundish ovate, doubly and sharply serrate, acuminate, usually glabrous beneath, 2–6 in. long: fls. greenish white. July, Aug. E. N. Amer. west to Minn. and Mo. B.B. 2:506.

Califórnica, Wats. Height 8–10 ft.: resembles the preceding: lfts. cordate, ovate or oblong-ovate, shortly acuminate, simply or doubly serrate: panicle loose; umbels fewer, larger, and with more numerous rays. Calif.

cordàta, Thunb. (*A. édulis*, Sieb. & Zucc.). Height 4–8 ft.: lvs. ternately or quinately decompound, pinnæ sometimes with 7 lfts.; lfts. cordate or rounded at the base, ovate or oblong-ovate, abruptly acuminate, unequally serrate, pubescent on the veins beneath, 4–8 in. long. Japan. Gt. 13:432 as *A. racemosa*, var. *Sachalinensis*. R.H. 1896, p. 55. A.G. 1892, pp. 6, 7.

Cachemírica, Decne. (*A. Cashmeriana*, Hort. Saul 1891. *A. macrophýlla*, Lindl.). Height 5–8 ft.: lvs. quinately compound, pinnæ often with 5–9 leaflets; leaflets usually rounded at the base, oblong-ovate, doubly serrate, glabrous or bristly on the veins beneath, 4–8 in. long. Himalayas.

cc. *Umbels several or few on slender peduncles; pedicels glabrous: 1–3 ft. high.*

hispida, Vent. Bristly Sarsaparilla. Wild Elder. Height 1–3 ft., usually with short, woody stem, bristly: lvs. bipinnate; lfts. ovate or oval, rounded or narrowed at the base, acute, sharply and irregularly serrate, 1–3 in. long: umbels 3 or more in a loose corymb; fls. white. June, July. From Newfoundland to N. Carolina, west to Minn. and Ind. B.M. 1085. L.B.C. 14:1306.

nudicaùlis, Linn. Wild Sarsaparilla. Small Spikenard. Stemless or nearly so: usually 1 leaf, 1 ft. high, with 3 quinately pinnate divisions; lfts. oval or ovate, rounded or narrowed at the base, acuminate, finely serrate, 2–5 in. long: umbels 2 or 3; fls. greenish. May, June. Newfoundland to N. Carolina, west to Mo. B.B. 2:506.

A. quinquefólia, Decne. & Planch.=Panax quinquefolium.—*A. trifólia*, Decne. & Planch.=Panax trifolium. (See also *Ginseng*.)

Alfred Rehder.

ARAUCÀRIA (Chilian name). *Coníferæ*, tribe *Araucàricæ*. About 15 species of S. Amer. and the Australian region, grown for their striking symmetrical habit and interesting evergreen foliage. In the S. some species will thrive in the open, where the climate is not too dry, but in the N. all are grown under glass only. Lvs. stiff, sharp-pointed, crowded: cones globular or oblong, terminal, hard and woody, of some species several inches in diameter. Most of the species become gigantic forest trees in their native haunts. As here treated, the genus includes *Columbea* and *Eutacta*.

L. H. B.

There are some 15 Araucarias in cultivation. Most of these, however, are grown in limited numbers in private and botanical collections. The kinds most popular in this country are *A. excelsa* and its varieties *glauca* and *robusta compacta*. Of *A. excelsa*, probably 250,000 plants in 5-inch and 6-inch pots are annually sold in the U. S. These are nearly all imported in a young state from Ghent, Belgium, where the propagation and growing of them is made the leading specialty at many nur-

series, of which there are over 700 in that one city. The trade of the world has been supplied for many years from Ghent. Some of the large English growers have

130. Good specimen of Araucaria excelsa.

begun to grow them in considerable quantities in the past five years, but it is likely that Ghent will be the main source of supply for many years to come. A few are now propagated in this country, and as they grow easily here, it is likely that the number will be largely increased in the near future, the high price of labor being the greatest drawback. The Araucaria is the most elegant and symmetrical evergreen in cultivation, and for this reason is very popular as an ornamental plant for home decoration. It is particularly popular at Christmas time, and is then sold in great quantities. Araucarias are propagated from seed and from cuttings; the latter make the most compact and handsome specimens. To make symmetrical specimens, take cuttings from the leading shoots (see Fig. 129). If used as house plants, they thrive best in a cool room, where the temperature is not over 60° at night, and they should be placed near the light. In summer they grow best if protected by a shading of light laths, placed about an inch apart, which will admit air and at the same time break the force of the sun's rays. They do well in any good potting compost, and should be shifted about once a year (in the spring) into larger pots. The cuttings should be planted in light compost or sand in the fall or during the winter in a cool greenhouse, with moderate bottom heat, and will root in about 8 or 10 weeks, after which they may be potted into small pots. In addition to *A. excelsa* and its variations, the following attractive species are grown in small quantities: *A. Bidwillii*, which, being of a tough and hardy nature, does remarkably well as a room plant, and it is hardy in Florida and many of the most southern states; *A. Goldieana*, a very distinct and handsome form, and rather scarce at present; *A. elegans* (a form of *A. Braziliana*), an elegant form of dwarf and exceedingly graceful habit, and a most beautiful table plant.

Cult. by ROBERT CRAIG.

A. *Lvs. (or most of them) awl-like.*

excélsa, R. Br. NORFOLK ISLAND PINE. Figs. 130, 131, 132. Plant light green: branches frondose, the lvs. curved and sharp-pointed, rather soft, and densely placed on the horizontal or drooping branchlets. Norfolk Isl. F.R. 2:411.—The commonest species in this country, being much grown as small pot specimens. A blue-green form is cult. as *A. glauca*. There is also a strong-growing, large variety, with very deep green foliage (*A. robusta*). In its native wilds the tree reaches a height of over 200 ft. and a diameter of even 9 or 10 ft. The solid, globular cones are 4 or 5 in. in diam. F.S. 22:2304–5.—An excellent house plant, and keeps well in a cool room near a window. In summer it may be used on the veranda, but must be shaded.

Cunninghami, Sweet. Plants less formal and symmetrical than *A. excelsa*, the upper branches ascending and the lower horizontal: lvs. stiff and very sharp-pointed, straight or nearly so. There is also a glaucous form (*A. glauca*); also a weeping form. Austral., where it reaches a height of 200 ft., yielding valuable timber and resin. Locally known as Hoop Pine, Moreton Bay Pine, Colonial Pine, Coorong, Cumburtu, Coonam.

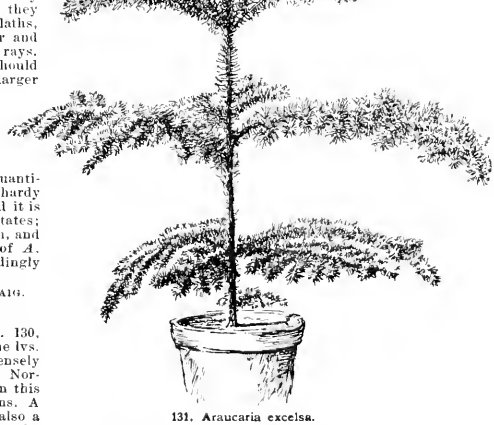
Cookii, R. Br. (*A. columnaris*, Hook.). Branches disposed as in *A. excelsa*, but tree tending to shed the lower ones: young lvs. alternate and rather distant, broad and slightly decurrent at base, slightly curved, mucronate; adult lvs. densely imbricated, short and ovate, obtuse; cones 3–4 in. in diam. and somewhat longer. New Caledonia, where it reaches a height of 200 ft., making very straight and imposing shafts. B.M. 4635. A.F. 12:559.—Named for Captain Cook.

AA. *Lvs. broader, usually plane and imbricated.*

Rulei, Muell. Leafy branchlets very long: lvs. ovalelliptic, imbricated, plane or lightly concave, arched towards the branch, nearly or quite obtuse, with a prominent dorsal nerve. Variable at different ages. When young, the branches are often drooping and the lvs. compressed and obscurely 4-angled and nearly or quite subulate (var. *polymórpha*, R.H. 1866, p. 350. There is a var. *compacta*). New Caledonia. Reaching 50 ft. in height. R.H. 1866, p. 392, and plate. I.H. 22:204. The figure in G.C. 1861:868, is *A. Muelleri*, Brongn. & Gris., a broader-leaved species.

Goldieàna, Hort. Like *A. Rulei*, and perhaps a form of it: lvs. in whorls, dark green, variable: branches drooping.

Bidwillii, Hook. Fig. 133. Rather narrow in growth, especially with age, the branches simple: lvs. in two rows, lance-ovate and very sharp-pointed, thick, firm and shining. Austral., where it attains a height of



131. Araucaria excelsa.
A ragged plant, grown with insufficient room and attention.

150 ft., and is known as Bunga bunga. R.H. 1897, p. 500. G.C. III. 15: 465, showing the pineapple-like cone. —One of the best and handsomest species for pots.

Braziliàna, A. Rich. Branches verticillate, somewhat inclined, raised at the ends, tending to disappear below as the plant grows: lvs. alternate, oblong-lanceolate, somewhat decurrent, much attenuated and very sharp-pointed, deep green, loosely imbricated: cone large and nearly globular. S. Braz., reaching a height of 100 ft. F.S. 21: 2202. *A. elegans*, Hort., is a form with very numerous branches and more crowded and often glaucous lvs. Var. *Ridolfiàna*, Gord., is a more robust form, with larger and longer lvs.

132. Araucaria excelsa (× ⅛).

imbricàta, Pav. MONKEY PUZZLE. Branches generally in 5's, at first horizontal, with upward-curving (sometimes downward-curving) tips, but finally becoming much deflexed, the lf.-shinged branchlets in opposite pairs: lvs. imbricated and persisting, even on the trunk, ovate-lanceolate, very stiff and leathery and sharp-pointed, an inch long and half as wide, bright green on both sides: cone 6–8 in. in diam. Western slope of the Andes in Chile, reaching a height of 100 ft. F.S. 15: 1577–80. R.H. 1893, p. 153; 1897, pp. 271, 319. Gt. 44: 115. G.C. III. 21: 288; 24: 154.—Hardy in the S. This is the species which is grown in the open in England and Ireland.

133. Araucaria Bidwillii (× ⅛).

L. H. B.

ARAÙJIA is treated under *Physianthus*.

ÁRBORICULTURE. The culture of trees. It is a generic term, covering the whole subject of the planting and care of trees. More specific terms are *sylviculture*, the planting of woods; *orchard-culture*, the planting of orchards or fruit trees.

ÁRBUTUS (ancient Latin name). *Ericàceæ*. Trees or shrubs; branches smooth and usually red: lvs. evergreen, alternate, petiolate; fls. monopetalous, ovate or globular, white to red, about ⅓in. long, in terminal panicles: fr. a globose, many-seeded berry, granulose outside, mostly edible. About 10 species in W. N. Amer., Mediterranean reg., W. Eu., Canary Isl. Ornamental trees, with usually smooth red bark and lustrous evergreen foliage, of great decorative value for parks and gardens in warm temperate regions; especially beautiful when adorned with the clusters of white fls. or bright red berries. They grow best in well-drained soil in somewhat sheltered positions not exposed to dry winds. Very handsome greenhouse shrubs, thriving well in a sandy compost of peat and leaf soil or light loam. Prop. by seeds sown in early spring or in fall, or by cuttings from mature wood in fall, placed in sandy peat soil under glass; they root but slowly. Increased also by budding or grafting, usually veneer-grafting, if seedlings of one of the species can be had for stock. Layers usually take two years to root.

A. *Panicles short, nodding: lvs. usually serrate.*

Unèdo, Linn. STRAWBERRY TREE. From 8–15 ft.: lvs. cuneate, oblong or oblong-lanceolate, 2–3 in. long, glabrous, green beneath: fls. white or red, ovate: fr. scarlet, warty, ¾in. broad. Sept.–Dec. S. Eu., Ireland. L.B.C. 2: 123. Var. **integérrima**, Sims. Lvs. entire. B.M. 2319. Var **rùbra**, Ait., and var. **Croòmi**, Hort. (Gn. 33, p. 320), have red fls.—Very beautiful in autumn, when the tree bears its large, scarlet fruits and at the same time its white or rosy fls.

AA. *Panicles erect: lvs. usually entire.*

Menziesi, Pursh. MADRONA. Occasionally 100 ft. high; trunk with dark reddish brown bark: lvs. rounded or slightly cordate at the base, oval or oblong, 3–4 in. long, glabrous, glaucous beneath: fls. white, in 5–6 in. long panicles: fr. bright orange-red, ½in. long. Spring. W. N. Amer. B.R. 21: 1753, as *A. prócera*. Dougl. S.S. 5: 231. P.M. 2: 147. G.F. 3: 515; 5, 151. Mn. 3: 85. —The hardiest and probably the handsomest species of the genus; it stands many degrees of frost.

Arizónica, Sarg. (*A. Xalapénsis*, var. *Arizónica*, Gray). Tree, 40–50 ft.: trunk with light gray or nearly white bark: lvs. usually cuneate at the base, oblong-lanceolate, 1½–3 in. long, glabrous, pale beneath: fls. white, in loose, broad panicles 2–3 in. long: fr. globose or oblong, dark orange-red. Spring. Ariz. G.F. 4: 318. S.S. 5: 233.—The contrast between the white bark of the trunk, the red branches, and the pale green foliage makes a very pleasant effect: fr. and fls. are also very decorative.

A. Andrachne, Linn. From 10–30 ft.: lvs. oval-oblong, usually entire, yellowish green beneath: fls. yellowish white: fr. bright red. Greece, Orient. P.M. 2024. B.R. 2: 113.—*A. andrachnoides*, Link (A. Andrachne × Unedo. A. hybrida, Ker. A. serratifolia, Lodd.). Lvs. serrate; panicles drooping; fls. white. B.R. 8: 669. L.B.C. 6: 580.—*A. Canariénsis*, Lindl. Height 10–30 ft.: lvs. oblong-lanceolate, serrate, glaucous beneath; panicles erect; fls. greenish white. Canary Isl. B.M. 1577.—*A. densiflòra*, HBK. Height 20 ft.: lvs. oblong or ovate, serrate, downy beneath: fls. white. Mex.—*A. hýbrida*, Ker. = A. arachnoides.—*A. buxifòlia*, Hook. = A. Menziesi.—*A. laurifòlia*, Lindl. = A. Xalapensis.—*A. mollis*, HBK. Shrub or small tree: lvs. oblong, serrate, pubescent beneath: fls. white, often tinged greenish red. Mex. B.M. 4365.—*A. pilòsa*, Grah. = Pernettya pilosa.—*A. prócera*, Dougl. = A. Menziesi.—*A. serratifòlia*, Lodd., not Salisb. = A. andrachnoides.—*A. Texàna*, Buckl. = A. Xalapensis.—*A. tomentòsa*, Pursh. = Arctostaphylos tomentosa.—*A. Uva-Ursi*, Linn. = Arctostaphylos Uva-Ursi.—*A. Xalapénsis*, HBK (A. laurifolia, Lindl.). Height 10–20 ft.: lvs. oval or ovate-lanceolate, entire or crenately serrate, glabrous or downy beneath: fls. reddish; corolla abruptly contracted above the middle. Mex., Tex. S.S. 5: 232. B.R. 25: 67.

ALFRED REHDER.

ÁRBUTUS, TRAILING. See *Epigæa*.

ARCHANGÉLICA (Greek, *chief angel*, from fancied medicinal virtues). *Umbellíferæ*. A few strong-smelling coarse herbs closely allied to Angelica, but differing in technical characters associated with the oil-tubes in the fruit.

officinàlis, Hoffm. A European and Asian biennial or perennial, known also as *Angelica Archangelica*. Stout herb, with ternately decompound lvs. and large umbels of small fls. The stems and ribs of the lvs. were once blanched and eaten, after the manner of celery, and they are still used in the making of sweetmeats. Little known in this country, although it is offered by American dealers. Its chief value to us is its large foliage. Seeds may be sown in the fall as soon as ripe, or the following spring.

ARCHONTOPHŒNIX (Greek, *majestic phœnix*). *Palmàceæ*, tribe *Arécеæ*. Tall, spineless palms, with stout, solitary, ringed candices: lvs. terminal, equally pinnatisect; segments linear-lanceolate, acuminate or bidentate at the apex, the margins recurved at the base, sparsely scaly beneath, the midnerves rather prominent, nerves slender; rachis convex on the back, the upper surface strongly keeled; petiole channelled above, sparsely tomentose; sheath long, cylindrical, deeply fissured; spadices short-peduncled, with slender, flexnose, glabrous, pendent branches and branchlets: spathes 2, entire, long, compressed, deciduous: bracts crescent-shaped, adnate to the spadix; bractlets persistent; fls. rather large: fr. small, globose-ellipsoidal. Species, 2. Austral. They are beautiful palms, requiring a temperate house. Prop. by seeds. The *Seaforthia elegans* of gardeners belongs here. For cult., see *Palms*.

AA. *Leaf segments whitish underneath.*

Alexándreæ, H. Wendl. & Drude (*Ptychosperma Alexándreæ*, F. Muell.). Trunk 70–80 ft.: lvs. several ft. long; rachis very broad and thick, glabrous or slightly scurfy; segments numerous, the longer ones 1½ ft. long, ½–1 in. broad, acuminate and entire or slightly notched, green above, ashy glaucous beneath. Queensland. F.S. 18:1916.

AA. *Leaf segments green on both sides.*

Cunninghamii, H. Wendl. & Drude (*Ptychosperma Cunninghamiana*, H. Wendl.). Trunk and general habit like the preceding, but the segments acuminate and entire or scarcely notched. Queensland and N. S. W. B.M. 4961 as *Seaforthia elegans*.

JARED G. SMITH.

ARCTIUM (from Greek word for *bear*, probably alluding to the shaggy bur). *Compósita*. BURDOCK. A few coarse perennials or biennials of temperate Eu. and Asia, some of them widely distributed as weeds. Involucre globular and large, with hooked scales, becoming a bur: receptacle densely setose: pappus deciduous, of bristles: lvs. large and soft, whitish beneath: plant not prickly: fls. pinkish, in summer.

Lappa, Linn. (*Lappa májor*, Gærtn.). COMMON BURDOCK. The Burdock is a common and despised weed in this country, although it is capable of making an excellent foliage mass and screen. In Japan it is much cult. for its root, which has been greatly thickened and ameliorated, affording a popular vegetable. It is there known as Gobo (see Georgeson, A.G. 13, p. 210).

ARCTOSTÁPHYLOS (Greek, *bear* and *grape*). *Ericàceæ*. MANZANITA. Shrubs or small trees: lvs. alternate, evergreen, usually entire, rarely deciduous: fls. small, urceolate, mostly white, tinged red, in terminal, often panicled racemes, in spring: fr. usually smooth, a red berry or rather drupe, with 1–10 1-seeded, separate or coherent cells. About 30 species in N. and C'ent. Amer., 2 species also in N. Eu. and N. Asia. Handsome evergreen shrubs, though generally with less conspicuous fls. and frs. than those of the allied genus Arbutus. Some Cent. Amer. species, however, as *A. arbutoides*, *arguta* and *pólifolia* are beautiful in flower, and well worth a place in the greenhouse or in the garden in temperate regions; of the American species, *A. Pringlei*, *viscida* and *bicolor* are some of the handsomest. Only the trailing species are hardy north. For culture, see *Arbutus*. Includes *Comarostaphylis*.

A. *Trailing or creeping: lvs. ½–1½ in. long: fls. in short and rather few-fld. clusters.*

Úva-Úrsi, Spreng. BEARBERRY. Lvs. obovate-oblong, tapering into the petiole, retuse or obtuse at the apex: fls. small, about ¼ in. long, white tinged with red. Northern hemisphere, in N. Amer. south to Mex. Em. 2:431.—Hardy trailing evergreen shrub, like the following valuable for covering rocky slopes and sandy banks. Cuttings from mature wood taken late in summer root readily under glass.

Nevadénsis, Gray. Lvs. obovate or obovate-lanceolate, abruptly petioled, acute or mucronate at the apex: fls. in short-stalked clusters, white or tinged with red. Calif., in the higher mountains.

AA. *Erect shrubs: lvs. usually 1–2 in. long: fls. in mostly many-fld. panicled racemes.*

B. *Lvs. glabrous, rarely minutely pubescent.*

C. *Pedicels glabrous.*

púngens, HBK. From 3–10 ft.; glabrous or minutely pubescent: lvs. slender-petioled, oblong-lanceolate or oblong-elliptic, acute, entire, green or glaucescent: fls. in short, umbel-like clusters: fr. glabrous, about ¼ in. broad. Mex., Low. Calif. B.R. 30:17. B.M. 3927.

Manzanita, Parry (*A. púngens*, Authors). Fig. 134. Shrub or small tree, to 30 ft.: lvs. ovate, usually obtuse and mucronulate at the apex, glabrous, dull green: fls. in prolonged panicled racemes: fr. glabrous, ¼–½ in. broad. W. N. Amer., from Ore. south. G.F. 4:571.

CC. *Pedicels glandular.*

glauca, Lindl. From 8–25 ft.: lvs. oblong or orbicular, obtuse and mucronulate at the apex, glaucescent or pale green: fls. in prolonged panicled racemes; pedicels glandular: fr. minutely glandular. Calif. Int. 1891.

víscida, Parry. From 5–15 ft.: lvs. broad ovate or elliptic, abruptly mucronulate, acute or rounded at the base, glaucous: fls. in slender and spreading, panicled racemes; pedicels viscid; corolla light pink: fr. depressed, about ¼ in. broad, smooth. Ore. to Calif.

134. Manzanita.—Arctostaphylos Manzanita.

BB. *Lvs. more or less pubescent; branchlets mostly bristly-hairy.*

tomentósa, Dougl. From 2–6 ft.: lvs. oblong-lanceolate or ovate, acute, sometimes serrulate, pubescent beneath, pale green: fls. in rather dense and short, usually panicled racemes; pedicels short: fr. puberulous, glabrous at length. W. N. Amer. B.R. 21:1791. B.M. 3320.—The hardiest of the erect species.

Pringlei, Parry. Shrub: lvs. broad-ovate or elliptic, usually abruptly mucronulate, pubescent, sometimes glabrous at length, glaucous: panicled racemes pedunculed, usually leafy at the base, many-fld.; slender pedicels and calyx glandular-pubescent: fr. glandular hispid. Calif., Ariz.

bicolor, Gray. From 3–4 ft.: lvs. oblong-oval, acute at both ends, revolute at the margin, glabrous and bright green above, white-tomentose beneath: fls. in nodding, rather dense racemes; pedicels and calyx tomentose; corolla ⅓ in. long, rose-colored: fr. smooth. Calif.

A. alpina, Spreng. Prostrate shrub: lvs. deciduous, obovate, serrate: racemes few-fld.: fr. black. Arctic regions and mountains of northern hemisphere.—*A. arbutoides*, Hemsl. Five to 6 ft.: lvs. lanceolate-oblong, ferruginously pubescent beneath: panicles erect, loose. Guatem. B.R. 29:30.—*A. arguta*, Zucc. (*A. nitida*, Benth.). Five to 6 ft.: lvs. oblong-lanceolate, serrate, glaucous and glabrous: panicles loose, erect. S. Mex. B.R. 31:32. B.M. 3904 as *A. nitida*.—*A. Californica*, Hort.=*A. Nevadensis*.—*A. diversifólia*, Parry. Six to 15 ft.: lvs. ovate or narrow-oblong, acute, usually serrate, tomentose beneath: racemes elongated. Calif. Mu. 5:231.—*A. nitida*, Benth. *A. arguta*.—*A. pallifólia*, HBK. Height 1–3 ft.: lvs. linear-lanceolate, glaucous and puberulous beneath: fls. red, in loose, erect racemes. Mex.

ALFRED REHDER.

ARCTÒTIS (Greek for *bear's ear*, alluding to the akene). *Compósita*. Herbs with long-peduncled heads and more or less white-woolly herbage, of 30 or more African species: akenes grooved, with scale-like pappus: involucre with numerous imbricated scales: receptacle bristly. One species, treated as an annual, is sold in this country.

breviscápa, Thunb. (*A. leptorhíza*, var. *breviscápa*, DC.). Stemless or nearly so (6 in. high), half-hardy, readily prop. from seeds, and to be grown in a warm, sunny place. Lvs. usually longer than the scape, incised-dentate: scape hirsute, bearing one large fl. with dark center and orange rays.

ARDÍSIA (*pointed*, alluding to the stamens or corolla lobes). *Myrsinàceæ*. Large genus of tropical trees and shrubs, with 5-parted (sometimes 4- or 6-parted) rotate corolla, 5 stamens attached to the throat of the corolla, with very large anthers and a 1-seeded drupe the size of

a pea. Lvs. entire, dentate or crenate, thick and evergreen: fls. white or rose, usually in cymes. Ardisias are grown in hothouses or conservatories, and bloom most of the year.

There are about a dozen Ardisias in cultivation; only two, however, are grown in quantity in America.—*A. crenulata* (red-berried) and *A. Japónica* (white-berried). The former is the more beautiful and valuable. It is one of the handsomest berry-bearing plants, and is very popular, particularly at Christmas time. The *A. Japonica* is not nearly so showy nor handsome as *A. crenulata*, and for this reason is not so generally grown. Ardisias are readily grown from seed, which should be sown in the spring; the seedlings will bloom the following spring, and the berries will be well colored by the next Christmas. They will thrive in almost any good potting compost and in a winter night temperature of about 50°. They are most beautiful when about 2 feet high, after which they generally lose their bottom foliage, and present a naked or "leggy" appearance. When they get in this state it is well to root the tops over again, which may best be done without removing them from the plant, by making an incision in the stem and covering the wounded part with moss, which should be tightly wrapped with string and kept damp; the moss will be filled with roots in about a month, when the tops may be cut off and potted, thus obtaining most beautiful young plants, covered with foliage to the bottom. This process will not interrupt the blooming at all; they frequently set an abundance of buds while undergoing this operation. The crop of berries on an Ardisia will remain on the plant for more than a year, if the plant be grown in a cool temperature, say not exceeding 50° at night in winter. Two full crops of ripe berries at one time are not unusual. Ardisias may be propagated also from cuttings of half-ripened wood; early spring is the best time to strike them. The greatest insect enemy of the Ardisia is the large brown scale; frequent sponging of the stems and lvs. with strong tobacco water is the best preventive.

Cult. by ROBERT CRAIG.

A. *Fls. red or rose-colored.*

crenulàta, Lodd. (*A. crenàta*, Sims. *A. crispa*, Hort.). Fig. 135. As cult., a compact and neat shrub, with lance-oblong, wavy-margined, alternate lvs. and drooping clusters of small coral-red frs. Sweet-scented. Prob-

135. Ardisia crenulata (× ⅓).

ably native to E. Ind. or China. B.M. 1950. L.B.C. 1: 2. Mu. 1: 58. A.F. 13: 558.—The commonest species. It thrives in a conservatory temperature (not lower than 45°). Best plants are obtained from seeds. The young plants should be given bottom heat and kept growing rapidly. If they become stunted, it is very difficult to make them into satisfactory plants. Well-grown plants should bear fruit in a year from the seed. The seed may be sown whenever ripe. The fruits often hang on for a year and more. Hardy in the South.

humilis, Vahl. Lvs. lance-oblong, shining: frs. shining black. India.

Óliveri, Mast. Lvs. nearly sessile, recurved, oblanceolate and acuminate, 6–8 in. long, entire: fls. pink, in large, dense heads, like an Ixora, the limb rotate, ½in. across. Costa Rica. G.C. II. 8: 681.—Elegant stove plant.

AA. *Fls. white.*

Japónica, Blume. Lvs. short-oblong or somewhat cuneate, whorled, serrate: fls. on red pedicels in drooping racemes: berries white. Dwarf. Jap. Probably hardy in the North.

polycéphala, Wall. Lvs. bright green, red or wine-colored when young, opposite: fr. black. E. Ind.

AAA. *Fls. black-dotted.*

Pickeringia, Torr. & Gray. Glabrous, 5–9 ft.: lvs. ovate to lance-oblong, entire, narrowed to a petiole: panicle many-fld.; corolla lobes oval and becoming reflexed: fr. as large as peas. E. Fla. Int. 1891.

A. umbellàta is offered in this country as coming from India. The *A. umbellata*, Baker (of the botanists), is a Madagascar plant, and it is doubtful if it is in cult. in this country. Species with white fls. are *A. acuminata*, Willd., B.M. 1678; *capitata*, Gray; *mamillata*, Hance; *paniculata*, Roxbg., *villosa*, Wall. Species with red or reddish fls. are *A. macrocarpa*, Wall., B.M. 6357; *paniculata*, Roxbg., B.M. 2364; *serrulata*, Swartz; *Wallichii*, DC.

L. H. B.

ARÈCA (from a native name in Malabar). *Palmàceæ*, tribe *Aréceæ*. Spineless palms, with trunks solitary or cespitose in a ring: lvs. terminal, equally pinnatisect, the segments lanceolate, acuminate, plicate, with the margins recurving at the base, the upper ones confluent and bifid or truncate and many-parted: rachis 3-sided, convex on the back, the upper face acute, the base and petiole concave: sheath elongated; spadix broad or narrow, the spreading branches at length pendent: spathes 3 or many, papery, the lowest complete, the upper ones bract-like: fls. white: fr. medium or large, red or orange. Species, 24. Trop. Asia, Malay Arch., Trop. Austral. and New Guinea. The name Areca is one of the most familiar of all palm genera, but most of the well-known species are now referred to other genera. *A. lutescens*, the most popular kind, is *Chrysalidocarpus lutescens*. *A. Catechu* and *A. triandra* are both very quick in germinating. They form very ornamental plants for a moderate sized greenhouse. For *A. aurea*, see *Dictyosperma*. For *A. Madagascariénsis*, see *Dypsis*.

Alicèæ, W. Hill. Sts. several from the same rhizome, 9 ft. or more high, slender: lvs. 3–6 ft. long; segments acute, several confluent, especially at apex. Queensland.

Cátechu, Linn. BETEL NUT. St. solitary, 40–100 ft.: lvs. 4–6 ft.; leaflets numerous, 1–2 ft., upper confluent, quite glabrous: fr. 1½–2 in., ovoid, smooth, orange or scarlet. Asia and Malayan Islands.

Ilsemanni, Hort. Resembles a red-stemmed Chrysalidocarpus: young lvs. very dark red, becoming green; fronds slender, arching, with curving pinnæ. Oceanica. A.G. 20: 223 (1899).

triandra, Roxb. Trunk 40–50 ft. high, 1 ft. thick, cylindrical: fronds 8 ft. long; segments with 6 primary nerves about 1 line apart; petiole about 1 ft. long. India.

A. álba, Bory.=Dictyosperma alba.—*A. Baùeri*, Hook. f.=Rhopalostylis Baueri.—*A. elegantíssima*, Hort. Trade name?—*A. furfuràcea*, Hort.=Dictyosperma furfuracea.—*A. gigantèa*, Hort.=Pinanga Quernatensis.—*A. grácilis*, Roxb.=Pinanga gracilis.—*A. grácilis*, Thou.=Dypsis pinnatifrons.—*A. grácilis*, Giseke=Drymophlœus appendiculatus.—*A. lutéscens*, Bory.=Chrysalidocarpus lutescens.—*A. monostáchya*, Mart.=Bacularia monostachya.—*A. montàna*, Hort. Trade name?—*A. Nìbung*, Griff.=Oncosperma filamentosum.—*A. oleràcea*, Jacq.=Oreodoxa oleracea.—*A. púmila*, Blume.=Nenga Wendlandiana.—*A. rùbra*, Hort.=Dictyosperma rubra.—*A. rùbra*, Bory.=Acanthophœnix rubra.—*A. Sanderiàna*, Hort. Trade name?—*A. sápida*, Soland.=Rhopalostylis sapida.—*A. speciòsa*, Hort. Trade name?—*A. tigillària*, Jack=Oncosperma filamentosa.—*A. Verschaffeltii*, Hort.=Hyophorbe Verschaffeltii.

JARED G. SMITH.

ARENÀRIA (*arena*, sand, where many of the species grow). *Caryophyllàceæ*. Low herbs, mostly with white fls., usually forming mats, and suitable for rockwork or alpine gardens. Only the perennial species are commonly cult. Of easiest culture in almost any soil. Prop. by division; also by seeds, and rare species sometimes by cuttings. The species inhabit temperate and cold regions. The stamens are usually 10; styles 3 or 4; petals 5 as a rule, entire or emarginate. Nearly 200 recognized species. Monogr. by F. N. Williams, Journ. Linn. Soc. 33: 326 (1897–8).

A. *Lvs. ovate or lanceolate.*

Baleàrica, Linn. Very low (3 in. high), with small ovate glossy lvs. Balearic Is., Corsica.—Not hardy in latitude of New York City.

macrophýlla, Hook. Sts. decumbent and angled, pubescent: lvs. lanceolate or elliptic, mostly acute; peduncles slender, 1–5-fld. Lake Superior to the Pacific. Int. 1881.

AA. *Lvs. linear or awl-like.*

B. *Sepals obtuse.*

Grœnlàndica, Spreng. Annual: very low, forming mats, the decumbent or erectish sts. bearing 1–5 fls.; lvs. linear and obtuse, $\frac{1}{2}$in. or less long: sepals and petals blunt, the latter sometimes notched. High altitudes and latitudes, but coming to the sea coast in parts of N. Eng., and ranging down the mountains to N. Car. Int. 1884.—A neat little alpine.

graminifòlia, Schrad. A foot or less high: lvs. long and filiform, rough-margined: fls. in 3-forked loose pubescent panicles. Eu.

BB. *Sepals pointed or even awned.*

grandiflòra, Linn. Variable: 6 in. or less high: lvs. flat-awl-shaped, 3-nerved and ciliate: fls. solitary or in 2's or 3's, long-stalked. Eu.

montàna, Linn. Smaller; lvs. linear or nearly so; fls. large, solitary, very long-stalked. S. W. Eu.

vérna, Linn. (*Alsine vérna*, Bartl.). Dwarf: 1–3 in. high: lvs. linear-subulate, flat, strongly 3-nerved, erect: fls. on filiform peduncles, with strongly 3-nerved sepals. Eu. and Rocky Mts.—Excellent little rock plant. Var. **cæspitòsa,** Hort., is a compact, leafy form.

aculeàta, Wats. Sts. 4–6 in. high: lvs. stiff and sharp, glaucous, fascicled, white, but often purple. W. Amer. Int. 1889.

Fránklinii, Dougl. Sts. 2–5 in. high, nearly or quite glabrous: lvs. in 3–6 pairs, narrow-subulate, sharp-pointed: fls. in dense cymes at the top of the st. W. Amer. Int. 1881.

L. H. B.

ARÉNGA (derivation doubtful). *Palmàceæ*, tribe *Arèceæ*. Spineless palms, with the thick caudex clothed above with dead, fibrous leaf-sheaths, at length bearing vigorous shoots. Lvs. terminal, elongated, unequally pinnatisect, the linear or cuneate somewhat petiolate segments præmorse or obliquely divided at the apex; midveins prominent; nerves parallel; margins irregularly toothed above the middle, recurved at the base and one or the other of them auricled, pale below; petiole plano-convex, with the margin spiny: sheaths short, reticulate-fibrous, the margin crenate: spadix large, with short reflexed peduncle and elongated, slender, pendulous branches; spathes numerous, attached to the peduncle, membranaceous, deciduous: bracts and bractlets broad: fls. brown or brownish green or purplish: fr. yellow, fleshy. Species 5. Trop. Asia, Malay Archipelago, New Guinea, and Trop. Austral.

Jared G. Smith.

Arenga saccharifera, in a young state, is surpassed in beauty by most palms. Specimens eight to ten years old, however, show their characteristics well, and from that period till they begin to flower (which they do from the top of the stem downwards in the axils of the leaves), they are among the most striking subjects for high and roomy conservatories. The temperature should not be allowed to fall below 55° F. during the coldest weather.

G. W. Oliver.

obtusifòlia, Mart. Trunk 20–30 ft. high, 1–1½ ft. thick: fronds 9–13, 12–16 ft. long: petiole thickly spiny: segments 1½in. apart, 2–3 ft. long, 1½–2 in. wide, alternate, lanceolate-linear, unequally acutely dentate, attenuate, 2-auricled at the base, the lower auricle the larger, glaucous beneath; branches of the spadix short, lax, nodding. Java.

saccharífera, Labill. Trunk 40 ft. high: petioles smooth: segments fasciculate, in 4's or 5's, linear-ensiform, 1- or 2-auricled at the base, the lower auricle the longer, 2-lobed or variously dentate at the apex, white or silvery beneath; branches of the spadix long, fastigiate, pendulous. Malaya.

Jared G. Smith.

ARETHÙSA (the nymph *Arethusa*). *Orchidàceæ*. A few species of handsome terrestrial orchids. Fl. gaping, the sepals and petals lanceolate and nearly alike, arching over the column.

bulbòsa, Linn. A very pretty hardy orchid, 8–10 in., with one linear, nerved lf. and a bright rose-pink fl. on an erect scape, the lip recurved and bearded. Bogs, N. Car., N. and W.; not common. May, June. Ms. 5: 141. G. W. F. 17.—Requires a moist and shady, cool situation and open, porous soil. A shady nook on north slope of rockery, where it can be watered in dry weather, is an ideal place. Prop. by the solid bulbs.

J. B. Keller.

ARÈTIA. See *Douglasia*.

ARGEMÒNE (fanciful name). *Papaveràceæ*. Argemony. A few American plants, mostly herbs, with prickly sepals and pods, 3–6-lobed stigma, coarse often white-spotted foliage, and yellow juice. Annuals, or cult. as annuals. Easy to manage from seeds sown where the plants are to stand, or transplanted from pots. They need a light soil and full sunny exposure. Monogr. by Prain, Journ. Bot. 33: 207 et seq.

A. *Fls. yellow or yellowish.*

Mexicàna, Linn. (*A. speciòsa*, Hort.). Prickly Poppy. Fig. 136. A moderately prickly-stemmed herb, 1–2 ft. high, sprawling, glaucous: lvs. coarsely sinuate-pinnatifid: fls. sessile or nearly so, the petals obovate and an inch or less long, orange or lemon-colored. Trop. Amer., but naturalized in E. and S. states and in the Old World. B.M. 243.

136. Argemone Mexicana (×½).

Var. **ochroleùca,** Lindl. Petals yellowish white, and style longer. Tex. B.R. 1343.

AA. *Fls. white (rarely purple).*

grandiflòra, Sweet. Glabrous and glaucous, 1–3 ft. high, almost destitute of prickles: lvs. sinuate-pinnatifid, the lobes only weakly spinescent: bracts scattered along the fl. branches: capsule valves scarcely crested. S. W. Mex. B.R. 1264. L.B.C. 16:1546. B.M. 3073.

platycèras, Link & Otto. Robust, 1½–4 ft., very spiny, the lvs. glaucous; lvs. sinuate-pinnatifid, spiny: fl.-bracts aggregated below the fls.: petals large (rarely purple): capsule valves crested or spiny. Mex. to Colo.

Var. **hispida,** Prain. (*A. hispida,* Gray). Petals rounded: sepals and capsule densely prickly: plant hispid. Wyo. and Ark., W. and S. L. H. B.

ARGYRÈIA (*silvery,* referring to the under side of the lvs.). *Convolvulàceæ.* Tender climbers from the orient, allied to Ipomœa. Lvs. usually large, silvery, tomentose or villous beneath: cymes usually few-fld. They require too much room before flowering to be popular here. *A. cuneata* is one of the dwarfest and most florriferous kinds. Light, rich soil. Prop. by cuttings or seeds.

tiliæfòlia, Wight. Lvs. heart-shaped: fls. white and violet. Prop. from seeds. E. Ind.—Int. 1890 by Peter Henderson & Co.

ÀRIA. See *Sorbus.*

ARISÆMA (Greek-made name, of no particular significance). *Aròideæ.* About 60 widely distributed herbs, with tuberous roots, and a spathe rolled in or convolute about the spadix below, and often arched over it: fls. unisexual, the pistillate on the lower part of the spadix, and each consisting of a 1-loculed ovary, and generally ripening into a showy berry. Some species are native, and several of them are hardy in the open; others are cult. under cover, as recommended for Arum (which see). Monogr. by Engler in De Candolle's Monographiæ Phanerogamarum, Vol. 2.

A. *Leaflets 7–11.*

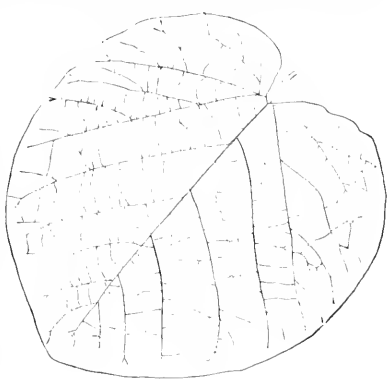
Dracòntium, Schott. Dragon-root. Sending up a solitary leaf 1–2 ft. high, pedately divided into oblong-

137. Jack-in-the-Pulpit, Arisaema triphyllum (× ⅓).

lanceolate pointed lfts.: spadix long-pointed and projecting beyond the greenish spathe: scape much shorter than the leaf. Low grounds in E. Amer.—Occasionally grown in borders and rockwork.

AA. *Leaflets 3.*

triphyllum, Torr. Jack-in-the-Pulpit. Indian Turnip. Fig. 137. Usually dioecious: lvs. usually 2, with ovate or elliptic-ovate lfts.: spadix club-shaped and



138. Aristolochia macrophylla.

covered by the arching purplish spathe. Common in woods. G.W.F. 28. D. 281.—Tuber or corm flattish and large, very acrid, often employed as a domestic remedy. Berries red and showy, ripening in early summer. Planted in a moist, shady place, the lvs. remain until fall; but in exposed places they die down early in summer. This and the last are very interesting native plants of easy culture, propagated by tubers and by seeds.

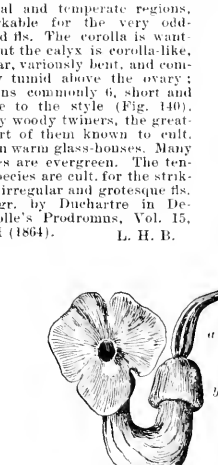
fimbriàtum, Masters. Fringed Calla. Leaf solitary, the petiole a ft. or less high, sheathed below; lfts. broad-ovate and acuminate, short-stalked: scape as long as the petiole, bearing a large, purple-limbed, white-streaked, long-pointed spathe: spadix ending in a long and gracefully drooping, feather-like appendage. E. Ind. G.C. II. 22: 689; III. 15: 763. B.M. 7150. Mn. 8: 59. —A handsome and striking pot-plant, blooming in summer. Grow in rich soil. Dry off the tuber when the lvs. turn yellow after flowering, and keep dry in sand or earth until spring.

Other species are: *A. anòmalum,* Hemsl. Lfts. 3, broad-ovate, acuminate: spathe small, purplish and streaked, arching over the short spadix: suggests *A. triphyllum.* Malacca. B.M. 7211. —*A. concinnum,* Schott. Leaf solitary, with 10 or more lfts.: spathe colored, tailed. India. B.M. 5014.—*A. curvatum,* Hook. —*A. tortuosum.*—*A. galeàtum,* N. E. Br. Leaf solitary, with 3 lfts.: spathe purple inside. India. B.M. 6457.—*A. Griffithii,* Schott. Lvs. 2, lfts. 3, nearly orbicular: spathe very large, with a spreading and wrinkled limb several inches broad, and rich purple with green veins. India. B.M. 6491. One of the handsomest of all Arisæmas.—*A. inpenthòides,* Mort. Leaf pedate, of 5 narrow lfts.: spathe auricled. India. B.M. 6446.—*A. ringens,* Schott. Lfts. 3, ovate, acuminate: spathe purple, arched. Japan. Perhaps hardy in the open. Gn. 37, p. 577.—*A. Sieboldii,* De Vriese.=A. ringens.—*A. speciòsum,* Mort. Lfts. 3: spathe large and very dark purple; spadix with a very long, string-like tip. India. Gn. 37: 758. B.M. 5064.—*A. tortuòsum,* Schott. Lvs. usually 2, with several or many lfts.: spathe purple outside: spadix long-tailed but erectish, greenish. India. B.M. 5033 (as *A. curvatum*).—*A.ùtile,* Hook. Lvs. 2, with 3 crenate lfts.: spathe reddish, green-ribbed: spadix purple: tubers eaten by natives in India. B.M. 6474.—*A. Wràyi,* Hemsl. Leaf solitary, pedate, the lfts. lanceolate: spathe green or whitish: spadix slender, recurved. India. B.M. 7105.—Except *A. ringens,* probably all the above species require pot cult. in the N. L. H. B.

ARISÀRUM (old Greek name). *Aròideæ.* Three or four variable species of Arum-like plants of the Mediterranean region. Differs from Arisæma, its nearest ally, in having the margins of the spathe connate rather than convolute, and in other technical characters. For culture, see *Arisæma* and *Arum.*

vulgàre, Targ. (*Arum Arisàrum*, Linn.). A foot high: lvs. cordate or somewhat hastate, long-stalked; spathe purple, incurved at the top.—Has many forms and many names. Can be grown in the open with protection.

ARISTOLÒCHIA (named for supposed medicinal virtues). *Aristolochiàceæ*. BIRTHWORT. Many species of tropical and temperate regions, remarkable for the very odd-shaped fls. The corolla is wanting, but the calyx is corolla-like, tubular, variously bent, and commonly tumid above the ovary; stamens commonly 6, short and adnate to the style (Fig. 140). Mostly woody twiners, the greater part of them known to cult. only in warm glass-houses. Many species are evergreen. The tender species are cult. for the strikingly irregular and grotesque fls. Monogr. by Duchartre in De Candolle's Prodromus, Vol. 15, Part I (1864). L. H. B.



139. Flower of Dutchman's Pipe, Aristolochia macrophylla.
Showing the ovary at *a*, and the swelling of the calyx-tube at *b*. Natural size.

The best known representative of this genus is *Aristolochia macrophylla* (or *A. Sipho*), the "Dutchman's Pipe," than which there is no better hardy climbing vine for shade or screen purposes. No insects or other troubles seem to mar its deep green foliage, for which it is most valued, as the fls. are small, siphon-shaped, and inconspicuous, in early spring soon after the lvs. are formed. There are many tropical Aristolochias, the fls. of some of them being of extraordinary size, structure, and odor, but they are rarely seen on account of the last characteristic, the odor being so suggestive of putridity as to make its proximity apparent to all, and even to deceive the flies as to its origin. One of the most gigantic varieties is *A. grandiflora*, var. *Sturtevantii*. Another fine species is *A. Goldiana*: but the best of the tropical kinds for general culture in glass structures is *A. elegans*, as it is very easily raised from home-grown seeds, flowers the first year, is very decorative as a climber, and has no odor. We find it very easy of culture in rich soil, and it is evergreen, as, indeed, are most of the tropical kinds. The Aristolochias are of easy culture, requiring only good loam and careful attention to keep them thrifty and free of insects. They can be trained on trellises, pillars, or rafters. Most of them require a rather warm temperature, but if in pots they may be flowered in the conservatory. The large-growing species require much room, and do not bloom, as a rule, until they are several feet high. Prop. readily by cuttings in a frame. Except as oddities, most of the Aristolochias are of little value. Cult. by E. O. ORPET.

A. *Herbs, not climbing.*

Serpentària, Linn. VIRGINIA SNAKEROOT. Height 3 ft. or less: pubescent, with short rootstocks and aromatic roots: lvs. ovate to lanceolate, cordate, acuminate at the top: fls. terminal, solitary, S-shaped, much enlarged above the ovary, greenish. E. states.—Occasionally cult. Roots used in medicine. Reputed remedy for snake bites.

Clematitis, Linn. Two ft. or less tall, glabrous: lvs. reniform-pointed, ciliate on the margins: fls. axillary and clustered, straight, greenish. Eu.—Rarely cult., and occasionally escaped.

AA. *Woody, twining*

B. *Cultivated in the open.*

macrophylla, Lam. (*A. Sipho*, L'Her). DUTCHMAN'S PIPE. Figs. 138, 139, 140. Very tall, twining, glabrous: lvs. very large, broadly reniform or rounded, becoming glabrous: fls. solitary or 2 or 3 together in the axils, U-shaped, enlarged above the ovary, with a 3-lobed, spreading limb, purplish. E. states. B.M. 534. G.W.F. 43. Gng. 1:53. G.F. 5:509 (habit).—An excellent vine for porches, the great lvs. affording a dense shade.

tomentòsa, Sims. Much like the last, but very tomentose: lvs. less rounded: fl. yellow, with reflexed lobes. N. Car. to Mo. and S. B.M. 1369.

Californica, Torr. Silky pubescent, 6–10 ft.: lvs. ovate-cordate, 2–4 in. long, obtuse or acutish, short-petioled: fls. U-shaped, little contracted at the throat, the limb 2-lobed, with the upper lip of 2 broad, obtuse lobes and a thickening on the inner side. Calif.

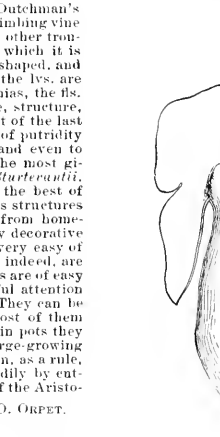
BB. *Greenhouse or warm house.*

c. *Flower-limb of 2 narrow lobes.*

ridìcula, N. E. Br. Very slender, stiff-hairy throughout: lvs. round-reniform, cordate: fls. axillary and solitary, 2 in. long aside from the limb, with a long sac at the base of the tube, pale yellow with dull purple veining; limb of two spreading, deflexed, narrow lobes, glandular, reminding one of donkeys' ears. Brazil. B.M. 6934. G.C. II. 26:361.

cc. *Flower-limb ample and flowing.*

cymbífera, Mart. & Zucc. (*A. labiòsa*, Sims). Glabrous: st. striate: lvs. reniform, obtuse and deeply cut at the base, pedately 7–9-nerved, long-stalked: fls. long-stalked, 8–10 in. long, strongly 2-lipped; the upper lip short and lanceolate, acute or acuminate; the lower lip (which, by position of fl. may seem to be the upper) very large, dilated at base, and produced into a long, beat-



140. Longitudinal section of flower of Dutchman's Pipe.
Showing the ovary, and short column of stamens at *q*.

shaped (whence the name, from *cymba*, a boat) usually 2-lobed projection: fl. creamy white, marked and blotched with maroon. Brazil. B.M. 2545. P.M. 6:53 as *A. hyperborea*, Paxt.

Brasiliénsis, Mart. & Zucc.(*A. ornithocéphala*, Hook.). Glabrous: lvs. cordate-reniform, obtuse, with deep sinus at base: peduncle 8–10 in. long, 1-fld.: fl. very large, dingy yellow, with marks and reticulations of purple, the limb strongly 2-lipped; upper lip 5 in. long, lanceolate-acuminate, projecting from the inflated head-like tube like the long beak of a bird, hairy within; lower lip on a stalk 2 in. long, then expanding into a flattened, wavy, beautifully marked limb 4–6 in. across. Brazil. B.M. 4120. Gn. 45, p. 289.—A most odd and interesting species, not infrequent in fine establishments.

grandiflòra, Swartz (*A. gygas*, Lindl.). PELICAN-FLOWER. GOOSE-FLOWER. Fig. 141. Downy climbing shrub: lvs. cordate-acuminate; peduncles opposite a leaf, striate, exceeding the petiole, 1-fld.; the fl.-bud is "bent like a siphon in the tube, so as to resemble the body and neck of a bird, while the limb, in that state, resembles the head and beak thrown back upon the body, as a pelican when that bird is at rest, whence the name" (Hook. in B.M. vol. 74): the great expanded cordate-ovate limb several inches across, wavy-margined, purple-blotched and veined, terminating in a long and slender ciliated tail: strong-scented. W. Ind., Cent. and S. Amer. B.M. 4368–9. B.R. 28:60. F.S. 4:351–2. G.F. 3:597–9. A.F. 10:157. G.C. III. 19:73. Gng. 3:23. Gn. 50:378. Var. **Stürtevantii,** W. Watson, is the form chiefly known in cult., being very large-fld., and with a tail 3 ft. long. Var. **Hookeri,** Duchartre (*A. gigantèa*, Hook.), is glabrous, inodorous, with a short-tailed fl. B.M. 4221.

141. Aristolochia grandiflora.

Goldieàna, Hook. Glabrous: lvs. ovate-cordate or triangular-cordate, acuminate, the base deeply cut: fls. very large, greenish outside but brown-veined and blotched inside, the lower part of the tube straightish and 8 in. long, the upper part sharply bent over and a foot long, with a funnel-shaped, spreading limb a foot or more across, and indistinctly 3-lobed, each lobe terminated by a short tail: stamens 24. W. Afr. B.M. 5672. G.C. III. 7:521; 21:337. G.M. 1890:286.

élegans, Masters. Slender, glabrous, the fls. borne on the pendulous young wood: lvs. long-stalked, reniform-cordate, 2–3 in. across, with wide sinus and rounded basal lobes, the tip obtuse: fls. solitary, long-stalked, the tube yellow-green, 1½ in. long, the limb cordate-circular, 3 in. across, purple and white blotched, white on the exterior, the eye yellow; not strong-smelling. Braz. G.C. II. 24:301; III. 22:123. B.M. 6909.—A small-fld. and graceful, free-blooming species.

A. altissima, Desf. Fls 2 in. or less long, brownish. Sicily and Algeria. Would probably be hardy with protection in the Middle states. B.M. 6586.—*A. anguicida*, Jacq. Lvs. long-cordate: fls. small, 1–2 in. long, with a long-pointed limb. New Granada. B.M. 4361. F.S. 4:344.—*A. barbata*, Jacq. Lvs. oblong and cordate: fls. 2½ in., purple. Venezuela. B.M. 5869.—*A. caudata*, Booth=A. macroura.—*A. ciliàta*, Hook., and *A. ciliòsa*, Benth.=A. fimbriata.—*A. clypeàta*, Lindl. & André. Lvs. triangular-ovate, pointed: fls. with a large, oval, purple-spotted, tailless limb. S. Amer. I.H. 17:40. B.M. 7512.—*A. Duchartrei*, André=A. Kuiziana.—*A. fimbriàta*, Cham. Lvs. small, cordate-orbicular: fls. small, the little limb glandular-ciliate. Braz. B.M. 3756 (as A. ciliata).—*A. hians*, Willd. Lvs. round-cordate: fls. bronze-green, with lobed limb and a hairy beak. Venezuela. B.M. 7073. Allied to A. Brasiliensis.—*A. Kæmpferi*, Willd. Tall-climbing: lvs. ovate-cordate or hastate, variable: fls. solitary, tomentose, with narrow rim, yellow outside, purple inside. Jap. Probably hardy in the N.—*A. longicaudata*, Masters. Lvs. ovate and cordate: fls. cream-colored with purple markings, with a large sac-like tube, hairy at the throat, with no expanded limb but a very long tail. S. Amer. G.C. III. 8:493.—*A. longifolia*, Champ. Branches climbing, from a woody rootstock: lvs. thick, linear-lanceolate: fls. U-shaped, with a 2-lobed purple limb 2½ in. across. Hong Kong. B.M. 6884.—*A. macroura*, Gomez. Lvs. reniform, lobed: fl. dark, 6-spurred, the lip with a twisted cusp. Braz. B.M. 3769 (as A. caudata).—*A. odoratissima*, Linn. Lvs. cordate-ovate: fl. solitary, purple, sweet. Jamaica.—*A. ringens*, Vahl. Lvs. round-reniform: fl. 7–10 in. long, green marked with dark purple, hairy inside, with 2 long lips, one of which has a much-expanded limb. Braz. B.M. 5700.—*A. Kuiziana*, Duchartre. Lvs. reniform-cordate: fls. with tube 1 in. or less long, the cordate-ovate limb 3 in. across, and brown-spotted. Braz. B.M. 5880 and G.C. 1868:516 (as A. Duchartrei).—*A. saccata*, Wall. Lvs. long-ovate: fls. small, U-shaped, with a very narrow rim (suggesting the "Dutchman's Pipe"), red. India. B.M. 3640.—*A. Salpinx*, Masters. Lvs. ovate-lanceolate: fls. small, with a trumpet-shaped, somewhat 2-lipped mouth, purplish. Paraguay. G.C. II. 26:457.—*A. triexandata*, Lem. Lvs. oblong-acuminate, rugose, ciliate: fls. purple, with 3 long tails. Mex. I.H. 14:522. R.B. 20:37. B.M. 6067.—*A. unguifolia*, Masters. Lvs. 3-lobed: fls. small, brownish and reddish, with a ciliate, tongue-like lip. Borneo. G.C. II. 14:117. B.M. 7424.—*A. Westlandii*, Hemsley. Lvs. oblong-lanceolate: fl. pendulous, with a spreading purple-marked limb 5 or 6 in. across. China. B.M. 7011

L. H. B.

ARISTOTÈLIA (after the Greek philosopher *Aristotle*). *Tiliàceæ*. Trees and shrubs from the southern hemisphere, allied to Elæocarpus. Lvs. nearly opposite, entire or toothed: fls. polygamous; sepals 4–5, valvate; petals of the same number: berries small, edible.

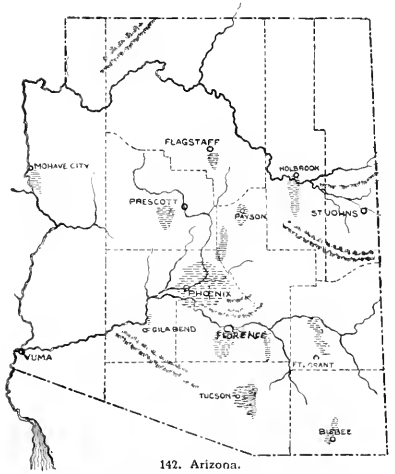
racemòsa, Hook. f. Small tree, 20 ft.: lvs. glossy: fls. white. New Zeal. Cultivated somewhat in southern California.

ARIZONA. In no part of Arizona, with the exception of occasional areas of a few acres in extent on the high mountains, is there sufficient rainfall to grow horticultural plants without irrigation. The rivers of Arizona available for irrigation on an extended scale are confined to the southern half of the territory. All of northern Arizona is drained by the Colorado River and its tributaries, but here the river lies at the bottom of a deep canon, and is practically valueless in its application to horticulture. All of this region has very limited possibilities from a horticultural standpoint, the flow of the few available streams being small and very uncertain. On the many mountain ranges of Arizona, at an elevation varying from five thousand to eight thousand feet, are isolated areas of limited extent where crops of great variety are grown without irrigation. Although these areas are utilized largely for growing hay, grain and hardy vegetables, some of the best flavored and choicest apples, peaches and small fruit grown in the territory are from these mountain "garden patches." The mountains at every side temper the climate, offer protection from winds, and make them almost ideal localities for the growing of a great variety of deciduous and small fruits, as well as many sorts of vegetables. Although these isolated, restricted areas are worthy of consideration, it is only in the valleys of southern Arizona having rivers of considerable size and regularity in their flow that large areas of land are available for cultivation. The shaded areas on the map (Fig. 142) show the leading horticultural areas thus far developed.

One cannot get an adequate conception of the problems confronting the horticulturist in this region without first carefully considering the meteorological conditions of this, the most arid, the most desert-like part of the United States. At Phœnix and Yuma, two repre

sentative localities of southern Arizona, having the greatest horticultural possibilities, the average yearly rainfall is only 7 inches for the former and 3 for the latter. In general, the precipitation is during two distinct seasons. The heaviest, or summer rains, begin about the first of July and increase in frequency until August, the month of greatest precipitation during the year. The winter rains are at their maximum in December. With the exception of infrequent intervals during the rainy season, dews are unknown and fogs are of rare occurrence. On the other hand, from experiments conducted at Tucson, the evaporation is about 78 inches per year, reaching the maximum of 11 to nearly 13 inches during the month of June.

At Phoenix the mean temperature may range from 32.2° to 66°F. in Jan. It steadily increases till July, when it may range from 72° to 107°. It then steadily declines until the next Jan. The corresponding ranges at Yuma are 42°-65° for Jan., and 77° to 106° for July. The variation



142. Arizona.
The shaded parts show horticultural sections.
There is also a horticultural section about Yuma.

in temperature from day to night is frequently, in summer, from 25° to 40°F., while in winter it is even greater. The annual range, however, is not so great as it is in the northern states.

The intense heat and dryness of the atmosphere, with continuous sunshine and frequent scorching winds, not only draw the moisture in wonderful rapidity from irrigated fields, but the foliage of cultivated plants, save those with firm leaves, protected by thick epidermis, are overtaxed at times, and not infrequently the leaves wither and burn, even when the roots of the plants are well supplied with water. In some instances the difference of a few days in time of irrigating makes or loses the crop. At times, flooding at midday is disastrous, destroying the plants as effectually as if swept by fire. The temperature of water in irrigating ditches in midsummer often ranges from 85° to 92°F.

The rivers of Arizona draw their moisture from the wooded mountains, but as these mountains are snow-covered only during winter and early spring, as the summer advances their supply gradually becomes less and less until the beginning of the rainy season. Consequently the cultivation of all crops must lead toward great economy in the use of water during the months of May and June. All crops sown broadcast or in narrow drills are irrigated by flooding, while orchards, vineyards and crops grown in rows are usually irrigated by running the water through furrows. In either system it is imperative that the land be graded and thoroughly worked, in order to attain the best results in the distribution of water. The desert lands of Arizona, in their virgin state, are seldom suited for orchards, vineyards, gardening, etc. It is expedient to grow alfalfa for a few years before attempting to produce horticultural crops. Usually the virgin soil is deficient in humus and nitrogen, constituents which are most economically supplied by growing alfalfa. Many orchards and vineyards have failed in Arizona on account of being planted on virgin soil.

Market-gardening in Arizona is largely in the hands of the Chinese, who practice high culture, and keep their lands in a continual succession of crops. Cabbage and cauliflower must be grown as winter crops. For years it was thought that corn could not be successfully grown in southern Arizona. When planted in the spring, the excessive heat and dryness of June renders the pollen impotent, and a well-developed cob bearing a few scattered kernels of corn is the result. Experience has recently taught that most excellent, well filled corn may be grown, if planted in July and pollenized at the end of the rainy season.

Artificial fertilizers are seldom used in Arizona. In preparing the soil for nearly all vegetables, both in amateur and commercial methods of culture, it is thrown into high ridges and the seed sown in hills or drills on either side of the ridge a few inches below the summit. In irrigating, the water is run between the ridges, so that it reaches the hills or drills without covering them, and is allowed to run for a greater or less length of time, depending upon the ability of the soil to take water. In many of the heavier adobe soils it is necessary, when planting melon and many other seeds, to cover them with sand. If the adobe soil of the field is used as a cover, it bakes so hard that the germinating seeds are unable to make their way to the surface. Beets, and occasionally other vegetables, when planted on an extended scale, are sown in drills without ridging the soil. After planting, furrows are made between the rows in which to run the water, it being imperative that the water be not allowed to break through the furrows and flood the crop.

In fruit-culture, the important principle is practically the same for all fruit, it being essential to fill the ground with water during the winter season, when the ditches are running full, and by thorough tillage during spring and early summer to retain the moisture, to fortify the plants against the lack of water in May and June. Orchards and vineyards may be flooded several times during the winter, or the same or better results may be obtained by making furrows at a distance of every 4 to 6 feet throughout the orchard, and running a subsoil plow in the furrows to loosen and break up the soil to considerable depth. When so prepared, the soil will take water with great avidity, and if the process be repeated two or three times during the winter, water required for subsequent culture will be much lessened.

In orchards and vineyards, frequent irrigation with little water is expensive and results are unsatisfactory. The ground should be thoroughly wet throughout, even between the rows, and as soon as practicable after irrigating, tilled and later leveled by using a fine-toothed harrow. This process will leave a mulch of loose earth a few inches in thickness over the moist soil, and assist greatly in retention of moisture. When necessary to improve the condition of the soil by adding plant food, it is most economically and satisfactorily accomplished by green-manuring, growing the crop during the fall and winter and turning it under in the spring.

Great variation in temperature during February and March is very disastrous to successful fruit and nut culture in southern Arizona. Almonds begin to bloom in February, and are followed in succession by apricots and peaches, all of which are likely to be injured by spring frosts.

In humid regions, methods of pruning tend toward thinning out the center of the tree, so that the sun may reach the fruit spurs within. In Arizona fruit trees are usually headed low, in order that the trunk be shaded. Deciduous trees are usually cut back annually, throwing the fruit spurs toward the center of the tree, that as much as possible of the developing fruit be shaded by

the foliage. Citrous, olive and fig trees are rarely if ever pruned, and grapes are usually cut back to two or three buds. Among small fruits, strawberries, although producing the larger part of their crop during April or May, ripen fruit every month of the year.

The following is a brief list of the best and most profitable commercial varieties of the more important fruits and nuts grown in the irrigated regions. The list is compiled from the answers to a circular letter sent to 60 of the largest fruit-growers in southern Arizona:

Almonds.—Ne Plus Ultra, IXL.
Apples, early.—Early Harvest, Early Strawberry, Red Astrachan.
Apples, late.—White Pearmain, Ben Davis.
Apricots, early.—Bennet's Early, New Castle, Peach, Pringle.
Apricots, late.—Moorpark, Royal Smith's Triumph, St. Ambroise.
Blackberries.—Lawton's Early, Crandall's Early, Early Harvest.
Dewberries.—May's.
Grapes.—Thompson's Seedless, Sultana Seedless, Rose of Peru, Salem, Muscat, Rogers' No. 9.
Grape Fruit.—Triumph, Walter, Bowin.
Lemons.—Villa Franca, Sicily.
Mulberries.—Downing, Russian.
Olives.—Manzanillo, Nevadillo Blanco, Mission.
Oranges.—Ruby Blood, Jaffa, Parson's Brown, Mediterranean Sweet, Bahia (Washington Navel).
Peaches, early.—Early Crawford, Parson's Early, Triumph, Sneed, Strawberry.
Peaches, late.—Elberta, Salway, Oldmixon, Heath's Freestone, Muir, December Cling.
Pears, early.—Wilder, Brandywine, Bartlett.
Pears, late.—Winter Nelis, Pia Berry.
Plums.—Wickson, Kelsey, Botan White, Royale Hative.
Pomegranates.—Ruby, Sweet, Red Papershell (?), Golden.
Quinces.—Champion, Portugal, Orange.
Strawberries.—Arizona Everbearing.

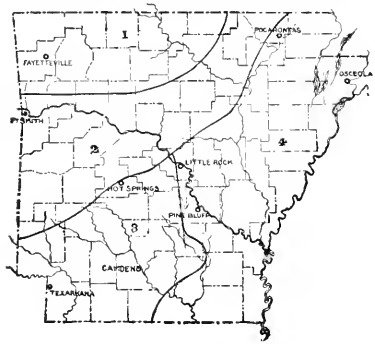
J. W. TOUMEY.

ARKANSAS. The horticultural products of Arkansas are varied, owing to the great differences of climate, elevation and soil. The seasons in the southern part of the state are about three weeks earlier than in the northern. There is much variation between nearby points. In the western part of the state, owing to the difference in altitude, within a distance of 60 miles there is from a week to 10 days difference in the seasons. This admits of a great diversity of fruit and vegetable production within the limits of the state.

The northwestern section of the state is noted for its fine apples, and they are grown extensively for market. This section has also produced a number of seedling apples that are being largely planted there as well as elsewhere. There are several of these new apples, and others of value are constantly coming into notice. A few of those of special value are Arkansas, Oliver, Collins, and Givens. It is probable that some of these new apples will become standard varieties, for in addition to being productive they are good keepers. Winter apples are not grown so extensively in other sections of the state, but summer and fall varieties are grown to some extent in all sections.

Peaches are grown for market along the lines of railroad in the western section of the state, and the acreage is being largely increased each year. For market-table purposes the Elberta is grown almost exclusively, and is shipped in car lots to the northern markets. The earlier varieties have not proved profitable for shipping purposes. Peaches are grown for home market throughout the state. Strawberry-growing is an important industry in western Arkansas, and is carried on to some extent in many localities in the eastern and southern parts, where they are grown in small quantities for shipment. The acreage around some of the shipping points in the western part is large, reaching about three thousand acres at one point. The varieties grown most extensively are Michel and Crescent. Owing to the strict laws against the selling of wine in the state, grape-growing is not carried on to any great extent. On the elevated sections the table and wine grapes succeed well, and in some localities table grapes are grown for shipment. The Scuppernong succeeds in south Arkansas. Pears are grown in some sections for market, but not to any great extent, owing to the prevalence of pear blight, while blackberries and raspberries are grown for the home market in most sections. Cherries are grown only for the home market, the Morello type alone being successful.

In order to describe more accurately the horticultural condition of the state, we have divided it into four sections, in the order of their present development and their natural adaptability to horticultural productions (Fig. 143). Section 1, located in the northwestern part of the



143. The horticultural zones of Arkansas

state, is a mountainous country, fairly well developed, and is adapted to all classes of horticulture. Section 2, located south of section 1, is partly mountainous and partly low land and, from a horticultural standpoint, is not so well developed as section 1, while in sections 3 and 4, located in the extreme southern and eastern parts of the state, horticulture has received little attention.

SECTION 1.—The elevation of this section ranges from 800 to 2,000 feet, the greater portion being about 1,200 feet. The country is mostly uneven, and parts of it are somewhat mountainous. The Ozark Mountain system enters the state from the northwest, while the Boston Mountains, a range of this system, extend across the section just north of and parallel with its southern boundary. Fruit and vegetables are grown for shipping along the lines of railroad in the western part. The remainder of this section, although remote from railroads, is well adapted to fruit-growing, and with transportation facilities it promises to be equally productive. The apple leads as a fruit product. In 1897, there were shipped from the western part, principally from two counties, over 2,000 cars of apples.

SECTION 2.—The elevation of this section ranges from 300 to 2,820 feet, the greater part of it, however, ranging from 300 to 800 feet. Most of this section consists of rough land. Strawberries are grown for shipment, principally in the western part. The berries ripen early in this locality, and the growers usually begin shipping the latter part of April. At a few points, peaches are extensively grown for shipment. Plums, blackberries, raspberries and summer apples are grown to some extent in all localities, while winter apples are successfully grown on the higher land. Here, vegetable-growing for the northern markets is receiving much attention. Such crops as beans, peas, tomatoes and cantaloupes are extensively grown in some localities along the railroads. The area in cantaloupes reaches nearly 1,000 acres at some of the shipping points. These crops can be grown early enough to bring good prices in the markets of the north, and are shipped in car lots.

SECTION 3.—This section is mostly low, but the land is uneven, and much of it is adapted to fruits and vegetables. It ranges in elevation from 140 to 360 feet. Peaches and summer apples succeed on the higher land, and are grown to some extent in all localities. Vegetables can also be successfully grown, but little attention has been given to these lines of farming here. Strawberries are grown only for home market.

SECTION 4.—This section comprises the low lands of the eastern part of the state. It ranges in elevation from 130 to 350 feet, and the land is low and flat, with the exception of a ridge a few miles wide running through it north and south. But little fruit is grown in this section for commercial purposes; however, fruits could be grown successfully for market in some parts of it, and early vegetables are now grown for market at several points. JOHN T. STINSON.

ARMENÌACA. See under *Prunus*.

ARMÈRIA (an old Latin name). *Plumbaginàceæ* SEA PINK. THRIFT. Small perennial herbs, with rosettes of narrow evergreen lvs, on the ground, sending up a naked simple scape 2–12 in. high, on which is borne a compact head of pink, lilac or white fls., the head being subtended by small bracts, forming a kind of involucre. Species much confused. They are excellent for borders, especially where a low edging is wanted; also for rockwork. They are of easiest culture, being hardy and free growers. Prop. by division of the stools; also by seeds. See Boissier, in DeCandolle's Prodromus, vol. 12.

A. *Calyx-tube pilose all over.*

maritima, Willd. Lvs. linear, 1-nerved, somewhat obtuse, glabrous or slightly ciliate: scape low, somewhat villose; calyx-tube about the length of the pedicel, the limb nearly equal to the tube, with very short ovate and aristate lobes. Eu. and Amer., along the sea coast.—The *A. vulgàris* of horticulturists seems to belong here. *A. Lauchèana,* Hort., with very bright rose-colored fls., is a form of it. Var. *álba,* Hort., has white fls. Also a white-lvd. form. *A. argéntea,* Hort., is perhaps another form, with small white fls.

Sibírica, Turcz. Lvs. linear, 1-nerved, obtuse, glabrous: scape rather taller, thicker; calyx-tube longer than pedicel, the limb about length of tube, with triangular, short-mucronate lobes: involucre brown: fls. white. Siberia.

júncea, Girard (*A. setácea,* Delile). Outer lvs. of rosette narrow-linear and subdentate, the inner ones longer and filiform: head small, with pale involucre, the pedicel much shorter than the calyx-tube: calyx-limb short, the lobes ovate-obtuse and aristate: fls. pink. Eu.

AA. *Calyx-tube glabrous, or pilose only on the ridges.*

B. *Lvs. elliptic-lanceolate or broader.*

latifólia, Willd. (*A. cephalótes,* Link & Hoffm., not Hook.). Glabrous and glaucous: lvs. broad-oblong, 5–7-nerved, the margin remotely denticulate: head large, the involucre dry: calyx-limb long, with very small or no lobes and long teeth: fls. bright pink. S. Eu. B.M. 7313. P.M. 11:79 (as *Statice Pseudo-Armeria*).—*A. formòsa,* Hort., probably belongs here.

Mauritánica, Wallr. (*A. cephalótes,* Hook., not Link & Hoffm.). Lvs. broad-spatulate or elliptic-lanceolate, 3–5 nerved, glaucous-green, the margin scarious-white: heads large (2–3 in. across), the involucre brownish, the calyx short-toothed and aristate: fls. pink. Eu., Algeria. B.M. 4128.

BB. *Lvs. linear-lanceolate or narrower.*

alpina, Willd. Glabrous: lvs. linear-lanceolate, equaling the scape, 1-nerved or obscurely 3-nerved: head large, the involucre pale brown: pedicels shorter than calyx-tube, the tube equaling the oblong long-aristate lobes: fls. deep rose. Mts., Eu.

elongàta, Hoffm. Lvs. linear, long, 1-nerved, acutish: involucre white: pedicels as long as calyx-tube, limb equaling the tube, and the lobes ovate-aristate: pink. Var. **purpùrea,** Boiss. (*A. purpùrea,* Koch), has purple heads. Central Eu.

plantaginea, Willd. Glabrous: lvs. linear-lanceolate, 3–7-nerved, acute or acuminate: scape tall: head dense and globular, the involucre white: pedicels as long as calyx-tube, the lobes ovate and long-aristate and as long as tube: pink. Central and S. Eu. Var. **leucántha,** Boiss. (*A. dianthoìdes,* Hornm. & Spreng.), has white flowers.

argyrocéphala, Wallr. (*A. undulàta,* Boiss.). Glabrous: outer lvs. in rosette, short and lanceolate or linear-lanceolate and 3-nerved and often sinuate, the inner ones linear or setaceous and 1–3-nerved: head large, the involucre white: pedicel nearly as long as calyx-tube, the calyx-limb with long-triangular aristate lobes: fls. white, showy. Greece. L. H. B. and J. B. KELLER.

ARMERIÁSTRUM. See *Acantholimon*.

ARNATTO. See *Bixa*.

ARNÈBIA (Arabic name). *Boraginàceæ.* Annual or perennial hispid herbs, of nearly 20 species in Africa and Asia. Lvs. alternate: fls. yellow or violet, in racemes or cymes, the color changing with the age of the blossom; corolla slender-tubed, with 5 obtuse lobes.

echioìdes, DC. (*Macrotòmia echioìdes,* Boiss.). PROPHET-FLOWER. Hardy perennial, 3–12 in. high, short-hairy, with spreading, obovate-oblong lvs.: fls. in a scorpioid raceme or spike, yellow, with purple spots, fading to pure yellow. Caucasus, Armenia, etc. B.M. 4409. G.C. II. 11: 689.—Blooms in spring. In full sun or in rather dry ground, it is difficult to keep this charming plant in a healthy condition; partial shade is essential to its welfare. One can grow luxuriant specimens on the northern slope of a rockery or close to a building on the east or north side. Prop. by seeds, division, or by root-cuttings.

cornùta, Fisch. & Meyer. ARABIAN PRIMROSE. Annual, 2 ft., bushy: lvs. lanceolate or linear-oblong, pointed: fls. $^3/_4$ in. across, yellow and black-spotted, changing to maroon and then to yellow. Orient. G.C. III. 7: 52. J. H. III. 31: 29. A. F. 5: 400. A. G. 44: 181 (1890).—An attractive and not very common annual, easily grown in the open.

A. Griffithii, Boiss. Annual: lvs. narrow-oblong, obtuse, ciliate: fls. long-tubed, with a black spot in each sinus: 9–12 in. India. B.M. 5206.—Not known to be in the American trade

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

ÁRNICA (ancient name). *Compósitæ.* Small genus of perennial herbs, with clustered root-lvs. and large, long-peduncled yellow heads. Native to Eu., Asia, and N. Amer.—Tincture of the European *A. montana* is used in medicine. Grown mostly as alpines or in rockwork; some species also grow fairly well in the common border. Prop. by division, and rarely by seeds.

A. *Radical lvs. cordate, with slender or winged petioles.*

cordifólia, Hook. Two ft. or less high, hairy: heads few or even solitary, with inch-long rays; involucre $^2/_3$ in. high, pubescent. Rocky Mts. and W.

latifólia, Bong. Glabrous or very nearly so, the stem-lvs. not cordate or petioled: heads smaller than in preceding. Rocky Mts. and W.

AA. *Radical lvs. not cordate, but petioled.*

amplexicáulis, Nutt. Glabrous or nearly so: lvs. ovate to lance-oblong, acute, those on the stem clasping and dentate: stem leafy to the top. Oregon and N.

foliósa, Nutt. Pubescent: lvs. lanceolate, strongly nerved, small-toothed, the upper ones somewhat clasping: heads sometimes solitary, short-peduncled: stem leafy, strict. Rocky Mts. and W.

montàna, Linn. MOUNTAIN TOBACCO. MOUNTAIN SNUFF. A foot high, the stem sparsely hairy: radical lvs. oblong-lanceolate, glabrous and entire: heads 3–4, large. Eu. B. M. 1749. J. H. III. 34: 441.—The best known species in cult.; but none of the Arnicas are common in American gardens. L. H. B.

ARÒIDEÆ, or ARÀCEÆ. AROIDS. A large order of spathe-bearing, tuberous herbaceous plants, containing many of the most highly prized greenhouse plants. The culture of Aroids is too diverse to be given in any one place. See the leading genera, as *Aglaonema, Alocasia, Anthurium, Arisæma, Arum, Caladium, Colocasia, Dieffenbachia, Dracunculus, Helicodiceros, Homalomena, Monstera, Philodendron, Richardia, Schizmatoglottis, Spathiphyllum, Xanthosoma,* etc.

ARÒNIA. See *Sorbus*. *A. alnifolia*, Nutt. = Amelanchier alnifolia.

ARPOPHŸLLUM (*Cimiter* and *leaf*). *Orchidàceæ*, tribe *Epidéndreæ*. Epiphytes: racemes dense, cylindrical, erect: lvs. strap shaped or linear, on jointed, terete stems; fls. small, inverted; segments concave. —Orchids of minor importance. Consult *Epidendrum*.

gigantèum, Lindl. Plants robust; sts. about 10 in. high; lvs. coriaceous, strap-shaped; peduncle stout; raceme several in. long; fls. numerous, pink-purple. Mex.—Give plenty of light.

spicàtum, Llave et Lex. Smaller than the above: lvs. linear: fls. paler. B M. 6022.

ARROW-ROOT. An edible starch, obtained from the rhizomes of various scitaminaceous plants, as Maranta, Curcuma, Tacca, Canna. The West Indian Arrow-root is mostly from *Maranta arundinacea*, Linn. The Brazilian is from *Manihot utilissima*, Pohl. The East Indian is chiefly from *Curcuma angustifolia*, Roxbg. Potato and maize starches are also a source of Arrow-root. Arrow root is also obtained from Manihot.

ARTABÒTRYS (*suspend grapes*, alluding to the hanging fruit). *Anonàceæ*. About 25 tropical climbing shrubs, with 3-sepaled and 6-petaled solitary or fasciculate fls., and shining evergreen foliage.

odoratíssimus, R. Br. Lvs. oblong or lanceolate, pointed, thick, dark glossy green: fls. brownish, very fragrant: hooks on the peduncles. E. Ind. B.R. 423.—Hardy in S. Fla. and S. Cal., and somewhat cult. The ylang-ylang perfume is made from the fls. The lvs. are used in native medicine.

ARTEMÍSIA (*Artemisia*, wife of Mausolus). *Compósitæ*. A large genus of aromatic herbs and small shrubs, mostly in the northern hemisphere, and most abundant in arid regions. Lvs. alternate, often dissected: heads small and mostly inconspicuous, numerous, and generally nodding, with yellow or whitish florets. In the West, many of the species, particularly *A. tridentata*, are known as *Sage Brush*. Grown for their medicinal properties or for foliage effects. The cult. kinds are perennials, and thrive in the most ordinary conditions, even in poor and dry soil. Prop. mostly by division. For an account of the species, see Besser, in DeCandolle's Prodromus, vol. 6, and Gray, in Synoptical Flora, vol. 1, part 2.

A. *Heads with two kinds of florets (heterogamous).*

B. *Disk-fls. with both stamens and pistils, but the ovary abortive (not producing seed): style usually entire.*

Dracúnculus, Linn. TARRAGON. ESTRAGON. Herb; green and glabrous, with erect, branched stems 2 ft. high: radical lvs. 3-parted at the top; stem-lvs. linear or lanceolate, entire or small-toothed: panicle spreading, with whitish green, nearly globular fl.-heads. Eu. R.H. 1896, p. 285.—Tarragon lvs. are used for seasoning, but the plant is little grown in this country. The lvs. may be dried in the fall, or roots may be forced in a coolhouse in the winter. Prop. by division; rarely produces seed.

Canadénsis, Michx. Herb, 2 ft. or less high, glabrous or very nearly so: lvs. usually 2-pinnate, with filiform, plane lobes: fls. in a long, narrow panicle, with numerous small greenish heads. Wild on banks and plains in the northern part of the country. Int. 1891.

filifòlia, Torr. Shrubby, canescent, 3 ft. or less high, very leafy, the branches rigid: lvs. filiform, the lower usually 3-parted: panicle long and leafy. Plains, W.—Plant has a purplish, mist-like aspect when in fruit.

BB. *Disk-fls. perfect and fertile: style 2-cleft.*

C. *Receptacle hairy.*

frígida, Willd. Herb, 8-12 in., with a woody base, silvery canescent: lvs. much cut into linear lobes: heads small and globular, with pale involucre, in numerous racemes. Plains and mountains W. Int. 1883.—Good for borders. Known in Colo. as "Mountain Fringe," and used medicinally.

Absínthium, Linn. WORMWOOD. Almost shrubby, 2–4 ft. high, spreading and branchy, white-silky: lvs. 2–3-parted into oblong, obtuse lobes: heads small and numerous, in leafy panicles.—Wormwood is native to Eu., but it occasionally escapes from gardens. It is a common garden herb, being used in domestic medicine, especially as a vermifuge. Wormwood tea is an odorous memory with every person who was reared in the country.

argéntea, L'Her. Shrubby, erect: lvs. white-silky, 2-pinnate, the lobes linear or lanceolate: heads globular, tomentose, nodding, in racemose panicles; 1–2 ft. Madeira.—Useful for rockwork.

CC. *Receptacle not hairy.*

Abrótanum, Linn. SOUTHERNWOOD. OLD MAN. Shrubby, 3–5 ft., green and glabrous, the st. rather strict: lvs. 1–3-pinnately divided, the divisions filiform: panicle loose, with yellowish white heads. Eu. —Southernwood is grown for its pleasant-scented foliage; and it sometimes escapes into waste places.

Póntica, Linn. ROMAN WORMWOOD. Shrubby, erect, 1–4 ft.: lvs. canescent below, pinnatisect, the lobes linear: panicle open and long, with small, globular, nodding, whitish yellow heads. Eu.—Roman wormwood is used for the same purposes as *A. Absinthium*, and is more agreeable. Chief source of absinthe.

vulgàris, Linn. MUGWORT. Herb, erect, paniculately branched: lvs. white-cottony beneath but soon green above, 2-pinnately cleft, with lanceolate lobes: upper lvs. sometimes linear. heads many, oblong, yellowish. Eu. and northern N. Amer., and naturalized in E. states.—Mugwort is grown for the ornament of its foliage. There are variegated-leaved and golden-leaved varieties. It was once a domestic remedy. Variable.

Stelleriàna, Bess. OLD WOMAN. Herb, 2 ft., from a woody creeping base, densely white tomentose: lvs. pinnatifid, with obtuse lobes: heads large and many-fld., in a racemose-glomerate inflorescence. N. E. Asia and on the coast of Mass.—Attractive from its whiteness. Useful for borders.

Ludoviciàna, Nutt. Herb, 2–3 ft., white-tomentose or lvs. becoming greenish above: lvs. linear to oblong, the lower ones toothed or parted, the upper ones entire: heads small, bell-shaped, paniculate. Plains and banks, W. Int. 1891.

AA. *Heads with perfect fls. throughout: receptacle not hairy.*

arbúscula, Nutt. SAGE BRUSH. Shrubby: a foot or less high: lvs. short, wedge-shaped, 3-lobed, the lobes obovate and often 2-lobed, canescent: panicle simple and strict, often spike-like, the 5–9-fld. heads erect. Plains, W.

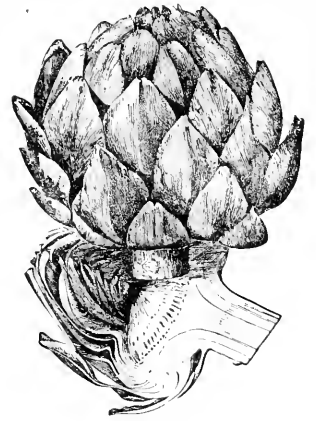
tridentàta, Nutt. SAGE BRUSH. Shrubby; reaching height of 12 ft., although often only a foot high, branchy, canescent: lvs. wedge-shaped, 3–7-toothed or lobed, truncate at the summit, the uppermost ones narrower: heads 5–8-fld. Plains, W. Int. 1881.

L. H. B.

ARTICHOKE (*Cynàra Scólymus*, Linn.). *Compósitæ*. A coarse and robust perennial, cult. for the edible fl.-heads and lvs. The fl.-heads are 3–5 in. across just before they open, and at this stage they are cut for the table. The fleshy outer scales and the "bottom" of the head (this is, the receptacle, the florets being removed) are eaten raw or cooked. When the blue florets begin to show, the head is too old for eating. Fig. 144 shows edible heads. For pickling, the heads are often taken when only half grown. The young sts. and lvs. are sometimes blanched and eaten, after the manner of cardoons; and these parts comprise the "Artichoke salad" of the markets. There are a score or more varieties in European gardens, but the Globe is the one generally sold here.

Although the Artichoke is perennial, the plant declines in vigor after it has borne two or three crops. In the N. the plants should be protected in winter with a liberal mulch. Artichokes are of easiest culture on rich soil. As they grow 3–5 ft. high and branch freely, and make lvs. 3 ft. long, they should not be set nearer than 2 or 3

ft. in the rows, and the rows should be 4 or 5 ft. apart. In this country, the plant is propagated mostly by seeds. These are sown early in the spring. Seedlings rarely



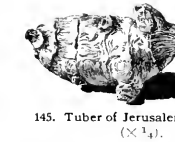
144. Edible heads of Artichoke (× ⅓).

give many heads before the second year. A quicker and better method of propagation is to use the suckers, which are freely produced about the crown. The suckers reproduce the variety. The Artichoke is little known in America, but is worthy greater attention. The habit of propagating by seed is, perhaps, one reason why the Artichoke has not obtained greater prominence in this country. The great woolly, pinnatifid lvs. and strong habit make the plant an attractive ornamental subject. See *Cardoon*.

L. H. B.

ARTICHOKE, JERUSALEM (*Helianthus tuberosus*, Linn.). *Compositæ*. While the Globe Artichoke is seldom seen in American gardens or on American tables, and surely not appreciated by our people, the Jerusalem Artichoke is so common as to be despised as a weed. The Jerusalem Artichoke is the tuber of a perennial sunflower-like plant. (Fig. 145.) It thrives on almost any drained land, without much attention as to manuring, and without coddling. The tubers may be cut to single eyes and planted like common potatoes. The cultivation is about the same as that usually given to corn or potatoes. Any time in the fall after frost has killed the tops, or the latter have matured, the crop can be gathered. Pull up the whole plant by the roots, or dig the tubers with a potato hook or prong hoe. Or, swine may be turned into the field and allowed to root up and feed on the tubers. All kinds of farm animals seem to be fond of them. They may be ground and fed, mixed with ground grains, to poultry with good results. As a succulent food for cattle, sheep, swine, and perhaps other farm stock, this tuber seems to deserve more general attention on the part of the American farmer than it has usually received. It is far ahead of the potato in productiveness, and much more cheaply grown. Raw or boiled and served with vinegar, the tuber also makes a very good winter or spring salad, and for this purpose it may find a limited sale in our markets. The chief demand for it will be for seed purposes. The easiest way of keeping the crop over winter is by leaving the tubers in the ground where they grew, as they are not hurt by frost when covered with soil. Tubers already gathered can be pitted like beets or turnips, but will need even less covering of soil. The Mammoth White French is said by some propagators to be an improved strain of the ordinary or Jerusalem Artichoke. The plant often becomes a weed; but hogs will root it out. The plant is native to upper Canada and middle parts of the U. S. It was cult. by the Indians. See *Helianthus*.

T. Greiner.



145. Tuber of Jerusalem Artichoke (× ¼).

ARTOCARPUS (*artos*, bread, and *carpos*, fruit). *Urticàceæ*. Bread Fruit. Tropical fruit plants, originally from the East Indies, sometimes cult. with difficulty in northern botanic gardens for their great economic interest. They need a hot, moist atmosphere, much water, and perfect drainage. Prop. slowly by cuttings of young lateral growth. The fruits do not bear shipment to the N.

incisa, Linn. f. Bread Fruit. Tree, 30–40 ft., with a viscid, milky juice; branches fragile; lvs. 1–3 ft. long, leathery, ovate, cuneate and entire at base, upper part 3–9-lobed; male fls. in a dense club-shaped yellow catkin, 10–16 in. long; female fls. in a subglobular echinate head, having a spongy receptacle; fr. as large as a melon, typically muricated, but in the best cult. varieties reticulated only, and seedless. Gt. 39, p. 273. Gng. 5: 233, and B.M. 2869–71, where the romantic story of its transfer to the West Indies is told. Sparingly cult. in S. Fla.

integrifolia, Linn. f. Jack Fruit. Tree, 30 ft., with milky juice: lvs. 4–6 in. long, very various; those of fertile branches nearly obovate, entire; those of higher branches more obovate and oblong; those of young shoots from the root very narrow, or 2–3-lobed; fr. attaining a weight of 60–70 lbs. Less palatable than the bread fruit. The oily seeds when roasted are said to resemble chestnuts. G. C. III. 20: 717. B. M. 2833–4. Gt. 39, p. 273. Gn. 35: 455.

Cannonii, Bull. Lvs. varying from cordate to deeply 3-lobed, 1 ft. long, red beneath, bronzy crimson and purple above, very showy. Society Is. F.S. 21: 2231–2.

ARUM (ancient name). *Aroìdeæ*. Tuber-bearing low herbs, of few species, in Eu. and W. Asia. Lvs. simple, the petiole sheathed at the base: spathe convolute, variously colored, mostly including the short spadix: pistillate fls. at the base. Grown usually as oddities, mostly under the general name of Callas. Some of the species are hardy; others, as *A. Palæstinum*, are tender, and require glasshouse treatment. The tender kinds are managed in essentially the same way as the fancy-leaved Caladiums. Plant the tubers sufficiently deep that roots may form from near the top. Give rich soil, and water freely when growing or in bloom. The hardy species should be well mulched in late fall. They thrive best in partially shaded places and in rich soil. Prop. by natural offsets; also by seeds or berries, which some species produce freely. Some of the species are acrid-poisonous. Monogr. by Engler in DeCandolle's Monographiæ Phanerogamarum, vol. 2.

The following names are in the American trade: *albispathum*, Nos. 5, 7; *alpinum*, 6; *Arisarum* = Arisarum vulgare; *Byzantinum*, 7; *Canariense*, 7; *concinnatum*, 7; *cornutum* = ?; *Corsicum*, 1; *crinitum* = Helicodiceros crinitus; *cylindraceum*, 7; *Cyprium*, 2; *detruncatum*, 3; *Dioscoridis*, 2; *Dracunculus* = Dracunculus vulgaris; *elongatum*, 5; *gratum*, 5; *immaculatum*, 6; *intermedium*, 6; *Italicum*, 7; *maculatum*, 6; *Mulyi*, 6; *marmoratum*, 7; *nigrum*, 5; *Nordmanni*, 5; *orientale*, 5; *Palæstinum*, 4; *pictum*, 1; *sanctum*, 4; *spectabile*, 2; *Syriacum*, 2; *ternatum* = Pinellia tuberifera; *variolatum*, 5; *vulgare*, 6; *Zelebori*, 6.

A. *Mature lvs. cordate, oblong-ovate.*

1. **pictum**, Linn. f. (*A. Corsicum*, Lois.). Lvs. appearing in spring, long-petioled, light green; spathe bright violet, swollen at the base; spadix purple-black, exceeding the spathe. Corsica, Balearica, etc.—Hardy.

AA. *Mature lvs. hastate or sagittate.*

B. *Tuber round-flattened or oblate, the lvs. and peduncles arising from a depressed center: lvs. appearing before the spathe.*

2. **Dioscoridis**, Sibth. & Smith (*A. spectábile*, Regel, *A. Syriacum*, Blume, *A. Cyprium*, Schott.). Leaf-

blade oblong-triangular or ovate-triangular: spathe tube pale within, the limb 6–8 in. long, lanceolate-oblong, and colored with large lenticular purple spots: spadix short, included. Asia Minor.—Runs into many forms, with variously marked spathes. Pots.

3. **detruncàtum,** Meyer. Lvs. more or less truncate at the base, the blade shorter than in the last: yellowish green and purple-spotted, large (10–15 in. long) and short-stalked, the limb acuminate. Persia.—Hardy.

146. Arum Italicum (× $\frac{1}{4}$)

4. **Palæstinum,** Boiss. (*A. sànctum,* Hort.). Black Calla. Solomon's Lily. Lvs. cordate-hastate, 6 in. broad across the base and about equal in length, the middle lobe broad-ovate and nearly blunt; spathe about the length of the leaf, with a short green tube, and an elongated lance-oblong-tapering limb, which is greenish on the outside and continuous black-purple within, the tip sometimes recurving; spadix shorter than the spathe, the upper part dark colored. Palestine. B.M. 5509. Gn. 45, p. 311.—Perhaps the most popular Arum at present, being grown in pots as an oddity.

5. **orientàle,** Bieb. A foot high: lvs. brownish, broadly hastate-sagitate, the front lobe oblong-acute: spathe tube oblong-ovoid and white within, the limb ovate to oblong and intense black-purple (rarely pale), resembling *A. maculàtum.*—A hardy species from Asia Minor, running into many forms. Some of the plants referred here are *A. nìgrum, variolàtum, Nordmanni, gràtum,* Schott.; *A. elongàtum* and *A. albispàthum,* Steven (not *A. albispathum,* Hort., which is *A. Italicum*).

BB. *Tuber ovoid or oblong, propagating horizontally, the lvs. and peduncles arising from the apex: lvs. appearing before or with the spathe.*

6. **maculàtum,** Linn. (*A. vulgàre,* Lam.). Lords-and-Ladies. Cuckoo Pint. Wake Robin (in England). About a foot high: lvs. usually black-spotted, hastate or sagittate, the front lobe triangular ovate, about as high as the spathe: the spathe swollen at its base, the margins of the lance-ovate limb becoming inrolled, spotted with purple: spadix shorter than the spathe, purple. Eu.—A hardy species, of many forms. A form with spotless lvs. and a whitish tube with a medial purple zone, is *A. immaculàtum* and *Zelebòri,* Schott. Var. **angustàtum,** Engler, has a narrow light-purple spathe (*A. intermèdium,* Schur. *A. Mìlyi,* Schott.). Var. **alpinum,** Engler (*A. alpìnum,* Schott. & Kotschy) has peduncles longer, and an ovate-lanceolate spathe.

7. **Itálicum,** Miller (*A. cylindràceum,* Gasp.). Fig. 146. Larger than the last: lvs. hastate, nearly truncate below, light-veined: spathe scarcely swollen below, the limb erect and not expanding and including the short spadix (tip sometimes deflexed after flowering). Yellowish or white and faintly striate. Eu. B.M. 2432.—A hardy species; also grown in pots. In the open, the lvs. appear in the fall. A very variable species. Var. **Canariénse,** Engler (*A. Canariénse,* Webb. & Berth.), has narrow leaf-lobes and spathe. Var. **concinnàtum,** Engler (*A. concinnàtum* and *marmoràtum,* Schott.), has broad gray-spotted lvs. Var. **Byzantinum,** Engler, (*A. Byzantìnum,* Schott.), has spathe tube oblong, white inside and purple at the mouth, and an acuminate purple or green limb. Var. **albispàthum,** Hort., has a white spathe.

L. H. B.

ARÙNCUS (old name). *Rosàceæ.* Tall perennial herbs, often referred to the genus Spiræa, with numerous small dioecious white fls. in panicled spikes: stamens many; pistils commonly 3. Two species, American and Japanese.

sylvester, Kost. (*Spiræa Aruncus,* Linn.). Tall (5–7 ft.), erect branchy herb: lvs. large, 1–2-pinnate, of 3–7 ovate lfts.: follicles deflexed in fr. Rich woods, N. Amer., N. Eu. and Asia.—A desirable hardy border plant of easy culture.

astilboides, Maxim. (*Spiræa Aruncus,* var. *astilboìdes,* Maxim. *S. astilboìdes,* Hort. *Astilbe astilboìdes,* Lemoine, Gn. 48, p. 355–6). Dwarfer and more graceful than the above (2 ft.): pedicels erect in fr. Japan.—Neater than the American species. See *Astilbe* for illustration.

L. H. B.

ARUNDINÀRIA. See *Bamboo.*

ARÙNDO (Latin, *reed*). *Graminèæ.* Tall leafy perennial grasses resembling bamboos, 5–15 ft. high, or even 30 ft. in favorable locations. Lvs. broad and gracefully arching: sts. leafy to near the top, terminating in an immense plume 1–2 ft. long: spikelets long and pointed.

Dónax, Linn. Giant Reed. Figs. 147, 148. Towering straight stems 8–30 ft. high, which grow very rapidly, clothed with broad, pointed leaves at regular intervals. Grown for lawn decoration and to conceal unsightly objects. In some countries used for laths, woven work and thatching, and the roots as a diuretic. The tall, showy plumes are reddish at first and last a long time. Mediterranean, Orient. Gn. 1, p. 391; 3, p. 493; 8, p. 199; 17, p. 407. P.G. 3:2. Var. **variegàta,** Hort. (var. *versicolor,* Hort.). Much dwarfer and less hardy than the type, usually 4–7 or even 12 ft. high, with elegant longitudinal stripes of creamy white and green. Gt. 39, p. 209. F.S. 14:1425. Var. **macrophylla,** Hort., has large, very glaucous lvs.

147. Arundo Donax.

conspícua, Forst. f. A rare and handsome form, bearing silky white fls., which are beautiful for months. Less hardy than *A. Donax,* and with narrower lvs. Lvs. 2–4 ft. long, very slender, involute, coriaceous, deeply channeled; upper surface, margins, and long, slender point roughish. N. Zeal. B.M. 6232. Gn. 18, p. 479; 49, p. 229.

P. B. Kennedy

Arundo Donax is one of the most popular of all grasses or hardy foliage plants, especially wherever the Pampas Grass is not hardy. Although it succeeds almost anywhere in borders, beds, and on lawns, it is really at home in moist soils and near the water. It is, therefore, one of the standard plants for striking aquatic effects. Prop. chiefly by division, or as follows: The ripe canes may be laid on damp moss during winter, and in a few months nearly every joint will sprout and form a small rooted plant. The canes may then be cut up and the young plants potted off singly, to be planted out the following spring.

J. B. KELLER.

148. Plume of Arundo Donax.

ÁSARUM (obscure name). *Aristolochiàceæ*. Low, nearly stemless herbs of a few species, but widely disseminated in N. Temp. zone, with odd purplish or brown fls. on the surface of the ground (or nearly so), underneath the heart-like or kidney-like lvs.: corolla wanting, but calyx corolla-like; stamens 12: ovary inferior. The Asarums inhabit rich, shady woods, spreading on the ground, and the fls. are unseen except by the close observer. They are of easy culture if transplanted to rich, moist places. They make attractive carpets in borders and groves. The species described below are sold by dealers in native plants. Some of the species are reported to have medicinal properties.

A. *Plant markedly pubescent.*

Canadénse, Linn. WILD GINGER. CANADA SNAKEROOT. Lvs. about 2 to a plant, thin, kidney-shaped, pointed, with a deep and open sinus, not mottled: fl. slender-stalked, with lance-acuminate calyx-lobes an inch or more across at the expanded mouth, chocolate-brown: style 6-lobed. Frequent in woods E. B.M. 2769. A.G. 13: 517. D. 279.

Hártwegi, Watson. Tufted, loose-pubescent: lvs. large and thick, cordate, with rounded basal lobes, mostly acute at the apex, margin ciliate, glabrous and mottled above: fl. stout-stalked, the lobes often ovate and long-pointed, the ovary inferior: styles 6. Sierra Nevadas, 4,000–7,000 ft. alt.

Europæum, Linn. Lvs. kidney-shaped, evergreen, dark green, the petiole 3–5 in.: fls. greenish purple, ½ in., with incurved lobes: styles 6, and grooved or 2-parted, recurved. Eu.

AA. *Plant slightly or not at all pubescent.*

candàtum, Lindl. Rather slender, with long root-stocks, sparingly pubescent: lvs. cordate-kidney-shaped, and more or less cupped or cucullate, acute: fls. slender-stalked, the calyx-lobes oblong and attenuate: styles united. Pacific coast.

Lémmoni, Watson. Like the last, but lvs. plane or flat, rounded at apex, less pubescent, calyx lobes short. Sierra Nevadas.

Virgínicum, Linn. Lvs. broad-ovate or orbicular, rounded at the top, the sinus narrow: fl. short-stalked, purple, the calyx-lobes broad and rounded: styles 6, 2-lobed; anthers not pointed. Va., S.

arifólium, Michx. Lvs. thickish and usually mottled, orbicular to hastate, obtuse: fl. stout-stalked, urn-shaped and much contracted at the throat: styles 6, 2-lobed; anthers pointed. Va., S.

L. H. B.

ASCLÈPIAS (ancient Greek and Latinized name). *Asclepiadàceæ*. MILKWEED. SILKWEED. Many herbs, mostly North American, generally with opposite or whorled lvs., milky juice, and umbels of odd fls. The fls. are gamopetalous, the corolla segments generally strongly reflexed; stamens 5, attached to the corolla, the anthers more or less united about the stigma; between the corolla and the stamens is a crown of five cornucopia-like appendages; pollen cohering into a waxy mass (pollinium), which is removed bodily by insects which visit the fl. The pollination of an Asclepias fl. is shown in Fig. 149. The pollen-masses are usually twin (as at *b*), and the handle or caudicle lies in a chink on the side of the stigma. The pollen-masses become attached to the legs or mouth parts of the insect, and are thereby transferred to another fl. The Milkweeds are common in waste places in N. Amer., and are rarely cult. Several species (described below) have been int. by dealers in native plants. The Butterfly-weed and some others are very showy and worthy of more general attention. The large-lvd. kinds are desirable when heavy foliage effects are wanted. They are all perennials of the easiest culture. Prop. by division, rarely by seeds. See Gray, Syn. Fl. N. Amer. 2., pt. 1 (which is here followed).

A. *Fls. (corolla and crown) orange.*

tuberòsa, Linn. BUTTERFLY-WEED. PLEURISY ROOT. Hairy, 2–3 ft. high, from long, horizontal roots, with more or less alternate, lance-oblong or lance-linear lvs.: umbels several, short-peduncled: pods pubescent, erect. Dry banks and fields; widespread, and not infrequent. B.R. 76. D. 223.—A handsome plant.

AA. *Fls. in shades of red or purple.*

Curassávica, Linn. Plant glabrous, 2 ft. or less: lvs. opposite and short-petioled, thin, oblong-lanceolate: corolla scarlet: pods glabrous, erect. Fla. and La. B.R. 81.

incarnàta, Linn. Glabrous or nearly so, leafy and branching, 3 ft.: lvs. opposite, oblong-lanceolate: corolla rose-purple to flesh color, with oblong lobes: pods glabrous, erect. B.R. 250. Var. **pùlchra,** Pers. Hirsute, and lvs. broader. Swamps.—Common.

AAA. *Fls. greenish, yellowish or white (sometimes purple-tinged, especially in A. quadrifolia).*

B. *Pods tomentose and soft-spiny.*

speciósa, Torr. (*A. Douglasii*, Hook.). Stem stout and simple, 3 ft. or less, fine-tomentose or becoming glabrous: lvs. large and broad, ovate, transversely veined, short-petioled: fls. purplish and large, the peduncle of the umbel shorter than the lvs. Neb. W. and S. B.M. 4413.

Cornùti, Decne. (*A. Syriaca*, Linn.). Differs from last in having obtuse and short hoods to the crown, taller, less pubescent: lvs. oblong or oval: fls. dull purple, in large, more or less nodding umbels. Mn. 7: 221.—The common milkweed of the E. states.

BB. *Pods glabrous and unarmed.*

c. *Fruiting pedicels decurved or deflexed, the pods erect or ascending.*

amplexicaùlis, Michx. Plant glabrous and glaucous: st. decumbent, 1–2 ft. long: lvs. numerous, cordate-ovate and clasping, obtuse, succulent: corolla green-purple. Barrens, N. Car. and S.

phytolaccoides, Pursh (*A. nivea,* Sims). Plant glabrous and green, 3–4 ft., erect: lvs. thin, oval to lance-oval, acuminate and short-petioled: fls. greenish, in large, loose umbels. Moist ground; frequent. B.M.1181.

149. Milkweed flower, showing pollination.

variegàta, Linn. Two ft. or less high: lvs. 3–7 pairs, oval, ovate or oblong, thinnish, green and glabrous above and pale beneath: fls. white and pink, in 1–3 umbels. Dry, shady places, Cent. and S. states. B.M.1182.

eriocárpa, Benth. Densely woolly all over: lvs. alternate or in 3's, long-oblong or lanceolate, short-petioled: fls. dull white, in few or several umbels. Calif.

cc. Fruiting pedicels erect, and the pods erect.

quadrifólia, Linn. About 2 ft., not branched, with lvs. towards the top of the st. in whorls of 4: lvs. ovate or lance-ovate, acuminate, thin, nearly or quite glabrous: fls. pink to white in 2–4 loose umbels. Dry soil; frequent. L.B.C. 13:1258.

verticillàta, Linn. About 2 ft., slender, very leafy: lvs. in whorls of 3–6, very narrow-linear and revolute: fls. greenish white, in many small umbels. Dry soil; frequent. L.B.C. 11:1067.

Var. **pùmila,** Gray. A few in. high, from a fascicled root: lvs. filiform, crowded. Plains, W.

Mexicàna, Cav. Height, 5 ft. or less: lvs. in whorls of 3–6, or sometimes opposite or fascicled, linear or narrow-lanceolate: fls. greenish white or purplish in dense, many-fld. umbels. Ore. W. and S. L. H. B.

ÁSCYRUM (Greek, *not hard or rough*). *Hypericàceæ.* Low herbs or subshrubs, with bright yellow fls., 2 small sepals and 2 large ones, 4 petals, and many stamens. Dry, sandy soils in E. states (also one or two West Indian and one Himalayan species), sometimes grown in borders. Of easiest culture, but should be covered in winter in the N. Prop. by division; also, by seeds.

hypericoides, Linn. (*A. Crúx-Andreæ,* Linn.). St. Andrew's Cross. A ft. or less high, branchy: lvs. oblong or obovate, narrowed to the base: styles 2. G.F. 5:257. Mn. 3:65.

stáns, Michx. St. Peter's-wort. Taller, scarcely branched: lvs. broad-oblong or oval and clasping: styles 3–4. L. H. B.

ASH. See *Fraxinus.*

ASÍMINA (from *Assiminier,* a French-and-Indian name). *Anonàceæ.* Papaw (the papaw of literature is Carica, which see). Small trees or shrubs: lvs. alternate, entire, usually deciduous: fls. purple or whitish, campanulate, solitary or few, axillary; sepals 3; petals 6, the inner ones smaller; stamens numerous: fr. consisting of one or a few large berries. Eight species in E. N. Amer. Ornamental trees or shrubs, with large fls. in early spring, and handsome foliage. Only 2 species are cultivated, of which the arborescent one is the hardier and the handsomer in foliage, while the more tender *A. grandiflora* has larger and showier fls. They grow best in rich and moist soil. They transplant with difficulty. Prop. by seeds sown in autumn, or stratified and sown in spring, or by layers in autumn; also, by root-cuttings. In the North, the seeds should be sown in pots or pans. Description of all species is given in Gray, Syn. Fl. N. Amer. 1, pt. 1, pp. 62 and 464.

triloba, Dun. (*Anòna triloba,* Linn.). Fig. 150. Small tree, 10–40 ft.: lvs. cuneate, obovate-oblong, acute, ½–1 ft. long, glabrous: fls. with the lvs. from branches of the previous year, green when expanding, changing to purplish red, with yellow in the middle, 2 in. broad: fr. oblong, 2–6 in. long, dark brown. S. states, north to N. York, west to Mich. and Kansas. S.S. 1:15, 16. Gn. 33, p. 321. G.F. 8:495. A.G. 44:713. — This is the only arborescent species of the genus. It is well worth a place in the garden, for its large foliage is very handsome and the fls., appearing in the early spring, are attractive. The large fr. is edible, and may be still improved by cultivation and careful selection of the best varieties. Many people do not relish the highly aromatic flavor; and the large seeds are a disadvantage. The tree has proved hardy in Mass. and Ontario. One or two named forms have been offered.

grandiflòra, Dun. Shrub, 2–6 ft.: lvs. cuneate, obovate or oblong, obtuse, 2–4 in. long, rufous-pubescent when young, at length glabrous and chartaceous: fls. large, appearing with the lvs.; outer petals cream-colored, over 2 in. long, much larger than the inner ones; the large fr. is said to be very delicious. S. Georgia, Fla.

Alfred Rehder.

ASPÁRAGUS, ESCULENT (*Aspáragus officinàlis,* Linn.). *Liliàceæ.* A perennial herb, cult. for the succulent young shoots which arise from the roots in spring. The plant is native to Eu. and Asia, and has been cult. for 2,000 years and more. It was known to the Greeks and Romans. The so-called lvs. of asparagus are really leaf-like branches. The lvs. are the scales, which are well shown on the shoot at the left in Fig. 151. From

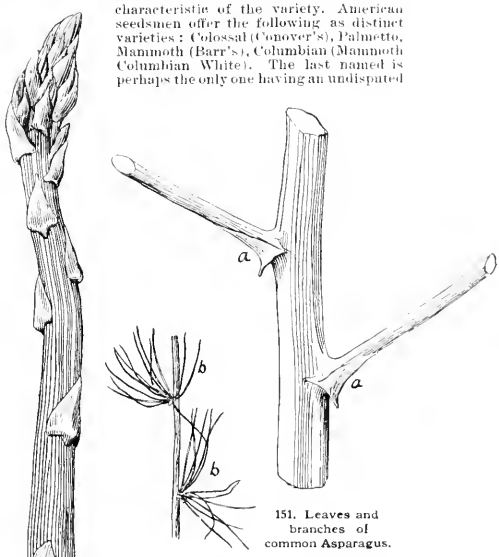
150. Asimina triloba (×⅓).

the axils of these scales branches may arise, *a a.* At *b b* are shown clusters of branchlets, or "leaves," issuing from the axils of scales or lvs.

Asparagus, being a rather rugged plant, will live, and in a measure thrive, on almost any kind of soil, even under neglect. One frequently finds apparently thrifty plants in neglected fence rows, or strong stalks pushing up through stone heaps or other rubbish piled several feet in thickness upon an abandoned asparagus bed. The stalks that are wanted for the table and for a dis-

criminating market, however, are those an inch or more in diameter and deliciously succulent, which one can grow only on good plants set far enough apart on well-drained, well-manured and well-tilled soil. To secure earliness of crop, the land selected for an Asparagus patch should be a warm loam, preferably exposed to south or east. Manures of any kind may be used with greatest liberality, too much being almost out of the question. Unless the soil is already well supplied with vegetable matter, and for that reason very loose and mellow, bulky manures, such as fairly-well rotted stable manure or rich compost, are almost indispensable at the start. A heavy dressing is to be plowed under. Afterwards concentrated manures, rich in nitrogen and potash, will do very well for loose soils, and may be used broadcast on top, as the crop seems to need them from year to year. Much depends on good plants. These are easily grown. To grow one's own supply for starting a plantation is ordinarily a safer plan than to depend on purchased plants. Use strong 1-year plants in preference to older ones. The male, or pollen-bearing plants, are more vigorous, therefore more productive of good stalks and more profitable than the female or seed-bearing plants; but it is not always an easy task to distinguish the one from the other at an early age unless they bloom. To raise the plants, sow seed in early spring thinly in drills, in a well-prepared seed-bed. Have the drills a foot apart; cover the seed half an inch to an inch deep, and thin the plants early to stand 3 inches apart. With the same attention as that demanded by other close-planted garden vegetables, strong plants will then be the sure outcome. Get the land ready for setting the plants by deep and careful plowing and thorough harrowing. Then plow out furrows 5 or even 6 feet apart. If the demand is for the green stalks (those grown above ground), popular in some markets, the furrows may be made 6 or 7 inches deep. If blanched shoots are wanted (and they are of superior flavor and tenderness, provided they are grown in mellow soil and under high and skillful culture), they have to be grown below ground; hence the furrows are to be made a few inches deeper than for plants set for green stalks. Set the plants in the furrows not less than 2 feet apart, each on a little mound of soil, spreading the roots in the same way as they grew in the seed bed. Cover with mellow soil to the depth of a few inches, and afterwards, in the course of some weeks and by means of suitable tools (smoothing harrow, cultivator, etc.), gradually fill the furrows even with the ground level. A still better plan where the material can be had, is to fill the furrows with fine old compost, as the covering above the crowns of the plants can not be made too loose. It is advisable, and will insure closer attention in cultivation, to grow some hoed crop, like beets, turnips, cabbage, beans, peas, radishes, etc., between the rows of Asparagus the first year. In the fall, and every fall thereafter, cut the Asparagus stalks close to the ground and remove them from the patch, to avoid the scattering of the seed.

In early spring of the second year, the surface of the ground is to be loosened by shallow plowing or deep cultivating; and when the first sprouts appear, the rows may be hilled up to some extent, especially if blanched stalks are to be grown. The wisdom of cutting that season more than a very few, if any, of the shoots for the table or sale may well be doubted. Plants left intact until the third year will grow much stronger and be more productive afterward. In the absence of a specially devised Asparagus knife, any ordinary table or pocket knife may be used for cutting the shoots, or in mellow soil the shoots may be broken off at the base with the finger. In cutting, be very careful to avoid injury to later shoots or to the crown of the plant. The third season and every year thereafter loosen up the ground as directed for the second season. The shoots are now to be cut indiscriminately and clean, up to the beginning of the green-pea season. After that, allow them to grow undisturbed, but continue cultivation, to keep the ground surface mellow and free from weed growth. For market, wash the freshly-cut stalks and tie them in neat, compact bunches of the size demanded by the particular market, using some bright-colored ribbon, or perhaps rubber bands. If to be shipped, especially for a longer distance, pack the bunches in moist moss or other material that will prevent the stalks from wilting. Variations in the Asparagus plant are due more to differences in culture and environment than to those characteristic of the variety. American seedsmen offer the following as distinct varieties: Colossal (Conover's), Palmetto, Mammoth (Barr's), Columbian (Mammoth Columbian White). The last named is perhaps the only one having an undisputed



151. Leaves and branches of common Asparagus.

claim to varietal distinction, on account of the white color of its young shoots. To save the seed, strip the scarlet berries off the ripe stalks by hand, or thresh them off with a flail, put them in a sound barrel or tank, and mash them with a wooden pounder, to separate the hard, black seeds from the pulp. Clean them by washing in plenty of water, pouring off the pulp and skins; dry and store.

In the Atlantic coast states, north of Virginia, the Asparagus rust (*Puccinia Asparagi*) has often done considerable damage. Outside of that region this fungous disease is hardly known. Burning the infected stalks is recommended. According to the Massachusetts Experiment Station, "the best means of controlling the rust is by thorough cultivation in order to secure vigorous plants, and in seasons of extreme dryness plants growing on very dry soil with little water-retaining properties should, if possible, receive irrigation." Asparagus anthracnose has appeared in a few instances. Of insect enemies, only two have thus far attacked Asparagus plants in America, namely, the common Asparagus beetle (*Crioceris Asparagi*, Linn.), and the 12-spotted Asparagus beetle (*C. 12-punctata*, Linn.). The following remedies are recommended: Chickens and ducks; close cutting of the young shoots in the early season, and the free use of fresh, air-slaked lime or of arsenites dusted on the dew-wet plants after the cutting period. Even with all kinds of vegetables in abundant supply and much cheaper than ever, there is hardly any danger that a superior article of Asparagus will go begging for customers in any of our markets, or that the grower of such product could not get several hundred dollars per acre for his crop.

There are no books of American origin devoted wholly or chiefly to Asparagus; but all the vegetable-gardening manuals discuss it.

T. GREINER.

ASPARAGUS, ORNAMENTAL. *Liliàcea*. The genus Asparagus comprises about 150 species, which are widely dispersed in warm or tropical regions, being particularly abundant in S. Afr. The species are of very various habit. Some are climbers, some drooping or trailing, and some erect-bushy. Many of them are highly prized for their very graceful and fine foliage. Some species even surpass the most delicate ferns in elegance of habit and delicacy of spray. The foliage is really composed of leaf-like branches (cladophylla) rather than of true lvs. (see Fig. 151, and the discussion of it). Although all are perennial, the sts. of some kinds annually die down or cast their lvs. With the exception of *A. verticillatus*, the following species must be grown under glass, except in S. Fla. and S. Calif. They are of easy culture. Best when propagated by seeds (which are usually freely produced), but are also multiplied by division and cuttings. Roots generally tuberous. Mongr. by Baker, Journ. Linn. Soc. 14 (1875); account of cult. species by Watson, G.C. III. 23:122, 147, 178.

A. *Foliage ovate.*

medeoloides, Thunb. (*Myrsiphýllum asparagoides*, Willd.). SMILAX of florists. Fig. 152. Tall, slender, glabrous twiner: cladophylla 1 in. or more long, thick, glossy green on both sides, strong-nerved, standing edgewise to the branch: fls. single, fragrant: berries dark green. S. Afr. B.M. 5584.—Much grown by florists for use in decorations (see cultural notes below).

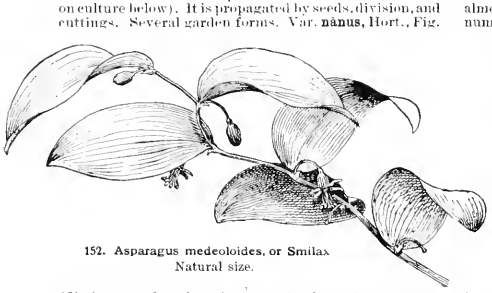
AA. *Foliage narrow, but distinctly flat and plain.*

Sprèngeri, Regel. Figs. 153, 154. Tubers fleshy, white: branches long and slender, branched, drooping: lvs. 1 in. long, glossy green: fls. small and whitish, in short racemes, fragrant: berry small, coral-red. Natal. Gn. 54, p. 88. A.G. 18:86, 883; 19:101. Gng. 4:167. F.E. 9: sup. Mn. 8:151.—One of the most popular basket and decorative plants, of easy cult. Prop. by division, but most efficiently by seeds, which can be purchased. At a night temp. of 65° they germinate in 4–5 weeks. Int. to horticulture by Dammann & Co., Italy, in 1890, and named for their collector, Herr Sprenger. There is a white-lvd. variety.

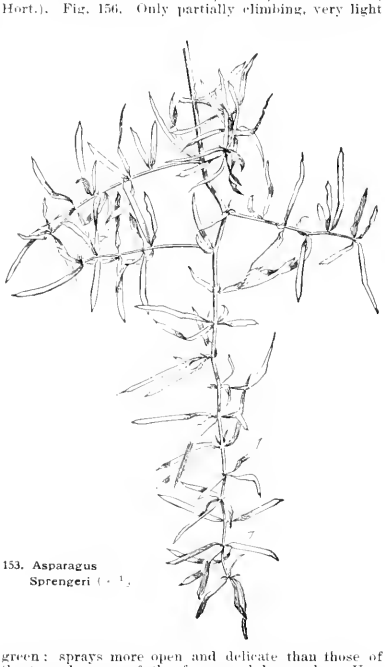
lùcidus, Lindl. Climber: tubers 1½ in. long: sts. 4–6 ft., spiny, branching: lvs. narrow and curved, 2 in. or less long, 2–6 in a cluster, more or less deciduous: fls. small, white, axillary: berries pink or white, ¼ in. in diam. China and Japan, where the tubers are eaten (A.G. 13:78).—Needs warm treatment.

AAA. *Foliage filiform or thread-like.*

plumòsus, Baker. Fig. 155. Tall-climbing, with spiny terete sts. (10–15 ft.): branches flattish and spreading horizontally in elegant sprays: lvs. short, bright green, in clusters: fls. white, commonly solitary: berry black, nearly globular, 1-seeded. S. Afr. G.C. III. 23:146.—One of the most popular of decorative plants, the cut strands holding their shape and color for weeks (see note on culture below). It is propagated by seeds, division, and cuttings. Several garden forms. Var. **nànus,** Hort., Fig. 155 (but not dwarf, as its name implies), is commoner than the type, from which it is distinguished, according to Watson, "by the fulness and flatness of its fronds, and by its refusal to multiply by means of cuttings, division of the plant or seeds being the only methods that answer for it." A.F. 11:1178. Var. **tenuissimus,** Hort. (*A. tenuissimus*, Hort.). Fig. 156. Only partially climbing, very light green: sprays more open and delicate than those of the type, because of the fewer and longer lvs. Var. **declinàtus,** Hort., has drooping sprays. Var. **cristàtus** Hort., has forking-tasseled sprays.



152. Asparagus medeoloides, or Smilax
Natural size.



153. Asparagus
Sprengeri (× ¹/₄).

Comorènsis, Hort. Similar to *A. plumosus*: more robust, darker green, softer foliage: berries globular. G.C. III. 23:181. I.H. 42, p. 61.

crispus, Lam. (*A. decúmbens*, Jacq., and Hort.). Tubers many, oblong: climbing (2–4 ft.), the sts. fine or almost hair-like and annual, the branches zigzag: lvs. numerous, usually in close pairs, very short (¼ in.), glaucous-green: fls. white, with orange anthers: berry large (½ in. long), oval, soft, brown, about 6-seeded. S. Afr. *A. deflexus*, Hort., is probably a form of this species.

verticillàtus, Linn. Tall-climbing (10–15 ft.) hardy plant: rootstock woody: sts. stout (½ in. in diam.), said to be edible when young, but becoming woody, spiny: lvs. in tufts, hair-like, 2 in. or less long: fls. small: berries red. Persia, Siberia

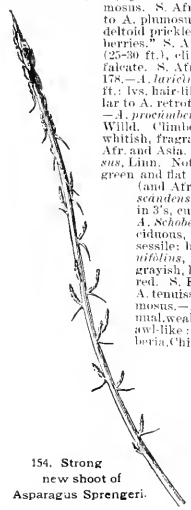
retrofràctus, Linn. (*A. retrofractus arbòreus*, Hort.). Sts. slender (4–8 ft.), becoming woody and gray, scarcely climbing, zigzag, spiny, the branches wiry: lvs. in close clusters, green, hair-like, 1–2 in. long: fls. white, small, umbellate: berry small, nearly globular, 1-seeded. S. Afr.

virgàtus, Baker. A bushy, branchy plant 3–6 ft., the branches arching: lvs. in 3's, dark green, 1 in. or less long: fls. small, white: berries red, 1-seeded. S. Afr.

A. acutifòlius, Linn. Hardy, rigid, 5 ft.: lvs. tufted, hair-like: fls. yellow: berry red. Eu.—*A. Æthiòpicus*, Linn. Suggests A.

Sprengeri: evergreen: lvs. flat and falcate, in clusters of 3-6. Afr.—*A. Africánus*, Lam. Climber: lvs. rigid, dark green, clustered, evergreen. S. Afr.—*A. Asiáticus*, Linn. Tall climber: lvs. hair like, soft, ½in.—*A. Cóoperi*, Baker. Similar to A. plumosus. S. Afr.—*A. declinátus*, Linn. "Allied to A. plumosus, from which it differs in having deltoid prickles, pale green stems, and smaller berries." S. Afr.—*A. falcátus*, Linn. Very tall (25-30 ft.), climbing: lvs. in whorls, flat and falcate. S. Afr.; Trop. Asia. G.C. III. 23: 123, 178.—*A. laricínus*, Burch. Shoots annual, 10-12 ft.: lvs. hair-like, persistent, in clusters. Similar to A. retrofractus. S. Afr. G.C. III. 23:122. —*A. procúmbens*, a trade name.—*A. racemósus*, Willd. Climber: lvs. grayish, 4-angled: fls. whitish, fragrant; racemes 2 in. long. Trop. Afr. and Asia. G.C. III. 23:147.—*A. sarmentósus*, Linn. Not climbing, but loose, 4 ft.: lvs. green and flat: berries bright red. Trop. Asia (and Afr.?). G.C. III. 16:747; 23:179.—*A. scándens*, Thunb. Climbing, slender: lvs. in 3's, curved, flat, dark green. S. Afr.—*A. Schoberioides*, Kunth. One ft.: lvs. deciduous, in 3's or 4's, linear, curved: fls. sessile: berries red. Hardy. Jap.—*A. tenuifólius*, Lam. Shrubby, hardy, 3 ft.: lvs. grayish, linear, curved: berries very large, red. S. Eu. Not to be confounded with A. tenuissimus, which is a form of A. plumosus.—*A. trichophýllus*, Bunge. Sts. annual, weak, 3-6 ft.: lvs. clustered, stiff and awl-like: fls. long-pedicelled. Hardy. Siberia, China.—*A. umbellátus*, Link. Somewhat shrubby, the sts. wiry: lvs. 3-angled, stiff, in clusters: fls. white, fragrant, in umbels.

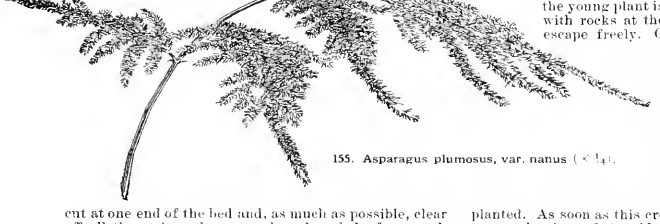
L. H. B.



154. Strong new shoot of Asparagus Sprengeri.

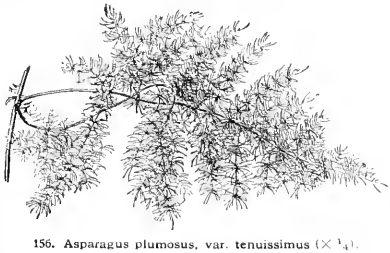
Culture of Smilax (*Asparagus medeoloides*). —Commercially, Smilax is grown in solid beds under glass, and the tall growth is tied to strings. These strings are cut for sale. Some growers do not renew their beds of Smilax for 3 or 4 years. It is, doubtless, the most profitable to replant with young stock every year. Smilax, like all its family, is a heavy feeder. A heavy loam with one-fifth half-rotted cow-manure is the best compost for the bed. A light house is not essential. The middle of an equal-span house running north and south is an ideal place for it, if there is height sufficient to run up the strings 7 or 8 feet. Plant as early as possible in July. Many florists who grow a few hundred strings of Smilax make the mistake of putting them in a coolhouse. It will grow in a temperature of 50°, but not profitably: 60° at night, and even 65°, is the right temperature. The plants should be 8 in. apart in the rows and 10 in. between rows. If not syringed frequently, red spider attacks the Smilax; but there is no excuse for that, as a daily syringing is a sure preventive. When cutting the strings, avoid picking out one here and there. Begin to cut at one end of the bed and, as much as possible, clear off all the strings, because when denuded of so much growth the fleshy roots are liable to rot if over-watered; little water is needed till young growth starts. Care should also be taken in cutting, for many times there will be several young growths a foot or so high that can be saved for a future string, and they may be worse than useless if cut. Smilax for planting in July should be raised from seed sown in February. When 2 or 3 in. high, and showing its character-leaves, it should be potted in 2-in. pots. In May, they should go into 3-in. pots. It is very important that the first growth, which is always weak, should be made in these 3-in. pots; then, when planted out, the first growth in the beds is strong enough to make saleable strings. Never neglect tying up Smilax as soon as the preceding crop is cut. Contrary to what is the case with many plants, the hotter Smilax is grown the hardier and more durable the leaves, providing it is not cut prematurely.

William Scott.



155. Asparagus plumosus, var. nanus (× ¼).

Culture of Asparagus plumosus.—The first and all-important factor in the cultivation of Asparagus is the construction of the bed. To meet with any degree of success, the bed must have perfect drainage. The house should be 25 or 30 feet high, and wired at the top and bottom. The wires beneath are made fast to each side of an iron trellis about 8 inches apart and at the top an equal distance apart, in order that the strings may be as nearly straight as possible.



156. Asparagus plumosus, var. tenuissimus (× ¼).

The early growth of *Asparagus plumosus*, var. *nanus*, is very slow; but as soon as it is transplanted and well rooted in a rich soil, the growth is more rapid, the tender shoots developing into a vine which will be ready to cut for the market in about a year. There is great difficulty in obtaining the seed of the nanus. In a whole house, there may be only a few seed-bearing strings. After being picked, the berries are allowed to dry for a month, and are then ready for planting. A good, rich soil, covered with a thin film of sand, serves very well to start them. The temperature should be about 65°, and as nearly constant as possible. When the plant is well rooted, it is removed to a deeper soil or potted in 3- or 4-inch pots and placed on a bench. Here it remains a year, and is then placed in the bed.

Up to this time a small amount of labor suffices to keep the plant growing in a healthy condition; but from now on great care must be taken and much labor expended to produce the best crop. The bed into which the young plant is set should be carefully laid with rocks at the bottom, so the water can escape freely. Over this place two or three feet of soil, manure, and dead leaves. It is but a short time now that the roots have room to expand before the shoots appear above the trellis, and the stringing begins. Strong linen thread is used for strings.

The first crop will not be ready to cut before the end of the second year; that is, from the time the seed is planted. As soon as this crop is exhausted, new strings are put in place of the old, and another crop is started. This goes on year after year. Now that the plant has gotten its growth, it is more hardy, and is constantly

sending up new shoots. If the bed is well made in the beginning, the Asparagus need not be disturbed for eight or ten years. However, at the end of that time it is well to take the plants up and fill the beds with fresh soil and manure.

In the spring, when the sun gets high, the Asparagus houses are shaded with a light coating of white lead, whiting and kerosene oil. This is absolutely necessary, as the summer sun would in a very short time burn the tops of the vine. The vine flowers in the fall, and only on strings that have been matured six months or more.

The vine alone is not the only source of profit. When the plant is a year old, a few of the most nearly perfect sprays may be taken without injuring its growth. These are very desirable in the market. There is, of course, some waste in working up the Asparagus to be shifted, but, on the whole, it is very slight. The different forms in which it is sold utilize by far the greater part of it.

Insects destroy the shoots and sprays. This is prevented to a great extent by insect powder. The cutworms do the most damage. About the only way to get rid of them is to pick them off the strings during the night, as they generally seek shelter under the thick clusters of the plant at daylight. There are many drawbacks in growing Asparagus, among which are expensive houses, the slow growth of the plants (which makes it necessary to wait at least two years before receiving any return from the expenditure), injury from insects, and the great amount of labor involved in looking after the houses. WILLIAM H. ELLIOTT.

ASPÀSIA (Greek personal name, of little significance here). *Orchidàceæ*, tribe *Vándeæ*. Pseudobulbous: lvs. sub-coriaceous: racemes radical: perianth spreading: lateral sepals free, the upper one connate at the base of the petals: labellum concave: column semi-terete: pollinia 2. Eight or 10 Trop. Amer. species. The genus is closely allied to Odontoglossum.

epidendroides, Lindl. Lvs. linear-lanceolate: racemes, with about 4 fls.; erect: sepals and petals streaked with brown; labellum white, dotted with violet-purple. Panama and Colombia. OAKES AMES.

ASPEN. See *Populus*.

ASPERÉLLA (diminutive of *asper*, rough). Syn., *Asprella*. *Gramíneæ*. Perennial grasses, with looser and more slender terminal spikes than Elymus. Spikelets usually in pairs, on short pedicels, empty glumes wanting or appearing as simple rudiments in the lowest spikelets of each spike. Species 4. N. Amer., Siberia, New Zeal.

Hýstrix, Humb. BOTTLE-BRUSH GRASS. Spikelets stand out at right angles, suggesting brushes used for cleaning bottles. A native grass, growing in woodlands and on the borders of thickets; sometimes used for lawn decoration. P. B. KENNEDY.

ASPÉRULA (*roughish*; referring to lvs.). *Rubiàceæ*. Mostly dwarf, hardy herbs, for borders, rockeries and shady places, with square stems, whorled lvs. (some of the lvs. are really stipules), and many small, 4-parted fls., produced freely from May to July. The commonest species is *A. odorata*, the Waldmeister of the Germans, which is used in their Maitrank, or May wine, and in summer drinks. The dried lvs. have a hay-like fragrance, lasting for years, and are often kept with clothes. The plant occasionally escapes from gardens. *A. hexaphýlla*, with its delicate, misty spray, is used with sweet peas and other cut-flowers that are inclined to look lumpy. Other plants for this purpose are *Gypsophila paniculata*, *Statice latifolia*, and several Galiums, all of which have small, abundant fls. in very loose panicles on long, slender stems. In half-shaded and moist soil, Asperulas grow very luxuriantly until late fall. In dry and sunny places they soon become stunted, and die down before the season is over. Prop. by division and by seeds.

A. *Plants perennial: fls. white.*

B. *Corollas 4-lobed.*

odoràta, Linn. SWEET WOODRUFF. Fig. 157. Habit erect or ascending: height 6–8 in.: lvs. usually in whorls of 8, lanceolate, finely toothed or roughish at the margin: corollas campanulate: seeds rough. Eu. and Orient.—Increases rapidly, and is used for carpeting shady places, and for edgings.

hexaphýlla, All. Plant-stem glabrous: habit ascending, slender: height 1–2 ft.: lvs. in whorls of 6, linear, acute, rough: corollas tubular-funnel shaped: panicles

157. Asperula odorata.

very loose: fls. larger than the bracts: seeds smooth. Italy, Hungary, Pyrenees on high passes and dry mt. sides.—Well grown specimens may be 3 ft. in diam. and nearly as high.

BB. *Corollas often 3-lobed.*

tinctòria, Linn. DYER'S WOODRUFF. Habit procumbent unless supported: height 1–2 ft.: lvs. linear; lower ones in 6's, middle ones in 4's, uppermost ones in 2's: bracts ovate: fls. reddish on outside: roots large, creeping widely, reddish. Dry hills and rocks of Eu.

AA. *Plants annual: fls. blue.*

orientàlis, Boiss. & Hohen. (*A. azúrea* and *A. setòsa*, Jaub. & Spach. *A. azurea-setosa* and *A. setosa-azurea*, Hort.). Height 1 ft.: lvs. in whorls of 8, lanceolate, bristly: fls. longer than the bracts. Eu. and Orient. N. 1: 124. J. B. KELLER and W. M.

ASPHODEL. See *Asphodeline* and *Asphodelus*.

ASPHODELÍNE (name modified from *Asphodelus*). *Liliàceæ*. Hardy herbaceous plants, distinguished from Asphodelus by their erect and leafy sts. They have long racemes of yellow or white fls. in June and July. All the older species were described under Asphodelus. In 1830, Reichenbach made the new genus Asphodeline for *A. lutea* and others. The only species advertised in America is *A. luteus*, but all those described below are likely to be in cult. Monog. by J. G. Baker in Journ. Linn. Soc. 15: 273–278 (1877). W. M.

The culture of *Asphodeline lutea* is simple. Any soil will suit. Partial shade is allowable, but fls. are often better in the sun. Prop. readily by division.

A. *Stems leafy up to the raceme.*

B. *Fls. yellow.*

lùtea, Reichb. (*Asphódelus lúteus*, Linn.). TRUE ASPHODEL of the ancients, or KING'S SPEAR. Height 2–4 ft.: roots thick, fleshy, stoloniferous: lvs. 3–12 in. long: margins rough: racemes 6–18 in. long, 3 in. wide: bracts large, membraneous, persistent. Italy, Mauritania and Algeria to Tauria and Arabia. B.M. 773. L.B.C. 12: 1102 as *A. Taúricus*.—The best species.

BB. *Fls. white.*

Taùrica, Kunth. Height 1–2 ft.: roots slender: lvs. 3–9 in. long; margins membranaceous: raceme 6–12 in. long, 1½–2 in. wide: bracts 9–12 lines long. Caucasus, Tauria, Syria, Asia Minor, Greece. G.C. III. 21: 175.

AA. *Stems leafy only a third or half the way to the raceme.*

B. *Fls. white: raceme dense.*

globífera, J. Gay. Height 2–3 ft.: capsule globose Cappadocia.

BB. *Fls. yellow: raceme lax.*

C *Bracts large, 6–12 lines long, long-cuspidate.*

tenuior, Ledeb. Height 1 ft. Caucasus, Armen., N. Persia. B.M. 2626.—Smaller than *A. luteus*, with finer lvs. and smaller, fewer and paler fls. Especially distinguished by the stalk being naked at the upper part, below the raceme of fls., and the bracts as short as or shorter than the peduncle.

CC. *Bracts small, 1½–3 lines long, short-cuspidate.*

Libúrnica, Reichb. (*A. Créticus*, Vis., not Boiss.). Height 1–2 ft. Greece, Crete, Dalmatia, Austria, Italy, not Asia Minor. L.B.C. 10: 915 as *A. Créticus*.

brevicaùlis, J. Gay (*A. Créticus*, Boiss., not Vis.). St. often flexuose, that of all the others here described being erect and strict. Asia Minor, Syria, Palestine, Egypt.

AAA. *Stems leafy only at the base: fls. white: racemes dense.*

B. *Racemes usually simple.*

C. *Stems having leaf-scales: height 8 ft.*

imperiàlis, Siehe. Tallest species of the genus: fls. large, reddish white. Cappadocia. G.C. III. 22: 397.

CC. *Stems not having leaf-scales: height 1½–2 ft.*

Damascèna, Baker. Height 1½–2 ft.: bracts membranaceous, lanceolate, the lowest 9–12 lines long. Mt. Lebanon.

Balánsæ, J. Gay. Height 2 ft.: bracts scarious, 6–9 lines long. Cilicia. Gt. 46, p. 521. G.C. III. 23: 111.

BB. *Racemes much panicled.*

isthmocárpa, Gay. Height 2 ft. Cilicia. G.C. III. 23: 117. W. M.

ASPHÓDELUS (Greek name of unknown origin). *Liliàceæ*. Hardy herbaceous stemless plants, with white, lily-like flowers in long racemes, fleshy, fascicled roots, and firm, linear, radical, tufted leaves. Perianth funnel-shaped; segments 6, oblong-ligulate, obtuse, equal, with a distinct nerve on the back, and always ascending. The Asphodel of the ancients, or King's Spear, is *Asphodeline luteus*, which see. Homer mentions the Asphodel meadows of the dead, where the shades of heroes congregated in Hades. The Asphodel in Greek mythology was the peculiar flower of the dead. It has always been a common weed in Greece, and its pallid yellow flowers are associated with desert places and tombs. The word daffodil is a corruption of Asphodel. The Asphodel of the early English and French poets is *Narcissus Pseudo-narcissus*. J. G. Baker, in his revision of the genus in Jour. Linn. Soc. 15: 268–272 (1877), refers 40 species of other botanists to *A. ramosus*, the dominant type, of which he makes three subspecies. These subspecies are here kept distinct, for horticultural purposes, as good species. They are the ones first described below. *A. ramosus* and *A. albus* are the only current trade names in America. Culture simple; see *Asphodeline*.

A. *Plant perennial: lvs. 3-angled.*

B. *Scape long.*

C. *Racemes simple or sparingly branched.*

álbus, Miller, not Willd. BRANCHING ASPHODEL. Bracts buff colored when young: filaments deltoid at the base: capsules medium-sized, 5–6 lines long, subglobular or ellipsoid. Southern Eu.

cerasiferus, J. Gay. Bracts pale yellow: filaments wedge-shaped at the base, but rapidly becoming awl-shaped: capsule large, 8–10 lines thick, flattish globular, umbilicate. Western Mediterranean region.

CC. *Racemes much branched or panicled.*

microcárpus, Vis. (*A. æstivus*, Brot.). Bracts pale yellow at first: filaments 4-angled at the base: capsule small, 3–4 lines long, obovoid-globose. Mediterranean, Canaries.

BB. *Scape short, almost wanting.*

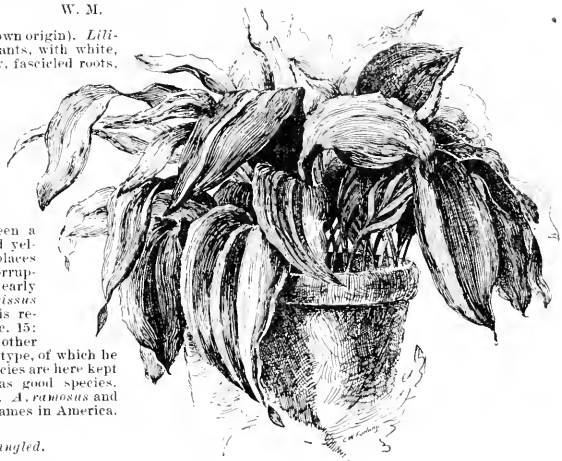
acaùlis, Desf. Lvs. 6–20, in a dense rosette, 3–4 in. long, minutely pubescent: fls. 6–20, in a crowded corymb: segments of perianth 2–3 lines wide. Algiers. B.M. 7004.

AA. *Plant annual: leaves cylindrical, hollow.*

fistulosus, Linn. Height 16–20 in.: lvs. 12–30, in a dense rosette, 6–12 in. long, striate, awl-like, glabrous: segments of perianth 1–2 lines wide, lined with pink: buds pink: fls. pinkish. France and Portugal to Syria, Arabia and Afghanistan. B.M. 984. L.B.C. 12: 1124.—Needs protection under glass in winter. If removed early in autumn to a greenhouse, it may be induced to seed freely.

A. Créticus=Asphodeline Liburnica.—*A. luteus* Asphodeline luteus.—*A. Villarsii*, Verl., is a form of A. ramosus, from E. France, with long, dense racemes and dark brown bracts. N. 1: 125 W. M.

ASPIDÍSTRA (Greek, *a small, round shield*; referring, probably, to the shape of the stigma). *Liliàceæ*. A popular florists' plant, grown for its stiff, shining, beautiful foliage, and still more interesting for its remarkable fls., which are inconspicuous because borne close to the ground. The casual observer never suspects that Aspidistra is a liliaceous plant. The parts of the fl. in monocotyledons are typically in 3's. The genus Aspidistra is considered abnormal, as usually having its parts in 4's. This tetramerous state (which is here considered the normal one, and described below) is pictured in B.M. 2499, but the species was first described upon a trimerous state, and pictured in B.R. 628. In *A. lurida* the trimerous state must be regarded as an exceptional reversion: in *A. typica*, B.M. 7484, the trimerous state is thought to be constant. Of all plants that



158. Aspidistra lurida.

are rented for the temporary decoration of public halls, *Aspidistra lurida* is one of the greatest favorites, as it stands much abuse, such as dust, dry air, and lack of water and light. It is, however, naturally fond of water, and grows freely on the margins of ponds or streams, especially south. In rich soil the variegation often disappears altogether until the plants begin to starve, hence a compost of nearly half sand is desirable. The best method of propagation is by means of division in spring, before active growth begins, as the young leaves are not then disfigured.

lurida, Ker-Gawl. Fig. 158. Lvs. 15–20 in. long, stiff, evergreen, oblong-lanceolate, sharp-pointed, radical;

blade narrowed into a channeled petiole a third of its length: fls. lurid purple, on short 1-fld. scapes; perianth segments 8; stamens 8; stigma broadly shield-shaped, like a small mushroom. China.—The variegated form is more commonly grown, the alternation of the green and white stripes being singularly beautiful. No two lvs. are exactly alike. E. O. Orpet and W. M.

ASPÍDIUM. See *Dryopteris* and *Polystichum*.

ASPLENÉNDRIUM. See *Thamnopteris*.

ASPLÈNIUM (Greek, *not the spleen*; referring to supposed medicinal properties). *Polypodiàceæ*. A large, widely distributed genus of ferns, containing some 200 species. Easily distinguished by the free veins, and by the elongated sori covered by an indusium, which normally is attached to one side of a vein.

Aspleniums enjoy an abundance of moisture at the roots, but they will turn brown in the winter months in an excessively moist atmosphere. They should be kept in a very lightly shaded position. A good potting material consists of equal parts of rich soil and leaf-mold or peat. The following are some of the most useful commercial kinds: *A. Belangeri*, height 2½ft.; *A. bulbiferum*, 2 ft.; *A. laxum*, which grows quickly into a handsome specimen about 20 in. high, and seems to stand the hot, dry American summers better than other species; *A. salicifolium*; and *A. viviparum*, which is dwarf, compact, with lace-like fronds, and easily propagated. For hanging baskets, *A. flaccidum* is best. The foregoing species and others of like habit develop small plantlets on the surface and edge of pinnæ. As soon as these are sufficiently strong, they may be detached, with a small piece of old pinnæ, and pricked into shallow pans, the older part being placed below ground to hold the young plant firmly in position until roots have formed. The best soil for this purpose is composed of equal parts of fresh garden soil, leaf-mold or fine peat, and sand. Plant very firmly, and place in a shady, moderately moist and close position, where in 10 to 15 days they will make roots. The foregoing ones do best in a temperature of 50° F. *A. cicutarium* is easily grown from spores, and is very useful for fern dishes. Nichol N. Bruckner.

Alphabetical list of species described below: A. Adiantum-nigrum, 14; affine, 13; angustifolium, 10; Baptistii, 12; Belangeri, 23; bulbiferum, 18; cicutarium, 20; cuneatum, 15; *ebeneum*, 8; ebenoides, 4; Filix-femina, 25; *furcidilaceum*, 16; fontanum, 17; formosum, 9; fragrans, 16; Hemionitis, 2; *laxum*, 18; *myriophyllum*, 19; *nobilis*, 24; obtusilobum, 21; *palmatum*, 2; parvulum, 7; pinnatifidum, 3; platyneuron, 8; rhizophyllum, 19; rutæfolium, 22; salicifolium, 11; serratum, 1; spinulosum, 27; thelypteroides, 26; Trichomanes, 6; viride, 5; viviparum, 24. The following are native and hardy: Nos. 3, 5, 6, 7, 10, 25, 26.

A. *Sori linear or oblong, straight, borne on the back of the lf.*

B. *Lf. simple, with a serrate margin.*

1. **serràtum,** Linn. Lf. 1–3 ft. long, on a very short stipe, 2–4 in. wide, gradually narrowed below: sori 1 in. or more long. Fla. to Brazil.

BB. *Lf. lobed or pinnatifid.*

2. **Hemionitis,** Linn. (*A. palmàtum*, Lam.). Lf. 4–6 in. each way, hastate, with a triangular terminal lobe and two lateral ones, and a large, rounded sinus at the base: sori often over 1 in. in length. Spain, Canary Islands. S. 1: 586.

3. **pinnatifidum,** Nutt. Lvs. clustered, from a short rootstock, 3–9 in. long, with mostly rounded lobes at the base and terminating in a slender point; texture thick, herbaceous; occasionally rooting at the tip. Pa. to Ala. S. 1: 628.

4. **ebenoides,** R. R. Scott. Texture thin: lvs. 5–10 in. long, with a few irregular divisions near the base, and a long, slender, much-incised apical portion, occasionally rooting at the apex. A very rare native species.

BBB. *Lvs. once pinnate.*

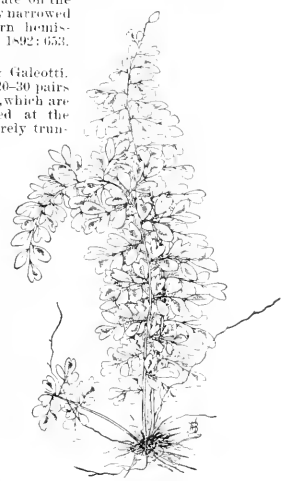
C. *Pinna less than ¾in. long, blunt.*

D. *Rachises greenish.*

5. **viride,** Buds. Lvs. 3–8 in. long, scarcely more than ½in. wide, with numerous rather distant lfts., which are ovate and deeply crenate: sori abundant, oblique. A subalpine species of N. Eu. and N. Amer. S. 1: 661.

DD. *Rachises purplish or blackish.*

6. **Trichómanes,** Linn. Lvs. densely clustered, 3–8 in. long, ½ in. wide, with densely crowded oval leaflets, which are slightly crenate on the upper side and suddenly narrowed at the base. Northern hemisphere generally. A.G. 1892: 653. S. 1: 653.



159. Asplenium rhizophyllum.

7. **parvulum,** Mart. & Galeotti. Leaf 5–9 in. long, with 20–30 pairs of mostly opposite lfts., which are ⅛–⅜ in. long, rounded at the outer margin and squarely truncate at the base. Southern states and Mex.

CC. *Pinna ¾–1 inch long, with a strong auricle at the upper side of the base or deeply incised on the upper margin.*

8. **platyneuron,** Oakes (*A. ebenèum*, Ait.). Lvs. 6–15 in. long, with 30–35 pairs of lfts. which have an enlarged auricle at the upper side at the base, the lower lfts. reduced to mere triangular auricles: sori, when mature, covering the entire surface. Canada to S. Amer. A.G. 1892: 654. S. 1: 535.

9. **formòsum,** Willd. Lvs. 12–16 in. long, with numerous alternate pinnæ which are mostly deflexed, with the upper margin deeply incised and the lower margin toothed: sori 3–5 to each lft. Trop. Amer. S. 1: 576.

CCC. *Pinnæ 3–6 in. long, linear or lanceolate.*

10. **angustifòlium,** Michx. Lvs. 18–24 in. long on stout stalks, 4–6 in. wide, with 20–30 pairs of nearly sessile pinnæ, which are truncate at the base and extend to a tapering point; fertile pinnæ narrower and more distant. Moist woods northward. S. 1: 496.

11. **salicifòlium,** Linn. Lvs. 12–18 in. long, with about 20 distinctly stalked horizontal pinnæ, which are wedge-shaped at the base, and curve upward to a long point: sori strongly oblique to the midrib, wide apart, not reaching either margin or midrib. W. Ind. to Braz.

BBBB. *Lvs. 2–4 pinnate.*

C. *Ultimate divisions linear or cuneate: venation somewhat fan-shaped: texture thick.*

12. **Báptistii,** Moore. Leaf bipinnate, with broadly ovate pinnæ 5 in. or more long, each with about 4 stipitate linear toothed pinnules; sori nearly parallel with the midvein and close to it; rachises scaly, with purplish lined scales. South Sea Islands.

13. **affine,** Swz. Leaf 9–18 in. long, with numerous pinnæ on either side, the lower ovate deltoid, the upper lanceolate; pinnules incised: sori linear. Mauritius and Ceylon to E. Ind.

14. **Adiántum-nigrum,** Linn. Stalks brownish, lvs. 3-pinnatifid from winged rachises, triangular, 5–9 in. long; ultimate divisions ovate, sharply incised and serrate on both sides. Old World generally. S. 1: 486.

15. **cuneàtum**, Lam. Lvs. 12–16 in. long, 4–6 in. wide, tripinnate below, the ultimate divisions broadly obtuse above and strongly cuneate below; sori linear, usually long for the size of the segments. Trop. regions generally.

16. **frágrans**, Swartz (*A. furiculàceum*, Kunth.). Lvs. 2–3-pinnate; ultimate segments lanceolate, sharp-serrate above; veins simple or the lowest forked; sori oblong, extending from midrib to near base of the lobes; petiole brownish, rachis flattened. W. Ind. S. 1: 577.

cc. *Ultimate division rhombic, sharply spinulose: texture herbaceous.*

17. **fontànum**, Bernh. Growing in dense clusters; lvs. 3–6 in. long, 1 in. or more wide, 2-pinnate; segments with 2–5 spinulose teeth which are widely divergent; sori at maturity covering nearly the entire surface of the segments. Eng. and Spain to the Himalayas. S. 1: 574.

ccc. *Ultimate divisions longer, not spinulose: texture membranous or herbaceous.*

18. **bulbíferum**, Forst. (*A. bùlbum*, Hort.). Lvs. 1–1½ ft. long, 6–8 in. wide, 3-pinnatifid; pinnæ tapering to a slender toothed point; often bearing bulbs from which new plants originate while still attached to the leaf. Afr. and Australasia. S. 1: 508.

19. **rhizophýllum**, Kunze (*A. myriophýllum*, Presl.). Fig. 159. Growing in extensive tufts, with grayish brown stalks and rachises; lvs. 6–15 in. long, 3-pinnate or 4-pinnatifid, the ultimate segments frequently deeply 2-lobed with a single sorus to each division. Fla. to S. Amer.

20. **cicutárium**, Swz. Lvs. 3-pinnatifid with a winged rachis, 8–18 in. long; pinnules ovate, with 5–7 narrow divisions, each bearing a single sorus; texture thin, membranous. Trop. Amer., rare in Fla.

aa. *Sori linear, marginal or submarginal, on narrow, linear, ultimate divisions of the leaf.* (*Darea.*)

b. *Lvs. bipinnatifid, less than a foot long.*

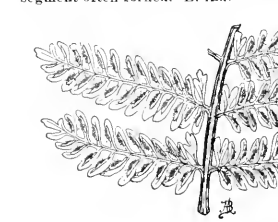
21. **obtusilobum**, Hook. Lvs. 4–7 in. long, 2 in. wide or less, with about 10 pinnæ, which are made up of 5–7 narrow segments bearing occasional sori on the outer margin of the segments. New Hebrides and Fiji Isls. S. 1: 624.

bb. *Lvs. 2-pinnate or 3-pinnatifid, over a foot long.*

c. *Pinnæ short, with close segments.*

22. **rutæfólium**, Kunze. Lvs. 13–15 in. long, with 12–20 pinnæ on each side, each with 7–11 narrow segments, 2 or 3 of the lower ones 2-fid. or rarely 3-fid. S. Afr., Ind. and Jap.

23. **Belángeri**, Kunze. Fig. 160. Lvs. 15–18 in. long, 3 in. wide, with numerous horizontal pinnæ on each side, cut into about 12 segments on either side, which are set nearly at right angles to the rachis; the lower basal segment often forked. E. Ind.



160. Asplenium Belangeri.

cc. *Pinnæ longer, with scattered narrowly linear segments.*

24 **vivíparum**, Presl. Lvs. 15–24 in. long, 6–8 in. wide, on rather short stalks with pinnatifid pinnules and ultimate segments, which are narrowly linear and often forked: plant often bulb-bearing, like *A. bulbíferum* Mauritius and Bourbon. Cult. under various names. S. 1: 662. *A. nóbilis*, Hort., is a garden variety.

aaa. *Sori more or less curved, sometimes horseshoe-shaped: lvs. ample, 2–4 pinnatifid.*

25. **Filix-fœmina**, Bernh. Lvs. 18 in. to 3 ft., broadly ovate-oblong, bipinnate; pinnæ 4–8 in. long, lanceolate, with numerous more or less pinnately incised or serrate segments. Eu. and N. Amer.—Very variable, especially in cult. Schneider describes 56 varieties.

26. **thelypteroides**, Michx. Lvs. 1–2 ft. long, on long, straw-colored stalks: 6–12 in. wide, 2-pinnatifid, with linear-lanceolate pinnæ; segments crowded, oblong, minutely toothed: sori 10–12 to each segment. Rich soil in the eastern U. S. S. 1: 651.

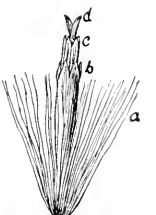
27. **spinulosum**, Baker. Lvs. 9–12 in. each way, deltoid, 3–4-pinnatifid, with 9–12-pinnæ on either side, the lowest much the largest; segments short and sharply toothed. China and Jap.

Supplementary list of less common trade names: *A. aculeàtum*, Hort. Hib. ?—*A. achoreàtum*. See Diplazium.—*A. bàtidum*=*A. lineatum*.—*A. decussàtum*. See Callipteris.—*A. ellipticum*, Hort., a trade name.—*A. flaccidum*, Forst. Coolhouse basket fern from Australia, Tasmania and N. Z. Fronds 2–3 ft. long, 4–8 in. broad; stipes stout, flexible, greenish, naked; pinnæ numerous, close or distant, lanceolate, leathery, 4–8 in. long, ½–¾ in. broad. Very variable.—*A. Goringiànum*, var. *pictum*, Mett. (Athyrium Goringianum, var. pictum, Hort.). Distinguished from all other members of the genus by the bright color of its entirely deciduous fronds, which are 10–15 in. long, spear-shaped, and pendulous. Possibly the only hardy variegated fern. It, however, needs glass protection for best results. Stalks purple or claret-colored; lvs. green with a central band of gray; lfts. divided into sharply toothed pinnules on which the oblong or kidney-shaped sori are arranged in two rows parallel to the midvein. Jap.—*A. lanceum*. See Diplazium.—*A. lineàtum*, Swz. Warmhouse species from Mauritius and Bourbon, is very variable, running into forms with lfts. again pinnate, which have either small, linear pinnules or these again twice cut; lvs. 1–2 ft. long, 4–6 in. wide; stalks erect, 6–9 in. long, more or less scaly.—*A. longissimum*, Blume. The best of all the genus for large baskets. Lvs. 2–3 ft. long, 4–6 in. broad; stalks blackish, 3–12 in. long; lfts. sessile, auricled. E. Ind. S. 1: 602.—*A. macrophýllum*, Swz. Coolhouse species from Polynesia, Malaya, China, and Himalayas. Lvs. 6–18 in. long, 6–12 in. wide, stalks brownish; lfts. 6–12 pairs, stalked, 3–6 in. long, 1–3 in. wide, sharp-pointed, serrate.—*A. Nidus*, or *A. Nidus-Àvis*. See Thamnopteris.—*A. Shèpherdi*, Spreng. See Diplazium.

L. M. Underwood.

ASPRÉLLA. See *Asperella*.

ÁSTER (*a star*). *Compósitæ*. Aster. Starwort. Michælmas Daisy. A large temperate-zone genus of attractive but botanically-confused herbs, particularly abundant in N. Amer. The genus is characterized by numerous flattish rays (white, blue, red, or purple), slender style appendages, compressed several-nerved akenes, and an involucre with unequal bracts in few or several rows, the pappus simple, soft, and abundant (Fig. 161). Leafy-stemmed, mostly blooming in the autumn. Some of the species are annual, but those in cult. are perennial (or rarely biennial). All are easy of cultivation in ordinary soil and exposures, and are among the best plants for the hardy border or for naturalizing in the freer parts of the grounds. They grow readily from seeds, but are generally prop. by division of the clumps. Calimeris and Linosyris are kept distinct in this book.



161. Disk floret of Aster.

a, pappus; *b*, corolla; *c*, stamens; *d*, styles.

a. *Old World Asters, some of them old garden plants, and somewhat modified by cult.*

b. *Stems simple and scape-like, bearing a single fl.*

alpínus, Linn. Lvs. entire and spatulate, forming a cluster on the ground, those on the stem small and linear; st. 3–10 in., bearing a large violet-rayed, handsome head. B.M. 199.—In its wild state, the plant also

occurs in the Rocky Mts. Valuable alpine or rockwork plant, with fls. varying to pink and white. Var. **speciòsus**, Hort., is taller and stronger, with heads 3–4 in. across. Var. **supérbus**, Hort. (Gn. 54: 1193), is a large and showy form.

Himalàicus, C. B. Clarke (*A. Himalaycnsis*, Hort.). Similar to *A. alpinus*, but dwarfer: rays lilac-blue, slightly recurved at the tip: sts. 4–12 in., slightly villous: lvs. oblong or elliptic, nearly entire. Himalayas, 13,000–15,000 ft.—Little known in America.

diplostephioides, Benth. Two to 3 ft., soft-pubescent or hairy, the st. simple and solitary: lvs. obovate or oblanceolate, entire but ciliate: solitary head large, inclined, 2–3 in. across, blue or pale purple, very showy. Himalayas. B.M. 6718. J.H. III. 33: 262.—In the Amer. trade has been misspelled *A. Deptostaphides*.

162. Aster cordifolius.
A handsome blue-flowered native Aster.

163. Aster Novae-Angliae.
One of the best and most showy of native Asters.

BB. *Stems usually branched and several- to many-fld.*

Amèllus, Linn. St. simple or nearly so, few-fld. or sometimes only 1-fld.: lvs. oblong-lanceolate, acute, somewhat serrate, more or less 3-nerved, roughish-pubescent: involucre scales oblong, obtuse or nearly so, spreading, in 4–5 rows; heads large, purple. Eu. and Asia. Gn. 35: 689.—Variable, and several well-marked garden forms.

Var. **Bessarábicus**, DC. (*A. Bessarábicus*, Bernh.). Lvs. oblong and attenuated at base; plant taller and larger-fld., deep purple. Gn. 35, p. 173.—Showy and desirable.

Var. **Cassùbicus**, Hort. (*A. Cassiavíbicus*, Maund?). Fls. larger than in the type, the rays regular and deflexed, the disk bright golden and broad.

Sibiricus, Linn. A foot or less high, somewhat pubescent, each branch terminating in a single head: lvs. oblong-spatulate to broad-lanceolate, serrate: heads violet or lilac. Arctic Eu. and Amer., and Rocky Mts.—Excellent rockwork plant.

àcris, Linn. About 2–3 ft., slender-branched: lvs. linear, or lance-linear: heads large and blue, with long, distinct, handsome rays. S. Eu. Gn. 37: 744.

trinérvius, Roxbg. About 3 ft., stout, corymbose at summit: lvs. lance-ovate and strongly toothed: heads large, blue or purple (a pale var.), with narrow, spreading rays. Himalayas. R.H. 1892: 396.—Hardy, handsome, variable.

Tatáricus, Linn. f. St. erect and striate, hispid, corymbose at the summit, often 7 ft. high: lvs. large (the radical 2 ft. long), lanceolate or oval lanceolate, attenuate at base, entire: involucre scales purplish at tip; heads blue or purple, late. Siberia. G.F. 4: 197.—Excellent for the hardy border, particularly for its very late blooming.

AA. NATIVE ASTERS. These plants are one of the charms of the Amer. autumn, and are amongst the best of all hardy border plants. They generally improve greatly in habit when transferred to cultivated grounds. Any of these wild Asters are likely to come into cultivation at any time. The number of kinds is large. The student will find them all described in Gray's Synoptical Flora of North America, 1, pt. 2. Those of the northeastern states and adjacent Canada will be found in Britton and Brown's Illustr. Flora of the U. S., and Gray's Manual. Those of the S. are described in Chapman's Flora of the S. states. The following list comprises those known to be in cult. Of these, only *A. Nova-Angliæ* is well known in domestication. The species are much confused:

A. acuminàtus, Michx.; *amethýstinus*, Nutt. (G.F. 5: 378); *Andersoni*, Gray; *Bigelovii*, Gray (B.M. 6430); *canéscens*, Pursh; *Carolinianus*, Walt.; *Chamissònis*, Gray; *Chápmani*, Torr. & Gray; *commutàtus*, Gray; *cóncolor*, Linn.; *conspícuous*, Lindl.; *cordifolius*, Linn. (Fig. 162); *corymbósus*, Ait.; *Cusickii*, Gray; *diffúsus*, Ait., and var. *horizontàlis*: *Douglasii*, Lindl.; *Drúmmondii*, Lindl.; *dumósus*, Linn.; *ericoides*, Linn.; *falcàtus*, Lindl.; *Fendleri*, Gray; *foliàceus*, Lindl.; *Frémonti*, Gray; *grandiflórus*, Linn.; *Hállii*, Gray; *Héreyi*, Gray (G.F. 2: 473); *integrifólius*, Nutt.; *lævis*, Linn.; *linariifólius*, Linn.; *Lindleyànus*, Torr. & Gray (G.F. 2: 449); *longifólius*, Lam. (G.F. 9: 507, G.W.F. 10); *macrophýllus*, Linn. (G.F. 4: 89); *Ménziesii*, Lindl.; *multiflórus*, Ait.; *nemorális*, Ait.; *Nóva-Anglia*, Linn. (Fig. 163. A.F. 9: 283), and var. *róseus*; *Nóvi-Bélgii*, Linn.; *oblongifólius*, Nutt.; *paniculàtus*, Lam.; *pátens*, Ait., and var. *Mechanii*; *polyphýllus*, Willd.; *Porteri*, Gray; *prenanthoides*, Muhl.; *ptarmicoides*, Torr. & Gray (G.F. 3: 153); *pulchéllus*, Eaton; *puniceus*, Linn. (Fig. 164), and var. *lævicaùlis* and var. *lucidulus*; *radulinus*, Gray; *sagitifólius*, Willd.; *salicifólius*, Ait.; *sericeus*, Vent. (G.F. 5: 473); *Shórtii*, Hook. (G.F. 4: 473); *spectábilis*, Ait. (Mn. 5: 41); *surculósus*, Michx. (G.F. 5: 521); *tanacetifólius*, HBK.; *Tradescánti*, Linn.; *turbinéllus*, Lindl. (G.F. 6: 17); *undulàtus*, Linn. (G.W.F. 4); *versicolor*, Willd.

In the following list, those marked * are offered by Amer. dealers: **A. cæruleum Nevadensis* = ?—**A. Dutschi* = ?—**A. hybridus nànus* = ? "Rosy color, only 6 in. high."—**A. laxiflórus Californicus* = ?—**A. lilacinus Nevadensis* = ?—**A.*

Meehani, Hort., is a well marked form of A. patens, found by Joseph Meehan at Antietam.—*A. *Novæ-cæruleus*=?—*A. *puræ quadalis*=?—*A. *Reevesii*, Hort., is A. ericoides var. Reevesii, Gray, a "rigid form, comparatively stout, glabrous, except that the lvs. are often hispidulous-ciliate toward the base, the heads and rays as large and the latter about as numerous as in A. polyphyllus." N. Amer.—*A. *rotundifolius*, Thunb.=Felicia.—*A. *Sikkimensis*, Hook. Three to 4 ft., stout and erect: lvs. lanceolate-acuminate, spinulose-serrate; heads purple, in large corymbs. Himalayas. B.M. 4357.—*A. *Strachevi*, Hook. Stemless and sarmentose, with 1-fld. bracted scapes: radical lvs. spatulate, hairy; heads lilac-blue, 1 in. across. Pretty. Himalayas. B.M. 6912.—*A. *terminatis*=?—*A. *Townshendii*, Hook. =A. Bigelovii, Gray (N. Amer.). L. H. B.

The native Asters are amongst the very best plants for borders and roadsides. They should be better known. *A. acuminatus* grows well in shade in ordinary soil, not necessarily moist; increases in vigor under cultivation. *A. cordifolius* prefers open or partial shade; improves much under cultivation with good soil. *A. corymbosus* prefers at least partial shade, and will grow even in very deep shade; seeds very freely; does well on dry ledges and in small crevices in rock; very tenacious of life. *A. dumosus* prefers full sunlight and dry situation. *A. ericoides* wants full sunlight and dry situation; will grow in very poor or shallow soil, but does best where roots can penetrate deep. *A. levis* grows in either full sunlight or partial shade and good soil. *A. Novæ-Angliæ* will not endure much shade; prefers moist soil, but grows well in ordinary garden situations. Fall-sown seedlings of *A. Novæ-Angliæ*, var. *roseus*, come practically true to varietal name, though varying in shade of color, and these seedlings bloom later than older plants and at height of 18 inches, making the plant of value as a late bedding plant treated as an annual. *A. Novi Belgii* prefers moist soil; will not endure heavy shade. *A. paniculatus* prefers moist soil, but will do well in rather dry situations; will endure more shade than either of the two above species. *A. patens* wants open or half-shaded places, and good soil; one of the weaker species, often proving short-lived. *A. puniceus* will not endure shade; prefers moist places, but will grow in good soil not over moist; in dry situations it loses its vigor; spreads rapidly in favored locations. *A. spectabilis* prefers open or partly shaded places; one of the weaker species in wild state; rather short-lived. *A. undulatus* wants open or half shade; late-flowering, handsome plant, forming large bushes where allowed to develop. *A. vimineus*, although not in the trade, is a fine plant in cultivation. F. W. Barclay.

ASTER, CHINA. *Callistephus hortensis*, Cass. (*Callistephus Chinensis*, Nees. *Callistemma hortensis*, Cass. *Aster Sinensis*, Hort.). *Compositæ*. The genus Callistemma is older than Callistephus, but it is too like Callistemon to stand. B.M. 7616. Gn. 53: 1163.—One of the most popular of all garden annuals, being particularly valuable for its fall blooming. The evolution of the China Aster suggests that of the chrysanthemum at almost every point, and it is, therefore, a history of remarkable variations. The plant is native to China. It was introduced into Europe about 1731 by R. P. d'Incarville, a Jesuit missionary in China, for whom the genus Incarvillea of the Bignonia family was named. At that time it was a single flower; that is, the rays or ligulate florets were of only 2–4 rows. These rays were blue, violet or white. The center of the flower (or head) was comprised of very numerous tubular, yellowish florets. Philip Miller, the famous gardener-botanist of Chelsea, Eng., received seeds of the single white and red Asters in 1731, evidently from France; and he received the single blue in 1736. In 1752 he obtained seeds of the double red and blue, and in 1753 of the double white. At that time there appears to have been no dwarf forms, for Miller says that the plants grew 18 in. or 2 ft. high. Martyn, in 1807, says that in addition to these varieties mentioned by Miller, there had then appeared a "variegated blue and white" variety. The species was well known to American gardeners at the opening of this century. In 1806 M'Mahon, of Philadelphia, mentioned the "China Aster (in sorts)" as one of the desirable garden annuals. Bridgeman, a New York seedsman, offered the China and German Asters in 1837 "in numerous and splendid varieties," specifying varieties "alba, rubra, cerulea, striata purpurea, etc." In 1845, Eley said that "China and German Asters" "are very numerous" in New England. This name German Aster records the fact that the first great advances in the evolution of the plant were made in Germany, and the seed which we now use comes largely from that country. The first marked departure from the type appears to have been the prolongation or great development of the central florets of the head, and the production of the "quilled" flower. This type of Aster was very popular 40 and 50 years ago. Breck, in the first edition of his Flower Garden, in 1851, speaks of the great improvement of the Aster "within a

164. Aster puniceus.

few years" "by the German florists, and others," and adds that "the full-quilled varieties are the most highly esteemed, having a hemispherical shape, either a pure white, clear blue, purple, rose, or deep red; or beautifully mottled, striped, or edged with those colors, or having a red or blue center." About 50 years ago the habit of the plant had begun to vary considerably, and the progenitors of our modern dwarf races began to attract attention. The quilled, high-centered flower of a generation or more ago is too stiff to satisfy the tastes of these later days, and the many flat-rayed, loose and fluffy races are now most in demand, and their popularity is usually greater the nearer they approach the form of the uncombed chrysanthemums. The China Aster had long since varied into a wide range of colors

of the cyanic series—shades of blue, red, pink and purple. The modern evolution of the plant is in the direction of habit, and form of flower. Some type varies—generally rather suddenly and without apparent cause—into some novel form, still retaining its accustomed color. The florist fixes the variation by breeding from the best and most stable plants, and soon other colors appear, until he finally obtains the entire range of color in the species. So it happens that there are various well marked races or types, each of which has its full and independent range of colors. The Comet type (with very flat rays), now one of the most deserving of the China Asters, illustrates these statements admirably. The Comet form—the loose, open flower with long, strap-like rays—appeared upon the market about 1886 or 1887, with a flower of a dull white overlaid with pink. The pink tended to fade out after the flower opened, leaving the color an unwashed white. The rose-colored Comet next appeared, and the blue was introduced in 1890. The first clear white was introduced in America in 1892, coming from Vilmorin, of Paris, and the China Aster had reached its greatest artistic perfection.

It is impossible to construct a satisfactory classification of the China Asters. It is no longer practicable to classify the varieties by color. Neither is it feasible to classify them upon habit or stature of plant, for several of the best marked types run into both tall and dwarf forms. Vilmorin, however, still divides the varieties into two groups, the pyramidal growers, and the non-pyramidal growers. The most elaborate classification is that proposed by Barron, from a study of extensive tests made at Chiswick, Eng. Barron has 17 sections, but they are not coördinate, and they are really little more than an enumeration of the various types

165. China Aster—The branching type.

or classes. After considerable study of the varieties in the field and herbarium, the following scheme seems to be serviceable:

A. Flat-rayed Asters, in which all, or at least more than 5 or 6 rows of rays, are more or less prominently flat and the florets open.
B. Incurved or ball-shaped.
BB. Spreading or reflexed.
AA. Tubular or quilled Asters, in which all, or all but the 2 or 3 outer rows of florets, have prominently tubular corollas.
B. Inner florets short, outer ones longer and flat. Represented by the German Quilled.
BB. All the florets elongated and quilled.

In 1895, 250 varieties of Asters were offered by Amer. seedsmen. For growing in borders, perhaps the best type is the Comet, in various colors. Other excellent races are the Branching (Vick's Branching is shown in Fig. 165), Truffaut (Fig. 166), known also as Perfection and Peony-flowered; Chrysanthemum-flowered; Washington; Victoria, Mignon; and Queen of the Market. The last is commended for earliness and graceful, open habit, and it is one of the best for cut-flowers. Many other types are valuable for special purposes. The Crown or Cocardeau is odd and attractive. Amongst the quilled Asters, the various strains of German Quilled (Fig. 167), Victoria Needle (Fig. 168), and Lilliput are excellent. The very dwarf tufted Asters are well represented in Dwarf Bouquet or Dwarf German, and Shakespeare. All these are easily grown in any good garden soil. For early bloom, seeds may be started under glass; but good fall bloom may be had, even in the North, by sowing seeds in the open as late as the 1st of June. Asters make very showy bedding plants when grown in large masses, and are also valuable for filling up vacancies in the mixed herbaceous border, where they ought to be planted in clumps, the dwarfer kinds put in front and the taller behind.

166. China Aster—Truffaut's Peony-flowered.

There are two or three insects which prey upon the China Aster, but they do not appear to be widespread. The most serious difficulty with them is the rust, a fungus (*Coleosporium Sonchi-arvensis*) which attacks the under side of the leaf and raises an orange-colored pustule. Timely sprays with the copper fungicides will keep this disorder in check. The Bordeaux mixture discolors the plants, and it is, therefore, better to use the ammoniacal carbonate of copper. Spray it upon the plants before the fungus appears, and repeat every week or ten days. Use a cyclone nozzle and spray upwards, so as to strike the under sides of the leaves. L. H. B.

In recent years, the Branching Asters have come to be prominent, and they are bound to increase in popularity as their merits become known. The long stem, large size, and soft shades of pink and lavender have made this the most useful to the florist of all the Asters. The Comet has been rather short-stemmed for a commercial cut-flower. As to culture, it does not seem to be generally understood, even by florists, that the young Aster plants will stand more frost than cabbage. If started under glass about the middle of February, in New York state, they will be ready to plant out the latter part of April or first of May. They will then come in at about the same time they would if grown entirely under glass, although not so long-stemmed. For fall flowers, we sow out-of-doors with seed drill and cultivate with wheel hoe. Plants have been ruined by being planted near squashes. The late brood of striped beetles fed on the Aster flowers.

GEORGE ARNOLD, JR.

The first requisite to the growing of China Asters is to have good, plump seed. As soon as the ground is in good or fair condition in spring, spade up a seed-bed

167. China Aster—German Quilled.

where the ground is rich, and rake it fine. Then make shallow drills about an inch deep; whiten the drills with air-slaked lime, to keep worms and insects from eating the young roots. Sow the seed in the drills, covering about ¼in. deep with fine dirt run through a sieve of ⅜in. mesh. When plants are about an inch high, draw good, fine dirt to the roots, so that the seed-bed is nearly level and all the weeds are covered. The plants are hardier and better when grown in the open ground than when started under glass. For the permanent quarters, plow ground that has been well and heavily manured with cow-manure the previous season; then harrow thoroughly. Scatter 20 to 30 bushels of common lime to the acre, if thought necessary, then plow again and harrow well. With a one-horse plow make furrows the length of the field about 3 or 4 inches deep and 2½ feet apart. In these furrows one man drops the plants in two rows about 12 or 16 in. apart, for two men to plant. Do not furrow much ahead of the planters, so that they have fresh dirt to put to the roots of the plants. By this method the plants seldom wilt. If a dry spell follows in three or four days, level the furrow with a hoe; if wet, let stand for about two weeks, then scatter 100 pounds of guano or other fertilizer to the acre, and work the land with a spike-tooth cultivator, with no shovels, so that no dirt is thrown on the small plants. Hand-hoe between the plants, running horse and cultivator twice in each row. The cultivator loosens the ground as deep as it was plowed. Cultivate and hoe every two weeks, especially after it has rained, until buds appear; then keep clean by hand. When blooms begin to appear, mulch liberally with tobacco stems, to keep down weeds and to kill aphis at the roots. When the fls. begin to open, keep a strict watch for the black beetle. When it makes its appearance, put about a pint of water and a gill of benzine in an old can and hold it under the bugs; they drop into it. These pests last from six to nine days. Have them looked after three times a day.

JAMES SEMPLE.

ASTÍLBE (Greek name, of no particular significance). *Saxifragàceæ*. Includes *Hoteia*. Tall perennial herbs, of 7 or 8 species in eastern N. Amer. and Asia. They look much like Aruncus (which see), and are often called Spiræa. Aruncus and Spiræa are rosaceous genera, and are characterized by many stamens and usually by several to many separate pistils, whereas Astilbe has 8 or 10 stamens (twice the number, or of the same number, as the petals), and a 2–3-lobed pistil (which finally separates into more or less distinct follicles). Astilbe and Aruncus are so much alike that they are constantly confounded by horticulturists and even by botanists. They probably inter-cross. It is probable that they should be placed in the same family, despite the technical botanical differences. The Astilbes are hardy plants of great merit. They are easily grown in any well-made border. They give conspicuous masses of bloom in summer. Prop. mostly by division.

L. H. B.

FORCING OF ASTILBE.—Few herbaceous plants force with greater ease than *Astilbe Japonica* and its var. *compacta;* but three weeks longer time should be given the latter to fully develop its feathery spikes. Astilbes are so easily and cheaply imported that for the commercial florist it is cheaper to buy than to divide and grow his own plants. When first received, the clumps of roots should be stored, with a little earth or moss between the roots and a little soil over the crown, until the florist is ready to pot them. No amount of freezing does them the slightest harm; but the boxes or flats in which they are stored are best covered with a little straw or litter, and should have the full benefit of rain or snow to keep the roots from drying. From potting or burying into the greenhouse, it requires from ten to fourteen weeks to bring them into flower, according to the earliness of the season at which they are wanted in flower. The quality of soil is of no consequence, provided it is light and easily handled. They need water in great abundance. Temperature is also of little consequence. Anything above 50° at night will do; but it is best not to flower them in higher temperature than 60°, or they will quickly wilt when cut or used for decorations. From the time the sprays begin to show white color until they are fully developed, every Astilbe should stand in a saucer in which there should be constantly an inch of liquid manure. When sold for window plants or for decoration, Astilbes are often disappointing. It is merely want of water. Before the full development of the shoots and lvs. they are easily hurt by tobacco smoke, and should be covered with paper or well wetted

168. China Aster—Victoria Needle.

when fumigation is necessary. Aphis, spider or thrips never trouble Astilbe. As a border plant, Astilbe is one of the hardiest of our hardy herbaceous plants; but the feathery plume obtained in the greenhouse is much shorter, more compact, and lacks the pure whiteness of the outdoor-grown specimens. WILLIAM SCOTT.

A. *Fls. opening white or yellowish.*

decándra, Don (*A. hibernáta*, Britt.). Somewhat pubescent, 3–6 ft.: lvs. 2-ternate, the lfts. ovate and cordate or abrupt at base, sharp-serrate: fls. yellowish white, in a large (10–12 in. long) racemose panicle; stamens 10. Woods, Va. and S.—Often confounded with *Aruncus sylvester.*

Japónica, Gray (*Holórea Japónica*, Morr. & Decne. *H. barbáta*, Morr. & Decne. *Spiræa Japónica*, Hort.).

169. Astilbe Japonica.

Fig. 169. Erect, 1–3 ft., hairy on the petioles and nodes: lvs. 3–2-ternate, petiole reddish; lfts. ovate-acute, tapering to the base, serrate: fls. white, in a pubescent racemose panicle; stamens 10. Japan. B.M. 3821. Gn. 48, p. 366. Mn. 5:174.—Commonly known as a spring glasshouse plant in this country, but hardy in the open. There are various cult. forms, as var. **grandiflòra,** Hort., with larger and denser panicle; var. **compácta,** Hort., the panicle more compact; var. **multiflòra,** Hort.; var. **variegáta,** Hort., with variegated lvs.; var. **purpùrea,** Hort., with purple-shaded foliage. *Astilbe Japonica* is often confused with *Aruncus astilboides;* Figs. 169 and 170 will aid in distinguishing them.

Lemóinei, Hort. Foliage graceful, standing 1½ ft. high, with lfts. broad-oval, dentate and crimped, satiny green, hairy: fls. with white petals and 10 pink stamens, very numerous, in plume-like clusters disposed in panicles 1½ ft. long. Gn. 48, p. 355. R.H. 1895, p. 567. A.F. 11:459.—Garden plant, supposed to be a hybrid of *A. Japonica* and *Aruncus astilboides.* Hardy, and forces well.

rivulàris, Hamilt. Rhizome creeping: st. 3–5 ft.: lvs. 2-ternate, the lfts. ovate, dentate, the petioles tawny-hairy: fls. yellowish white, changing to reddish, in large spikes, which are disposed in panicles; stamens 8 or 10, pure white. Nepal. Gn. 18, p. 355.—Attractive border species, blooming late. Probably needs protection.

Thùnbergii, Miq. Silky-hairy, 1–2 ft.: lvs. pinnate, the lfts. oval, serrate, yellowish green: fls. white, on reddish stalks, changing to pink, in clusters on the fl.-branches. Japan. R.H. 1895, p. 568.—A graceful plant. Forces well.

AA. *Fls. opening pink or red.*

Chinénsis, Franch. & Sav. Plant 1½–2 ft., graceful: lvs. 3-ternate, the lfts. serrate: fls. in a branchy, rather compact panicle, with purplish or pink reflection, but the petals whitish. China.—Possibly a form of the preceding. Yet rare in Amer.

rùbra, Hook. & Thom. St. simple, 4–6 ft., long-hairy: lvs. 2-ternate; lfts. oblique-ovate, more or less cordate, sharp-serrate: fls. numerous, rose-red, in compact, robust panicles; stamens 10, shorter than petals. India. B.M. 4959.—Needs protection. Little known in Amer.

L. H. B.

ASTRÁGALUS (ancient Greek name of some shrub). *Leguminósæ.* MILK VETCH. A genus of over 1,000 species of hardy herbs or subshrubs. Lvs. mostly odd-pinnate: fls. in spikes or racemes, yellow, purple or white. They prefer a light, porous soil and no shade. The dwarfer kinds may be placed in the front of the border or in the rockery. Prop. chiefly by seeds, which germinate slowly, or slowly by careful division in early spring. Many kinds are likely to die if divided or transplanted. Many kinds are cultivated in the Old World, but the four described below are the only kinds commonly sold in America. Of the many native kinds, mostly known as rattle-weeds, the following are advertised at present: *A. Canadensis* = *A. Caroliniánus, A. corrugátus, A. Drummóndii, A. flexuósus, A. Lárimani, A. Parryi, A. racemósus, A. Robbínsii, A. Shortiánus.* The Locoweed of the prairies, which is said to poison cattle, is *A. mollissimus.* For these and many others the student is referred to Britton and Brown's Illustrated Flora, and Coulter's Manual of Rocky Mountain Botany.

170. Aruncus astilboides.
For comparison with Astilbe.

A. *Fls. yellow.*

alopecuroides, Linn. St. erect, strict: height 2–5 ft.: lfts. ovate-lanceolate, pubescent. Siberia. B.M. 3193.

AA. *Fls. not yellow.*

Monspessulànus, Linn. St. trailing: height 9 in.: fls. purple, purplish or white, in smaller and looser heads than the above. Eu. B.M. 375.

hypoglóttis, Linn. Height 3–24 in.: lfts. 17–25: fls. violet-purple, 6–10 lines long, in dense heads: pods 4–5 lines long, 2-celled, densely villous, with white hairs. Eu., Asia, and from Kansas W. to Nev. and N. to Alaska.—Also a white var., excellent for pots.

alpínus, Linn. Height 6–15 in.: lfts. 13–25: fls. violet, keel darker: pods 1-celled, black-pubescent. Northern and Arctic regions round the world.

J. B. KELLER and W. M.

ASTROCÀRYUM (Greek, *astron,* star, and *karyon,* nut; referring to star-like arrangement of the fruits). *Palmàceæ,* tribe *Cocoíneæ.* Spiny palms, stemless or with a short caudex, or with a tall, ringed, spiny cau-

dex: lvs. terminal, pinnately parted; segments approximate, equi-distant or fasciculate, lanceolate-acuminate or attenuate to the obliquely truncate apex, plicate, whitish beneath, the terminal ones free or confluent, the spiny margins recurved at the base; petiole very short; sheath short, open; spadices short or long, the finely divided branches pendulous, thickened at the base, thence very slender, long, naked, the floriferous naked basal portion, as it were, pedunculate; spathes 2, the lower one membranous, deciduous, the upper fusiform, coriaceous or woody, open on the ventral side, persistent; bracts of the female fls. broad, imbricated, like the bracteets; pistillate fls. with a stipitate male one on either side: fr. rather large, ovoid or subglobose, beaked, smooth or spiny, red or orange. Species 30. Tropical America

Astrocaryums are elegant palms of medium height, very suitable for moderate sized conservatories. *A. Murumuru*, *A. Mexicanum* and *A. argenteum* are the kinds most commonly met with in collections. The lvs. are pinnate, and in small plants, at least in some of the species, the segments are narrow, four or five pairs of these alternating with two very broad ones. *A. argenteum* has the under surfaces of the lvs. of a much lighter color than the others. In a young state, the plants require the temperature of the stove, and after attaining the height of a few feet they may be removed to a house where the temperature frequently falls as low as 45° F. Specimens 8–10 ft. high fruit freely. Prop. by seeds, which are slow in germinating. The soil in which they are sown should be changed occasionally, to prevent it from becoming sour. Be careful not to overpot, or the fleshy roots will decay. See *Palms*.

A. *Lvs. scurfy, at least beneath or on the petioles.*

Murumuru, Mart. Lvs. 9–12 ft. long; segments lanceolate, somewhat falcate, rich green above, silvery beneath: sts. 12–15 ft. high, densely covered with stout, black spines 6 in. long. Brazil. I.H. 22: 213.

argénteum, Hort. Petioles and under surface of the lvs. covered with silvery white scurf; lvs. arching, wedge-shaped, 2-lobed, distinctly plicate, bright green above; petioles with numerous dark, spreading spines 1 in. long. Colombia. F.R. 3: 569.

filiáre, Hort. Small, slender: lvs. erect, narrowly cuneate, with 2 divergent lobes, inversely sagittate; petioles densely scurfy; rachis scurfy on both sides; spines numerous on the petioles and rachis, and on the principal nerves above; brown. Colombia.

AA. *Lvs. not scurfy.*

Ayri, Mart. Trunks 18–30 ft. high, 8–12 in. in diam., usually cæspitose: lvs. 15 ft. long, equally pinnatisect to the apex; petiole plano-compressed, membranaceous on the margins, densely scaly and with scattered spines; lower segments over 3 ft. long, 1¼–2 in. wide, 2 in. apart, the upper ones 2–2⅓ ft. long, 1 in. wide, 1¾ in. apart, conduplicate at the base, linear, long attenuate, pointed, minutely and remotely spiny along the margins, white-tomentose below. Braz.

Mexicànum, Liebm. St. 4–6 ft. high, cylindrical, thickly covered with rings of black, straight, ancipital spines: petiole 2 ft. long, 4-sided, the 2 upper sides concave, clothed (as is the rachis) with straight black spines; blade 6 ft.; segments 15–18 in. long, 1 in. wide, alternate, broadly linear, acute, straight, white beneath, with deciduous black spines along the margins. Mex.

A. Granatense, Hort., is an unidentified trade name.

JARED G. SMITH and G. W. OLIVER.

ASTROPHÝTUM. See *Echinocactus*.

ASYSTÁSIA (obscure name). Including *Henfreya* and *Mackaya*. *Acanthàceæ*. Twenty to 30 herbs or shrubs of the Old World tropics. Corolla tube straight or curved, the spreading limb 5-lobed and nearly or quite regular: stamens 4, unequal: stigma blunt or minutely 2-lobed: lvs. thin, entire: fls. white, blue or purple, in axillary or terminal clusters, often very showy. General treatment of Justicia, in intermediate or warm-houses.

bélla, Benth. & Hook. (*Mackàya bélla*, Harvey) Glabrous, upright subshrub: lvs. ovate-oblong, acuminate, spreading, short-stalked, sinuate-toothed: fls. lilac, 2 in. long, with a long tube below the flaring throat, the spreading segments ovate-obtuse, disposed on one side of a raceme 5–8 in. long. S. Afr. B.M. 5797.—A beautiful plant, rarely seen, and thought to be difficult to manage; but it seems to flower readily in fall in our climate, if rested during the previous winter and brought on in the summer. Prop. by cuttings of firm wood in spring or summer. Young plants in small pots often bloom well.

A. *Coromandeliana*, Nees (A. Comorensis, Bojer. Justicia Gangetica, Linn.). Zigzag subshrub: lvs. ovate-cordate, wavy: fls. purple, nearly sessile, in 6–10-fld. raceme. Ind. B.M. 4248. P.M. 14: 125. F.S. 2: 170.—*A. scandens*, Lindl. (Henfreya scandens, Lindl.). Climbing: lvs. obovate to ovate, thick, entire: fls. large, yellow, white and blush, in a thyrse. Afr. B.M. 4449. B.R. 33: 31. F.S. 3: 231.

L. H. B.

ATAMÁSCO LILY. See *Zephyranthes*.

ATHANÀSIA. Consult *Lonas*.

ATHŸRIUM. See *Asplenium*.

ATRÁGENE. See *Clematis*.

ATRAPHÀXIS (ancient Greek name). *Polygonàceæ*. Low shrubs: lvs. alternate or fasciculate, deciduous: fls. small, apetalous, in few-fld. axillary clusters, forming terminal racemes; sepals 4–5; stamens 6–8: fr. a small akene, enclosed by the enlarged inner sepals. Summer. About 18 species in central and western Asia, Greece, and N. Afr. Low shrubs of spreading habit, with usually small lvs., attractive with their numerous racemes of white or rose-colored fls., which remain unchanged for a long time, owing to the persistent calyx. They grow best in well-drained soil and sunny situations, but do not stand transplanting well when older. Prop. by seeds sown in spring; the seedlings are liable to rot if kept too moist, or in damp air. Increased, also, by greenwood cuttings under glass in early summer, and by layers.

A. *buxifòlia*, Jaub. & Spach. (Polygonum crispulum, Sims). Height 1–2 ft., spineless: lvs. obovate, crenate, dark green, ½–1 in. long: racemes short. Transcaucasia, Turkestan. B.M. 1065.—*A. frutéscens*, Koch (A. lanceolata, Meissn.). Height 1–2 ft., spineless: lvs. ovate-lanceolate, glaucescent, ⅓–1 in. long: racemes loose. Caucasus, Turkest., Siberia. L.B.C. 5: 489. B.R. 3: 254.—*A. latifòlia*, Koehne (A. Muschketowi, Krassn.). Erect, 2–3 ft., spineless: lvs. lanceolate, crenate, ¾–2 in. long: fls. white, in compact racemes. Turkest. B.M. 7445. Gt. 40: 1344. —*A. spinòsa*, Linn. Height 1–2 ft., spiny: lvs. elliptic, entire, glaucescent, ¼–½ in. long: racemes short. S. Russia, Orient, Siberia.

ALFRED REHDER.

ATRIPLEX (derivation disputed). *Chenopodiàceæ*. A large genus containing many succulent weeds of desert regions. *A. hortensis* is a garden vegetable used like spinach; for culture, see *Orach*. *A. leptocarpa* and *A. semibaccata* are two plants lately introduced as supplementary forage plants for arid regions. See Circular No. 3, Div. of Agrost., U. S. Dept. Agric.

A. *Garden vegetable (with ornamental-lvd. variety).*

hortènsis, Linn. ORACH. SEA PURSLANE. Annual: stem herbaceous, erect: lvs. hastate, cordate, or triangular-oblong, acute, 4–5 in. long, 2½–3 in. wide; petioles 12–18 lines long: fruiting bracts 4–8 lines long, short-pedicelled. Var. **àtro-sanguínea,** Hort., is a crimson-leaved ornamental about 4 ft. high, sometimes grown with amarantus-like plants.

AA. *Ornamental shrubs.*

canéscens, James. A pale, densely scurfy shrub, 1–3 ft. high: lvs. oblanceolate, entire: fruiting bractlets with 4 vertical, reticulated wings. July–Sept. N. Mex. to S. Dak. and W. to Calif.

Hálimus, Linn. Low-spreading shrub with grey foliage, cult. in Calif. for hedges and for seaside planting: lvs. 1–1½ in. long; petioles 3–4 lines long: fls. purplish: fruiting bracts 1½ lines long, 2 lines wide, sessile, reniform, obtuse, entire: seed compressed, yellowish. Mediterranean region and S. Afr.

W. M.

ÁTROPA (after *Atropos*, that one of the three Fates who cut the thread of life). *Solanàceæ*. BELLADONNA. Calyx with 5 ovate leafy divisions, enlarging in fruit; corolla bell-shaped or funnel form. The purple berries are poisonous. The plant is used in medicine.

Belladónna, Linn. Plant low, spreading: lvs. ovate, entire, pointed: fls. single or in pairs, nodding on lateral peduncles; corolla dull purple. Eu. to India.

ATTALÉA (*attalus*, magnificent). *Palmàceæ*, tribe *Cocoineæ*. Spineless palms, with a single, thickish ringed or scarred caudex: lvs. arising almost perpendicular and the upper part arched, pinnately cut, linear-lanceolate, acuminate, with the margins recurved at the base; petiole concave above: fls. yellow: fr. rather large. Species 20. Trop. Amer. The leaflets on the lower side of the rachis hang straight down, and those on the upper side point straight up. The Attaleas are unprofitable to grow as commercial decorative plants, because they take too long to make good sized plants from the seedling state. Perfect drainage, and a soil having a mixture of leaf-mold or peat, with a temperature ranging from 60° to 80° F., will be found to suit them. Put the seeds about 2 in. deep in a box and sink the box in a warm border out of doors in summer, cover with a mulch of moss, and water frequently.

A. *Trunks becoming tall.*

excélsa, Mart. St. 90–100 ft. high in the wild, 16–20 in. in diam.: lvs. erect-spreading; pistillate fls. solitary on the branches of the spadix: drupe obovate. Braz.

funífera, Mart. St. 18–30 ft., 8–13 in. diam., smooth: lvs. as long as the caudex; petioles with very long hanging fibers; segments broadly linear-acuminate, in clusters of 3–5, divaricate: drupe 4 in. long. Braz.

Cohúne, Mart. St. 40–50 ft.: lvs. erect, pinnate, the dark green pinnæ 30–50 and 18 in. or less long; petiole flat above and rounded below: drupe broadly ovate, nearly 3 in. long, with a very short beak. Honduras.—Fruit used for soap-making, and exported from Cent. Amer. for that purpose. Used for thatching.

AA. *Without trunks.*

spectábilis, Mart. Stemless, or with a very short caudex: lvs. 18–21 ft. long, the lower segments 3–4 ft., the upper 12–16 in., ½ in. wide, linear-acuminate. Braz.

amygdalína, HBK. (*A. mucífera*, Karst.). Stemless: lvs., 5–6 ft. long, crowded, pinnatisect; segments 90–100 on each side, ensiform, glabrous above, with hairs along the outer margins beneath, 2–1⅓–2⅔ ft. long, about 1¾ in. wide; petiole with rusty scales beneath. Braz.

A. Guichire is a trade name; "extremely long-leaved."—*A. Maripa*, Mart. (*A. Mariposa*, Hort.) See Maximiliana.

JARED G. SMITH and G. W. OLIVER.

AUBRIÈTIA (Claude Aubriet, French natural history painter of last century). *Cruciferæ*. Perennial, more or less evergreen trailers, excellent for rockwork or edgings. Prop. by seeds, or by layers or cuttings. The genus is distinguished chiefly by the outer sepals being saccate at base, the shorter filaments toothed, and the valves of the silique convex and not ribbed. Italy to Persia.

deltoídea, DC. Lvs. oblong-spatulate, deltoid or rhomboid, with 1 or 2 teeth on either side, grayish, narrowed into a very short petiole: fls. in few-fld., lax clusters, the violet or purple petals twice the length of the calyx. —Grows 2–12 in. high. Pretty spring bloomer. Hardy in the north. Var. **Bougainvíllei**, Hort. Fls. light violet: dwarf and compact. Var. **Campbélli**, Hort. Fls. large, purple: plant large. Var. **Eyrei**, Hort. Fls. large and long, deep violet. Var. **Græca**, Hort. Dwarf and compact, large-fld. One of the best. Var. **Hénderson**, Hort., probably the same as *Campbelli*. Var. **Leichtlíni**, Hort. Profuse bloomer, pink fls. Var. **Olýmpica**, Hort. Fls. large, violet, like var. *Eyrei*. Var. **violácea**, Hort. One of the largest forms.

L. H. B.

AUCÚBA (its Japanese name). *Cornàceæ*. One evergreen shrub, with glossy, often variegated lvs., enduring smoke and dust: fls. small, dioecious, 4-merous, in panicles: fr. a 1-seeded drupe. Hardy S. In the N. states, Aucubas are grown in coolhouses—those adapted to azaleas are excellent—and they are kept evergreen by keeping them in a pit during winter, or by holding them cool and partially dry in the house. They will stand 5 or 6 degrees of frost in a pit. From cuttings of half-ripened wood, good specimen plants may be had in 2 or 3 years. Fruiting plants, with their numerous bright scarlet berries, are exceedingly attractive, but as the plant is dioecious, there must be male plants with the female ones. If grown in pots and under glass, the plant must be fertilized by shaking the flowering male plant over the female, or by applying the pollen with a camel's hair pencil. If the male plant flowers earlier, the pollen may be collected and kept dry until the female plant is in flower; it remains effective for some weeks. In the open, Aucuba grows well in any good, somewhat moist though well-drained soil, in a half-shaded position. In pots, it will thrive in a sandy loam with sufficient drainage, and requires plenty of water during its growing period. Fruiting plants should not have too large pots. Prop. very easily by half-ripened greenwood cuttings at nearly any time of the year, under glass, and by seeds sown soon after maturity; the varieties are sometimes grafted on the common form in early spring, under glass.

Japónica, Thunb. Shrub, 4–15 ft.: fls. usually ovate, 3–8 in. long, remotely and coarsely dentate, acuminate, shining: berries scarlet, rarely white or yellow, usually oblong. From Himal. to Jap. B.M. 5512. I.H. 11:399. Var. **Himalàica**, Dipp. (*A. Himalàica*, Hook. & Thom.). Lvs. ovate-lanceolate, more dentate: panicles more pilose: fr. orange to scarlet. Himal. F.S. 12:1271. I.H. 6:197.—There are many garden forms, mostly with variegated lvs., which are more cultivated than the green forms. Handsome variegated varieties are: **albovariegàta, aùrea, aùreo-maculàta** (Flor. Mag. 10:527. Flor. World 1876:353), **bicolor, latimaculàta, limbàta, mèdio-variegàta, picturàta, punctata, variegàta** (B.M. 1197. F.M. 5:277). The following forms have green lvs.: **angustifòlia, dentàta, macrophýlla, ovàta, salicifòlia, pygmæa**. *A. crenifòlia*, once offered in Amer. trade, is probably a form of *A. Japonica*.

ALFRED REHDER.

AUDIBÉRTIA (*M. Audibert*, of Tarascon, Provence). *Labiàtæ*. Perennial, hoary, aromatic herbs from Calif., with rugose, sage-like lvs.

grandiflòra, Benth. St. villous, glandular, 1–3 ft. high: lvs. woolly beneath; lower lvs. hastate, obtuse, 3–8 in. long, coarse; bracts crowded, conspicuous: fls. 1–1½ in. long, red or crimson-purple, in dense, showy glomes or clusters.—Prized for bees.

AURÍCULA (*Primula Auricula*, Linn.). Fig. 171. A European perennial, sending up short scapes, bearing fls. of many colors. It is one of the most famous of florists' flowers, but it has never received the attention in this country that it has in Europe. Our summers are generally too hot for it. In this country generally treated as a greenhouse plant; but it is hardy, and in the Old World is grown largely in frames. See *Primula*.

Auriculas may be propagated by seed for general purposes and for the production of new varieties, but to perpetuate very choice varieties, it is necessary to propagate either by offsets or division of the plants. Seed should be sown in shallow pans or 4-inch pots early in March, so that the seedlings will be well developed before very warm weather sets in. The soil used in the seed pans should be very light and sandy, the surface should be made smooth, and the seeds then pressed lightly into the soil, after which a light covering of sand should be given, and the pans placed in a temp. of 60° until they have germinated, which usually takes from three to four weeks; they should then be removed to a light position, shaded from direct sunlight, in a rather lower temperature, to induce a stocky growth. As soon as the seedlings are large enough to handle conveniently, they should be pricked off into other pans or shallow boxes containing a mixture of three parts leaf-mold and one part sifted loam and clean silver sand. Watering should be carefully attended to, and everything done to promote active growth, so that, if possible, the plants may be large enough to require a second shift into other boxes, similarly prepared, by the end of June. Auricula seedlings

Azalea nudiflora, or Pinxter-flower. Also known as Wild Honeysuckle

go through the hottest months much better in boxes than in pots, as they can be kept more evenly moist. For their summer quarters, a wooden frame placed on sifted coal ashes on the north side of a building or wall, or almost any position where they will be sheltered from the sun and still receive plenty of light, should be given them. The frame should be provided with sash, which should be kept over the plants most of the time, giving air in abundance in favorable weather, and during the warmest weather the whole frame should be raised by placing a brick under each corner, so as to allow a good circulation of air among the plants. About the second week in September the young plants should be potted, using a compost of two parts good, fibrous loam, one part leaf-mold, and one part well decayed cow or sheep manure, with a little sand added. The frame should be kept a little close for a few days after potting, and from this time care must be taken not to wet the foliage in watering. The plants may remain in the frame until danger of freezing, when they should be transferred to a cool greenhouse for the winter. All decaying leaves should be carefully removed, and but little water will be required during the dull winter months. Towards the end of February the plants will show signs of flowering, when they should be given a top-dressing of pulverized sheep manure and placed in a light, airy position, in a temp. of 55°. The flowering season lasts about two months, after which the plants should receive their annual potting. All diseased or decayed roots should be cut away, and most of the old soil carefully removed. The propagation of very choice varieties by offsets or division is best done at this time. The pots used in potting should be well drained, and no larger than will just accommodate the plants. The soil best suited is the same as before recommended. After potting they may be placed in their summer quarters. Offsets should be inserted round the edge of 4-inch pots, using very sandy soil, and kept in a moist, shaded position until rooted. By annually repotting and giving a little extra care during the summer months, a batch of Auriculas will return very satisfactory results, and may be kept in a good, healthy condition for several years.

171. Auricula (× ½).

EDWARD J. CANNING.

AVÈNA (classical name). *Gramíneæ*. OATS. A genus of annuals or perennials well known from the cultivated oat. Panicles wide open, and loosely flowered, bearing large 2-6-flowered spikelets. A long, twisted, geniculate awn present, except in the cultivated oat. Species, about 50. Widely spread in the temperate regions of the Old and New World.

fátua, Linn. WILD-OATS. SAND-OATS. Resembles the cultivated oat; can be distinguished by the larger spikelets and long, brown hairs on the flowering glume. Awn an inch in length. En.—A very troublesome weed in some parts. Not cult.

stérilis, Linn. ANIMATED OATS. Much larger than the cultivated oat: spikelets large, in a drooping panicle; awn very long and geniculate. Mediterranean region and E.— Occasionally cult. for the odd behavior of the "seeds." It is the twisting and untwisting of this awn, when exposed to moisture and dryness, that has given to the grass the name Animated Oats. The untwisting of the awn causes the spikelet to tumble about in various directions, suggestive of independent motion.

The common oat is *Avena sativa*, Linn., native of the Old World. Pasture grasses sold as Avenas are *A. elatior*, which is an Arrhenantherum; and *A. flavescens*, which is a Trisetum.

P. B. KENNEDY.

AVERRHÒA (after Averrhoes, the Arabian physician). *Geraniàceæ*. Tropical fruit trees, cult. in India and China, and sometimes grown under glass for ornament. Lvs. alternate, odd-pinnate; lfts. alternate, ovate-acuminate, entire, stalked, sensitive: fls. borne on the naked stems and branches, minute, fragrant, rose-colored to reddish purple, racemose; calyx red; corolla campanulate; petals 5.

Carambòla, Linn. CARAMBOLA. Height 15-20 ft.: lfts. 4-5 pairs: fls. rosy purple: fr. varying in size from a hen's egg to a large orange, ovate, acutely 5-angled, yellow, fragrant, the pulp acid. The half-grown fr. used as pickles; the ripe fr. for preserves. Said to produce 3 crops a year. P. M. 15: 231. Cult. sparingly in S. Calif.

A. Bilímbi, Linn. CUCUMBER TREE. BILIMBI. Height 8-15 ft.: lfts. 5-10 pairs: fls. red, in longer racemes than the above: fr. smaller than the Carambola, cucumber-shaped, smooth, green rind, and acid pulp. Extensively cult. in S. Amer. P. M. 15: 231.

AVOCÁDO, ALLIGATOR PEAR. *See Persea.*

AZÁLEA (from Greek *azaleos*, dry: Linnæus believed them to grow in dry locations). *Ericàceæ*. Shrubs: lvs. deciduous or persistent, alternate, more or less hairy and ciliate, rarely glabrous and never lepidote or scurfy: fls. in terminal umbellate racemes, rarely lateral; corolla 5-lobed, funnel-form, campanulate or rotate; stamens 5-10; ovary 5-celled, hairy or setose, with or without glands: fr. a loculicidal capsule (Fig. 172), with numerous minute seeds. This genus is often united with Rhododendron, which is easier to distinguish by its lvs. and general habit than by its fls. In Rhododendron, the lvs. are coriaceous, generally persistent, usually revolute at the margin, glabrous or tomentose beneath, often lepidote, not ciliate, or ciliate and lepidote; stamens usually 10; ovary glabrous, glandular, lepidote or tomentose, never setose, sometimes more than 5-celled. The glabrous species of Azalea have 5 stamens and deciduous lvs. There are 35 species in Asia (especially E. Asia) and N. Amer. Consult Maximowicz, Rhododendreæ Asiæ Orientalis, St. Petersburg, 1870. The Azaleas belong to our most ornamental and beautiful flowering shrubs, and are often completely covered with large showy fls. of brilliant and various colors. They grow best in peaty or sandy soil containing no limestone, and prefer somewhat moist and half-shaded situations. In regard to the culture, they may be divided into two groups: Hardy deciduous Azaleas, and Indian Azaleas.

HARDY DECIDUOUS AZALEAS.—These include the species of the sections Euazalea and Rhodora, and the hybrids known as Ghent Azaleas. They are hardy, but in the N. and in exposed situations a protection with brush, hay or mats should be given during the winter, to prevent the flower-buds from sudden changes of temperature. They are usually increased by seeds sown in early spring in frames or pans, in sandy peat, without covering, and kept moist and shady. When the seedlings appear they should have air and a daily syringing. In autumn they are transplanted into boxes or frames, in sandy, peaty soil. The seeds germinate very readily sown in cut sphagnum, but ought to be pricked into boxes as soon as they can be handled. The second year the seedlings should be planted out in beds, sufficiently wide apart to allow a growth of two years. Long upright branches should be shortened, to secure well-branched plants. The named varieties are grafted on any of the common species, usually by veneer-grafting in autumn in the greenhouse, on potted stock. They may also be increased by cuttings of mature wood 2-3 in. long, taken with a heel late in summer, and placed in sand under glass. Layers usually require 2 years to root sufficiently; they are made in spring, and the buried part enclosed in moss. Azaleas are easy to transplant, either in early spring or in early autumn, when the year's growth has ripened. If desired, they may be planted for decorative purposes in early spring, in beds, without injuring the abundance or brilliancy of the flower, and after-

wards removed to give space for other decorative plants, and planted carefully in nursery beds, where they remain till next spring; and so on every year. Especially the hybrids and varieties of *A. mollis* are often and easily forced for winter-flowering. If intended for early forcing, they should be grown in pots, and care taken to allow them to finish their growth as early as possible; for later forcing, after Christmas, they may be potted in fall, or even just before bringing them into the forcing-house. With a temperature of 50–55° at night, they will bloom in about 6 weeks. The Ghent Azaleas are grown in great quantities in the Low Countries and in Germany for export to America; it is usually more profitable to buy this stock each fall than to attempt to raise it here, where labor is high-priced and the climate dry and hot.

In the open, the flowering period of hardy Azaleas extends from April to July. First comes *A. Canadensis*, *A. rhombica* and *A. Vaseyi*; then *A. nudiflora* and *A. mollis*, followed by *A. Pontica* and *A. calendulacea*, and nearly at the same time *A. Schlippenbachi* and *A. Albrechti*; somewhat later, *A. occidentalis*, and last, *A. arborescens* and *A. viscosa*. One of the most beautiful is the American *A. calendulacea*, which is hardly surpassed in the brilliancy and abundance of its flowers by any of the Ghent hybrids. Some good hybrids, or Ghent Azaleas, are the following:

Single-fld. varieties: Albicans, white with yellow blotch, fragrant; Admiral de Ruyter, deep red scarlet; Altaclarensis, white, bordered pink, spotted yellow, fragrant, B.R. 28:27; Anthony Foster, orange-yellow; Comte de Gomer, bright rose, spotted orange, R.B. 1:97; Daviesi, nearly pure white, fragrant, Gt. 42:1307; Directeur Charles Baumann, cherry red, spotted yellow; Géant des Batailles, deep crimson; Hilda, red-orange; Louis Hellebuyck, carmine, blotched orange, F.S. 19:2019; Marie Verschaffelt, pink, blotched yellow; Morteri, rosy pink with yellow blotch, S.B.F.G. II. 1:10; Princesse d'Orange, salmon-pink; Sanguinea, deep crimson; Tsarine, bright pink, R.B. 20:277; Van Dyck, blood-red; Viscosa floribunda, pure white, fragrant.

Double-fl. varieties: Arethusa, creamy white, tinged yellow; Bijou de Gandbrugge, white, bordered rose, F.S. 19:2024; Louis Aimé Van Houtte, carmine, tinged orange, F.S. 19:2022; Madame Mina Van Houtte, pink, tinged salmon and white, F.S. 19:2021; Murillo, pink, tinged purple, R.B. 19:232; Phebe, yellow, tinged orange, R.B. 19:232; Raphael de Smet, pink; Virgile, pale rose, striped yellow in the center, R.B. 19:232.

Indian Azaleas.—This group contains *A. Indica* and other species of the section Tsusia and the hybrids of them. They are well known evergreen shrubs, in the N. requiring cultivation in the greenhouse during the winter, but some varieties, as *A. Indica*, var. *Kompferi* and var. *amœna*, are hardy even near New York. *A. rosmarinifolia* and *A. linearifolia* will stand many degrees of frost in somewhat sheltered positions. They are rarely increased by seeds, which may be sown in the greenhouse in the same way as with the former group. Usually they are propagated by cuttings or grafting. The cuttings root best when made in August from half-ripened wood, and placed in sand under a frame, with gentle bottom heat. Choicer varieties are usually increased by veneer- or tongue-grafting, either in winter or in July and Aug. on vigorous-growing varieties raised mostly from cuttings. Grafting on Rhododendron is now used in some German nurseries with very good results. The best soil for Azaleas, if grown in pots, is a sandy compost of half peat and half leaf-soil, with an addition of good fibrous loam. It is essential to plant them firmly, and to give very good drainage. The base of the stem should be just above the surface. The best time for repotting is after flowering, when the new growth commences. During the summer, they should be kept in a coldframe or in the open in a sheltered spot, with the pots plunged in the soil, or planted out in prepared beds, where they make a very vigorous and healthy growth. In Sept. they should be repotted and transferred to the greenhouse. They must have plenty of water and free syringing during the hot months. The natural flowering time is from April to June, but in the greenhouse, Azaleas may be had in flower from Nov. till June. Against the red spider and thrips, from which the Azaleas are liable to suffer if the air is too dry, free syringing with water is the best remedy. Most of the plants used for forcing in this country are imported from Holland and Belgium; and it is cheaper to buy them than to attempt to raise them. Formerly Azaleas were kept in summer in shade or partial shade, but now it is the custom of the best growers to give them full exposure to the sun, either planted out or in the pots plunged to the rim in ashes or other good drainage material; in the latter case a top-dressing of 2 or 3 inches of old cow manure is very beneficial. The only American treatise is Halliday's Treatise on the Propagation and Cultivation of Azalea Indica, Baltimore, 1880.

Some of the best varieties of Indian Azaleas are the following (for a complete account, see August Van Geert, Iconographie des Azalées, abbreviated here as Ic. Az.):

Single-fld.: Antigone, white, striped and spotted violet, R.B. 7:241; Ic.Az. 3; Apollo, vermilion, Ic. Az. 20; Charmer, rich amaranth, very large, F.M. 5:303–4, 1; Comtesse de Beaufort, rich rose, blotched deep crimson; Criterion, rich salmon-pink, bordered white and blotched crimson, F.S. 8:796; Diamond, white, blotched dark crimson, F.S. 21:2233–34; Duc de Nassau, rich rosy purple, very free and large; Eclatante, deep crimson, shaded rose; Fanny Ivery, deep salmon-scarlet, blotched magenta, F.M. 10:342; Fielder's White, pure white, early, A.F. 13:1169; Flambeau, rich, glowing crimson, Gn. 16:242, 4; Fuerstin Bariatinsky, white, striped red, Gn. 16, 242, Ic.Az. 13; Jean Vervæne, salmon, striped, bordered white, R.B. 2:145, Ic.Az. 11; John Gould Veitch, lilac rose, bordered and netted white, striped crimson, F.S. 20:2071–72; La Victoire, reddish, white towards the edges, spotted maroon crimson; Louise von Baden, pure white, sometimes speckled pink; F.S. 17:1796, F.M. 3:158; Madame Charles Van Eeckhaute, pure white, with crisped edges; Madame Van Houtte, scarlet rose, bordered white, F.S. 23:2383, Ic. Az. 5; Marquis of Lorne, brilliant scarlet, very fine; Miss E. Jarret, pure white, with crisped edges, R.B. 14:213; Mrs. Turner, bright pink, bordered white, spotted crimson, F.S. 8:451; Mons. Thibant, orange-red; President Victor Van den Heeke, white striped and speckled crimson, with yellow center, F.S. 15:1567–68; Princess Alice, pure white, one of the best; Princesse Clementine, white, spotted greenish yellow; Reine des Pays-Bas, rich violet-pink, bordered white, I.H. 13:479; Roi de Hollande, dark blood-red, spotted black; Sigismund Rucker, rich rose, bordered white, blotched crimson, very showy, F.S. 19:2040–41, Ic.Az. 31; Stella, orange-scarlet, tinged violet; Wilson Saunders, pure white, striped and blotched vivid red.

Double-fld.: Borsig, pure white; Alice, deep rose, blotched vermilion, I.H. 23:244; Baron M. de Rothschild, rich purple-violet, large, F.S. 23:2477–78; Bernard André, dark violet-purple, large; Bernard André alba, white, I.H. 17:15, Ic. Az. 19; Charles Leirens, dark salmon, blotched dark purple, good form and substance, F.S. 19:1971–72; Charles Pynaert, salmon, bordered white, R.B. 10:25; Chicago, deep carmine, bordered white, large; Comtesse Eugenie de Kerchove, white, flaked red-carmine; Deutsche Perle, pure white, early, R.H. 1886·

172. Capsule of Azalea nudiflora.

173. Azalea nudiflora ($\times \frac{1}{3}$).

516, Gn 33:649, lc. Az. 25; Dominique Vervæne, bright orange; Dr. Moore, deep rose, shaded white and violet, very fine, R. Br. 11:61; Empereur du Brésil, rich rose, banded white, upper petals marked red, lc. Az. 15; François de Vos, deep crimson, I.H. 14:512, lc. Az. 14. F.M. 8:443; Imbricata, white, sometimes flaked rose, I.H. 24:281, F.S. 22:2284–85; Imperatrice des Indes, salmon-rose, festooned white and dark carmine, F.M. 18:357, lc. Az. 21; Johanna Gottschalk, white; Louise Pynaert, white, R.B. 4:209; Mme. Iris Lefebvre, dark orange-carmine, shaded bright violet and blotched brownish red, F.S. 18:1862–63; Madame Van der Cruyssen, pink, fine form, A.F. 12:1003; Madeleine, white, large, semi-double; Niobe, white, fine form; Pharailde Mathilde, white, spotted cherry-red, R.B. 13:145; President Ghellinck de Walle, bright rose, upper petals spotted yellow and striped crimson; President Oswald de Kerchove, pink, bordered white, blotched carmine; Raphael, white; Sakuntala, white, very free-flowering; Souv. du Prince Albert, rich rose-peach, broadly margined white, very free-flowering, F.M. 4:201, lc. Az. 24; Theodore Reimers, lilac, large; Vervæneana, rose, bordered white, sometimes striped salmon.

The following Azaleas are described below: *A. alba*, No. 15; albiflora, 16; Albrechti, 12; amœna, 14; arborescens, 2; *balsaminæflora*, 14; calendulacea, 5; *Californica*, 1; calyciflora, 14; Canadensis, 9; canescens, 4; crispiflora, 14; crocea, 5; *Danielsiana*, 14; flammea, 5; Gandavensis, 7; glauca, 3; hispida, 3; Indica, 14; Kæmpferi, 14; lateritia, 14; *ledifolia*, 15; *litiiflora*, 15; macrantha, 14; *mollis*, 8; narcissiflora, 15; nitida, 3; nudiflora, 4; obtusa, 14; occidentalis, 1; Pontica, 6; punicea, 15; purpurea, 15; rhombica, 10; *Rollissoni*, 14; rosiflora, 14; rosmarinifolia, 15; Schlippenbachi, 13; Simsi, 14; Sinensis, 8; *speciosa*, 5; Vaseyi, 11; viscosa, 3.

A. *Fls. in terminal 1–many-fld. clusters.*

B. *Lvs. and fls. from different buds; winter-buds with many scales: lvs. deciduous.*

C. *Corolla with rather long tube and usually acute segments, pubescent or hairy outside: stamens 5: lvs. ciliate. (Euazalea.)*

D. *Stamens as long as or longer than the limb: tube long and narrow, outside glandular.*

E. *Color white, pink or rose.*

1. **occidentàlis**, Torr. & Gray (*Rhododéndron occidentàle*, Gray. *A. Californica*, Hort.). Height 2–6 ft.: branchlets glabrous or pubescent: lvs. obovate-oblong, finely ciliate, slightly pubescent beneath when young: corolla 2–2½ in. long, white or slightly tinged rose, with yellow on the upper lobe, fragrant. May, June. Calif. B.M. 5005. F.S. 14:1432. Gn. 34:673.

2. **arboréscens**, Pursh (*Rhododéndron arboréscens*, Torr.). From 8–20 ft.: branchlets nearly glabrous: lvs. obovate or obovate-oblong, acute, ciliate, glabrous, green or glaucescent beneath: fls. white or tinged rose, 2 in. long, fragrant; style and stamens red. June, July. Allegh. Mts. G.F. 1:401. L.B.C. 17:1632, as *A. verticillata*.

3. **viscòsa**, Linn. (*Rhododéndron viscòsum*, Torr.). From 4–8 ft.: winter-buds glabrous: branchlets with stiff hairs: lvs. obovate-oblong, obtuse or mucronulate, ciliate, bristly hairy on the veins beneath: fls. white or tinged rose, 1½–2 in. long, viscid ontside, fragrant; style red. June, July. E. N. Amer. Em. 2:438. Var. **nitida**, Nichols. From 1–3 ft.: lvs. oblanceolate, bright green on both sides: corolla tinged red. B.R. 5:414. Var. **glàuca**, Ait. Lvs. whitish-glaucous beneath, dull and glaucous above. L.B.C. 16:1518. Var. **hispida**, Britt. (*A. hispida*, Pursh). Pedicels bristly hispid: fls. usually pink: lvs. glaucescent beneath. L.B.C. 5:441.

4. **nudiflòra**, Linn. (*A. lùtea*, Linn. *R. nudiflòrum*, Torr.). Figs. 172, 173. Height 2–6 ft.: winter-buds more or less pubescent: branchlets pubescent and often with stiff hairs: lvs. oblong or obovate, hairy on the midrib or pubescent beneath: fls. pink to nearly white, before or with the lvs., about 1½ in. broad, pubescent outside. Apr., May. E. N. Amer. B.R. 120. L.B.C. 1:51. G.W.F. 36. Mn. 2:17. Var. **canéscens**, Rehder (*A. canéscens*, Michx.). Lvs. tomentose or pubescent beneath, usually elliptic: fls. glandular outside.

EE. *Color yellow to flame-red.*

5. **calendulàcea**, Michx. (*R. calendulàceum*, Torr.). From 4–10 ft.: branchlets glabrous or with stiff hairs: lvs. obovate or ovate, usually pubescent beneath, serrulate-ciliate: fls. orange-yellow or flame-red, often 2 in. broad, with the lvs., nearly scentless; tube usually shorter than the limb; stamens thickened at the middle. May, June. E. N. Amer. Var. **flámmea**, Michx. (*A. speciòsa*, Willd.). Fls. flame- or orange-red. B.R. 145. L.B.C. 7:624. B.M. 180. Var. **crócea**, Michx. Fls. yellow or orange-yellow. B.M. 1721. L.B.C. 14:1324.—One of the most showy species.

6. **Póntica**, Linn. (*R. flàvum*, Don). Plant 2–6 ft.: branchlets hairy: pedicels and petioles glandular: lvs. cuneate, oblong, usually hairy on both sides when young, 2–4 in. long: fls. yellow, 2–2½ in. broad, very fragrant; stamens as long as the limb. May. Orient, Caucasus. B.M. 433; 2383 (var. albiflora).—A very fragrant and free-flowering species, not common in cult. Nearly all varieties referred to this species in nursery catalogues are hybrids, for which the collective name *A. Gandavensis* may be used.

7. **Gandavénsis**, Hort. GHENT AZALEAS. Fig. 174. These are hybrids between *A. Pontica*, and the American

174. Ghent azalea—A. Gandavensis (×⅓)

species, and *A. Sinensis*, now more in cult. than the typical species. Of a number of them the parents are easily recognized, but many are hybrids of the second degree or more, and it is impossible to be sure about their parentage. They vary in all shades of white, yellow, orange, pink, carmine, lilac, and red, with single and double fls., and also in the time of flowering, from May to July. A short selection of some good varieties has already been given.

DD. *Stamens shorter than the limb; corolla funnel-form-campanulate, outside pubescent, not glandular.*

8. **Sinénsis**, Lodd. (*A. móllis*, Blume. *R. Sinénse*, Sweet). From 3–8 ft.: branches hairy: lvs. oblong or obovate-oblong, 2–4 in. long, appressed-setose above, glaucescent beneath and nearly glabrous except on the midrib, rarely pubescent: fls. 2–2½ in. broad, yellow, orange or pink. April, May. China, Japan. F.S. 19: 2032–36. Gn. 46, p. 265, 546. B.R. 15:1253. L.B.C. 9:885.

Gt. 16:556. Gng. 4:279.—A valuable species, with large but scentless fls. A large number of varieties and hybrids has been raised, which are well adapted for forcing purposes and also for groups in the open, being as hardy as the American species. See *Rhododendron* for picture.

cc. *Corolla with very short tube, rotate-campanulate or two-lipped, glabrous outside: segments obtuse: stamens 7–10.* (*Rhodora.*)

D. *Limb of corolla 2-lipped, not spotted, the two lower segments divided nearly to the base: fls. before the lvs.*

9. **Canadénsis**, O. Ktze. (*Rhodóra Canadénsis*, Linn. *Rhododéndron Rhodóra*, Don). From 1–3 ft.: lvs. oval, obtuse and mucronulate, glaucous and slightly pubescent beneath: fls. 5–7, on very short pedicels 1–1½ in. broad, rose-purple; segments narrow, the lower ones revolute; stamens 10. Apr., May. E. N. Amer.: Newfoundland to Pa. Em. 2:441. B.M. 474.

10. **rhómbica**, O. Ktze. (*Rhododéndron rhómbicum*, Miq.) Shrub, 3–8 ft.: lvs. rhombic-elliptic, acute at both ends and sparsely hairy above, yellowish pubescent at the nerves beneath: fls. 2–3; corolla 1½–2 in. broad, somewhat campanulate, bright rose-colored, segments oblong; stamens 10. Apr., May. Japan. B.M. 6972. Gt. 17:586; G.C. III. 20:38.

DD. *Limb of corolla rotate-campanulate, or slightly 2-lipped, divided usually till below the middle: upper lobes spotted.*

11. **Vàseyi**, Rehder (*Rhododéndron Vàseyi*, Gray). From 5–15 ft. high; branchlets without bristles: lvs. oblong or oblong-lanceolate, acute, sparsely hirsute: fls. before or with the lvs.; corolla slightly 2-lipped, lower lobes widely spreading; stamens 7, rarely 5. Apr., May. N. Car. G.F. 1:377. G.C. III. 20:71.—Excellent.

12. **Álbrechti**, O. Ktze. (*Rhododéndron Albrechti*, Maxim.). From 2–5 ft.: branchlets glandular-pilose: lvs. obovate or elliptic, acute, 3–5 in. long, appressed-pilose above, pubescent along the veins beneath: fls. purple, with the lvs. 2 in. broad; stamens 10. Japan.

13. **Schlippenbachi**, O. Ktze. (*Rhododéndron Schlippenbachi*, Maxim.). Three to 5 ft.: branchlets glandular-pilose: lvs. cuneate, broadly obovate, 2–5 in. long, rounded and mucronate at the apex, hirsute on both sides or glabrous at length: fls. with the lvs., 2–3 in. broad, pale rose-colored, upper lobes spotted reddish brown; stamens 10. May. Japan. B.M. 7373. Gn. 46:972. G.C. III. 19:561.

BB. *Lvs. and fls. from the same terminal bud: winter buds with 2–4 scales of nearly equal length: corolla glabrous outside: lvs. usually persistent.* (*Tsusia.*)

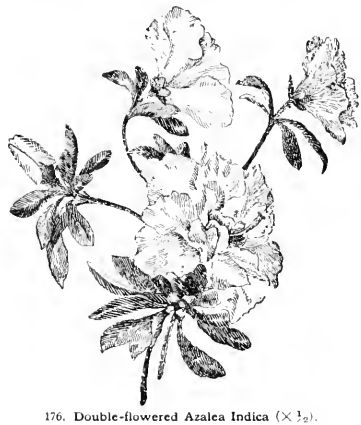
14. **Índica**, Linn. (*Rhododéndron Indicum*, Sweet). Figs. 175, 176. From 1–8 ft.: branchlets, lvs. and pedicels more or less rufously appressed-strigose: lvs. lanceolate or obovate: fls. 1–3; calyx densely setose, not glandular, with usually small lobes; corolla pink or purple, upper segments spotted; stamens 5–10. China, Jap. Gn. 50, p. 192; 54, p. 487. R.B. 20:121; 21:85; 23:37. A.G. 14:473. Gng. 4:359. F. E. 9:431. F.R. 2:579.—This is a very variable and much-cultivated species, and the following varieties are often described as species.

175. Azalea Indica ($\times \frac{1}{2}$)

(1) *Lvs. lanceolate or elliptic, acute, 2–3 in. long, dull above and rufously strigose: shrubs, 2–8 ft. high, somewhat loosely branched.*

Var. **Kæmpferi**, Rehder. Lvs. deciduous, only a few small ones below the fl.-buds persisting till spring, elliptic, bright green: fls. 2–3, with or before the lvs.; calyx-lobes oval, rounded; corolla 1–2 in. broad, pink or orange-red; stamens 5, with yellow anthers. Apr., May. Jap.—This is the hardiest variety; hardy even in New Eng.

Var. **Simsi**, Rehder (*A. Indica*, Sims, not Linn.). Lvs. persistent, dark green, lanceolate: fls. 1–3, rose-



176. Double-flowered Azalea Indica ($\times \frac{1}{2}$).

colored or carmine; calyx-lobes lanceolate; stamens 10, with purple anthers. May, June. China. B.M. 1480. L.B.C. 3:275.

(2) *Lvs. obovate or obovate-lanceolate, obtuse, rarely acute: ½–2 in. long, less strigose, and usually shining above: low, much-branched shrubs.*

Var. **macrántha**, Reichb. (*A. macrántha*, Bunge. *A. Danielsiàna*, Paxt.). Lvs. coriaceous, dark green, shining, obovate or oval: fls. usually single, 2–3 in. broad, pink or purplish pink; stamens 5–10, usually enclosed. May, June. China. P.M. 1:129. S.B.F.G. II. 3:261.—From this variety nearly all of the beautiful garden forms of the Indian Azaleas have originated by cross-breeding with other varieties and forms of *A. Indica* introduced from Japanese and Chinese gardens, and by hybridizing, especially with *A. rosmarinifólia*. To this variety may be referred the following remarkable forms: Var. **crispiflòra**, Van Houtte. Fls. large, rose-colored, with distinctly crisped segments. F.S. 9:887. B.M. 4726. Var. **lateritia**, Lindl. Lvs. oblong-lanceolate: fls. salmon or brick-red. B.R. 1700.

Var. **rosiflòra**, Rehder (*A. rosiflòra*, Flor. Mag. *A. balsamináflòra*, Carr. *A. Rôllissoni*, Hort.). Lvs. oblong-lanceolate: fls. salmon-red, very double, with imbricated, oblong segments, resembling the blooms of a camellia-fld. balsam. F.M. 19:418. Gn. 18:249. R.H. 1882:432.

Var. **obtùsa**, Rehder (*A. obtùsa*, Lindl.). Lvs. obovate or ovate, obtuse: fls. 1–3, pink or orange-red; corolla 1–1½ in. broad, lobes oval-oblong; stamens 5, exserted, anthers yellow. May. China, Jap. B.R. 32:37. G.C. II. 25:585. R.H. 1876:370. Var. **obtùsa álba**, Hort. Fls. white. G.F. 9:395. Var. **calyciflòra**, Rehder (*A. calyciflòra*, Hort.). Fls. brick-red, corolla double (hose-in-hose).

Var. **amœ̀na**, Rehder (*A. amœ̀na*, Lindl.). Lvs. obovate or elliptic, obtuse or acute, ½–1 in. long, dark green: corolla usually double (hose-in-hose), purple, ⅝–1 in. broad; stamens 5. Apr., May. China, Jap. B.M. 4728. F.S. 9:885. G.C. III. 23:fig. 125. A.G. 15:373; 18:568. Gng. 2:385. A.F. 12:33. F.E. 9:573. —Flowering early and very abundantly; hardy north

Azalea viscosa, Swamp Pink, one of the plants erroneously known as Honeysuckle

to New York. There are some forms and crosses of this variety, of which the following may be recommended: Caldwelli, with larger purple fls., Geert. le Az. 18; Marvel, lilac-carmine, double, Flor. Mag. 11: 14; Princess Maud, rosy magenta, R.H. 1886: 516; Mrs. Carmichael, crimson-magenta; Princess Beatrice, bright mauve; Prime Minister, soft pink; Miss Buist, pure white.

15. **rosmarinifolia,** Burm. (*A. álba,* Sweet. *A. ledifólia,* Hook. *A. liliiflóra,* Poit.). Much branched, low shrub, 1–3 ft.; branches, lvs. and pedicels densely rufously appressed-strigose: lvs. elliptic or elliptic-lanceolate, persistent, 1–3 in. long: fls. 1–3; calyx with lanceolate serrate-glandular lobes; corolla pure white or rosy purple, 2–3 in. broad, fragrant; stamens usually 10. May. China. B.R. 10: 811. B.M. 2901. L.B.C. 13: 1253.—Some remarkable varieties of this species are the following: Var. **alba,** Rehder (*A. índica,* var. *álba,* Lindl. *R. leucánthum,* Bunge). Fls. white, sometimes striped pink. Var. **purpúrea,** Rehder (*R. ledifólium,* var. *purpúreum,* Max.). Fls. rosy purple. Var. **narcissiflóra,** Rehder (*A. narcissiflóra,* Fort.). Fls. double, white; rarely purple. Var. **punícea,** Rehd. (*A. punícea,* Sweet. *A. ledifólia,* var. *phœnícea,* Hook. *A. índica,* var. *calycína,* Paxt.). Fls. single, purple; calyx with linear, not serrate and less glandular lobes. B.M. 3239. L.B.C. 18: 1735. *A. rosmarinifólia* has produced, with *A. índica,* a large number of beautiful hybrids, of which one of the first was figured in 1833 as *Rhododendron pulchrum.*

AA. *Fls. from lateral 1-fld. buds toward the end of the branches: corolla rotate campanulate, glabrous.* (*Azaleastrum.*)

16. **albiflóra,** O. Ktze. (*Rhododéndron albiflórum,* Hook.). About 2–3 ft.; branches strigose and glandular when young; lvs. oblong, pale green, appressed-strigose above and at the midrib beneath, slightly ciliate; fls. nodding, on short pedicels; corolla white, 5-cleft, about 1 in broad; calyx glandular; stamens 10. Rocky Mts. B.M. 3670.

A. Dahúrica, Koch = Rhododendron Dahuricum.—*A. dianthiflóra,* Carr. = A. rosmarinifolia, var. dianthiflora.—*A. dilatáta,* O. Ktze. (R. dilatatum, Miq.). Allied to A. rhombica. Lvs. glabrous; stamens 5. Japan.—*A. Farrérae,* Koch (A. squamata, Lindl.). Allied to A. Schlippenbachi. Lvs. rhomboid-ovate, somewhat coriaceous; fls. whitish pink, spotted. China. B.R. 33: 3.—*A. Japónica,* Gray = A. Sinensis.—*A. Kámschatica,* O. Ktze. (Rhododendron Kamschaticum, Pall.). Low or prostrate shrub, to 10 in. high; lvs. obovate, setose; fls. 1–5, long-pedunculed, $1\frac{1}{2}$–2 in. broad, campanulate, purple. N. E. Asia, N. W. Amer. Gt. 36: 1260.—*A. Lappónica,* Linn. = R. Lapponicum.—*A. lineariflólia,* Hook. (R. linearifolium, Sieb. & Zucc.). Allied to A. rosmarinifolia. Lvs. linear-lanceolate; corolla pink, deeply divided into 5 linear-lanceolate segments. April, May. Japan. B.M. 5769.—*A. macrosépala,* O. Kuntze (R. macrosepalum, Maxim.). Height 1–2 ft.; branchlets densely villose; lvs. deciduous or semi-persistent, elliptic; fls. umbellate, rose-lilac, spotted, about 2 in. broad; calyx pubescent-glandular. Japan. Gt. 19: 662.—*A. mucronáta,* Blume = A. rosmarinifolia.—*A. obtúsa,* Lindl. = A. Indica, var. obtusa.—*A. ovata,* Lindl. (R. ovatum, Planch.). Allied to A. albiflora. Height 2–12 ft. lvs. ovate, glabrous; fls. pink or nearly white, spotted, rotate, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad; stamens 5. China. B.M. 5064.—*A. reticulata,* Koch = A. rhombica.—*A. semibarbata,* O. Kuntze (R. semibarbatum, Maxim.). Allied to A. albiflora. Lvs. elliptic, crenately ciliate, setose beneath; fls. greenish yellow, spotted purple, $\frac{1}{2}$–$\frac{3}{4}$ in. broad. Japan. Gt. 19: 666.—*A. serpyllifólia,* Gray (R. serpyllifolium, Miq.). Allied to A. Indica. Low, rigid shrub; lvs. deciduous, obovate, $\frac{1}{4}$–$\frac{1}{2}$ in. long; fls. single, rosy red, $\frac{1}{2}$–$\frac{3}{4}$ in. broad. Japan. B.M. 7503.—*A. Sieboldi,* Miq. = A. Indica.—*A. squamáta,* Lindl. = A. Farrerae.—*A. Tschonoskii,* O. Kuntze (R. Tschonoskii, Maxim.). Allied to A. Indica. Low shrub. lvs. elliptic, $\frac{1}{4}$–$\frac{3}{4}$ in. long; fls. 2–4, white, $\frac{1}{4}$ in. broad. Japan

ALFRED REHDER.

AZARA (J. N. Azara, a Spanish promoter of science, especially of botany). *Bixàceæ.* Shrubs or small trees: lvs. evergreen, alternate, with usually enlarged and leaf-like stipules: fls. small, in axillary pedunculed racemes or clusters, apetalous; sepals 4–5; stamens numerous, rarely 5: fr. a many-seeded berry. About 20 species in S. America, especially Chile. Handsome evergreen shrubs, with small but fragrant fls., for warm temperate regions; probably only *A. microphýlla* will thrive farther north in a sheltered position and protected during the winter. Grow best in a sandy compost of loam and leaf soil. Prop. by seeds or cuttings of mature wood in autumn, placed in slight bottom heat under glass.

microphýlla, Hook. f. From 3–12 ft.: lvs. obovate, serrate, or nearly entire, $\frac{1}{2}$–$\frac{3}{4}$ in. long, shining, glabrous, the stipules similar, but half the size: fls. greenish, in few-fld. clusters; stamens 5: berries orange. Feb., Mar. Chile. G.C. II. 1: 81.—Graceful evergreen shrub, regularly pinnately branched, excellent for covering walls; the hardiest of all the cultivated species.

Gilliesi, Hook. & Arn. Height 10–15 ft.: lvs. $2\frac{1}{2}$–3 in. long, broad-ovate, with coarse, spiny teeth, glabrous; stipules orbicular, much smaller: fls. in dense, elliptic, nodding heads, yellow. Feb., Mar. Chile. B.M. 5178. F.S. 23: 2445.—The handsomest of all Azaras.

A. ceassifólia, Hort. = A. Gilliesi.—*A. dentáta,* R. & Pav. Height 12 ft.: lvs obovate or elliptic, crenate serrate: fls. yellow, in small corymbs. Chile. B.R. 21: 1788.—*A. integrifólia,* R. & Pav. Height 10–20 ft.: lvs. entire: fls. yellow, in oblong heads. Chile. Has a variegated form.

ALFRED REHDER.

AZÓLLA (Greek, *to destroy by drying*). *Salviniàceæ.* A small genus of floating aquatics with small, pinnate stems and minute fleshy 2-lobed lvs., producing two sorts of spores in globular sporocarps. The species multiply rapidly by self-division, but will grow readily in water containing a little nutriment. The species are distinguishable only by microscopic examination.

Caroliniàna, Willd. Plant $\frac{3}{4}$–1 in. long: anchor-like processes of spores with septa. N. Y. to the Gulf of Mex.

filiculoides, Lam. Plants 1–2 in. long: anchor-like processes without septa. Calif. to Chile.

L. M. UNDERWOOD.

B

BABIÀNA (said to come from Dutch for *baboon*, because those animals eat the bulbs). *Iridàceæ*. About 50 cormous plants of S. Afr. Fls. showy, red or purplish, in a short spike-like cluster or raceme, tubular at the base, the segments with claws or narrow bases, and the limb erect-spreading: ovary 3-loculed: lvs. narrow, hairy, plaited, standing edgewise to the stem. Low plants, of easy culture if treated like freesias or hyacinths. Three or 4 corms in a 4-in. pot give attractive bloom in March or later. Grown only indoors or under frames in the N. They are showy and useful plants. Monogr. by Baker in Handbook of the Irideæ, 1892.

A. *Perianth limb regular or nearly so, and widespreading.*

stricta, Ker. (*B. villòsa*, and *B. purpùrea*, Ker.). Fig. 177. A foot or less high: lvs. broad, oblong-lanceolate or sword-shaped, barely reaching the spikes: fls. scattered, showy, usually red or purple, with a prominent tube, the segments oblong-lanceolate. B.M. 583, 621.—Babianas are not sold under species-names in this country, but as mixed varieties. These varieties are chiefly, if not wholly, of this species. Many forms and colors. Var. **angustifòlia,** Sweet. Lvs. linear. B.M. 637. Var. **rùbro-cyánea,** Ker. Limb lilac, throat red. B.M. 410. Var. **sulphùrea,** Ker. Yellow or whitish. B.M. 1053. Two other long-cultivated types are described below.

177. Babiana stricta (×⅓).

AA. *Perianth limb distinctly ringent or gaping.*

plicàta, Ker. Low: lvs. lanceolate, hairy, usually overtopping the spikes: fls. lilac or red, long-tubed, the segments oblong and unequal. B.M. 576.

dísticha, Ker. Differs from the last in having the perianth-tube distinctly exserted from the spathe.

L. H. B.

BABY'S BREATH. See *Gypsophila*.

BÁCCHARIS (*bakkaris*, an ancient Greek name). *Compósitæ*. GROUNDSEL TREE. Shrubs or herbs: lvs. alternate, usually serrate, deciduous or persistent: heads of fls. small, white or yellowish, dioecious; involucre with many imbricate scales: akenes with pappus. About 250 species in America, mostly in tropical regions. A few species are cultivated particularly for the snow-white pappus, which gives the fruiting plant a very showy appearance. They grow in almost any well drained soil in a sunny position, and are well adapted for dry and rocky slopes, and valuable for seashore planting. Prop. by seeds or by cuttings under glass.

halimifòlia, Linn. Shrub, 3–12 ft.; branches angular: lvs. cuneate, oblong or obovate, coarsely toothed, the uppermost entire, glabrous, 1–2 in. long: fls. in large panicles; pappus white, about ¼in. long. Sept. Seacoast, from N. Eng. southward. Gng. 7: 113.—The hardiest species; in fruit resembling a shrub with abundant snow-white fls.

B. Patagónica, Hook. & Arn. Low evergreen shrub: lvs. ⅛–¼in. long: heads mostly axillary. Patag.—*B. pilularis*, DC. Height 6 ft.; evergreen: lvs. 1 in. long: heads in racemose panicles. Pacific coast.—*B. salicifòlia*, Torr. & Gray. Allied to *B. halimifolia*. Lvs. narrow-oblong or linear-lanceolate. Colo. to W. Texas.

ALFRED REHDER.

BACHELOR'S BUTTONS. See *Centaurea Cyanus*, *Gomphrena globosa* and *Ranunculus acris*.

BÁCTRIS (Greek, *baktron*, cane; the young stems used for walking-sticks). *Palmàceæ*, tribe *Coroíneæ*. Usually low palms, very rarely entirely spineless, with solitary or fasciculate ringed, spiny or smooth caudices, sprouting from the roots: lvs. terminal or scattering, equally or unequally pinnatisect, glabrous or pubescent; segments sparse or aggregated, or more or less imperfectly connate, forming a bifid blade, acute or rarely obtuse at the apex, the ciliate margins recurved at the base; petiole short or long; sheath long, spiny; spadices sessile or pedunculate, perforating the leaf-sheaths; spathes 2, the lower short, open at the apex, the upper coriaceous or woody, exceeding the spadix, or fusiform, ventrally dehiscent, smooth, bristly or spiny; bracts persistent: fls. small or medium, pale yellow or greenish: fr. small, green, ovoid or globose. Species, about 100. Tropical America. Ornamental, but little grown on account of the spines. See *Palms*.

A. *Spines yellow, tipped black.*

pallidispìna, Mart. (*B. flavispina*, Hort.). St. 10–18 ft. high, 1–2 in. in diam., the internodes spiny: lvs. showy, 5–9 ft. long, equally interruptedly pinnatisect; petiole 4–6 ft., brown-scaly, thickly covered with very long (¾–2¼in.), black-tipped yellow spines, either solitary or in groups of 2–4; segments linear-lanceolate, caudate-acuminate, prickly on the margins, the basal ones 2–8 in. long, 1½in. wide, the upper, 12 in. by 1¾in. Brazil.

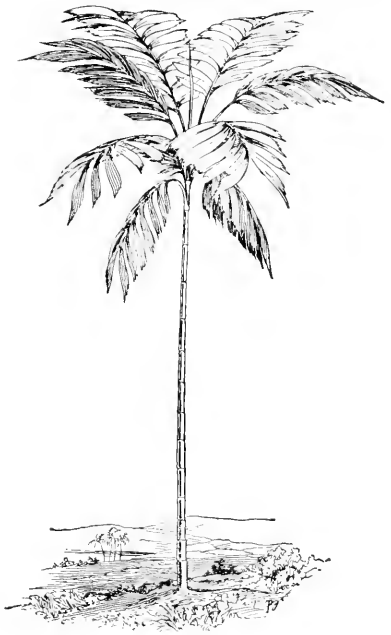
AA. *Spines black.*

B. *Lf.-segments acute at both ends.*

màjor, Jacq. St. 9–15 ft. high, 1–1½in. in diam., armed with rows of black spines, 2 in. long: petiole armed with very long black, terete spines; lvs. 4–6 ft. long, equally pinnatisect nearly to the rachis; sheath and rachis spiny and white or brown tomentose; segments linear, acute at both ends, 25–35 on each side, 1-nerved, 8–12 in. long, ⅛–½in. wide, glabrous on both sides, densely setose, with black hairs along the margin. Brazil.

BB. *Lf.-segments acute at tip.*

Gasipàes, HBK. (*Guilielma speciòsa*, Mart.). St. about 60 ft. high, single or cæspitose, with rings of subu-



178. Balaka Seemanni.

late-compressed black spines, 1 in. long, the rings about as far apart as the diam. of the st.: lvs. 6 ft. long, curving; segments dark green above, pale green below, very numerous, approximate, $1\frac{1}{2}$ ft. long, $1\frac{1}{4}$ in. wide, linear-lanceolate, long-acuminate, bristly or minutely prickly along the margins. Lower Amazon.

horrida, Oerst. Cæspitose stems 6–8 ft. high, 8–9 in. diam., very spiny, sheathed for most of its length with bases of dead lvs.; spines 3–4 in. long, 4-sided, whitish tomentose, at length glabrous: lvs. $2\frac{1}{2}$–3 ft. long; sheath 8 in., brown-tomentose; petiole $1\frac{1}{2}$ ft., densely spiny, subtetragonal, densely brown-tomentose beneath; segments 7 in. long, $\frac{1}{2}$ in. wide, lanceolate, rigid, glaucous. Nicaragua.

JARED G. SMITH.

BACULÀRIA (Latin, *baculum*, a small walking-stick). *Palmàceæ*, tribe *Arèceæ*. Low spineless palms, with annular reed-like single or fasciculate sts: lvs. terminal, unequally pinnatisect; segments membranous, broad or narrow, split or toothed at the apex, the broader ones many-nerved, the narrow ones 1-nerved, the terminal confluent; midrib and nerves without scales below; margins not thickened, recurved at the base; petiole and rachis sparsely scurfy, convex on the back, flat above or concave toward the base; sheath short, open; spadices numerous, longer than the lvs., spreading, recurved; peduncle very slender, scurfy, compressed at the base; spathes 2, remote, the lower one at the base of the peduncle tubular, the upper membranaceous, linear, ensiform; fls. green; fr. small, elongate-ovoid, subacute, green, $\frac{1}{4}$–$\frac{1}{2}$ in. long. Species 2. Temperate and tropical Australia. See *Palms*.

monostàchya, F. Muell. (*Arèca monostàchya*, Mart. *Kèntia monostàchya*, F. Muell.). Trunk 6–12 ft. high; lvs. $1\frac{1}{2}$–4 ft. long; the sheath broad, coriaceous, about 6 in. long, produced into 2 stipular lobes; segments very irregular, acuminate, very variable in breadth and distance, adnate to the rachis, or tapering at the base, the longest about 1 ft. long. Queensland, N. S. W. B.M. 6644.

JARED G. SMITH.

BAÈRIA (after the Russian zoölogist, Karl Ernst von Baer). *Compósitæ*. Californian annuals (or one perennial species), with numerous showy, inch-wide yellow fls. in early summer.

grácilis, Gray (*Burrìdia grácilis*, DC.). Easily distinguished from *Actinolepsis coronaria* by its hairy sts. and foliage and undivided lvs.: plant much branched: height 4–12 in.: lvs. opposite, connate, linear-lanceolate: fls. solitary, on slender terminal peduncles: involucre leafier than in *Actinolepsis coronaria*, the scales longer, downy, in 2 series: rays 8–12. B.M. 3758.—This is likely to be cult. as *Lasthenia Californica*, which, however, is not hairy and has much longer lvs.

B. chrysóstoma, Fisch. & May. Lvs. narrowly linear, 1 line or less wide: fls. larger than in *B. gracilis*: habit more erect —*B. coronària*=Actinolepsis coronaria

BALÀKA (the Fijian vernacular name). *Palmàceæ*, tribe *Arèceæ*. Differs from Ptychosperma in having the seed not sulcate, and in the half-rhomboid segments of the lvs.; and from Drymophloeus in the form of the leaf and the caduceus spathes. Species 2. Fiji Islands.

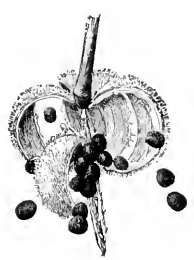
Seèmanni, Becc. (*Ptychospérma Seèmanni*, H. Wendl.). Fig. 178. Caudex slender, 8–12 ft. high, straight, ringed, about 1 in. in diam.: lvs. pinnatisect, 4 ft. long; segments erose-dentate at the apex, alternate, 9 on each side, semi-rhomboid, obliquely truncate, the upper margin longer, cuspidate at the apex, the terminal one deeply bifid. Growing as underwood in dense forests, Fiji.—Stems used for spears by natives, because of their strength and straightness. Fig. 178 is adapted from Seeman's Flora Vitiensis.

JARED G. SMITH.

BALLOON VINE. See *Cardiospermum*.

BALM (*Melissa officinàlis*, Linn.). *Labiàtæ*. Sweet herb, the lvs. being used for seasoning, particularly in liquors. It has a lemon-like flavor. It is a hardy perennial from southern Eu. The plant grows 1–2 ft. high, somewhat hairy, loosely branched, with ovate-crenate lvs. and yellowish or whitish fls. in loose axillary clusters. Thrives in any warm position, and is easy to grow. Prop. by seeds; also by division.

179. Pod of garden Balsam.



180. Explosion of Balsam pod.

BALSAM, *Impàtiens Balsámina*, Linn. (*Balsámina hortènsis*, DC. *Balsámina Impàtiens*, Hort. *Impàtiens coccínea*, Sims, B.M. 1256). *Geraniàceæ*. An erect, much-branched, half succulent annual, long ago introduced from India, and now widely cult. for its showy

fls. It has varied immensely in the doubling, size and color of its fls. and in the stature of the plant. It was known to Gerarde in 1596. The plant has lanceolate, toothed lvs., the lower ones being mostly in pairs. The fls. are clustered in the axils of the lvs., on very short

181. Camellia-flowered Balsam.

stalks; sepals and petals similarly colored and not easily distinguished, one of the sepals (of which there seem to be 3) long-spurred; petals apparently 3, but two of them probably represent two united petals, thus making 5; stamens 5. The pod, shown in Figs. 179 and 180, is explosive. It has 5 carpels and very thin partitions, and seeds borne on axile placentæ. When the capsules are ripe, a pinch or concussion will cause the valves to separate and contract, the seeds being thrown with considerable force.

The full-double Balsams are known as the Camellia-flowered varieties (Fig. 181). In well selected stock, the greater part of the flowers from any batch of seedlings should come very double. The colors range from white to dark blood-red, yellowish and spotted. Balsams are of very easy culture. They are tender, and should be started in thumb-pots or boxes indoors, or in the open when danger of frost is past. The seeds are large, and germinate quickly. The plants prefer a rich, sandy loam, and must not suffer for moisture. Transplanting, and pinching-in the strong shoots, tend to make the plants dwarf and compact. It is well to remove the first flower-buds, especially if the plants are not thoroughly established. Better results are obtained when only a few main branches are allowed to grow, all the secondary and weak ones being pinched out. The lower lvs. may

182. The garden Balsam.

be removed if they obscure the fls. Well grown plants should stand 2 ft. apart each way, and the tall kinds will reach a height of 2–2½ ft. Seed of the finest double strains is expensive, but inferior or common seed gives little satisfaction. Plants started early in May should give fls. in July, and should bloom until frost. A full grown plant is shown in Fig. 182. At the present time, Balsams are grown chiefly for their value as flower-garden plants; but some years ago the fls. were largely used as "groundwork" in florists' designs, particularly the double white varieties. The flowers were wired to toothpicks, and were then thrust into the moss which formed the body of the design.

L. H. B.

BALSAMORRHÍZA (Greek, *balsam root*). *Compósitæ*. Low perennials with thick, deep, resinous roots, tufts of radical lvs., and large, yellow fls. Cent. and W. N. Amer

Hookeri, Nutt. Height 4–12 in.: lvs. lanceolate, 1–2-pinnately parted: fls. solitary, on naked scapes. Int. 1881 by E. Gillett, but scarcely known to horticulturists.

BAMBOO. Various giant perennial grasses consisting of the genera and species of the tribe *Bambúseæ*, order *Gramíneæ*. Usually large and often tree-like, woody, rarely herbaceous or climbing, of wide geographical range. The species are irregularly distributed throughout the tropical zone, a few occurring in subtropical and temperate zones, and reaching their maximum development in the monsoon regions of Asia. About 23 genera, only 2 being common to both hemispheres. Something more than 200 species are recognized, of which upwards of 160 occur in Asia, about 70 in America, and 5 in Africa. They extend from sea-level to altitudes of more than 10,000 ft. in the Himalayas and 15,000 ft. in the Andes, and under the most favorable conditions some species may attain a height of 100–120 ft., with a diam. of culm of 8–12 inches.

An attempt to portray the many economic uses of the giant-grasses would greatly overreach the field of this article; but as objects of grace and beauty in the garden, conservatory, and special conditions of landscape, the Bamboos are invaluable. Not only are they available to planters where the climatic conditions are very favorable, but it is possible to grow certain species where the cold of winter may reach zero Fahrenheit, or even occasional depressions of greater severity.

Bamboos delight in a deep, rich loam, and generously respond to good treatment. A warm, slightly shady nook, protected from the prevailing winds of winter, and where moist but well-drained soil is plentiful, is an ideal location for these beautiful grasses. A top-dressing of manure and leaves is not only beneficial in winter, by preventing the frost from penetrating the ground too deeply, but it also preserves the moisture that is so essential to the welfare of the plants during the growing season. Some species produce rampant subterranean stems, and spread rapidly when once established. It is best to plant each group of but one species, and to restrict the rapidly-spreading sorts to isolated positions. The most effective results to be obtained by planting Bamboos are secured on gentle banks above clear water and against a strong background of the deepest green. In such situations the gracefully arched stems, the dainty branches, bending with their wealth of soft green lvs., and the careless lines of symmetry of each individual, lend a bold contrast of the richest beauty. It will require a few years to thoroughly establish a clump of Bamboos in the open air, and until this is effected the vigor, hardiness and beauty that characterize some noble sorts are lacking. During the early life of the groups, some protection should be given where the winters are trying, and even with this precaution it is likely the plants will suffer to some extent at first during cold weather. Planted out in conservatories or confined in tubs or large pots, the Bamboos present many admirable qualities. As decorative plants in tubs or pots, either alone or associated with palms and other stock, several species offer many inducements to their cultivation, especially as they may be grown in summer and wintered in a coolhouse. Propagation is best effected by careful division of the clumps before the annual growth has started. The difficulty of procuring seeds in some instances is very great; indeed, the fruiting of a number of species has never been observed. Some species flower annually, but the majority reach this stage only at intervals of indefinite and frequently widely separated periods. In some species the fls. appear on leafy branches:

in others the lvs. fall from the culms before the fls. appear, or the inflorescence is produced on leafless, radical stems. Fructification does not exhaust the vitality of some species; but others, on the other hand, perish even to the portions underground, leaving their places to be filled by their seedling offspring. Owing largely to the difficulty in obtaining flowering specimens, the systematic arrangement or nomenclature of the Bamboo is in a sad plight. As it is sometimes even impossible to accurately determine the genus without fls., the correct positions of some forms are not known.

Four subtribes of Bambuseæ are regarded by Hackel, namely: *Arundinarieæ*.—Stamens 3; palea 2-keeled: fr. with the seed grown fast to the seed-wall. To this belongs Arundinaria. *Eubambuseæ*.—Stamens 6: fr. with the seed fused to a delicate seed-wall. Bambusa is the only garden genus. *Dendrocalameæ*.—Stamens 6 (rarely more): palea 2-keeled: fr. a nut or berry. Here belongs Dendrocalamus. *Melocanneæ*.—Characters of last, but palea not keeled. Melocanna is an example.

The genera Arundinaria, Bambusa and Phyllostachys contain the most important species in cultivation, some of which are briefly described below. Roughly, the species of Arundinaria may be separated from Phyllostachys by the persistent sheaths and cylindrical stems. In Phyllostachys the sheaths are early deciduous, and the internodes, at least those above the base, are flattened on one side. Arundinaria and Bambusa cannot be separated by horticultural characters. It is probable that many of the forms now classed as species of Bambusa will eventually be found to belong to Arundinaria. Extended information regarding the Bambuseæ may be found in the following publications: Munro's Monograph, in Transactions of the Linnæan Society, vol. 26 (1868); Hackel, in Die Natürlichen Pflanzenfamilien, vol. 2, part 2, p. 89 (1887), English Translation by Lamson-Scribner & Southworth, as The True Grasses, N. Y., 1890; papers by Bean in Gardeners' Chronicle III., 15: 167, et seq. (1894); Freeman-Mitford, The Bamboo Garden, 1896, N. Y., Macmillan, p. 224; A. and C. Rivière, Les Bambous, Paris, 1879. The first two are systematic; the others contain popular and cultural notes. The following species are commended as being among the hardiest: *Phyllostachys Henonis*, *P. nigra*, *P. viridi-glaucescens*, *Arundinaria Japonica*, *A. nitida*, *A. macrosperma*, *Bambusa pulmata*, *B. tessellata* and *B. pygmæa*. C. D. BEADLE.

183. Arundinaria Veitchii.

The illustrations in the present article are adapted from Mitford's Bamboo Garden. Mitford's work cannot be praised too highly. It has done much to create a popular appreciation of Bamboos, and also to clear up the complete confusion into which the trade names have fallen. Mitford's book has a literary quality that is very rare in horticultural writing, and represents a type that deserves the warmest appreciation in America; viz., the discriminating enthusiasm of the expert amateur.

Arundinaria is derived from Latin *arundo*, a reed; Bambusa from a Malay name; Phyllostachys from Greek *phyllon*, leaf, and *stachys*, spike. W. M.

The following alphabetical list contains all the kinds of Bamboos known to be cult. in Amer. A = Arundinaria; B = Bambusa; D = Dendrocalamus; P = Phyllostachys; T = Thamnocalamus, which is here considered a subgenus of Arundinaria. No Japanese native names are given below, although many Bamboos are still advertised under such names. The prevailing tendency is to discard Japanese native names in every branch of horticulture, as they breed hopeless confusion.

B. angustifolia, 15; B. arundinacea, 11; *B. aurea*, 28; P. aurea, 28; A. auricoma, 16; P. bambusoides, 32; P. Castillonis, 26; A. chrysantha, 17; *B. chrysantha*, 17; B. disticha, 18; B. erecta, 10; A falcata, 9; *B. falcata*, 9; A. Falconeri, 8; *T. Falconeri*, 8; A. Fortunei, 14; *A. Fortunei*, var. *aurea*, 16; *A. Fortunei*, var. *viridis*, 22; *B. Fortunei*, 14; *B. Fortunei*, var. *aurea*, 16; B. gracilis, 8; *B. Henonis*, 30; P. Henonis, 30; A. Hindsii, 10; A. humilis, 22; A. Japonica, 6; *P. Kumasasa*, 33; P. Kumasasa, 33; A. macrosperma, 4; *A. macrosperma*, var. *suffruticosa*, 5; *B. Maximowiczii*, 7; B. Mazeli, 29; *B. Metake*, 6; *B. mitis*, 25; P. mitis, 25; *B. nana*, 18; *A. Narihira*, 7; *B. Narihira*, 7; *B. nigra*, 24; P. nigra, 23; A. nitida, 3; B. palmata, 19; *B. plicata*, 7; A. pumila, 2; *B. pumila*, 2; B. pygmæa, 21; B. quadrangularis, 12; *B. Quilioi*, 29; P. Quilioi, 29; *B. Ragamowskii*, 20; *B. ruscifolia*, 33; P. ruscifolia, 33; A. Simoni, 7; *B. Simoni*, 7; A. tecta, 5; B. tessellata, 20; A. Veitchii, 1; *B. Veitchii*, 1; *B. Vilmorini*, 15; *B. viminalis*, 33; *B. violascens*, 24; P. violascens, 24; *B. viridi-striata*, 7; *B. viridi-glaucescens*, 31; P. viridi-glaucescens, 31; B. vulgaris, 13.

SECTION I.—*Internodes not flattened; sheaths persistent.* (*The genera Arundinaria and Bambusa.*)

A. *Color of stems purple, or purplish.*

B. *Height 1–2 ft.*

1. **A. Veitchii**, N. E. Brown (*Bambusa Veitchii*, Carr.). Fig. 183. Height about 2 ft.; stems purple, white-waxy below the nodes: lvs. 5–7 in. long, about 2 in. wide, bright green above, below pale and minutely pubescent, serrate. Jap. M. 77, but not G.C. III. 15: 169, or R.B. 23, p. 270, which are pictures of *B. palmata*, as explained in G.C. III. 15: 209.—This is also liable to confusion with *B. tessellata*, No. 20. The edges of the lvs. wither in late autumn, giving a variegated but shabby appearance.

2. **A. pùmila**, Mitford (*B. pùmila*, Hort.). Height 12–20 in.: stems very slender, purplish, white-waxy below the nodes: lvs. 4–5 in. long, ⅜ in. or less wide, minutely pubescent, bright green.—Much rarer than No. 1, dwarfer, the stems merely purplish, the lvs. shorter and narrower. The lvs. are a darker green than in *A. humilis*, shorter, narrower, and tapering less gradually: nodes less well defined and less downy, but having a waxy bloom; internodes about 2½ in. long.

BB. *Height 6–8 ft. or more.*

3. **A. nitida**, Mitford. Fig. 184. Stems slender, about the size of a goose-quill: lvs. 2–3 in. long, ½ in. wide, shining green above, pale beneath; sheaths purplish, pubescent. China. M. 73. G.C. III. 18: 179; 24: 211. Gn. 49, p. 388.—Considered by Mitford the daintiest and most attractive of all the genus, and exceptionally hardy. Some shade is needed, as the lvs. curl up in full sunlight. Easily distinguished from Nos. 1 and 2 by the deeper color of the stems, which are almost black, and from *A. Falconeri*, which it resembles in habit, the branches of both occurring in dense clusters.

AA. *Color of stems green.*

B. *Height more than 6 ft.*

C. *Species native to the U. S.*

4. **A. macrospérma**, Michx. LARGE CANE. Height 10–20 ft., branches numerous, short, divergent: lvs. 4–6 in.

long, $^3/_4$–2 in. broad, smoothish or pubescent: sheaths very persistent: stems arborescent, rigid, simple the first year, branching the second, afterwards fruiting at indefinite periods, and soon after decaying. Banks of the

184. Arundinaria nitida.

larger rivers N. C. to Fla., forming cane-brakes.—This and the next are the only two species of Bamboos native to the U. S. They are rarely cult. in Calif. and Eu. as ornamentals.

5. **A. técta**, Muhl. (*A. macrospérma*, var. *suffruticósa*, Munro). Small Cane. Switch Cane. Scutch Cane. Height 2–15 ft.: stems slender: lvs. $3^1/_2$–8 in. long, 4–12 lines wide, roughish: sheath bearded at the throat. Swamps and moist soil, Md. and S. Ind. southward. B.B. 1: 233.—Sometimes fruiting several years in succession.

CC. *Species not native to the U. S.*

D. *Plants relatively hardy.*

E. *Branches borne singly in the axils.*

6. **A. Japónica**, Sieb. & Zucc. (*B. Metáke*, Sieb.). Height 6–10 ft.: lvs. 6–12 in. long, 1–2 in. wide, above smooth and shining, below whitened and finely pubescent: sheaths conspicuous. Jap. M. 1. G.C. III. 15: 239; 18: 185.—The commonest of all hardy Bamboos, and readily distinguished from all other tall kinds by the broader and larger lvs. and by the broad, persistent sheaths which almost cover the sts. It is especially distinguished from *A. Simoni* by the bud being a simple flattish scale instead of a complex scaly one, and also by the less amount of waxy bloom on the st. Particularly recommended for cities.

EE. *Branches borne in dense, semi-verticillate clusters (which easily distinguishes the Himalayan species from Phyllostachys).*

F. *Plants sometimes variegated.*

7. **A. Simóni**, A. and C. Rivière (*B. Simoni*, Carr. *B. viridi-striáta*, Hort. *A.* and *B. Nuchikiri*, Hort.). Height 10–20 ft.: lvs. 8–12 in. long, about 1 in. wide, pale beneath, very minutely pubescent, tapering to a long, fine point: mid-vein glaucous on one side toward the apex, green on the other. Himal. and China. G.C. III. 15: 301; 18: 181.—A silver variegated form is sometimes known as *B. Maximowiczii*, Hort., and *B. plicáta*, Hort. B.M. 7146. This is the tallest of the genus, and, next to *P. mitis*, the tallest of all hardy Bamboos. The plant is very late in beginning growth, and many of the culms should be removed in order to let the strong ones ripen, as weak shoots are untidy. It flowers occasionally, but does not die thereafter. It has a shabby appearance until midsummer, and may take several years to become established, meanwhile sending up dwarf, slender shoots and narrow foliage, but Mitford urges patience, as the plant is hardy, and ultimately very vigorous and handsome.

FF. *Plants never variegated.*

8. **A. Fálconeri**, Mitford (*T. Falconeri*, Hook. f. *B. grácilis*, Hort., not Wall.). Height 10–15 ft.: stems slender, bright green, the internodes white-waxy: lvs. thin, 3–4 in. long, about $^1/_2$ in. wide. Himal.—Not very hardy. The leaf-sheaths are smooth, cut short at the top, without a fringe, and with an elongated ligula; while *A. falcata*, No. 9, has very downy leaf-sheaths, fringed with long hairs at the intersection with the leaf. The serrations of the leaf-edges are more pronounced in *A. Falconeri*, especially on one side. Venation of lvs. on upper surface is striate, not tesselated.

9. **A. falcàta**, Nees (*B. falcàta*, Hort.). Height 6–10 ft.: lvs. 3–5 in. long, about $^1/_3$ in. wide, light green: stems annual (perennial under glass), slender, tufted, Himal.—The great majority of the plants cult. under this name are really *A. Falconeri*, which has larger lvs. In a small state, *A. falcata* can be distinguished from No. 8 only by the glabrous leaf-sheaths of the latter. The flower-bearing and leaf-bearing sts. of *A. falcata* are distinct, the former flowering and seeding each year.

10. **A. Hindsii**, Munro (*B. crécta*, Hort.). Height sometimes 7 ft., branches quasi-verticillate: lvs. upright at first, of various lengths up to 9 in., and about $^5/_8$ in. wide; veins conspicuously tesselated; internodes 3–7 in. long, waxy-white; leaf-sheaths with a few hairs. Jap.—The erect habit of growth is very marked. A recent species of doubtful hardiness. Adv. by Dr. Franceschi, who considers it one of the hardiest.

DD. *Plants relatively tender (Nos. 11, 12, 13).*

E. *Branches spiny.*

11. **B. arundinàcea**, Retz. A majestic species, often attaining a height of more than 40–60 ft. The stems, which are produced in dense clumps, are green and shining, with more or less spiny branches: lvs. 4–8 in. long, $^1/_2$ in. or a little more wide, nearly glabrous; sheaths persistent: fls. are produced at long intervals, and after perfecting seeds, the plants die. India.—Nos. 11 and 12 are greenhouse plants, not recommended by Mitford for outdoors.

EE. *Branches not spiny.*

12. **B. quadrangulàris**, Fenzi Stems square, especially in older plants, 20 ft. or more high: lvs. deep green, serrate, 6–7 in. long, about 1 in. wide. Jap.—Franceschi says it is as hardy as any Phyllostachys. See No. 11.

13. **B. vulgàris**, Schrad. Height 20–80 ft.: stems hollow, 4 in. in diam. or more; branches numerous, striate; internodes $1–1^1/_2$ ft. long: lvs. usually 6–10 in. long, 8–15 lines wide, sometimes 1 ft. long, 2 in. wide, rough on and near the margins and beneath. India. G.C. III. 25: 390. —Sold south, but not recommended by Mitford. This and *D. giganteus* are the only two Bamboos extensively cult. in the Orient, though others are more useful. It is also naturalized and cult. in the W. Ind., Mex. and Braz., but there is no evidence of an Amer. origin.

BB. *Height less than 6 ft.*

c. *Variegation white.*

14. **A. Fórtunei,** A. and C. Rivière (*B. Fórtunei*, Van Houtte, and var. *variegàta*, Hort.). Height 3–4 ft.: lvs. 4–5 in. long, half as wide or a little more, striped with white. Jap. F.S. 15: 1535.—Loses its lvs. in winter, but quickly recovers in spring. More popular than the next two species. The internodes are rarely more than 1 in. apart, while in *A. auricoma* they are 3–5 in. apart. Var. *aùrea*, Hort., with yellow variegation, is *A. auricoma*. Var. *viridis*, Hort.=*A. humilis*. This is an old favorite, and far more common than the next 4 species. Rhizomes are more active than the next, and demand more room.

15. **B. angustifòlia,** Mitford (*B. Vilmorìni*, Hort.). Height about 1 ft.: sts. slender, purplish or light green: lvs. 2–4 in. long, about ¼ in. wide, serrate, frequently variegated with white. Jap.

cc. *Variegation yellow.*

16. **A. aurìcoma,** Mitford (*A.* and *B. Fórtunei*, var. *aùrea*, Hort.). Height 2–3 ft.: lvs. 5–6 in. long, about 1 in. wide, brilliantly variegated with yellow, softly pubescent beneath, serrate. Jap.

17. **A. chrysántha,** Mitford (*B. chrysántha*, Hort.). Height 3–5 ft.: lvs. 5–7 in. long, 1 in. or less wide, nearly smooth, sometimes variegated with yellow, but not so brightly as in *A. auricoma*. Jap. Also distinguished from *A. auricoma* by the lower surface of the leaf being markedly ribbed, and lacking the soft, velvety down. "Being neither frankly green nor frankly variegated, it is rather a disappointing plant."—Mitford.

ccc. *Variegation absent.*

D. *Arrangement of lvs. distichous.*

18. **B. distìcha,** Mitford (*B. núna*, Hort., not Roxb.). Height 2–3 ft.: branches numerous: lvs. 2–2½ in. long, ⅛ in. wide or less, serrate, green, produced in two vertical ranks. Origin uncertain. A recent and rare species of great interest, the distichous arrangement of lvs. being quite unique among Bamboos, and giving a very distinct habit.

DD. *Arrangement of lvs. not distichous.*

E. *Lvs. long, 10–18 in.*

19. **B. palmàta,** Burbidge. Fig. 185. Height 2–5 ft.: lvs. 10–15 in. long, 2–3½ in. wide, bright green, sharply serrate, smooth and shining above, below pale and minutely pubescent: longitudinal veins very prominent. Jap. M. 79. Gn. 49, p. 59, shows a clump 36 ft. in circumference.

20. **B. tessellàta,** Munro (*B. Ragamówskii*, Hort.). Height 2–3 ft.: lvs. 12–18 in. long, 3–4 in. wide, smooth and shining above, whitened beneath, sharply serrate; midrib prominent, and bearing a tomentose line on one side. China and Jap. G.C. III. 15: 167; 18: 189. R.B. 23, p. 269.—Produces the largest lvs. of any hardy Bambusa in cult., which is especially remarkable on account of its dwarf habit. Much confused in gardens, but unnecessarily, with *A. Veitchii*, as the tomentose line on one side of the midrib is unique in *B. tessellata*. The lvs. are used by the Chinese for wrapping tea.

EE. *Lvs. shorter, 3–6 in.* (Here might be sought *A. pumila*, No. 2.)

21. **B. pygmæa,** Miq. Height ½–1 ft.: stems very slender, much branched: lvs. 3–4 in. long, about ½ in. wide, serrate, pubescent, bright green above, glaucous and pubescent beneath. Jap.—The smallest of Bamboos, and remarkably hardy. It is especially valuable for making a thick carpet in wild places, but its rampant growth makes it a nuisance in a border. The sts. are purple: the nodes prominent, and furnished with a waxy, glaucous band round the base.

22. **A. húmilis,** Mitford (*A. Fórtunei*, var. *víridis*, Hort.). Height 2–3 ft.: branches in 2's and 3's, long in proportion to sts.: lvs. 4–6 in. long, the largest about ⅞ in. wide: internodes 2–5 in. apart. Dies down in a hardy winter. A rare species, liable to confusion with *A. pumila*, No. 3.

SECTION II.—*Internodes flattened, at least on one side: sheaths early deciduous.* (*The genus Phyllóstachys.*)

A. *Color of stems black.*

23. **P. nigra,** Munro (*B. nigra*, Lodd.). BLACK BAMBOO. Fig. 186. Height 10–20 ft.: stems green at first, but changing to black the second year: lvs. very thin, 2–6 in. long, 6–10 lines broad. China and Japan. M. 142, and frontis. G.C. III. 15:369; 18:185. R.B. 23, p. 268.—One of the most popular of all Bamboos, and very distinct by reason of its black stems. Var. **punctàta,** Hort. Franceschi, has yellowish stems spotted with black.

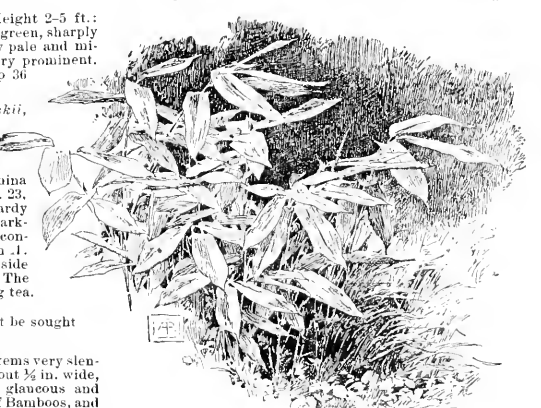
24. **P. violáscens,** A. and C. Rivière (*B. violáscens*, Carr.). Height sometimes 13 ft.: stems violet, almost black the first months, changing the second year to a dingy yellow or brown: lvs. very variable in size, 2–7 in. long, ½–2 in. wide, the larger lvs. borne on young shoots or on the ends of the lower branches near the ground. The lvs. are sharply serrated and have a well-defined purplish petiole. Franceschi says it is hardy, and that *P. bambusioìdes* is often sold under this name.

AA. *Color of stems yellowish, or striped yellow.*

25. **P. mitis,** A. and C. Rivière (*B. mítis*, Hort., not Poir.). Height 15–20 or more ft.: stems arched, yellowish; internodes at the base not short: leaf characters identical with *P. aurea*, with which it is closely allied. Japan. Gn. 17, p. 44.—The tallest of all Bamboos, but, unfortunately, not one of the hardiest.

26. **P. Castillònis,** Hort. (*B. Castillònis*, Hort.). Unique in the genus for having both sts. and lvs. variegated. Height 6–20 ft.: sts. 1 in. or more thick, much zigzagged, bright yellow, with a double groove of green: lvs. sparingly striped yellowish white, 7 in. long, 1½ in. wide, serrated on both margins: leaf-sheath topped by a whorl of dark brown or purple hairs. Jap.—Cult. by Dr. Franceschi, Santa Barbara, Calif.

27. **B. striàta,** Lodd. Height 4–5 ft.: stems striped yellow and green, as thick as the thumb; internodes 4–6 in. long: lvs. 6–8 in. long, ¾–1 in. broad. China.



185. Bambusa palmata.

B.M. 6079, which shows a flowering specimen with conspicuous anthers, red-purple at first and fading to lilac. Not described by Mitford. Sold S. and by Yokohama Nursery Co.

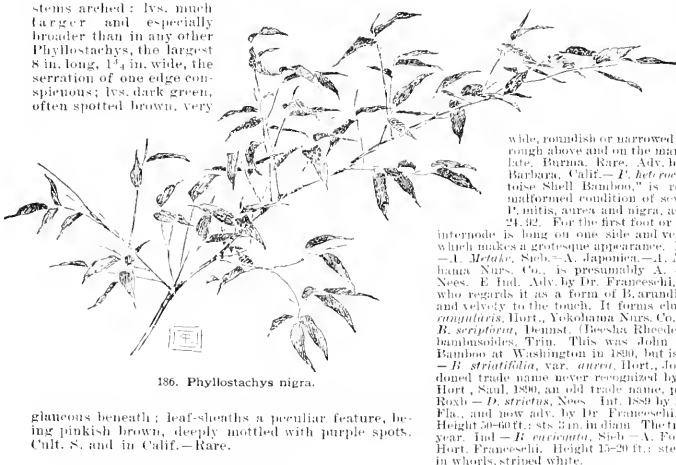
28. **P. aurea**, A. and C. Rivière (*B. aurea*, Hort.). Height 10–15 ft.: stems straight, yellowish; internodes at the base remarkably short: lvs. narrowed from near the base to the apex, minutely and regularly serrate on only one border, usually 2–4 in. long and $^3/_4$in. wide, but variable, light green, glabrous; sheaths deciduous, marked with purple. Japan. Gn. 8, p. 206. A.F. 5:41. —The name is not distinctive, as others of the Phyllostachys group have yellowish stems. Hardier and easier of cult. than *P. nitis*.

AAA. *Color of stems green, often yellowish when ripe.*

B. *Height 6–18 ft.*

C. *Lvs. spotted with brown.*

29. **P. Quilioi**, A. and C. Rivière (*B. Quilioi*, Hort. *B. Mazelii*, Hort.). Height sometimes 18 ft.: habit looser than in *P. nitis or aurea*: stems arched: lvs. much larger and especially broader than in any other Phyllostachys, the largest 8 in. long, $1^3/_4$ in. wide, the serration of one edge conspicuous; lvs. dark green, often spotted brown, very glaucous beneath; leaf-sheaths a peculiar feature, being pinkish brown, deeply mottled with purple spots. Cult. S. and in Calif.—Rare.



186. Phyllostachys nigra.

CC. *Lvs. not spotted with brown.*

D. *Habit slightly zigzag.*

30. **P. Henonis**, Mitford (*B. Henonis*, Hort.). Height 6–15 ft.: stems arched: lvs. 2–3 in. long, a little under $^1/_2$in. broad, narrowed below the middle to the base and long attenuate at the apex, bright green; sheaths deciduous, yellowish, inclined to purplish: internodes 5–6 in. long near the base and middle of the stem, distinctly grooved with a double furrow. Japan.—This is Mitford's favorite Bamboo.

DD. *Habit strongly zigzag.*

31. **P. viridi-glaucescens**, A. and C. Rivière (*B. viridi-glaucescens*, Carr.). Height 10–18 ft.: stems slender, zigzag, arched, bright green at first, fading as they ripen to a dingy yellow: lvs. 3–4 in. long, about $^1/_2$in. wide or little more, bright green above, whitened below. China. Gn. 7, p. 279. G.C. III. 15:433; 18:183.—The name is unfortunate because not distinctive, as all Bamboos have green lvs. with more or less whitened lower surfaces. Very hardy and common.

32. **P. bambusoides**, Sieb. & Zucc. Height about 5 ft. in the second year: stems zigzag, green at first, ripening to yellow, the branch-bearing side flattened rather than grooved, as in other species of Phyllostachys: internodes long in proportion to length of stem, sometimes 8 in.: branches in 3's, the longest at the middle of the st., and only about 9 in.: lvs. of various sizes, the largest 8 in. long, $1^1/_4$ in. wide, edges serrate, sharply on one side. Jap.—Cult. by Dr. Franceschi, Santa Barbara, Calif.

BB. *Height 2 ft. or less: habit zigzag.*

33. **P. ruscifolia**, Hort. Kew. (*P. Kumasasa*, Munro, *P. Kumasasa*, Mitford, *B. ruscifolia*, Sieb. *B. viminalis*, Hort.). Height $1^1/_2$–2 ft.: stems zigzag, dark green; sheaths purple: lvs. 2–3 in. long, about 1 in. wide, ovate in outline. Jap. G.C. III. 15:369. G.C. III. 18:189.—The stem is channeled on the branching side, almost solid: nodes 1–2 in. apart: branches in 3's and 4's, not more than 1–$1^1/_2$ in. long.—Dwarfest species of Phyllostachys.

C. D. BEADLE.

The following are trade names in America of rare kinds: *B. agrestis*, Poir. India, Cochin China. Adv. by Yokohama Nurs. Co.—*B. argentea*, Hort. *B. argentea-striata*, Regel?—*B. aureo-striata*, Regel. Jap.—*A. falcis-carinatis*, Hort.: is presumably A. Fortunei, the commonest low-growing, variegated Arundinaria.—*B. Marliacea*, Hort. Adv. by Yokohama Nurs. Co. as a "wrinkled Bamboo," doubtless named after M. Latour Marliac, the celebrated French hybridizer of water-lilies, and dealer in Bamboos and aquatics.—*D. membranaceus*, Munro. Height attaining 60–70 ft.: lvs. 4–5 in. long, 4–6 lines wide, roundish or narrowed at the base, mucronate, rough above and on the margin, hairy below, petiolate. Burma. Rare. Adv. by Dr. Franceschi, Santa Barbara, Calif.—*T. heterocycla*, Carr., the "Tortoise Shell Bamboo," is really an abnormal or malformed condition of several species, especially *P. nitis*, *aurea* and *nigra*, as explained in G.C. III. 24:32. For the first foot or two above ground each internode is long on one side and very short on the other, which makes a grotesque appearance. M. 100. G.C. III. 15:359. —*A. Metake*, Sieb.=*A. Japonica*.—*A. Narihira*, Hort., Yokohama Nurs. Co., is presumably *A. Simoni*.—*B. orientalis*, Nees. E. Ind. Adv. by Dr. Franceschi, Santa Barbara, Calif., who regards it as a form of *B. arundinacea*, with lvs. larger and velvety to the touch. It forms clumps quickly.—*P. quadrangularis*, Hort., Yokohama Nurs. Co.=*B. quadrangularis*?—*B. scriptoria*, Bennt. (Reesha Rheede, Kunth)=Melocanna bambusoides, Trin. This was John Saul's favorite hardy Bamboo at Washington in 1890, but is no longer advertised. —*B. striatifolia*, var. *aurea*, Hort., John Saul, 1890, an abandoned trade name never recognized by botanists.—*B. stricta*, Hort., Saul, 1890, an old trade name, probably not *B. stricta*, Roxb.—*D. strictus*, Nees. Int. 1889 by Reasoner Bros., Oneco, Fla., and now adv. by Dr. Franceschi, Santa Barbara, Calif. Height 50–60 ft.: sts. 3 in. in diam. The true species flowers every year. Ind.—*B. variegata*, Sieb.—*A. Fortunei*.—*B. verticillata*, Hort. Franceschi. Height 15–20 ft.: stems orange-yellow: lvs. in whorls, striped white.

W. M.

BANANA (*Musa sapientum*, Linn., chiefly). *Scitamineæ*. This very valuable tropical plant is prized for its fruit, textile fiber, and decorative effect in landscape gardening. Most species are cultivated for their fruit, and one or two species for fiber—although all sorts have a fiber of considerable value. Every species is worthy a place in decorative planting. For an account of the species and their ornamental values, see *Musa*.

The species mostly in demand for fruiting seldom or never produce seeds, and naturally increase by suckers around the base of each plant. These form a large clump, if allowed to grow without care. They are most readily separated from the parent root-stalk by a spade, and are then fit for further planting. This is a slow process of increase, but it is sure, and the suckers so produced make large and vigorous plants. A quicker method of propagation is to cut the entire root-stalk into small, wedge-shaped pieces, leaving the outer surface of the root about 1 by 2 inches in size, planting in light, moist soil, with the point of the wedge down and the outer surface but slightly covered. The best material for covering these small pieces is fine peat, old leaf-mold, mixed moss and sand, or other light material which is easily kept moist. The beds so planted should be in full open sunshine if in a tropical climate, or given bottom heat and plenty of light in the plant-house. The small plants from root-cuttings should not be allowed to remain in the original bed longer than is necessary to mature one or two leaves, as that treatment would stunt them. The textile and ornamental species, also, may be

increased by the above process, but as these species usually produce seeds freely, seedlings can be more quickly grown, and with less trouble. The seeds of Bananas should be sown as fresh as possible, treating them the same as recommended for root-cuttings. As soon as the seedlings show their first leaves, they should be transplanted into well-prepared beds of rich, moist soil, or potted off and plunged into slight bottom heat, as the needs of the grower or his location may demand. Both seedlings and root-cuttings should have proper transplanting, sufficient room and rich soil, as a rapid, unchecked growth gives the best and quickest results.

The cultivation of Bananas for fruit is carried on very extensively in all tropical countries. In the West Indies, Central America and Mexico, they are raised for export to the United States and Canada. The site selected is usually a level plain in the lowlands, near the coast, or in valleys among the hills, where the rainfall or artificial moisture is sufficient. The variety most commonly grown at present is the Martinique, having large bunches, with long, yellow fruit. The Baraçoa (or Red Jamaica) is more sparingly grown now than formerly, and its dark red fruits, of largest size, are not commonly exported. For distant shipping, bunches of fruit are cut with "machetes" or knives, after they reach their full size and are almost mature, but quite green in color. Ripening is effected during shipment in warm weather, and by storing in dark, artificially-heated rooms during cold weather. Banana flour is a valuable product of ripe Bananas prepared among the plantations in the tropics. It is nutritious, and has an increasing demand and use as human food. A recently invented process of drying ripe Bananas has been found very successful, and the industry promises to be of vast importance as the marketable article finds ready sale. In the United States there is little commercial cultivation of Bananas, since the frostless zone is narrow and the fruit can be grown

187. A bearing Banana plant.

so much more cheaply in Central America and the West Indies. Small Banana plantations are common in southern Florida, however, and even as far north as Jacksonville. They are also grown in extreme southern Louisiana, and southwestward to the Pacific coast. The plants will endure a slight frost without injury. A frost of 5 or 6 degrees will kill the leaves, but if the plants are nearly full grown at the time, new foliage may appear and fruit may form. If the entire top is killed, new suckers will spring up and bear fruit the following year. A stalk, or trunk, bears but once; but the new sprouts which arise from the roots of the same plant continue

188. Tip of flower-cluster of Banana.

the fruit-bearing. A strong sprout should bear when 12–18 months old (from 2–3 years in hothouses). The plantation will, therefore, continue to bear for many years. A bearing stalk, as grown in southern California, is shown in Fig. 187.

The peculiar flower-bearing of the Banana is shown in Fig. 188, which illustrates the tip of a flower-cluster. This cluster may be likened to a giant elongating bud, with large, tightly overlapping scales or bracts. Three of these bracts are shown at *a a a*, in different stages of the flowering. As they rise or open, the flowers below them expand. The bracts soon fall. The flowers soon shed their envelopes, but the styles, *b*, persist for a time. The ovaries soon swell into Bananas, *c*. The bracts are royal purple and showy.

E. N. Reasoner.

BANCROFT, GEORGE. The famous American historian (1800–1891) deserves remembrance among horticulturists for his splendid collection of roses at his summer home in Newport, R. I., an account of which may be found in the American Garden, 1891. For a portrait and sketch, see Appleton's Annual Cyclopedia for 1890. In Mr. Bancroft's garden, George Field found a rose without a name, which is now known to be the French variety Mme. Ferdinand Jamin. It was introduced by Field & Bro. as the American Beauty. Though little known abroad, it is, probably, the most famous of all roses cult. in America.

BANEBERRY. See *Actæa*.

BÁNKSIA (Sir Joseph Banks, 1743–1820, famous English scientist), *Proteàcea*. Many species of Australian evergreen shrubs, with handsome foliage, but scarcely known in cult. here. Prop. by nearly mature cuttings, in frames.

BANYAN TREE. See *Ficus Indica*.

BAOBAB. See *Adansonia*.

BAPTÍSIA (Greek, *to dye*, alluding to the coloring matter in some species). Syn., *Podalýria*. *Leguminòsæ*. Small genus of perennial herbs of eastern N. Amer. Corolla papilionaceous, the standard not larger than the wings; calyx campanulate, the 5 teeth separate and equal or the 2 upper ones united; stamens 10, distinct; pod stalked in the calyx.—Plants usually turn black in drying. Baptisias are suitable for borders. They thrive in any ordinary soil and under common treatment, preferring free exposure to sun. Prop. by division or seeds.

A. *Lvs. simple: fls. yellow.*

simplicifòlia, Croom. Branchy, 2–3 ft.; lvs. 2–4 in. long, sessile, broadly ovate and obtuse; fls. in numerous terminal racemes. Fla.—Int. 1891.

perfoliàta, R. Br., of S. Car. and Ga., with small axillary fls. and broad perfoliate lvs., is occasionally planted, and is hardly as far N. as Washington, but is evidently not in the trade. B.M. 3121.

AA. *Lvs. compound, 3-foliolate.*

B. *Fls. yellow.*

tinctòria, R. Br. WILD INDIGO. Bushy-branched, 2–4 ft., glabrous; lvs. stalked, the lfts. small, obovate or oblanceolate, and nearly or quite sessile and entire; fls. ½in. long, bright yellow, in numerous few-fld. racemes. Common in E. States. B. M. 1099. Mn. 5: 81.

lanceolàta, Ell. About 2 ft., pubescent when young, but becoming nearly glabrous; lvs. short-stalked, the lfts. thick, lanceolate to obovate and obtuse; fls. large, axillary and solitary. Pine barrens, N. Car. S.

BB. *Fls. blue.*

australis, R. Br. (*B. cærùlea*, Eat. & Wr. *B. exaltàta*, Sweet). Stout, 4–6 ft., glabrous; lvs. short-stalked; lfts. oblanceolate to oval, entire, obtuse; fls. lupine-like, nearly or quite an in. long, in loose-fld., long terminal racemes. Penn. W. and S. J. H. III. 29: 64; 34: 511.—Handsome. Probably the best species for cultivation.

BBB. *Fls. white or whitish.*

álba, R. Br. Wide-branching, 1–3 ft., glabrous; lvs. stalked; lfts. oblong or lanceolate, obtuse, thin, drying green; fls. white, ½in. long, in long-peduncled, elongated lateral racemes. N. Car. W. and S. B.M. 1177.

leucántha, Torr. & Gray. Branching, more or less succulent, 2–4 ft., glabrous; lvs. stalked; lfts. obovate to oblanceolate to cuneate, very obtuse, drying black; fls. white, nearly an in. long, in loose-fld., lateral racemes. E. states.

leucophæa, Nutt. Stem stout and angled, but low and wide-branched, 1–2½ ft., hairy or nearly glabrous; lvs. short petioled; lfts. oblanceolate to obovate, stiff, drying black; fls. large and cream-colored, on slender erect pedicels, borne in 1-sided declined racemes. Ga. W. B.M. 5900. Mn. 3: 177. F.S. 23: 2449.

L. H. B.

BARBACÈNIA (Barbacena, a Brazilian governor). *Amaryllidàceæ*. About 20 Brazilian plants, with scape bearing a single large purple flower. Grown mostly in baskets, after the manner of many orchids. **B. purpùrea**, Hook., is occasionally seen in fine collections, but does not appear to be in the Amer. trade. Grown in a warm, moist house. It has many scapes and long, grass-like, toothed lvs. B.M. 2777.

BARBADOES CHERRY is *Malpighia*; **B. Lily**, *Hippeastrum*.

BARBARÈA (from the old name, Herb of Saint Barbara). *Cruciferæ*. Hardy biennials, with yellow fls.; allied to water cress and horseradish.

vulgàris, R. Br. COMMON WINTER CRESS. UPLAND CRESS. YELLOW ROCKET. Height 10–18 in.; lower lvs. lyrate, the terminal lobe round, the lateral usually 1–4 pairs; upper lvs. obovate, cut-toothed at the base. Eu. Asia.—Cult. for salad. Var. **variegàta**, Hort., lvs. splashed and mottled with yellow, is cult. as a border plant, and grows freely in rich soil. If the fls. are picked off, stem and all, before they open, the plant will be practically perennial. A common native.

præcox, R. Br. EARLY WINTER, or BELL ISLE CRESS. Distinguished by the more numerous divisions of the lvs. (4–8 pairs). Slightly cult. as a salad, and known S. as Scurvy Grass. Naturalized from Eu.

J. B. KELLER.

BARBE DE CAPUCIN. See *Chicory*.

BARBERRY. See *Berberis*.

BARBÈRIA (after J. B. G. Barbier, French physician). *Leguminòsæ*. A genus of only two species, one from Porto Rico and one from Peru. Its nearest allies familiar to the horticulturist are Indigophera and Tephrosia. It is distinguished from allied genera by the long fls. Tender evergreen shrubs, with odd-pinnate lvs., numerous entire lfts., and awl-shaped stipules: fls. large, racemose red. Prop. by seed.

polyphýlla, DC. (*Clitòria polyphýlla*, Poir.). Lfts. 9–11 pairs, elliptic-oblong, mucronate, pubescent with age; racemes few-fld., shorter than the lvs.; fls. 2 in. long. Porto Rico.—*B. glabélla*, Hort., Peter Henderson & Co., 1899, is probably a variety.

BARK. Is often used in a general way to designate the softer outer envelope of a stem or root. In this sense, it includes all that peels readily, as the bark of the hemlock and oak, used for tanning leather. In a stricter sense, it is applied to the corky layers formed on the outer surface of woody plants. It is formed from an active layer of tissue,—the phellogen. The bark is developed in different ways upon different trees. So distinct are the resulting tissues that species of trees may be readily recognized by their bark alone. Cork of commerce is the bark of the cork oak, a native of southwestern Europe.

W. W. ROWLEE.

BARKÈRIA. See *Epidendrum*.

FARLÈRIA (J. Barrelier, 1606–1673, French botanist). *Acanthàceæ*. Many species of tropical shrubs, mostly African, sometimes seen in fine collections of stove plants, but not offered in the Amer. trade. They have large fls. (yellow, purple or white), often in clusters. Prop. by softwood cuttings. **B. cristàta**, Linn., E. Ind., is a good blue-fld. bedder.

BARLEY. Various kinds of *Hórdeum* of the *Gramineæ*. Common Barley is *H. sativum*, Jess. According to Hackel, it "undoubtedly originated from *H. spontàneum*, C. Koch, which grows wild from Asia Minor and Caucasian countries to Persia and Beloochistan, as well as in Syria, Palestine, and Arabia Petræa." The common Barley has a 4-rowed ear or head. There are also 2-rowed and 6-rowed races, and other well marked forms. They are probably all domestic forms of one parent stock.

BARÓSMA (*heavy scent*). *Rutàceæ*. Some 25 to 30 South African heath-like shrubs. They are evergreens, and in the N. must be grown under glass. Prop. by mature-wood cuttings. **B. pulchélla**, Bart. & Wendl., is now handled by florists from imported stock. It grows 3 ft. or less high, and has axillary purplish fls., with 5 sepals, 5 petals and 10 stamens.

BARRY, PATRICK. Plate II. Nurseryman, editor and author; was born near Belfast, Ireland, in May, 1816, and died in Rochester, N. Y., June 23, 1890. He came to America at the age of twenty, and after four years of service with the Princes, at Flushing, on Long Island, he founded, in 1840, with George Ellwanger, at Rochester, N. Y., the Mount Hope Nurseries. Ellwanger and Barry introduced fruit-growing into western New York at a time when there were no collections of fruits, no railroad or telegraphic facilities, nor any fast ocean steamers to bring over their importations from Europe. From 1844 to 1852, Barry edited "The Genesee Farmer," an excellent and influential paper—afterwards merged in "The Cultivator and Country Gentleman." After the death of A. J. Downing he succeeded to the editorship of "The Horticulturist," which he removed to Rochester, until June, 1855, after which this famous magazine had many vicissitudes until 1887, when it went to swell the number of periodicals now represented commercially by "American Gardening." In 1851 appeared his "Treatise on the Fruit-Garden," a new and thoroughly revised edition of which was issued in 1872, under the title of "Barry's Fruit-Garden." It is still one of our most popular books on pomology, and deservedly so. The catalogue of fruits which he compiled for the American Pomological Society is a monumental work. Mr. Barry did much to make Rochester a city of nurseries and western New York a famous fruit-growing region. The Western New York Horticultural Society, of which he was president for more than thirty years, and until his death, has long exercised a more than sectional influence. The work of Barry was truly national, and essentially

Plate II. Prominent American Horticulturists

that of a pioneer. He must be considered in the front rank of pomological authors, with the Downings, Warder, and Thomas, whose combined weight gave a great impulse towards establishing orcharding on a large scale in America. For a fuller account, with portrait, see "Annals of Horticulture," 1890, 287–290. W. M.

BARTÒNIA. See *Mentzelia*.

BARTRAM, JOHN. Called by Linnæus the greatest natural botanist in the world. Was born at Marple, near Darby, Pennsylvania, Mar. 23, 1699, and died Sept. 22, 1777. He was a Quaker farmer, who became interested in botany after the age of twenty-four. In 1728, at Kingsessing, on the Schuylkill River, he established the first botanic garden in America, which, together with his house, built in 1731, of stone hewn by his own hands, is happily preserved to-day as part of the park system of Philadelphia. He traveled much in America, and was for many years the chief medium of exchange between Europe and America of plants of all kinds, especially new and important species, as *Rhododendron maximum* and *Cypripedium acaule*. His correspondence with Peter Collinson lasted nearly half a century. The letters, preserved to us in Darlington's "Memorials of John Bartram and Humphrey Marshall," are rich in botanical, historical and general interest. "Observations on the Inhabitants * * * made by John Bartram in his Travels from Pensilvania to Onondago, Oswego, and the Lake Ontario * * * London, 1751," is similarly readable, and a document of great value in the study of aboriginal races.

At the age of seventy he undertook, with his son William, an expedition to Florida, which is recorded in the "Journal Kept upon a Journey from St. Augustine up the River St. Johns." Bartram was probably the first American to perform successful experiments in hybridization. His sons, John and William, continued his garden. For many years it was the largest and best collection of trees and shrubs in America, and the services of the garden to early American horticulture were very great. He is commemorated in Bartramia, a genus of mosses, and in "Bartram's Oak," for the literature of which, see I. C. Martindale's "Notes on the Bartram Oak, *Quercus heterophylla*, Michx.," published at Camden, N. J., 1880. Bartram's garden is a unique spot in America. Many of the trees have attained great age, size and beauty. The garden also contains many quaint and picturesque relics which have associations of great interest. On the whole, John Bartram is one of the most illustrious, and by far the most picturesque, of the early botanists and horticulturists of America, and his simple, wholesome, powerful personality presents a picture that is altogether amiable. New editions of the works of Bartram and Darlington are much to be desired, and offer a promising field to critical labors. John Bartram's son William is well known to students of American history for his "Observations on the Creek and Cherokee Indians, 1789." It is very much to be regretted that no authentic portrait of John Bartram is known. For an excellent illustrated account of Bartram and his garden, see the article by Miss M. L. Dock in Garden and Forest, 9: 121–124 (1895). See also Harper's Mag. 60: 321–330 (1880). W. M.

BASÉLLA (native Malabar name). *Chenopodiàceæ*. MALABAR NIGHTSHADE. A genus containing only one species, which is, however, remarkably variable. Annual or biennial herbs, cult. in the tropics as a pot-herb, like spinach. Rarely cult. N. as an ornamental warm-house climber. It may also be started indoors, and set out in May for use as a garden vegetable, to follow spinach. Prop. by seeds.

rùbra, Linn. Lvs. succulent, alternate, rarely opposite, almost entire, of various forms; fls. not pedicelled, in simple spikes or racemes; spikes short or long, lax, few-fld. The following species are now considered only forms of the above: *alba*, a white-fld. form rarely cult. as a trailer from roofs of warm-houses, or as a basket plant; *caniniflòlia*; *cordifòlia*, with heart-shaped lvs. 4–5 in. long and 2–2½ in. wide; *crassifòlia*; *Japónica*; *lùcida*, from India; *nigra*, a Chinese form; *ramòsa* and *volùbilis*. Under the name of Sweet Malabar Vine, A. Blanc advertises a form with tiny yellow and red fls., and lvs. variegated with white, pink, and green. He says, "with age it assumes a drooping habit. When cut keeps fresh for weeks."

BÁSIL. Species of *Ocimum*, of the *Labiàtæ*. They are Indian annuals, and are cult. as pot-herbs, the clove-flavored foliage being used as seasoning in soups, meats and salads. They are of easiest culture, the seed being sown in the open as soon as the weather is settled. Common Basil is *O. Basilicum*, Linn., a ft. high, branching, with ovate toothed lvs., and white or bluish white fls. in leafy terminal racemes or spikes. *O. minimum*, Linn., the Dwarf Basil, is lower, and smaller in all its parts; rarely seen. When Basil is in bloom, it can be cut and dried for winter use.

BASKET PLANTS. Fig. 189. Under this term are included all those plants which, from their habit of growth and blooming, have been found especially suitable for use in hanging baskets. Most of these are dwarfish plants of indeterminate growth, of gracefully drooping or vine-like habit, and are valued either for their grace, or for freedom and daintiness of bloom. Some of the plants used in baskets are of upright habit. These are either plants of naturally small stature, or are practically such for a season from a slow habit of growth. The suitability of these erect-growing plants for the purpose is determined, aside from their stature, by their freedom of bloom, beauty of foliage, striking form, or grace of habit. Such plants are used principally for filling the central part of the basket; whereas, plants of trailing habit are inserted near the sides—some to droop, others to twine upwards on the cords or handle by which the basket is suspended. In addition to the long drooping or climbing plants, there are a number of half-erect habit, like the lobelia, sweet alyssum and russelia. These may droop somewhat, but are not of a truly vine-like habit. Some plants are more suitable than others for shady places; the selaginellas, for instance. Others thrive only with several hours of direct sunshine each day.

189. Basket.

The following list of common trade names embraces a number of the most important basket plants, arranged according to their habit of growth and blooming. The list is not given as a complete one. Any list would need amending from year to year to suit individual taste and experience. Plants which will bear considerable shade are marked with an asterisk (*); those which will bear more are marked with two asterisks (**):

1. PLANTS OF VINE-LIKE HABIT.

a. LONG-DROOPING.

**English Ivy, *Kenilworth Ivy, *Vinca major, *V. Harrisonii. Saxifraga sarmentosa, *Cissus discolor, * Moneywort Ivy, Tropæolums (Nasturtiums), Lonicera Halliana, L. aurea, var. reticulata, Nepeta Glechoma, Ampelopsis quinquefolia, A. Veitchii.

NOTE.—The Ampelopsis is deciduous, and not suitable for winter baskets.

b. CLIMBING

Maurandia, **Lygodium scandens, *Senecio scandens, Thunbergia, Cobæa scandens, Japanese Variegated Hop, Manettia bicolor, Lonicera Halliana, L. aurea, var. reticulata, Clematis coccinea, Tropæolum peregrinum

c. SHORT-DROOPING, OR HALF-ERECT.

*Lobelia Erinus, *Othonna crassifolia, *Sweet Alyssum, *Tradescantia, Petunias, Oxalis floribunda, *Russelia juncea (also bears sun well), *Fittonia, *Fuchsia procumbens, Ice Plant, Verbena, *Ivy Geranium, **Selaginellas, *Begonia glaucophylla, var. scandens, *Sedum Sieboldi, *S. carneum, var. variegatum, *Asparagus Sprengeri, *Passifloras, *Panicum variegatum, Gazania splendens, Abutilon megapotamicum and var. variegatum, Lantana delicatissima, Solanum jasminoides, S. Seaforthianum, Convolvulus Mauritanicus.

2 PLANTS OF UPRIGHT HABIT.

a. LOW-GROWING.

1 *Flowering Plants*

*Torenia, *Pansy, Cuphea platycentra, C. hyssopifolia, *Primula obconica, Dwarf Alyssum, Bellis perennis, Linum or Reinwardtia trigynum, Phlox Drummondii, Dutch bulbs.

2. *Foliage Plants.*

*Peperomia, *Begonia Rex, *Farfugium grande, Alternanthera, **Maidenhair Fern, Geraniums (especially Mme. Salleroi), *Isolepis gracilis (droops with age).

b. TALLER GROWING.

1. *Flowering.*

Geraniums—Pelargonium *Fuchsias, Petunias, *Begonias, Browallia, *Stevia serrata, var. nana, Madagascar Periwinkle, *Nierembergia, Lantana, *Impatiens Sultana, Cuphea Llavea, Swainsona, Chrysanthemum frutescens, Salvias.

2. *Foliage.*

*Dusty Miller, *Crotons, *Palms, **Ferns, *Fancy Caladiums, Coleus, Achyranthes, **Aspidistra, *Cyperus alternifolius, *Dracæna indivisa, *D. terminalis, Cocoloba platyclada.

Some of the above plants make large subjects when growing in the open ground. Of such, only young or smaller plants are available for use in hanging baskets. Ordinarily, several different sorts of plants are used for filling a basket. In some cases, however, a pretty basket is made by using but one kind of plant. A hanging basket filled with sword fern, for instance, makes a handsome object.

Baskets of a variety of patterns are obtainable from florists and other dealers. The baskets most extensively used, perhaps, are made of strong wire, woven into hemispherical or other forms. These are sometimes plain, and again of ornamental character. The better form has a flat bottom, or a stand, formed of wire, to support the basket in an upright position when it is not pendent. Another style is f rmed of rustic work. Here the vessel or plant basin is covered about the sides with rough bark or knotted roots. For this purpose the roots of the laurel are much used. Above the basket there is an arch or handle by which it is suspended. Again, earthenware vessels, to be suspended by wires, are offered for sale in a variety of shapes. Some of these are moulded and painted in imitation of logs, and are known as "stick" and "log baskets." Such baskets are often without provision for drainage. When this is the case, holes should be drilled at the lowest point in the bottom. A special form of basket is much used for orchids. It is made of square cedar slats in raft- or log-fashion. Fern-fiber and broken bits of brick, flower-pots or charcoal, are used for filling them.

The soil used in hanging baskets is simply good, common florists' potting soil. This usually contains about 25 per cent of humus, and a small amount of sharp sand to make it porous. Prior to filling, wire baskets must be lined with moss. This is merely common woodland moss from rotting logs, or rich, damp soil. In filling baskets, a few drooping or climbing plants are disposed around the sides; then one or more upright-growing or half-erect plants, according to the size of the plants and basket, are planted in the center. Immediate effects require plants which have already made considerable growth. Florists usually carry a stock of suitable plants. In case seedlings or cuttings are grown for the purpose, it is usually best to start them in seed-pans or cutting-boxes, and transfer them later to the basket. Seeds may be sown, or the cuttings started in the basket, but it is so long before they fill the basket that there is no advantage in it.

A common mistake in arranging baskets is crowding, or filling them too full. Fewer plants will appear more graceful, growth will be more vigorous, and the basket will retain its grace and beauty for a longer time. Exercise vigilance and care in watering. After the roots have well filled the basket, watering is best done by dipping the basket in a tub or barrel of water, and allowing it to remain until it is well saturated. Dipping the basket in weak liquid manure once or twice a month will greatly promote vigor when the plants have been long in the basket. These remarks also apply in a general way to vases and rustic stands.

ERNEST WALKER.

BASSWOOD. See *Tilia*.

BAST. The soft part of the fibro-vascular bundles in plants, abundant in the inner bark. It increases in thickness simultaneously with the wood, but much less rapidly. The fibrous elements in the bast of Basswood have been used in making cordage; also in making strong paper. W. W. ROWLEE.

BATATAS. See *Ipomœa*.

BATEMÁNNIA (in honor of James Bateman, the distinguished collector and cultivator, and author of important works on Orchids). *Orchidàceæ*, tribe *Vandeæ*. Pseudobulbs short: leaf-blades coriaceous: fls. large, 2½–3 in. in diam., single or in pairs. Cult. like Cattleya. During the growing period they should be well supplied with water and kept from strong sunlight.

Colleyi, Lindl. Petals and sepals purplish or umber-brown, shading to yellowish green at the base. Demerara. B.R. 1714. B.M. 3818.

Meleàgris, Reichb. f. Petals and sepals pale yellow, brown toward the summits, broad at the base: labellum white at the base. Brazil.

B. Burtii, Endr. & Reichb. f., with 1-fld peduncles. Zygopetalum. OAKES AMES.

BAUHÍNIA (after John and Caspar Bauhin, sixteenth century herbalists; the twin leaflets suggesting two brothers). *Leguminòsæ*, but there is nothing to suggest the legume family to the northern horticulturist except the pod. MOUNTAIN EBONY. A genus of over 200 species, allied to Cercis. Tropical trees, shrubs, or vines, with showy fls. ranging from white to purple, and lvs. which may be entire or 2-lobed, in some cases the lfts. being entirely free; the petiole is prolonged into a short but characteristic awn between the lfts.: petals 5. The number and fertility of the stamens are important characters in determining the subgenera. They are much cult. in S. Fla. and S. Calif. in sandy soils. Prop. by seeds; rarely by cuttings of half-ripened wood.

B. variegata and *B. purpurea* are two of the commonest and showiest small trees of India, and, although frequently introduced into northern greenhouses, have rarely succeeded permanently. *B. variegata* is much cult. in India, and, when covered with blossoms, resembles a gigantic Pelargonium. The astringent bark is used in tanning and dyeing, and the lvs. and fl.-buds as a vegetable, the latter being pickled. "The reason for these plants being so little grown in our hothouses," says J. D. Hooker, "is, no doubt, that they must attain some size before they flower, and that they require a dry season to ripen their wood, the giving of which, without killing the plant by drought, is the standing crux of all establishments." Great numbers of species of Bauhinia are likely to be introduced from time to time because of their gorgeous appearance in the tropics. In the experience of Old World gardeners, the most reliable species under glass are *B. variegata*, *B. corymbosa*, and *B. Natalensis*. These can be planted outside here in summer, and kept over winter as oleanders are.

A. *Lvs. divided not to the middle.*

B. *Fls. usually colored.*

variegàta, Linn. Tree, 6–20 ft.: lvs. 3–4 in. across, orbicular, 9–11 nerved, lobes rounded; petiole 1–2 in. long: fls. about 7, in a short raceme, 4 in. across; calyx

spathe-like; petals 5, clawed, obovate-oblong, veined, rose-colored, the lowest one larger, broader above the middle, strongly marked with crimson; pod 1–2 ft. long. India. B.M. 6818.—The coloring of the fls. varies

Var. **cándida**, Roxb. (*A. álba*, Buck.-Ham.). Height 12 ft.; fls. white, beautifully veined with green; fls. Feb. to May. B.M. 7312. "A taller grower than *A. acuminata*, blooming in late winter and early spring. Very quick-growing, and ornamental even when not in bloom."—Reasoner Bros.

purpùrea, Linn. Height 6 ft.; lvs. coriaceous, rufous-tomentose beneath when young; lfts. broadly ovate, 4-nerved; petals red, one streaked with white on the claw, lanceolate, acute; fertile stamens 3, very long, the rest sterile or abortive; pod 1 ft. long. India, Burma, China.—Without doubt one of the finest flowering small trees in S. Fla. Flowers are borne in the greatest profusion, 3 to 5 inches across, varying in color from almost white to a shade of rich purple, and marked and shaded with many tones. The plant is very robust and hardy here, growing to a height of 15 feet in less than 2 years, and blooms all winter and spring.

Gálpini, N. E. Brown. Half-climbing shrub, 5–10 ft.; lvs. 1–3 in. long, 2-lobed from one-fifth to one-half their length, 7-nerved; petiole about ¼ in. long; racemes 6–10-fld.; petals 5, all alike, 1–1½ in. long; claw as long as the limb; limb orbicular, emspidate, brick-red; fertile stamens 3; pod 3–5 in. long; seeds dark brown. S. and Trop. Afr. B.M. 7494.—Discovered 1891. Fls. borne continuously from spring to late autumn.

BB. *Fls. pure white.*

acuminàta, Linn. Height 5–6 ft.; lfts. ovate, acuminate, parallel, 4-nerved, closing at night; fls. 2–3 in. across; fertile stamen long and nearly free, the other 9 short, connected, and sterile. India, Malaya, China. —One of the most satisfactory of all, either for open ground or greenhouse culture, as it will bloom the first summer, when but a few months old and but a foot or two high, and in succeeding summers blooms continuously from May to September.

AA. *Lvs. divided beyond the middle.*

B. *Leaflets not entirely free; fls. colored.*

corymbósa, Roxb. Woody climber, branching from the ground.; branches grooved; tendrils opposite, revolute; lvs. 1½–2 in. long, outer edges slightly rounded, inner edges straight and parallel; nerves 2–4; fls. numerous, corymbose, 1 in. across, rosy, ithw fluted petals, and characteristic venation; stamens 3, bright red, 3 very long, the rest abortive. China. B.M. 6621.

BB. *Leaflets entirely free; fls. white.*

Natalénsis, Oliver. Small shrub; lvs. numerous; leaflets each 1 in. long, with a midrib and a few nerves, dark green; petioles ¼–½in. long; fls. single or in 2's, 1½in across, white, the midvein of the 3 upper petals reddish; petals erect or spreading, the 2 lower ones larger; stamens 10, 5 long and 5 short; pod 3 in. long. S. Afr. B.M. 6086.—Not advertised at present.

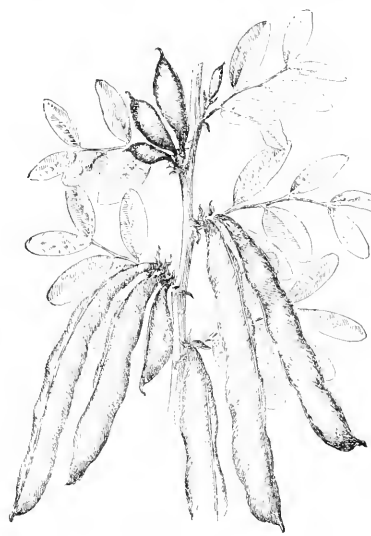
B. Hookeri, F. Muell., from Austral., and *B. Richardsoni*, Hort., Franceschi, are also advertised at present.

E. N. Reasoner and W. M.

BAY TREE. See *Laurus*.

BEAN. A name applied to various plants of the *Leguminosæ*. The Beans chiefly known to agriculture are of five types: (1) The Broad Bean (*Vicia Faba*), or the Bean of history, an erect-growing plant, producing very large and usually flat, orbicular or angular seeds. Probably native to S. W. Asia (Figs. 190, 191, *a*). See *Vicia*. These types of Beans are extensively grown in Europe, mostly for feeding animals. They are either grown to full maturity and a meal made from the Bean, or the plant is cut when nearly full grown and used as forage or made into ensilage. The Broad Bean needs a cool climate and long season. In the U. S. the summers are too hot and dry for its successful cultivation on a large scale, and the plant is practically unknown there. In Canada, the plant is used in connection with corn to make ensilage; and this combination is known as the "Robertson mixture."

(2) Kidney Bean (*Phaseolus vulgaris*, which see; Figs. 191, *b*, 192). This is the plant which is everywhere known as Bean in North America, comprising all the common field, garden, snap and string Beans, both bush and climbing. By the French it is known as Haricot, and this

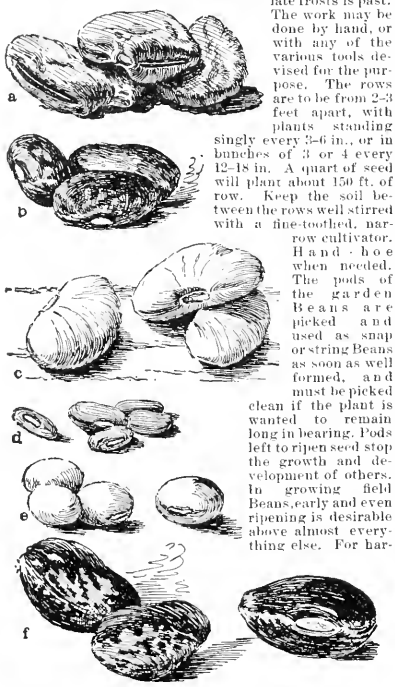


190. Broad Bean—Vicia Faba (× 1/5).

word is often found in our literature. Its nativity is unknown, but it is probably of tropical American origin. For inquiries into the nativity of the Bean, see DeCandolle, Origin of Cultivated Plants; Gray & Trumbull, Amer. Jour. Sci. 26:130; Sturtevant, Amer. Nat. 1887: 332; Wittmack, Ber. der Deutschen Bot. Gesellschaft, 6:374 (1888). (3) Lima or Sugar Beans (*Phaseolus lunatus*, which see). Long-season, normally tall-climbing plants, producing large, flat seeds (Figs. 191, *e*, 193). Native to S. Amer. See Bailey, Bull. 87, Cornell Exp. Sta. (4) Various species of Dolichos (as *D. sesquipedalis*). Vines which produce very long, slender pods and small, narrow Beans (Figs. 191, *d*, 194). Native to trop. Amer. See *Dolichos*. (5) Soy, or Soja, Bean (*Glycine hispida*, which see). A bushy, erect, hairy plant, producing small pods in clusters, and pea-like seeds (Figs. 191, *c*, 195). In this country comparatively little known, and used mostly for forage. Native to China and Japan, where it is much grown. Aside from these types, there are others of less economic importance. The Scarlet Runner type is a perennial Phaseolus (*P. multiflorus*), grown in this country mostly for ornament (Fig. 196). Various other species of Phaseolus are also cult. in various parts of the world under the name of Beans. *P. radiatus* is prized in Japan, and has been int. into the U. S. as Adzuki Bean (see Georgeson, Bull. 32, Kans. Exp. Sta.). *Vigna Sinensis*, known in N. Amer. as Cowpea (which see), is sometimes called a Bean. The Velvet Bean of the South is a Mucuna (which see). The Jack Bean is a Canavalia (Fig. 197). The Sea Beans of the Florida coast are seeds of various tropical leguminous plants, and are transported by ocean currents (see Coe, in G.F. 7:503). L. H. B.

Culture of the Bean.—The practical grower usually divides the many varieties of Beans into two groups—the bush and the pole Beans. The one includes all those

grown as "field Beans" for the dry-shelled seeds, as also both the green-podded and the yellow-podded garden, string, or snap Beans. The pole or running sorts are usually grown for garden purposes, and rarely for the dry-shelled Bean. The ordinary bush Beans make no great demands for soil fertility. They do well on ordinarily good, warm farm loam. If the soil contains a fair proportion of humus, the plants will secure much of their nitrogen from the air; and if additional fertilizers are needed, they may be given in potash and phosphoric acid alone. Plant only after danger from late frosts is past. The work may be done by hand, or with any of the various tools devised for the purpose. The rows are to be from 2-3 feet apart, with plants standing singly every 3-6 in., or in bunches of 3 or 4 every 12-18 in. A quart of seed will plant about 150 ft. of row. Keep the soil between the rows well stirred with a fine-toothed, narrow cultivator. Hand-hoe when needed. The pods of the garden Beans are picked and used as snap or string Beans as soon as well formed, and must be picked clean if the plant is wanted to remain long in bearing. Pods left to ripen seed stop the growth and development of others. In growing field Beans, early and even ripening is desirable above almost everything else. For harvesting the crop, special tools have been devised and are in use by those who make a business of Bean-growing; but when a regular Bean-puller is not available, or when hand labor is cheap, the plants may be pulled by hand and placed in rows on the ground, bottom-side up, and when sufficiently cured put in stooks or taken to the barn, and, in due time, threshed with the flail or with a regular Bean-thresher. After being cleaned by running through a fanning mill, picking over by hand will also be required in most cases.



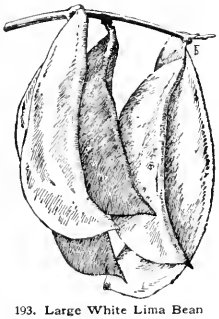
191. **Types of Beans.** Natural size.

a Vicia Faba. b, Phaseolus vulgaris. c, Phaseolus lunatus. d, Dolichos sesquipedalis. e, Glycine hispida. f, Phaseolus multiflorus.

Among the leading sorts of field Beans are White Marrowfat, Navy or Pea Bean, Medium, and the Kidneys. For string Beans, Early Valentine, which has various strains, probably stands first in popular favor as a green-podded variety for the market-garden at the present time. Other good current sorts are Stringless Green Pod, Early Mohawk, Refugee, etc. The best among yellow-podded sorts are Black Wax or German Wax, Golden Wax, Kidney Wax and White Wax. The Wax or Yellow-podded sorts need a richer soil than the other kinds. A good string Bean has a thick, meaty pod, which snaps off completely when broken, leaving no string along the back. Fig. 198 shows ideal pods.

192. Common or Kidney Bean — Phaseolus vulgaris.

Pole or running varieties of Beans require fertile soil; and for that king of table Beans, the Lima of all forms, too much can hardly be done in the way of enriching the ground. Warm soil is one of the first essentials of success in growing pole Beans. When poles are to be used for support, they should be set not less than 4 ft. apart each way, before the Beans are planted. Four or five Beans are to be placed around each pole, 1 to 1½ in. deep. While it is a safe rule to put the seed eye downward, it is not a necessary condition of prompt and uniform germination. In case of absence or scarcity of poles, a serviceable, cheap and ornamental trellis may be constructed by setting posts firmly at proper distances along the row, connecting them with two wires, one a few inches and the other 5 or 6 ft. from the ground, and finally winding cheap twine zigzag fashion around the two wires. Cultivate and hoe frequently. A top-dressing of good fertilizer, or of old poultry or sheep manure, hoed in around the plants, may be of great help in keeping up the productiveness of the plants to the end of the season. To have a continuous supply during the entire season, the pods, when large enough, must be gathered frequently and clean. Among the varieties used both for string and shell Beans, we have the Green-podded Crease-back, several wax varieties, Golden Cluster, and the popular Horticultural or Speckled Cranberry Bean, besides any number of others. A very fine Bean is the Dutch Runner (Fig. 196), which approaches the Lima in quality and resembles it in habit of growth. The seed is of largest size and clear white in color. Highly ornamental is the closely related Scarlet Runner, with its abundance of showy scarlet blossoms. This Bean is grown in Europe for eating, but is rarely used for that purpose here.



193. **Large White Lima Bean** (× ⅓).

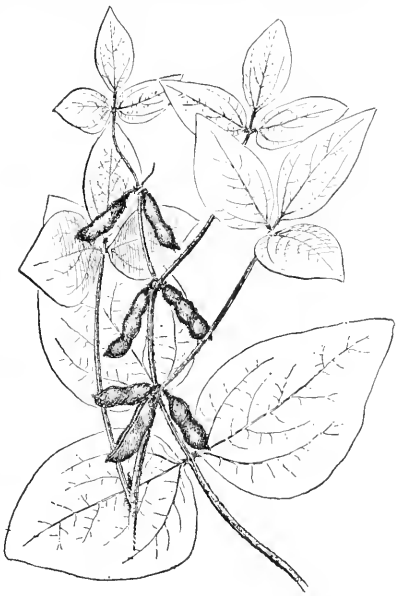
Of all pole Beans, the Limas have undoubtedly the greatest economic value. They enjoy a deserved popularity, and are usually grown with profit by the market-gardener. The varieties might be classed in three types,—that of the Large Lima, the Dreer Lima, and the Small Lima or Sieva. Each of them has a number of sub-varieties or strains, and appears in both pole and bush form. The old Large Lima (Fig. 193) is a very large, flat Bean, and yet largely grown for main crop. To the same type belong Extra-early Jersey, King of the Garden, and others. The pods of these are very large, and the Beans in them somewhat flattened. The dwarf form of this type is known as Burpee's Bush Lima. The Dreer Lima of both forms is appreciated especially for its high quality. The seeds are more roundish and crowded close together in the pods, the latter being much smaller than those of the Large Lima. The seeds of these two types are light colored, with a greenish tinge, but the Large Lima is also represented by red and speckled (red-and-white) sports. The Small Lima, or Sieva, with its dwarf form, Henderson's Bush Lima, seems to be hardier and earlier than the two larger types, but pod and Bean are quite small. The color of this Bean is nearly clear white, but there is also a speckled sub-variety of it. Wherever there is a place for the Sieva, its bush form will be appreciated. The bush forms of the two larger types, however, are not uniformly productive enough to take the place of the pole forms entirely. The latter will often be found preferable where a long season of continuous bearing is desired. For further notes on Lima Beans, dwarf and pole, see Bailey, Bulls. 87 and 115, Cornell Exp. Sta.

Beans are easily forced under glass, in a temperature suitable for tomatoes. They may be grown either in pots or beds. The bush varieties, as Sion House, are preferred. Keep them growing, and look out for red spider. See Bailey, Forcing-Book; and for the forcing of pole Beans, see Rane, Bull. 62, N. H. Exp. Sta. See *Forcing*.

Three other members of the Bean tribe might be mentioned in this connection; namely, the Black Bean or Cow-pea of the South, the Japanese Soy Bean, and the English or Broad Bean. The Cow-pea takes in some measure the same place in the southern states that red clover takes at the North, being used both as stock food and as a green-manure crop. There are many varieties of it, early and late, some of strictly bush habit and some producing long runners. (See *Cow-pea*.) Of greater value for the same purposes, north of New Jersey, seems to be the Japanese Soy Bean, which is early enough to come to maturity almost anywhere in the United States. Its foliage is rather thin or open, however, which impairs its value for green-manuring. The dry Bean constitutes one of the richest vegetable foods known, and its flavor seems unobjectionable to all kinds of stock. Sow 1 bus. to the acre. Similar to this in value is the English Broad Bean, several varieties of which, as the Broad Windsor, the Horse Bean, etc., are grown

194. Dolichos sesquipedalis, or Yard-long Bean.

and are popular in England and in some parts of the European continent. In most parts of the United States they are scarcely known, and in none generally cultivated. Only a few of our seedsmen list them in their otherwise complete catalogues. Yet they are a decidedly interesting group of plants, and worthy of greater attention in the cooler parts of the country. Being about as hardy as peas, they may be planted much earlier than would be safe for ordinary Beans. The Windsor is used



195. Soy Bean — Glycine hispida (× $\frac{1}{8}$).

by people in England much in the same way that we use Lima Beans; but the latter are so much better that in the United States we have no need of planting the former as a table vegetable.

T. GREINER.

BEARBERRY. See *Arctostaphylos*.

BEAR'S BREECH. See *Acanthus*.

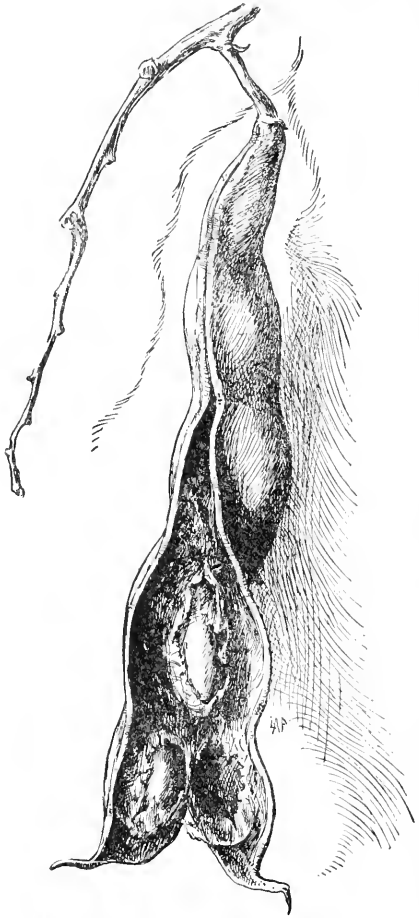
BEAUCÁRNEA. See *Nolina*.

BEAUMÓNTIA (after Mrs. Beaumont, of Bretton Hall, Yorkshire, Eng.). *Apocynàceæ*. A genus of three East Indian trees or tall climbers, with very large, white, fragrant, bell-shaped fls. in terminal cymes. The genus is more nearly allied to the familiar greenhouse shrub *Trachelospermum jasminoides* than to the splendid tropical climbers in Allamanda and Dipladenia. *B. grandiflora* has been neglected of late, presumably because it needs so much room. It should be planted out in the strong, fibrous, loamy soil of a warm house, as it rarely succeeds in pots. It is best trained to the roof, as full light is necessary for flowering, if not for growth. The shoots may be thinned if the large lvs. cast too much shade on the plants beneath. The wood should be well ripened to produce an abundance of winter bloom. The fls. are produced on the growth of the previous season. After flowering, the plant should be severely pruned to produce lateral shoots for the next season's bloom. In its native country, this vine climbs over very tall trees.

grandiflòra, Wall. Lvs. obovate, cuspidate, wavy margined; sepals 5, large, ovate, wavy, pink-tipped; corolla tube veined with green, the limb 5-cleft. B.M. 3213. Gn. 45, p. 138; 49, p. 314. J.H. III. 28:243.

BEDDING, or BEDDING-OUT. The temporary use out-of-doors of plants that are massed for showy and striking effects. There are four main types: spring, summer, subtropical, and carpet bedding.

SPRING BEDDING is the most temporary of all, and is usually followed by summer bedding in the same area.



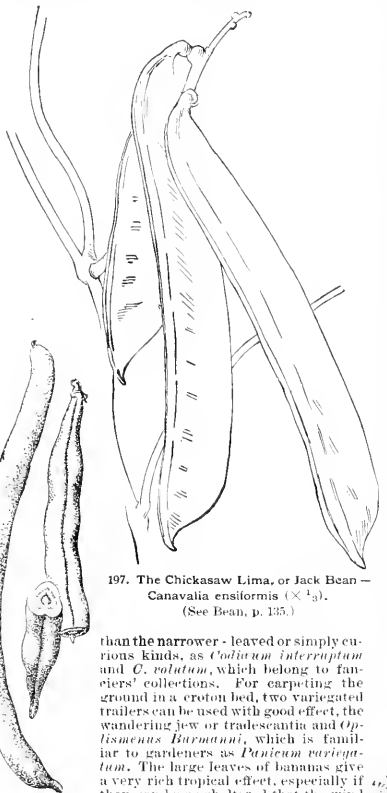
196. Phaseolus multiflorus. Natural size. (See Bean, p. 135.)

It is the only kind that largely employs hardy plants, as crocuses, narcissi, daffodils, tulips, hyacinths, and other Dutch bulbs. All four types of bedding are commonly seen in public parks, but spring bedding is the most appropriate for amateur and home use, as the bulbs flower at a dreary time of the year, when their brave colors are most cheering, and also because they are much more familiar than the subtropical and foliage plants of summer. Then, too, hardy bulbs are more easily cultivated than any other class of plants, and they are cheap. The main principle is to plant them early enough to secure a strong root development. Hence they should be ordered early, and planted in the latter part of October or first of November. The colors may be massed or mixed according to taste, the terms massed and mixed bedding referring to unity or variety of effect, and being applicable in each of the four main types mentioned above. Opposed to this style of bedding is the naturalizing of bulbs in the lawn. Crocuses and squills are particularly charming when they appear singly, or in twos or threes, at unexpected places in the lawn. Daffodils are usually naturalized in large masses in spots where the grass is not mowed. Pansies are the only other plants that are used extensively for spring bedding. English double daisies and catchflies are largely used for edgings. Pansies are set out between April 1 and 15. In large operations, pansy seed is sown in August of the preceding year, and the young plants are transplanted once and wintered in a coldframe. After flowering, the plants are thrown away. The other method is to sow the seed in a greenhouse in January. The August-sown pansies give larger and earlier blooms, but the January-sown pansies will last longer, and in partially shaded places will give scattering bloom all summer, especially if protected from drought.

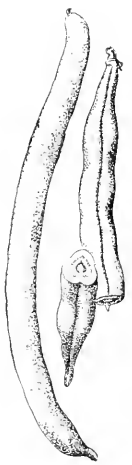
SUMMER BEDDING often follows spring bedding in the same space of ground, and employs chiefly geraniums, coleus, begonias, ageratum, salvia, vinca, alyssum, petunia, verbena, heliotrope, grasses, cacti, and aquatic plants, the culture and varieties of which may be sought elsewhere in this work. As to tenderness, these fall into two groups, the first of which may be set out about May 15 in New York, and the second about June 1. Geraniums are the most important of the first group, and coleus is an example of the tenderest material, which is set out simultaneously with subtropical plants when all danger of frost is past. As to fondness for sunlight, there are again two groups, but the only bedding plants of importance that prefer shade are tuberous begonias and fuchsias. The wonderful popularity lately achieved by the former in Europe will probably never be duplicated in America. The secret of their culture is shade, shelter, and moisture at the roots. Hence a clay bottom is desirable for a bed of tuberous begonias, as being more retentive of moisture than a sandy or porous soil. They enjoy cool air and as much indirect light as possible, but not the direct rays of the sun. Hence the north side of a building is better for them than a station under trees, as the trees usually give too dense a shade, and their roots interfere. On the other hand, coleus is more highly colored in full sunlight than in shade. The only fibrous-rooted begonias largely used for bedding are varieties of the semperflorens type, of which Vernon and Erfordii are extremely popular at present. In the manipulation of tender perennials, there are often two methods of propagation, either of which may be better, according to the ideal in view. As a matter of general tendency, propagation by cuttings gives bloom that is earlier but not as continuous or profuse as by seeds. Salvias and verbenas are pronounced examples. On the contrary, cuttings must be depended on, as a rule, to keep the choicest varieties true to type, as the mission of seeds in nature seems to be to produce more variation than can be attained by non-sexual methods of propagation, as by bulbs or cuttings. Salvias are also an example of plants that are particularly effective when seen at a great distance, and also of plants that are generally massed for unity of effect, and not mixed with others. Verbenas are commonly grown by themselves, but this is because they demand much room by reason of their trailing habit.

SUBTROPICAL BEDDING is a department of summer bedding which employs chiefly cannas, musas, castor-oil plants, crotons, palms, ferns of coarser habit, screw-pines, dracænas, araucarias, elephant-ear caladiums, and to a lesser extent, abutilon, acalyphas, achyranthes, anthericum, *Carica Papaya*, sanchezia, and others. Cannas are by far the most popular at the present time, especially for mass-work. Sometimes the tall, purple-leaved, old-fashioned, small-flowered types are used in the center or at the back of the bed, and the dwarf,

modern, large-flowered types around the edges or in front. Frequently, massing with a single variety of canna is practiced. Next to cannas in popularity probably come the crotons or codiæums,—the broad-leaved types, as Queen Victoria, being better for this purpose than the narrower-leaved or simply curious kinds, as *Codiæum interruptum* and *C. volutum*, which belong to fanciers' collections. For carpeting the ground in a croton bed, two variegated trailers can be used with good effect, the wandering jew or tradescantia and *Oplismenus Burmanni*, which is familiar to gardeners as *Panicum variegatum*. The large leaves of bananas give a very rich tropical effect, especially if they can be so sheltered that the wind will not split them. One of the very best plants for encircling a public fountain is the huge-leaved elephant-ear caladium. For interesting points concerning its culture, see *Colocasia*.



197. The Chickasaw Lima, or Jack Bean — Canavalia ensiformis (× 1/3). (See Bean, p. 135.)

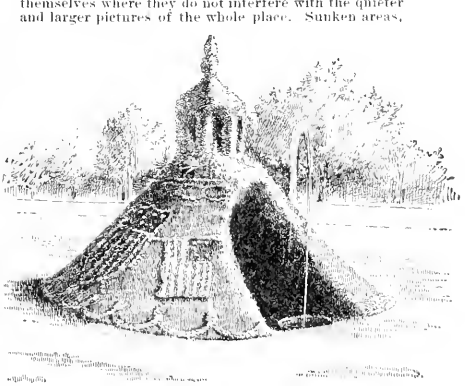


198. Typical Snap, or String Beans (× 1/2). (See p. 136.)

Among the first half-dozen favorites for subtropical bedding is the castor-oil plant, or ricinus. Its marvellous growth from seed in a single season makes it one of the very best of all plants for rapidly filling up large areas temporarily. Grasses furnish an exception to the general rule that bedding plants are tender. There are many kinds of bamboos that are perfectly hardy in the northern states, and these are bound to increase in popularity. A favorite combination of grasses for bedding is *Arundo Donax*, the giant reed, surrounded by eulalias. Grasses and their kind are particularly effective in aquatic groups. No well kept establishment is complete without a pond or body of water in which aquatic plants are naturalized. For a more extended account of this attractive subject, see the article *Aquatics*. There is a large class of tender material—as palms, screw-pines, the coarser ferns, dracænas, araucarias—a class of foliage plants which really does better outdoors during summer in a shady and sheltered position than indoors all the year round. In the more formal styles of ornamental gardening, such plants often form the nucleus of a subtropical bed, the large tubs of the palms being hidden by lower-growing plants, as begonias, or whatever may be left over from the spring operations. In less formal gardening, the tubs may be hidden by plunging them half-way into the ground and grading the sod, which has been previously broken, in such a manner as to conceal the tubs entirely. The plants are arranged in a freer and more natural manner, and the outer fringe of begonias and the like may be dispensed with. The chief dangers to such plants are from the sun and wind. Palms once scorched or wind-whipped are ruined. Hence, a sheltered position on the north side of a building, or under the shade of trees, is usually the best spot for their summer vacation.

CARPET BEDDING is the most formal and most expensive of all kinds of bedding, and employs plants that stand pinching and shearing, as coleus, achyranthes, alternanthera, lobelia, one of the dusty millers (*Centaurea gymnocarpa*,—*C. candidissima* will not bear the shears), certain succulents of the hen-and-chickens type (as echeverias), and many others, which list may be found in a classified and convenient form at p. 245 of Bailey's Garden-Making. The terms "geometrical bedding" and "fancy bedding" are somewhat synonymous. Here belong the imitations of buildings and animals, the portraits of men, the lettered greetings to conventions, the calendars, floral clocks, and similar ingenuities. A single example is pictured in Fig. 199. A ground plan for a fancy carpet bed is shown in Fig. 200. For designs and for extended cultural information, the reader is referred to the numerous German books on the subject, to Mottet's La Mosaïculture, and to a book published by Geo. A. Solly & Son, Springfield, Mass. This style of bedding requires the highest degree of technical skill, and is especially enjoyed by the Germans, whose gardeners excel in it.

The position of a bed is far more important than the style of bedding or the kinds of plants that are used. The natural school of landscape gardening, as opposed to the various schools of ornamental gardening, makes no objection to beds in themselves, but dislikes their usual position. They are commonly given the most conspicuous places, where they must be seen, whether people like them or not. They should be in a place by themselves where they do not interfere with the quieter and larger pictures of the whole place. Sunken areas,

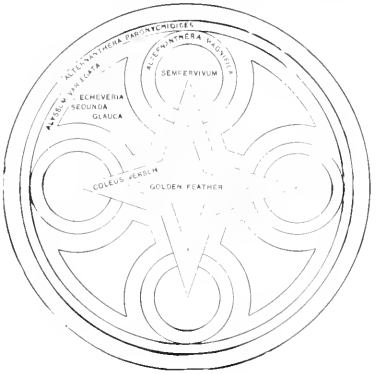


199. Example of fancy bedding.

as in Fairmount Park, Philadelphia, are particularly commendable. A flower-bed should not be in the middle of a large lawn, because it distracts the attention

from the larger picture, and because the lawn is the canvas upon which the landscape gardener makes his picture. The chief merit of beds is their attractiveness and brightness, which accounts for their presence in parks and public places. On the other hand, they are expensive, and they are at their best only two or three months in the year, while a mud-hole in a lawn for nine months of the year is an unsightly object. Formal beds, especially of foliage plants, with their gaudy colors and unchanging monotony, are considered by some the most unnatural and the least artistic style of gardening. Nevertheless, they require a high degree of technical skill, which deserves appreciation.

A few practical suggestions may be given for making a bed. The soil should be rich and full of vegetable matter. If a foot or 18 in. of the surface soil is so poor that it must be removed, it may be replaced by two parts of fibrous loam and one of well-rotted manure, with some upturned broken sods in the bottom for drainage. The fall is the proper time to apply manure, and if the bed be thoroughly spaded over and left rough during the winter, the alternate freezing and thawing will fine both the soil and the fiber of the manure. Beginners nearly always fail to supply perfect conditions for watering. A midsummer mulch of half-rotted manure enables the plants to take all the moisture they need during the drought and to keep it. The soil should be in ideal condition before the plants are set into it,—mellow, rich, full of fiber, and of firm and uniform texture. Begin in the middle and work toward the edges. When the bed is finished, give it one thorough soaking, to settle the soil at the roots.



200. Plan of a complex carpet bed.

ROBERT SHORE.

BEECH. See *Fagus*.

BEECHER, HENRY WARD (1813–1887). The celebrated American clergyman and orator deserves especial remembrance for his work as editor of the Western Farmer and Gardener in pioneer days of western horticulture. A selection of his contributions was printed in 1859 as a book of 420 pp., entitled "Plain and Pleasant Talk About Fruits, Flowers and Farming." A second edition was published in 1874 as "Pleasant Talk, etc.," a book of 498 pp., containing also articles written for the New York Ledger. These papers have a higher literary quality than is usual in horticultural writings, and are still entertaining and suggestive. They did much to spread the taste for country life and gardening.

BEET. There are 4 or 5 species of the genus Beta, which are sometimes cultivated under the name of Beet, but *Beta vulgaris*, Linn., is the only one of practical importance. From it all our common garden varieties are derived. According to DeCandolle, the aboriginal slender-rooted species is found in sandy soil, and especially near the sea, throughout southern Europe, and on nearly all the coasts of the Mediterranean. It also occurs as far eastward as the Caspian Sea and Persia. "Everything shows that its cultivation does not date from more than two or three centuries before the Christian era." It is now highly improved, principally in the one direction of large and succulent roots, and is much esteemed in all civilized countries. See *Beta*.

201. Bassano Beet.

Young Beets constitute one of the most important early crops in truck-gardening. Many acres of them are grown near all the city markets, and as they bear transportation well, they are often grown at comparatively remote places. Large quantities are shipped early from Norfolk, Va., and from other southern points to northern markets. Like all root crops, the Beet needs a loose, light, fresh, clean, rich soil, which must be in the best condition of tillage. No fermenting manure should be used, but instead fully rotted barn manure, with some good potash fertilizer. The seed for the first crop is sown early in spring, as soon as the soil can be well worked. Where intensive gardening is practiced, the drills may be as close as 1 ft. apart, in which case the young Beets are thinned to 6 in. apart in the row. But in ordinary gardening, it will be found most convenient to run the rows 2–3 ft. apart, allowing cultivation with the horse. The plants in such rows can be left 4 in. apart at thinning time. The thinning is done when the young plants are large enough to be pulled for "greens," for which purpose they find a ready market. Beets are also grown in quantities as a fall crop, and are stored for winter use. When this is to be done, the seed is sown in June, and the plantation is managed in all respects like the spring sowing. Beets are sometimes forced in greenhouses, but as they are hardly profitable, they are grown only in vacant spaces or after other crops are out. When the young roots are ready for the early market, they are pulled and tied in bunches of five or six. The fall crop is pulled soon after the first frost, the tops are removed, and the roots stored in pits or root cellars.

The most popular varietal types of the garden Beet are the following: *Bassano* (Fig. 201).—Flesh white and light red mixed; an old-time early variety, now less grown than formerly. *Early Blood Turnip.*—Rich, deep blood-red, flattened turnip-shape; an old and well-known sort. *Edmand.*—Moderate size; handsome, rounded, smooth, deep red; good grain and flavor; not quite first early. *Eclipse.*—Uniformly globular, bright red; fine-grained and sweet; one of the best quick-growing early Beets. *Egyptian Turnip.*—Tops quite small; roots fair size, rich, deep red; a standard early variety.

For field culture of culinary Beets, the long-rooted varieties are chiefly used. These are sown in the field as soon as the weather is settled, in rows far enough apart to allow of tillage by horse. Most of them require the entire season in which to mature. They are grown mostly for storing for winter use. They were once grown for stock, but the Mangel-wurzels give much greater yields. The various types of Long Blood Beet (Fig. 202) are chiefly used for field culture.

Favorite varieties of Mangel-wurzels are Golden Tankard, Golden Yellow Mammoth, Mammoth Long Red. Several sorts of Sugar Beets, mostly imported from Germany, are being grown in divers places in America. Of Chard, there are no selected varieties offered in America.

The varieties of *Beta vulgaris* may be conveniently divided into five sections, though the distinctions are somewhat arbitrary and of no fundamental importance. These sections are as follows:

1. GARDEN BEETS. Varieties with comparatively small tops; roots of medium size, smooth, regular and fine-grained; mostly red, but sometimes whitish or yellowish.

2. MANGEL-WURZELS, or MANGELS. Large, coarse-growing varieties, with large tops and often very large

roots, the latter frequently rising some distance out of the ground; rather coarse-grained. Extensively grown for stock-feeding.

3. SUGAR BEETS. Sometimes said to belong to another species, but doubtless to be classified here. Rather small-growing varieties, with medium tops: roots small to medium, usually fusiform, smooth, nearly always yellowish or whitish.

4. CHARD, or SWISS CHARD. Varieties with comparatively large tops, broad leaf-blades and very large, succulent leaf-stems, which are cooked and eaten somewhat like asparagus. The thrifty, tender young lvs. make a very excellent pot-herb. Chard has sometimes been referred to a separate species, *Beta Cicla*, but should be included with *B. vulgaris*. See *Chard*.

5. FOLIAGE BEETS. A race which has been developed to produce luxuriant foliage of many colors and varied markings. Of such varieties are the Brazilian, Chilian, Victoria, and Dracæna-leaved. The ribs of the lvs. are usually beautifully colored. Where the leaf-blight fungus is not serious, these foliage Beets make excellent borders where strong and heavy effects are desired, and they are excellent for bedding. Raised from seeds, as other Beets are; roots may be kept over winter.

The Beet is not often damaged by insects. It is sometimes attacked by rust, rot, spot-diseases, and

202. Long Blood Beet.

scab, of which the last is the worst. The scab is the same disease which attacks the potato, and one of the chief precautions is, therefore, to avoid following potatoes with Beets. For the most part, clean culture and proper rotations will forestall serious injury from plant diseases. Spraying with Bordeaux mixture may be expected to prevent the leaf diseases.

F. A. WAUGH.

BEGONIA (named after M. Begon). *Begoniàceæ*. ELEPHANT'S EAR. BEEFSTEAK GERANIUM. A large genus of very popular and useful plants for the house, conservatory and garden. Succulent herbs or undershrubs, having the stem in some cases reduced to a thick rhizome, in others to a distinct small tuber, while a few others possess a semi-tuber, in which there are a number of closely set scales or suppressed lvs., resembling bulbs: lvs. variable, alternate, more or less unequal-sided, entire, or lobed, or toothed, ovate-acuminate, orbicular or peltate: fls. usually in axillary cymes, monœcious, large; males usually with 4 petals, females with 5 (rarely 2), pink, white, rose, scarlet, yellow, and all shades of these, being represented; stamens numerous; filaments free or united at the base; styles 2 or 4, free, sometimes connate; stigmas branched or twisted like a corkscrew: fr. usually a 3-winged capsule, which is often colored; ovary inferior; seeds numerous, very minute. The first Begonia was introduced into England in 1777. Since then, out of the 350 species known, about 150 have proved of value to the horticulturist. Few other plants have been improved so rapidly, there being thousands of varieties now in cult., displaying the most gorgeous colors in their fls. and beauty and coloring in their lvs. Their geographical distribution is very disjunctive and localized. They are indigenous to Mex., Cent. and S. Amer., Asia, and S. Afr. They seem to have no genetic relationship with other plants now living. For literature, see Dryander, The Genus Begonia, Trans. of the Linn. Soc., Vol. I, 1789; Klotzsch, Begoniaceen-Gattungen und Arten, 12 plates, 1855; De Candolle's Prodromus, 15, 1864; Ravenscroft, B.C., Begonia Culture for Amateurs, 1894; Wynne, Tuberous Begonias.

The Begonias now in cult. may be roughly divided into four sections or groups:

I. FIBROUS-ROOTED, or WINTER-FLOWERING. Nos. 1–71.

II. SEMI-TUBEROUS, or SOCOTRANA. Nos. 72–76.

III. TUBEROUS, or SUMMER-FLOWERING. Nos. 77–99.

IV. REX, or ORNAMENTAL-LEAVED. Nos. 100–103.

In the following account, the dates refer to introduction into cultivation, not into American trade. They are European dates.

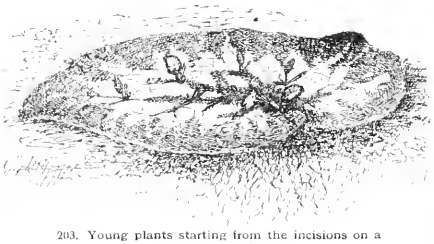
P. B. KENNEDY.

There are four sections of the Begonia family, and as each requires somewhat different directions for their cultivation, it is desirable to treat them separately. The first section, the Fibrous-rooted, comprises such varieties as *B. nitida*, *semperflorens*, var. *gigantea rosea*, *alba-picta*, *Haageana*, and *Duchartrei*. Cuttings taken from clean, healthy stems will strike readily in an ordinary propagating box or bench, and if potted-on, as they require root-room, will make fine plants for late winter- and spring-flowering. As soon as one neglects good treatment, especially in regard to light, fresh air and fresh soil, the red spider, a physiological disease appearing like rust, and the dreaded nematodes, will soon attack them and give them a sickly and stunted appearance. They require a temperature of from 55–60° at night and 65–70° in the day time. The plants should be kept close to the glass during the early stages of their growth, on account of the tendency of many of the varieties to send out rather long shoots. A compost of 3 parts good loam, 1 part well-rotted manure, and 1 part sand, will be found very suitable for their growth. While Begonias in general are injured by too strong sunshine during summer, they are benefited by all the sunshine they can get during the winter and early spring months. Strong sunshine, however, pouring through imperfect glass upon wet foliage, is apt to blister the leaves of any Begonia. Such varieties as *B. Dregei* and *Weltoniensis*, which produce at their base a thickened, fleshy stem like a potato, may be propagated either by division or by cuttings. Nearly all the varieties belonging to this section can be grown by amateurs, and make excellent house plants, especially *B. manicata*, *rubra*, *speculata*, *argyrostigma*, var. *picta*, *ricinifolia*, *heracleifolia*.

The second section, the Semi-tuberous, comprises such Begonias as *B. Socotrana* and Gloire de Sceaux. They require greater care, and should be grown in a soil with considerably more leaf-mold and a temperature of 65–70° in the daytime and 60° at night. Of Gloire de Sceaux and other hybrids, plants 2 years old will be found best for decorative purposes.

The third section, the Tuberous Begonias, are grown in pots, boxes or baskets, under glass, or as bedding plants in a shaded border. If the plants are intended for pot culture in the greenhouse, it is best to use the tubers. For early flowering, start the tubers in February or March, either in small pots or shallow boxes. The soil may be composed of loam, sharp sand and leaf-mold, and the temperature about 60°–65°. When the plants are ready for repotting, well-rotted manure may be added, and when the roots have taken a fresh hold a cooler temperature may be maintained. For bedding purposes, seedling plants, as well as tubers, may be used, providing they are of a first-class strain. Tubers are preferred if early-flowering plants are desired. They bloom more abundantly in the early part of the season, as they have the strength of the already formed tubers. Plant in the mid-

dle of May or beginning of June, according to locality, from 3½ or 4-inch pots. Although they grow fairly well under trees, the north side of a building is to be preferred; but they must not be crowded. Plenty of light, with moisture at the roots, and a mulching with half-rotted leaves



203. Young plants starting from the incisions on a Begonia leaf.

in hot weather, will greatly benefit the plants. Water, when necessary, under the leaves. See *Bedding*.

The tubers should be lifted after the first light frost, and stored. Seeds sown in March will produce flowering plants by July or August, but 2-year-old tubers are more satisfactory for continual blooming. The seed may be sown in any shallow box or seed-pan, which should first be filled with material which will give plenty of drainage, over which place some finely sifted soil to receive the seed. Scatter the seed thinly. Sufficient covering will be given by simply pressing the soil down level. Keep in darkness by covering with glass or paper for a few days, in a temp. of not less than 70°. As soon as the seedlings appear the covering must be removed, and when the little plants attain roots about ¼in. long they may be pricked into nicely prepared soil. In most places in this country, Tuberous Begonias do not thrive out of-doors, but in some places and with careful treatment they do well. They are very satisfactory for blooming in a well-shaded greenhouse in the summer.

The fourth section, the Rex Begonias, are grown entirely for the beauty of their foliage. They may be prop. by means of either shoot- or leaf-cuttings, the latter being the better when plants have to be raised in quantity. Large and well-matured, but still healthy and vigorous, leaves may have the principal nerves cut on the under side. The leaf is then pegged or weighted down on the surface of a well-drained propagating bed. If carefully shaded, roots will be formed at every cut, a tiny leaf will follow (Fig. 203), and the little plants may be inserted singly in small pots. Another method is to cut the large leaves into triangular parts, with a bit of the main petiole at the tip of each, and insert the pieces about 1 in., with the lower or thickest end of the rib downward (Fig. 204). Still another method is to cut the leaf in two, across the veins (Fig. 205), and stand it edgewise in the propagating bed. The young plants may be potted-up into small pots, using a light, porous, sifted soil. Keep shaded in a low house with a moist atmosphere. The soil may be gradually made coarser with each potting until, in the final shift, an unsifted compost of 2 parts loam, 1 part leaf-mold, 1 part well-rotted manure, and 1 part sand, is used, adding a sprinkling of lime. While watering, avoid wetting the leaves as much as possible, and keep large, well developed plants in a shaded house, with plenty of ventilation day and night during the summer.

204. Plant arising from the base (or tip) of a triangular leaf-cutting.

ROBERT SHORE.

The Begonia is exacting in its requirements; yet these requirements are simple. It responds readily to intelligent culture; most of the varieties are extremely rapid in growth, and a year's time will produce an excellent specimen from a rooted cutting. For horticultural purposes, Begonias are usually divided into three general classes: the Tuberous-rooted, Rex, and Shrubby or Flowering sections. Tuberous-rooted Begonias attained a short-lived popularity in this country some 12 or 15 years ago, when they were imported in large quantities from France and England and used as bedding plants. It was hoped that they might share patronage with the Geranium, but our burning summers and long-continued droughts wrought such havoc with them that they speedily fell into disfavor, and very few growers now handle them. This is much to be regretted, for they are gorgeous flowers, and careful selection has produced blooms of enormous size and wonderful form, in the most vivid shades of red, white, yellow and pink.

The Rex division has been a great favorite for many years. In no other class of plants are the rich metallic shades of various colors found so satisfactorily blended

205. Upright leaf-cutting of Begonia.

as here, while the form and size of the lvs. are of the greatest variety; those of the old Rex and of Mrs. Bonner are frequently a foot and more in length, while little Marquis Peralta makes a compact mass of tiny zoned foliage averaging only 2 or 3 in. long. To the Rex varieties showing bright green, pure silver, bronze, and velvety green, have been added Lucy Closson and Louise Closson, both showing bands of bright, rosy plum color, and Mme. Gache, with its zone of light, dull red. A class of Hybrid Rex contains some of the most useful and beautiful of ornamental plants. They are nearly all crosses between Lesoudii and Diadema. These all show the Rex texture and general habit, while the lvs. are deeply notched and zoned; they are more substantial than the average Rex, and they make symmetrical specimens with less trouble. Some of the principal American varieties of this section are Anna Dorner, Elsie Coles, Bertha McGregor, Flora Hill, Mrs. Shepherd, and Richmond Beauty. Rex Begonia culture is simple. Soil should be a mixture of loam, woods earth, sharp sand, and well-rotted cow-manure. It must be light and porous. Temperature required is a warm greenhouse for growing; but grown specimens can be hardened to a much lower temperature. They enjoy a moist atmosphere, and must be shaded from hot sunshine. They have few insect enemies. Of later years they have been subject to the attack of a very destructive fungous-like disease, but careful attention to handling and propagation will keep it in check. The propagation of Rex Begonias is very simple, a leaf, or portion of leaf with a strong midrib, rooting very readily in the propagating bench with bottom heat.

The Shrubby or Flowering Begonias comprise a number of ornamental sorts with inconspicuous flowers, and also varieties that are huge bouquets of bloom. Among the former are Albo-picta, Diadema, Nigricans, Mme.

Lionnet and Metallica, all forming beautiful specimens of foliage. Of the flowering sorts, two of the most widely cultivated are the old favorites, Rubra and Weltoniensis. Vernon and Erfordii are veritable weeds for growth, and are covered with bloom. Paul Bruant is one of the freest bloomers of the group, the plant being covered with fls., while the lvs. are large, dark, pointed and shining. Gloire de Lorraine is the most wonderful of recent Begonias, a well grown plant being a sight never to be forgotten. The fls. are large, bright pink, and borne in wonderful profusion. It is semi tuberous in character, and requires a season of rest each year. The Semperflorens gigantea class is a very useful one, and many improved varieties now add value to it. Among them are La France, Elegantissima alba, Goliath, Mastodonte and Obelisque. The Shrubby section thrives in much the same soil as Rex, or a trifle heavier, requiring less heat and moisture. Cuttings can be struck as easily as those of the geranium. E. G. Hill.

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1. Fibrous-rooted or Winter-flowering.

A. *Lvs. hairy, velvety, or downy on the upper surface.*

B. *Shape of lvs. obliquely ovate-acuminate, orbicular-acuminate, or peltate.*

C. *Size of lvs. large, more than 2 in. wide.*

D. *Fls. with red hairs on under surface of petals, large.*

1. **Scharffiàna**, Regel. Fig. 206. A robust herbaceous perennial, 1½ ft. high: lvs. large, thick, fleshy, hairy, olive-green above, crimson below: stipules very large and prominent: fls. waxy white. Braz.—This Begonia requires warmth and care to succeed well. When well-grown, it is an excellent bracket plant.

206. Begonia Scharffiana. No. 1.

2. **Duchartrei,** Hort., hybrid (*B. echinosépala* × *Scharffiana*): st. 2–3 ft. high, branched profusely, hairy, purple: lvs. ovate-lanceolate acuminate, green above, hairy, red below: fls. large, waxy white, a few red hairs on the under surface of petals.—Int. by Bruant in 1892.

3. **Haageàna**, Watson (*B. Scharffi*, Hook.). Fig. 207. Tall-shrubby, whole plant hairy: lvs. ovate-cordate, acuminate, wavy, red-nerved above: fls. rose-pink, with a cyme 8–12 in. in diam., males with 2 round and 2 narrow petals, females with 5 equal petals. Brazil. G.C.

III 16:633 (1894). B.M. 7028, as *B. Scharfii*.—One of the most beautiful plants of the genus. Has been distributed as *B. Scharffiana* by mistake.

B. Crédneri, Hort. (*B. Scharffiàna* × *metállica*). Int. by Haage & Schmidt, 1890. There is another plant named *B. Crédneri*, which was raised by Lemoine in 1891 from the same parents. Bruant also used these two parents in 1891, and called his plant *B. Picturensis*. All three plants are identical, and can only be distinguished from *B. Haageana* by their smaller flowers and the peduncles standing erect and not gracefully bending over, as in Haageana. There is another plant spelled *B. Picturensis*, raised by Bruant in 1881, a cross of *B. Schmidtii*×*semperflorens*. It has also been called *B. Bruanti*. (See R.H. 1882, p. 377; 1883, pp. 8, 52.)

DD. *Fls. white or greenish white, small.*

4. **imperiàlis**, Lem. St. short, herbaceous, green: lvs. 4–6 in. wide, very hairy, brownish green, with irregular bands of bright green along the nerves: fls. insignificant, white. I.H. 8:274. Var. **maculàta**, Hort., has brown lvs. with green blotches. Var. **smaragdina**, Hort., has wholly bright green lvs. I.H. 7:262.

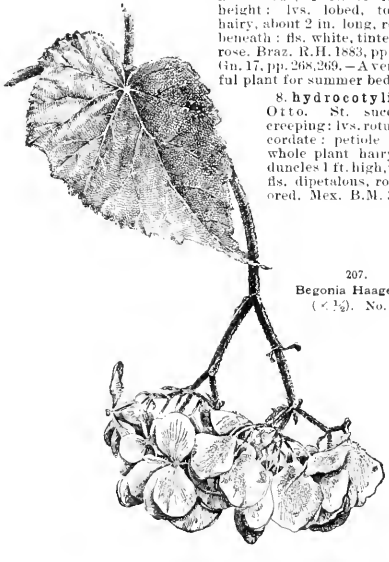
5. **peltàta**, Hassk. (*B. Hüsskarli*, Zoll.). St. perennial: lvs. peltate, ovate-acuminate, thick and succulent, covered with a whitish tomentum, 6–9 in. long: fls. small, white, on long peduncles. Braz.—It is the only Begonia in cult. with thick, felted, peltate, silvery lvs.

CC. *Size of lvs. small, less than 2 in. wide.*

6. **Margaritæ**, Hort. (*B. metállica* × *echinosépala*). Plant 1–2 ft. high: sts. purple, hairy: lvs. ovate-acuminate, sinuously dentate, green above, red beneath: fls. in cymes, large, rose colored; sepals with long hairs at the base.—Int. by Bruant in 1884.

7. **Schmidtiàna**, Regel (*B. Schmídti*, Hort.). Dwarf, herbaceous, 1 ft. or less in height: lvs. lobed, toothed, hairy, about 2 in. long, reddish beneath: fls. white, tinted with rose. Braz. R.H. 1883, pp. 56, 57. Gn. 17, pp. 268, 269.—A very useful plant for summer bedding.

8. **hydrocotylifòlia**, Otto. St. succulent, creeping: lvs. rotundate-cordate: petiole short: whole plant hairy: peduncles 1 ft. high, pilose; fls. dipetalous, rose-colored. Mex. B.M. 3968.



207.
Begonia Haageana
(× ½). No. 3.

BB. *Shape of leaves incised, or parted.*

C. *Fls. white or whitish.*

9. **platanifòlia**, Graham. St. 5–6 ft. high, erect, robust, smooth, green, joints annulated: lvs. 8–10 in. in diam., reniform, lobed, hispid on both sides, dark green, lobes acute, toothed, ciliated: fls. in axillary dichotomous cymes, large, white, tinted rose. Braz. B.M. 3591.—*B. gunneræfolia*, Lind. (*B. Washingtoniana*, Hort.), once offered by Saul, is very similar to this, but its lvs. are not so deeply lobed and the fls. are very insignificant. I.H. 22:212.

208. Begonia fuchsioides (× ½). No. 13.

CC. *Fls. pink.*

10. **metállica**, G. Smith. Sts. perennial, succulent, hairy, 4 ft. high, branched: lvs. obliquely cordate, lobed and serrated, 3–6 in. long, upper surface green, shaded with a dark metallic color: fls. blush-white, under side of petals clothed with red bristly hairs. There are a number of varieties; e. g., var. **variegàta**, var. **velutìna**, var. **cyprea**, but they do not differ much from the original. Bahia. R.H. 1844: 218. G.C. II. 5:397.—A very attractive plant, both in foliage and flower.

11. **ricinifòlia**, Hort. (*B. heracleifòlia*×*peponifòlia*). St. a short, thick rootstock: lvs. large, bronzy green, lobed, resembling castor-oil plant: fls. numerous, on long, erect peduncles, rose pink.

AA. *Lvs. glabrous, or only a few scattered hairs on the upper surface or on the margins.*

B. *Under surface of lvs. green.*

C. *Margins entire or toothed.*

D. *Width of lvs. less than 1 in.*

E. *Fls. pink, scarlet, or carmine.*

12. **incarnàta**, Link & Otto (*B. aucubæfòlia*, Hort. *B. Martiàna*, Schlecht. *B. insignis*, Grah.). St. erect, herbaceous, 2–3 ft. high: lvs. unequally cordate, lanceolate, toothed: fls. rose-colored, abundant, males 1½ in. across, with 2 ovate and 2 narrow petals; females smaller, with 5 equal petals. B.M. 2900, as *B. insignis*. A.G. 16:97. A.F. 12:724–5; 13:588. R.H. 1870, p. 266; 1875:151. Var. **grandiflòra**, Hort., is a new and much improved variety, which is very useful for cut-flowers or decoration in winter.

13. **fuchsioides,** Hook. Fig. 208. Rootstock woody. sts. tall and succulent: lvs. ovate, 1½ in. long, tinged with red when young: fls. drooping like a fuchsia, rich

209. Begonia semperflorens.

A recently struck cutting. To show the precocity of bloom No. 20.

scarlet, males with 4 petals, females with 5 petals. New Granada. B.M. 4281. Var. **miniàta,** Linden (*B. cinnabarina*, Hort.), differs only in having flesh-colored fls. R.H. 1855: 221. F.S. 8: 787.

EE. *Fls. white or whitish, small.*

14. **foliòsa,** HBK. Shrubby, sts. herbaceous, slender, branching: lvs. frond-like, very small, 3-lobed, glossy green: fls. white, tinged with rose. Blooms early summer. New Granada. — An elegant basket and ornamental plant.

15. **álbo-picta,** Hort. Shrubby, compact growth: freely branched: lvs. elliptical, lanceolate, covered with numerous small silvery white spots: fls. greenish white, males with 2 broad and 2 narrow petals, females of 5 subequal petals. Braz. — An elegant foliage plant. Int. by Bull in 1885.

DD. *Width of lvs. more than 1 in.*

E. *Stem rhizomatous, creeping, or climbing.*

16. **scándens,** Swartz (*B. lùcida*, Otto & Dietr. *B. elliptica*, Kunth). Sts. climbing or trailing, clinging by means of short aërial roots: lvs. ovate, acuminate, lobed, glossy green, 4 in. long: fls. small, white, hanging in ball-like clusters. W. Ind. R.H. 1879, p. 300. — An excellent basket or climbing plant.

17. **manicàta,** Brongn. A short-stemmed, succulent plant: lvs. ovate, obliquely cordate, thick, fleshy, smooth, shiny green, 6–8 in. long: petioles covered with fleshy, scale-like hairs: peduncles a foot or more long, bearing loose panicles of pink dipetalous fls. Mex. Var. **aùreo-maculàta,** Hort., has large blotches of yellowish white on the lvs. F.E. 8: 1159. F.R. 2: 435.

18. **glaucophýlla,** Hook. (*B. glaucophýlla splèndens*, Hort. *B. glaucophýlla scándens*, Hort. *B. Comte de Limminghe*, Hort.). Probably a hybrid, but parents not known. Sts. long, drooping or creeping: lvs. ovate, wavy, 3 in. long, glaucous-green, reddish and variegated in bud: fls. rose-red, males 1 in. across, with 2 ovate and 2 narrow petals, females of 4 equal petals. Braz.? B.M. 7219. — A good basket plant, flowering freely all winter.

19. **álbo-coccínea,** Hook. (*B. Grahamiàna*, Wight). Rootstock creeping: lvs. peltate, ovate, leathery, 6 in. long: peduncles 1 ft. long, coral red: male fls. 1 in. across, with 4 petals: female fls. also of 4 petals, white above, coral-red beneath. Flowers in winter. Braz. B.R. 32: 39. B.M. 4172.

EE. *Stem erect.*

20. **semperflòrens,** Link & Otto (*B. Sèllowii*, Kl.). Fig. 209. St. herbaceous, smooth, green or reddish, 6–18 in. high: lvs. ovate, rotundate, obtuse at the base, toothed and ciliate along the margin, pale glossy green, tinged with red on the midrib and petiole: peduncles axillary, few-flowered: fls. white or rose-colored: males with 4 petals, females with 5 petals: capsule green, wings tinged with red. Braz. L.B.C. 15: 1439. R.H. 1897, p. 46. B.M. 2920. — This is an exceedingly variable species. An endless number of garden forms has been produced from it. Some of the most important are as follows: Var. *atropurpùrea compàcta*, Gt. 44, p. 570 (*Vernon*), an excellent bedder, deep red; *Fairy Queen*, bright rosy carmine, bedding; *Duchess of York*, crimson, bedding; *Crimson Gem*, foliage crimson-bronze, fls. elegant carmine; *Duchess of Edinburgh*, fls. large, white, easily grown from seed; *Reading Snowflake*, white; *Diadem*, dark rose; *Illustration*, carmine; *Albatross*, *elegantissima*, *Mastodonte*, *Goliath*, *La France*, *Obelisque*, etc.

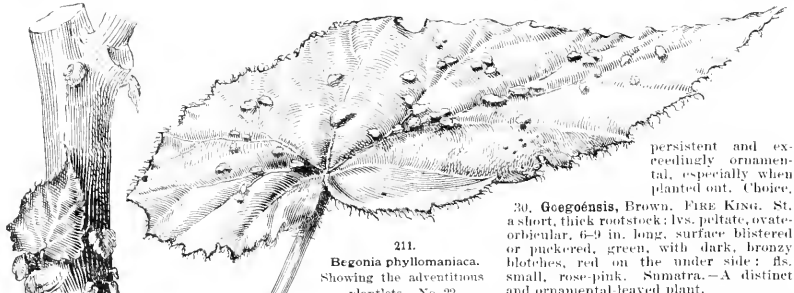
21. Var. **gigantèa rósea** (*B. semperflòrens × Lynchiàna*). Very distinct: rootstock woody; sts. succulent, about 3 ft. high: lvs. on short petioles, ovate or reniform, toothed at the margins, about 7 in. across, bright green, with a red spot at base of sinus: peduncles axillary, stout, 4–8 in. long, bearing large panicles of large rosy red fls., of which the males have 2 ovate petals, the females 2–4 smaller petals. A.F. 13: 586. A.G. 16: 41. — One

210. Begonia semperflorens, var. Sieberiana. No. 21.

of the best Begonias for winter decoration in the greenhouse. Int. by Lemoine in 1888. Var. **Sieberiàna,** int. by Lemoine, is shown in Fig. 210 (from the French).

22. **phyllomaniaca**, Mart. Fig. 211. St. perennial; lvs. obliquely cordate, attenuate, 4–6 in. long, slightly lacinia-ted and fringed; fls. pale pink. B.M. 5254. Brazil.—This species is peculiar in that it produces from the stem, petioles and lvs. innumerable lfts. or small growths. It is one of the most interesting of plants, though not of much decorative value.

23. **nitida**, Dryander (*B. minor*, Jacq. *B. speciósa*, Hort. *B. obliqua*, L'Her.). St. 3–4 ft. high, perennial, fleshy, woody at the base when old; lvs. obliquely ovate, wavy, 4–6 in. across, glossy dark green; fls. on long, axillary peduncles, pale pink, with a silvery blush; males 1^1_2 in. across, with 2 broad and 2 narrow petals; females smaller, with 5 equal petals. Jamaica. B.M. 4046. —A very useful plant in the greenhouse, flowering all winter. Also interesting on account of being the first Begonia introduced into Europe (1777). Var. **odoràta álba** is a very handsome variety of this species, which



211.
Begonia phyllomaniaca.
Showing the adventitious plantlets. No. 22.

has smaller fls. of the purest white and sweet-scented. **Dr. Nachtigal**, hybrid (*B. nítida*, Dry., var. *odoràta álba* × *Lynchenàna*), is similar in general form to the above, but has fls. of a delicate rose-pink, especially on the inner surface of petals.

cc. *Margins incised, lobed or parted.*

D. *Width of lvs. less than 2 in.*

24. **Drégei**, Otto & Dietr. (*B. Cáffra*, Meissn. *B. parvifólia*, Grah. *B. reniformis*, Hort.). Rootstock a fleshy, globular tuber; sts. succulent, annual, 1–2 ft. high; lvs. thin, small, green, deeply serrated, reddish on the under side; fls. white, small, profuse. Cape of Good Hope. B.M. 3720.

25. **Weltoniénsis**, hybrid (parents not known). St. reddish, 1^1_2–2 ft. high; lvs. light green, smooth, ovate-acuminate, lobed, dentate, 1^1_2–2 in. across; petiole red, 1–1^1_2 in. long; fls. pink, profuse, on short peduncles.—Int. by Major Clark, of Welton Park. Var. **álba**, Hort., has white fls.

DD. *Width of lvs. more than 2 in.*

26. **coronáta**, Hort., hybrid (*B. caroliniæfólia* × *polyántha*). St. shrubby, coarse, 2–3 ft. high, covered with numerous withered stipules; lvs. large, lobed, on long petioles; fls. pale pink, with large, somewhat drooping cymes.

27. **Verschaffeltiàna**, Regel. (*B. Verschaffélti*, Hort. *B. manicata* × *caroliniæfólia*). St. a thick rhizome; lvs. large, ovate, acuminate, lobed; fls. rose-colored, pendent on long peduncles. I.H. 2: 68.—Tall, coarse and unsightly as an old specimen, but when well grown from year to year from cuttings makes a splendid plant.

BB. *Lvs. red, reddish or red-veined on the under surface.*

c. *Margins entire or serrate.*

28. **maculata**, Raddi (*B. argyrostigma*, Fisch.). St. erect, branching, woody when old; lvs. cordate, lanceolate, wavy, 4–6 in. long, upper surface sometimes with large white, roundish spots; fls. pale rose or white, males with 2 ovate and 2 narrow petals, females with 5 equal petals. It includes several forms. Braz. B.R. 666. Var. **argyrostigma picta**, Hort., is a common form, with very large white spots on the lvs.

29. **coccínea**, Hook. (*B. vàbra*, Hort. *B. maculàta*, var. *corallìna*, Hort.). Tall, succulent sts.; lvs. on short petioles, obliquely oblong, angular, with wavy red margins, 4–6 in. long; fls. deep coral-red; males $^1_2$in. across, with 4 unequal petals; females more attractive, owing to the length and rich color of the ovary, which has 3 small subequal wings. Braz. B.M. 3990.—The fls. are very persistent and exceedingly ornamental, especially when planted out. Choice.

30. **Goegoénsis**, Brown. FIRE KING. St. a short, thick rootstock; lvs. peltate, ovate-orbicular, 6–9 in. long, surface blistered or puckered, green, with dark, bronzy blotches, red on the under side; fls. small, rose-pink. Sumatra.—A distinct and ornamental-leaved plant.

31. **sanguínea**, Raddi. Sts. perennial, woody at the base, red; lvs. subpeltate, obliquely cordate, thick, fleshy, smooth, shining, bright green above, blood-crimson below; fls. small, white. Rio de Janeiro. B.M. 3520.—A handsome evergreen foliaged Begonia.

32. **dædàlea**, Lem. (*B. strigillòsa*, Dietr.). St. a short, thick rootstock; lvs. large, green, ovate-acuminate, cordate, margins slightly serrate and beset with long reddish hairs, surface covered with a peculiar network of russet-brown; peduncles spotted and slightly hairy; fls. white, tinged with pink. Mex. I.H. 8: 269.—A handsome foliage plant, not very widely known.

cc. *Margins incised, lobed or parted.*

D. *St. creeping; a short, thick rhizome.*

33. **heracleifólia**, Cham. & Schlecht. (*B. jatrophaefólia*, Hort.). St. a short, thick rhizome; lvs. 6–12 in. across, palmate, lobes toothed, rich green; peduncles 3–4 ft. long; fls. white or rose-tinted. Mex. B.M. 3444. B.R. 1668. Var. **nígricans**, Hort., has the margins of the lvs. bordered with dark green. B.M. 4983. Var. **longipila**, Hort., has long, fleshy hairs on the leafstalks and peduncles. Var. **punctàta**, Hort., has green lvs., reddish near the margin; fls. rose-colored, with deep red spots on the outside.

34. **rubélla**, Hamilt. St. a short, thick rhizome; lvs. large, cordate, acuminate, deeply lobed, smooth, spotted with irregularly shaped dark brown marks; fls. pale pink, on long peduncles. Nepal.

35. **speculàta**, Hort., hybrid? St. a short, thick rhizome; lvs. broadly ovate, acuminate, cordate, on long, hairy petioles, dull green, rough, speckled with grey, hairy, reddish on the under side, veins very prominent, light green, profusely branched; fls. on long, hairy peduncles, pink-white, males and females both with 2 petals; capsule green, with small red spots.—Origin not known, though quite common in cultivation. A hardy and useful Begonia.

DD. *Stem erect.*

36. **Ólbia,** Kerchove. St. leathery, 2–3 ft. high; lvs. lobed, hairy and olive-green above, smooth and red beneath, margins reddish, petioles grooved, smooth, veins prominent as dark lines: fls. concealed by lvs., in small clusters directly on the st. without peduncles, large, white, male and female in same cluster. Braz.

37. **Teuscheri,** Lind. St. 2–3 ft. high, erect, strong grower: lvs. large, acutely lobed, ovate lanceolate, margins serrate, bright green above, with grevish blotches, red-veined below: fls. in axillary clusters, bright red, large. Malaya. I.H. 26: 358.

38. **argénteo-guttàta,** Hort. (*B. albo-picta* × *Ólbia*). Profusely branching: lvs. shining green, ovate-acuminate, slightly lobed, smooth, 2½in. wide, 3–5 in. long, thickly dotted with white spots: fls. in clusters, variable; petals white, tinged with pink: capsule rose-pink.—Int. by Lemoine, 1889.

SUPPLEMENTARY LIST—FIBROUS-ROOTED

39. *Abundance* (B. fuchsioides × semperflorens). Plant, 2 ft. high: st. reddish: lvs. glossy green, ovate, 2 in. long, dentate: fls. rose-pink.—Int. by Lemoine in 1891.

40. *Amélie* (B. Bruanti × Rœzlii). Plant, 2 ft. high: lvs. green, broadly ovate, smooth: fls. rose-colored. —Int. by Bruant in 1886.

41. *angulàris,* Raddi (B. zebrina, Hort.). St. smooth, succulent, 2–3 ft. high: lvs. elongate, ovate-acuminate, margins undulate, shiny green, veins white: fls. insignificant, light pink. Braz.

42. *Ascotiénsis,* Webb. Lvs. ovate, 2 in. long, smooth, brown, margin green, dentate: fls. on peduncles 4 in. long, bright red

43. *Bertha de Chateauvieux,* Hort. Var. of B. Ascotiensis: fls. bright currant-red.—Useful for cut-flowers.

44. *Bijou de Gand,* Hort. Caulescent: fls. rose, in clusters. Very similar to Teuscheri (which see).

45. *Bismarcki,* Hort. Caulescent: fls. in clusters, rose, males insignificant, females a gorgeous display. Very similar to Teuscheri.

Cattra, Meissn. See B. Dregei.

46. *carolinæfólia,* Regel. St. erect, thick, fleshy: lvs. palmate, lobes deeply divided into 6 or 8: fls. pink, on long peduncles. Mexico

47. *Cucricèi,* Hort. (B. semperflorens × Schmidtii). Dewdrop. Bruanti. Plant, about 1 ft. high: lvs. like semperflorens: fls. white.—Excellent bedding Begonia. Int. by Bruant in 1883.

212. **Begonia Madame de Lesseps** (× ⅓). No. 62.

48. *Corbeille de Feu* (B. semperflorens × fuchsioides). Fls. bright coral-red.—Int. by Lemoine in 1891.

49. *diadema,* Linden (B. sceptra, Hort.). Plant, 2 ft. high: lvs. green, deeply parted, blotched with white, dentate: fls. insignificant. Borneo. I.H. 29: 146.

213. **Begonia President Carnot.** No. 65.

50. *digitàta,* Raddi (B. palmata, Hort.). Lvs. palmate, 10–12-parted, somewhat pubescent, green above, brownish beneath. Brazil.

51. *echinosépala,* Hort. St. green, succulent: lvs. obliquely oblong: fls. on axillary peduncles, white, with curiously papillose sepals.

52. *Erfordii,* Hort. (B. Schmidtii × semperflorens Vernon). Very dwarf and bushy, 1½ft. high: fls. abundant, rose-carmine. —Excellent for bedding. Int. by Haage & Schmidt in 1894.

53. *Fenstii,* Hort. (B. manicata × hydrocotylifolia). St. a short, thick rootstock: lvs. suborbicular, thick, red beneath, entire; petioles irregularly marked: fls. light pink, on long peduncles. —Int. by John Feast, of Baltimore, before 1880.

Saùli, Hort., is a newly introduced species from Guatemala, resembling Feastii in the shape and color of its lvs., but with a distinct red sinus at junction of petiole with leaf.

54. *Gilsoni,* Hort. (origin American). Plant, 2 ft. high: st. shrubby, coarse: lvs. large, lobed: fls. on long, erect peduncles, pale pink.—Interesting as being the only double-fld. fibrous-rooted Begonia. Named for Gilson, colored gardener to Mrs. Livingston, N. Y.

55. *hýbrida multiflóra,* Hort. (B. hybrida floribunda, Hort.). Plant 2–4 ft. high: lvs. small, 1 in. long, ½in. across, dentate, green below: fls. rose-pink, hanging in clusters like a fuchsia.

56. *Ingrami,* Hort. (B. nitida × fuchsioides). Combines the characters of the two species: fls. light pink.—Int. by Ingram in 1849.

insignis. See B. incarnata, No. 12.

57. *Knowsleyàna,* Hort. (origin not known). Very similar to B. incarnata.

58. *Kunthiàna,* Walp. Stem erect. lvs. lanceolate, acuminate, serrate, smooth, green above, red below: fls. white, large. B.M. 5284. Brazil.

59. *Lubbersi,* E. Morr. Stem a short rhizome: lvs. large, palmate, green: fls. pink, on long peduncles. Brazil. G.C. III. 3:301. R.H. 1888, p. 225.

60. *Luciànæ,* Hort., hybrid (B. Lyncheana × Bruanti). Fls. large, in the axils of the lvs., rose.—Int. by Bruant in 1889

61. *Lyncheàna,* Hook. (B. Rœzlii, Regel.). St. erect, tall, succulent, smooth: lvs. green, smooth, ovate-cordate: sinus red. fls. in axillary, drooping cymes, deep, reddish crimson. New Granada. B.M. 6758.—Almost identical with B. semperflorens gigantea rosea, but not so strong a grower.

microphilla, Willd. Is B. foliosa, No. 14

manuata, Planch. & Linden. Is B. fuchsioides, No. 13.

62. *Madam de Lesseps*. Fig. 212. Strong, erect grower: lvs. acutely lobed, large, margins serrate, green above, red and strongly veined below: fls. large, white, in axillary clusters, males insignificant

63. *peltanthifolia*, Cham. & Schl. (B. hernandiæfolia, Hort.) St. a short, thick rhizome: lvs. large, 12–18 in. long, 8–12 in. wide, peltate, hairy on the under side: fls. small, white or rose-colored. Mex.

Rœzlii, Regel. See B. Lyncheana, No. 61

64. *B. Paul Brunet* (B. manicata × ?). St. short, thick: lvs. large, olive green tinged with red, deeply lobed: petioles large, long, striped with red: a ring of fine hairs at the junction of petiole and leaf: fls. abundant, pale pink, large, on long pedunces. R. H. 1888, p. 544.—Int. by Brunet in 1892

65. *President Carnot*. Fig. 213. Plant, 2–6 ft. high, leggy: lvs. ovate lanceolate, acute-lobed, ribs on the under side red: fls. in a large cluster: males small, insignificant: females large, bright red carmine, 2 in. long, including capsule.—Striking

66. *Sandersoni*, hybrid (origin not known. B. Dregwelliana, Hort.). Fls. scarlet. 1882.

Saüli. See below B. Feastii, No. 53.

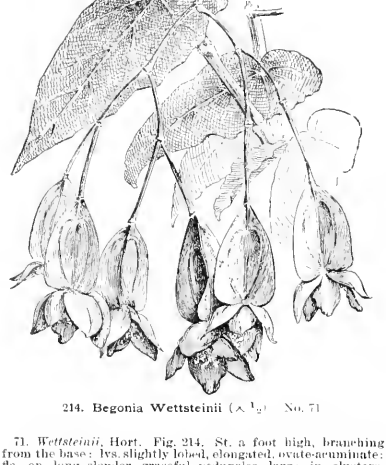
67. *stigmosa*, Lindl. St. a short, creeping rhizome: lvs. large, cordate-acute, irregularly toothed, smooth above, hairy beneath, green, with purple brown blotches: fls. insignificant, white, in cymose panicles. Mex.

68. *sulpeltata nigricans*, Hort. (B. nigricans, Hort.). Plant, 2–3 ft. high: lvs. ovate, acuminate, blood-red below, silvery and slightly hairy above, 4–8 in. long, 2–4 in. across: fls. rose-pink, profuse: capsule wings equal, pink.—Very useful for decoration. Var. *Pres. de Bonrouilles*, Hort., has lvs. of a much richer color, and more profusely studded with red hairs: fls. of a deeper pink

69. *Sünderbruchi*, Hort. An American form of B. heracleifolia, var. longipila: lvs. bronze-green, silver bands along the nerves, purple underneath.

70. *Thürstoni*, Hort. (B. metallica × sanguinea). St. 2 ft. high: lvs. orbicular-acuminate, shiny, smooth, rich purple, red on the under side, veins prominent: fls. insignificant, small, rosy white, on slender peduncles. A. F. 7: 728.—Excellent.

velutina, Hort. See B. metallica, No. 10.



214. Begonia Wettsteinii (× ⅛). No. 71

71. *Wettsteinii*, Hort. Fig. 214. St. a foot high, branching from the base: lvs. slightly lobed, elongated, ovate-acuminate: fls. on long, slender, graceful peduncles, large, in clusters, bright red: capsule large, red and showy, very profuse.

zebrina, Hort. See B. angularis, No. 41

II. Semi-tuberous or Socotran Section.

72. **Socotràna**, Hook. Fig. 215. St. annual, stout and succulent, forming at the base a number of closely set scales or suppressed lvs., resembling bulbs: lvs. dark green, orbicular, peltate, 4–7 in. across, center depressed, margin recurved, crenate: fls. in terminal few-fld. cymes, bright rose. B. M. 6555. Gn. 21: 327. Gn. 49: 1069. G. C. II. 15: 8. A. F. 13: 587, 588.—Semi-tubers were brought from the burning hot, sandy island of Socotra by Dr. I. B. Balfour, and given to Kew in 1880. The plant was discovered by Alexander Scott, the gardener accompanying the expedition to Socotra sent out by the Geogr. Soc. of London. Semi-tubers should rest during summer and be planted in heat in winter.

The following are Socotrana derivatives:

73. *Triomphe de Lemoine* (B. Socotrana × Rœzlii). Stem herbaceous, spreading, then erect and branching into numerous flowering branches: lvs. large, coriaceous, orbicular, somewhat oblique, margins slightly cenerous, 6 in. diam.: fls. in numerous cymes from axils of lvs., rose-carmine, female fls. exceedingly rare, males very profuse, plant resembling a large bouquet when in full bloom. G. F. 2: 557.—Int. by Lemoine in 1887. Retains its fls. after they are withered, a rare occurrence in Begonias. Another hybrid from the same parent is *Triomphe de Nancy*, with fls. rich yellow in the center, double, and the outer petals of a paler hue.—Int. by Lemoine in 1888.

74. *John Heal* (B. Socotrana × Viscountess Domeraile). A tuberous variety. Plant intermediate between parents, 9 in. high, branching naturally and freely: lvs. obliquely heart-shaped, not peltate, as in B. Socotrana; light green: fls. borne loosely on graceful peduncles, standing well above the foliage, every stem developing male flowers, 1½ in. diam., bright, rosy carmine. Blooms from Sept. to Jan. Gn. 35: 491.—No female fls. have been produced from this hybrid, so that seedlings have been impossible. Prop. by cuttings and semi-tubers. Int. by John Heal in 1885. *Adonis* (John Heal × tuberous variety). Plant more robust: fls. twice as large as John Heal, 3 in. diam., all male, soft rose color, on graceful, arching peduncles.—Int. by John Heal. *Winter Gem* (B. Socotrana × crimson tuberous variety). Habit like B. Socotrana, but more compact: fls. large, deep carmine.—It combines the characters of the tuberous and semi-tuberous sections. Int. by John Heal. *Julia* (Socotrana × tuberous variety). The plant is very similar to a double summer-flowering tuberous Begonia. It has fls. of a salmon-pink shade.

75. *Gloire de Lorraine* (B. Socotrana × Dregei). Lvs. small, nearly regular, pure green: fls. almost exclusively male, 4-petaled, large, borne in broad panicles, covering the whole superior part of the plant, rose-colored, not deciduous. Gl. 42, p. 111. A. F. 12: 842. G. F. 5: 247.—Although B. Socotrana is semi-tuberous and B. Dregei has a thickened rhizome, the hybrid forms show neither, but the base of the stem throws out many shoots, which can be separated and insure the multiplication of the plant. Int. by Lemoine in 1892.—Excellent.

76. *Gloire de Sceaux* (B. Socotrana × sulpeltata). Fig. 216. Plant stout, half shrubby, erect, vigorous, compact, 2 ft. high, 1–1½ ft. across: lvs. dark metallic green, thick, large, red beneath, veins red above, sub-orbicular, slightly oblique: fls. profuse, beautiful rose-pink, shiny, females none. Fls. from Dec. till May. R. H. 1884: 516. G. F. 7: 185.—Interesting as connecting the fibrous-rooted and semi tuberous sections. Int. by Thibaut and Keteleer in 1885. *Autumn Rose* (B. Socotrana × insignis). Lvs. intermediate between parents, but larger than either, oblique; fls. intermediate, clear, deep rose. Fls. all winter.—Interesting as connecting the fibrous-rooted and semi-tuberous sections. Int. by John Heal, of Veitch & Sons, 1882. *Bijou* is another hybrid from the same parents, with large green lvs. and red-carmine fls.; males and females present.

III. Tuberous or Summer-flowering Section (Figs. 217, 218, 219).

A. *Stemless, lvs. springing directly from tuber.*

B. *Color of fls. bright red or brilliant scarlet.*

77. **Dàvisi**, Veitch. Stemless: lvs. springing directly from a rootstock, ovate-cordate, shining green, slightly hairy, underside red, petiole short, fleshy: peduncles, pedicels, and fls. bright red. Peru. B. M. 6252. F. M. 1876: 231. G. C. II. 15: 669.—A favorite with hybridists. Has given rise to numerous dwarf, erect-habited garden forms, with small but brightly colored fls.

78. **Frœbeli**, A. DC. Stemless; lvs. numerous, cordate, acuminate, green, covered with fleshy, purplish hairs: fls. in tall, lax, drooping, branching cymes, brilliant scarlet, large. Winter. Ecuador. Gn. 12, p. 376.—A beautiful flowering plant, useful for conservatory work in winter. *B. Frœbeli verantii*, Hort., hybrid (Frœbeli × Dregei), similar to type. Int. by Deleuil in 1880.

Begonia Gloire de Lorraine, now one of the most popular members of the genus

BB. *Color of fls. rose-red or white.*

79. **rosæflòra**, Hook. Stemless: petioles, scapes, bracts, and stipules bright red: lvs. green, 2–4 in. wide,

215. Begonia Socotrana (× ½). No. 72.

on stout, hairy petioles, 2–6 in. long, orbicular, reniform, concave, margins lobed, red, toothed: fls. 2 in. across, rose-red. Peru. B.M. 5680.—Light colored seedlings of this species gave rise to Queen of Whites, put into commerce in 1878, and destined to be a most important factor in subsequent garden forms of the same color. Int. in 1867.

80. **geranioides**, Hook. Stemless, rootstock fleshy: lvs. radical, reniform, 6 in. across, lobed and toothed, green, hairy, petioles 8 in. long: peduncles erect, 6–12 in. long, reddish, hairy, bearing a lax panicle of fls., each $1\frac{1}{4}$ in. across, pure white, with a button-like cluster of yellow anthers. Natal. B.M. 5583.—Planted in a border in a sunny greenhouse, this is a fine Begonia, flowering profusely during Oct. and Nov. Int. to Kew in 1866.

AA. *St. present.*

B. *Color of fls. cinnabar-red, orange-red, bright red or scarlet.*

81. **Boliviénsis**, A. DC. St. herbaceous, succulent, 2 ft. high, branching: lvs. lanceolate, acuminate, serrate, 3–5 in. long: fls. in drooping panicles, cinnabar-scarlet, fuchsia-like; males twice as large as females. Bolivia. B.M. 5657.—The first Tuberous Begonia introduced into England, 1864.

82. **Veitchii**, Hook. St. very short, thick, fleshy, green: lvs. orbiculate, cordate, lobed and incised, margins ciliated, green, principal veins radiating from a bright carmine spot near the center, under side pale green; petiole thick, terete pilose: fls. $2\frac{1}{4}$ in. in diam., cinnabar-red: capsule smooth, unequal wings. Peru. B.M. 5663. F.S. 22: 2326.—One of the progenitors of the Tuberons race. Int. 1867.

83. **Chélsoni**, Hort. (*B. Sédeni* × *Boliviénsis*). St. fleshy, 2 ft. high: lvs. oblique, lanceolate, irregularly lobed: fls. large, orange-red, drooping. Gn. 4: 109.—Int. by Veitch in 1870.

84. **Clárkei**, Hook. St. purplish, fleshy, stout: lvs. obliquely-cordate, serrate: fls. in pendulous racemes, abundant, large, bright red. Bolivia. B.M. 5675.—Resembles *B. Veitchii*. It was the seed parent of Vesuvius and Emperor, two important and useful varieties for bedding out.

BB. *Color of fls. rose-red or pink.*

85. **Evansiàna**, Andr. (*B. discolor*, R. Br. *B. grándis*, Dry.). St. herbaceous, branching, smooth, 2 ft. high: lvs. ovate-acute, sub-cordate, lobed, margins denticulate, green above, under side and petioles red, peduncles branching, axillary: fls. numerous, flesh-colored, large. Java, China, Jap. B.M. 1473.—A handsome and almost hardy species. Int. in 1804 to Kew. Little cult. now.

86. **Baùmannii**, Lemoine. Tubers as large as ostrich eggs: lvs. large, orbicular, with short, thick petioles: peduncles 18 in. high, bearing panicles of 4–6 fls., which are rose-red, 4-petalled, from 3–4 in. across, and fragrant as roses. Bolivia. Gt. 40: 1348: 42, p. 25. A.F. 7: 561. G.F. 5: 77.—It is described as plentiful in the moist valleys of the Cordilleras, where it is eaten by cattle. Sweet-scented. Distributed by Lemoine in 1890.

87. **grácilis**, H.B.K. (*B. bicolor*, Watson. *B. diversifólia*, R. Grah.). St. erect, not branched, succulent: lvs. thinly scattered along sts., almost heart-shaped, slightly hairy, lobed, denticulate, ciliate: fls. on short, axillary peduncles, pink. Mex. B.M. 2966.—In axils of lvs. between stipules a cluster of bulbils is borne. These may be gathered and sown as seeds. Along with its varieties, **annulàta, diversifolia, Martiàna**, etc., it makes a very beautiful summer-flowering greenhouse Begonia. Int. by P. Neil, of Cannon Mills, Edinburgh, in 1829.

88. **Pèarcei**, Hook. St. 1 ft. high, succulent, branching: lvs. lanceolate, cordate, acuminate, toothed, glabrous above, tomentose beneath, pale red on under surface: fls. in loose, axillary panicles, large, bright yellow. Bolivia. B.M. 5545.—It has been the chief factor in the production of the hundreds of yellow, buff and orange-colored garden forms. Int. in 1865.

SUPPLEMENTARY LIST—TUBEROUS-ROOTED.

(A) The following tuberous-rooted species are not known to be in the Amer. trade, but they are in cultivation in greater or less purity:

89. *cinnabarina*, Hook. Sts. annual, short, green, zigzag, slightly downy: lvs. on short petioles, obliquely ovate, lobed

216. Begonia Gloire de Sceaux (× ½). No. 76.

and serrated: peduncles 9–12 in. long, red; fls. cinnabar-red, 2 in. across. Bolivia. B.M. 4483. P.M. 16: 225.—Int. by Henderson in 1849.

90. *crinita*, Oliver. Sts. red, hairy, 1 ft. high. lvs. ovate-ordate, irregularly toothed, tinged with red on the under side: peduncles erect, red, producing 3 pale rose-colored fls. Bolivia. B.M. 5897.—Int. by Veitch in 1866.

91. *cyclophylla*, Hook. Stemless: lvs. orbicular, 6 in. across, green, with fimbriated margin: peduncles erect, 6 in. long; fls. rose-colored, with the fragrance of roses. China. B.M. 6926.—Int. to Kew in 1885.

92. *geranifolia*, Hook. St. 1 ft. high, erect, greenish: lvs. cordate, lobed, serrated, green, margins red, whole plant smooth: fls. 2 or 3 on terminal peduncles, outer petals orbicular, red, the two inner obovate, white. Lima. B.M. 3387.—Int. 1833.

93. *Natalensis*, Hook. Sts. fleshy, annual, 1–2 ft. high: lvs. obliquely cordate, lobed, sinnate, 2–3 in. long, green, sometimes mottled with grey, veins reddish: fls. bluish white, 1 in. across. Natal. B.M. 4811.—Int. to Kew in 1854.

94. *octopetala*, L'Her. (*B. grandiflora*, Knowl. & West). Stemless, lvs. long, succulent, downy, petioles 1½ ft. long, cordate, deeply lobed and serrated, bright green: fls. greenish white, males with 8 petals, females generally fewer. Peru. B.M. 3550. F.S. 20: 2056–7. A.F. 4: 225 (var. Leimoinei).

217. Single Tuberous Begonia (× $\frac{1}{3}$).

95. *polypetala*, A. DC. St. short, fleshy, annual: lvs. ovate-cordate, toothed, hairy, with raised veins, 10 in. by 8 in.: fls. with 9 or 10 ovate-oblong petals an inch long, red: ovary hairy, with one long wing. Peru. Gn. 14, p. 531.—Int. by Froebel in 1878.

96. *rubricaulis*, Hook. Lvs. 4–6 in. long, ovate, wavy, ciliate along the margins, deep green: fls. large, males 1½ in. across, 5-petaled: females smaller, 6-petaled, reddish. Country unknown. B.M. 4131.—Int. to Birmingham Bot. Gar. in 1844.

97. *Södeni*, Hort., hybrid (B. Boliviensis × Veitchii?). Lvs. long, pale green: fls. solitary, brilliant red: females of 4 petals; males of 5 petals. R.H. 1872: 90.—Int. by Thibaut and Keteleer in 1872.

98. *Sutherlandii*, Hook. St. annual, herbaceous, 1–2 ft. high, bright red: lvs. 4–6 in. long, lanceolate, lobed and serrated, green, with red veins and margin, petioles slender, red: fls. numerous, coppery or salmon-red. Natal. B.M. 5089.—Int. by Backhouse in 1867.

99. *tenera*, Dry. (B. Thwaitesii, Hook.). Lvs. radical, cordate, 5 in. long, coppery green, mixed with purple and blotched with grey, under surface crimson: fls. white, tinged pink. Ceylon. B.M. 4692.—Chiefly interesting as a variegated plant. Int. to Kew in 1852.

(aa) The following list comprises some of the best and most distinct of the innumerable garden forms and hybrids now existing, which have almost all been produced from six species; viz., *B. Boliviensis*, *B. Pearcei*, *B. Veitchii*, *B. roseiflora*, *B. Davisii*, and *B. Clarkei*, by crossing and recrossing:

(1) SINGLE-FLOWERED VARIETIES.

a. Crimsons and Scarlets.—*Admiration*, fls. vivid orange-scarlet, of dwarf, compact habit, free flowering. *Charles Baltet*, rich, velvety vermilion: *Dr. Masters*, fls. large, with immense spikes, deep red crimson; *F. E. Lemoine*, deep, velvety crimson, full and free. *Mrs. Brassey*, deep, glowing crimson; *Lothair*, dark scarlet-carmine. *Scarlet Gem*, very dark scarlet, dwarf, and very floriferous. *Vesuvius*, bright orange-scarlet, compact and free; one of the finest bedders.

b. Rose-colored.—*Lady Guinthorpe*, rose-color, extra large and fine. *Marguerite*, large, round fls., white, with a margin of bright pink. *Pecke*, soft, rosy red, shaded light rose. *Stanstead Surprise*, deep rose, very large.

c. Whites.—*Alba fimbriata*, a fine, large, pure white flower, with fringed petals. *Bexley White*, an immense flower of the purest white. *Mrs. J. Thorpe*, white, the petals edged with reddish lake. *Queen of Whites*, large, erect, pure white fls. of great substance. *Moonlight*, pure white, very free.

d. Orange and Yellows.—*Duchess of Leinster*, orange-buff, large, erect fls. *Miss A. de Rothschild*, pure yellow. *Sovereign*, rich golden yellow, very free, and excellent in every way. *Torrey Laing*, reddish orange-yellow, an unusual color.

218. Form of double Tuberous Begonia (× $\frac{1}{3}$).

(2) DOUBLE-FLOWERED VARIETIES.

a. Crimsons and Scarlets.—*Cannell's Gem*, bright scarlet. *Dandy*, intensely bright scarlet, extremely free-flowering. *Flamingo*, brilliant scarlet. *Henshaw Russell*, scarlet, one of the best. *Triomphe*, rich, bright crimson. *Duke Zeppelin*, dazzling scarlet fls., new.

b. Rose-colored.—*Althæiflora*, bright rosy cerise, distinct. Duke of York, deep rose. *Glory of Stanstead*, soft rose, light center. *Hecla*, bright, glistening pink, free bloomer. *Rosa Mora*, rose-pink, large, broad, wavy petals.

c. Whites.—*Countess of Craven*, pure white fls., dwarf. *Miss Edith Wynne*, pure creamy white. *Octavie*, pure white blossoms, very floriferous. *Picotee*, delicate white, pink margin, dwarf. *Princess May*, pure white, undulated or crimpled at the edges.

d. Yellows.—*Lady Balfour of Burleigh*, large yellow fls., erect. *Miss Falconer*, clear yellow. *Mrs. Reynart*, chrome-yellow, petals prettily undulated. *Alice Manning*, primrose-yellow blossoms.

IV. Rex, or Ornamental-leaved Section.

100. **Griffithii**, Hook. (*B. picta*, Hort.). St.-lvs. and habit as in *B. Rex*: lvs. olive-green, with a broad zone

of grey, tinged with red on the under side; fls. large, fleshy, pink; ovary curiously crinkled along the angles. Assam. B.M. 4984.—Int. by Henderson, England, in 1856.

101. **laciniàta**, Roxb. St. perennial; lvs. roundly ovate, lobed, pubescent, black-purple, with a broad zone of green, reddish on the under side; fls. as in *B. Rex*. India, S. China. B.M. 5021.—Int. to Kew in 1857. Var. **Bowringiana**, Hort., has green lvs. and rosy fls. B.M. 5182.

102. **xanthina**, Hook. Similar to *B. Rex*, and probably only a form of that species: lvs. large, fleshy, cordate-ovate, acuminate, sinuate-ciliated, dark green above, purplish beneath; fls. yellow; capsule with one large wing. B.M. 4683.—Var. **pictifòlia**, Hort., B.M. 5102. Var. **Lázuli**, B.M. 5107.

103. **Rex**, Putz. Fig. 220. St. a short, fleshy rhizome, from which spring the long-stalked, large, ovate, wavy lvs., which are hairy and colored a rich metallic green, with a zone of silvery grey; peduncles erect; fls. large, rose-tinted, males 2 in. across, with 4 unequal petals; females smaller, with 5 nearly equal petals; ovary 3-angled, with 2 short and 1 long wing. Assam. F.S. 12:1255–1258. B.M. 5101.—This magnificent species is the principal parent in the production of the numerous ornamental-foliaged Begonias. It has been crossed with a few species in the first place, and then hybrid seedlings have been raised again and again from the progeny. Fig. 220 is a copy of a part of the original figure in Flore des Serres (1857), and is given here for the purpose of showing what this species was like when first known to horticulturists.

Following are some of the derivative types of Rex Begonias:

104. *Rex*×*discolor hybrids*. I.H. 28:434. *Mad. Jos. Moens*, silvery white, with green articulations towards the margins, and a green disc. *Mad. Chas. Weber*, green, spotted with white. *Mad. G. Van Meerbeeke*, silvery, with a narrow green edge, and a central green disc running out along the veins. *Souv. de Mad la Baronne de Bleichroder*, disc and broad margin downy green, central portion silvery. *Mad. Franck*, disc and broad margin light apple-green, intermediate portion silvery. *Baron A. Vrière*, disc dark green, center silvery, margin broad, dark green, silver-spotted. Others are *Mad Treyve*, *Mad. Luizet*, *Edw. B. Kennedy*, *Henri Vilmorin*, *Pres. Belle*, *Sir Joseph Hooker*, *Ed. Pynaert*, *Pres. de la Devansaye*, *Mad. F. Alégatiere*, *Abel Carriere*.

105. *Rex*×*diadema hybrids*. R.H. 1888, p. 20. R.B. 15, p. 91. *Lesoudii*, very similar to B. Rex, but larger leaved. *Adrien Schmidt*, green on the margins, marked and spotted silver in the center. *Clementinæ*, lobes very acute, white blotches in center. *Mad. Alamagny*, lvs. very large, deeply lobed, pure metallic-white, with a green center. *Mad. Isabelle Bellon*, finely dentate, lobed and undulated, center olive-green, surrounded by a zone of white, becoming rose on the inner margin. *M. Crousse*, very long, dentate, green center, band of silver around margin. Others are *Theodore Schmidt*, *Henri Donweck*, *Lucie*, *Papillon*, *Mad. D. Wettstein*, *D. Wettstein*, *A. Dallière*, *Mad. Georges Bruant*, *Wilhelm Pfitzer*.

106. *Rex*×*Socotrana*. A plant has been produced which combines the characters of the two parents in a pleasing manner: lvs. like B. Rex, but with shorter petioles, and crowded on the stem; prettily colored; fls. in erect, sturdy racemes, which stand well above the plant; like B. Socotrana in color, but paler. Plant said to be evergreen.—Interesting as a connecting link between the Rex and semi-tuberous sections. Int. by Sander & Co. in 1897.

107. Miscellaneous Rex hybrids of known origin: *Rex leopardinus* (Rex×xanthina, var. Reichenheimii). Very similar to B. Rex, but much larger. F.S. 13:1307.—Int. by Van Houtte in 1859. *Grandis* (Rex×splendida). Very similar to B. Rex. F.S. 13:1359.—Int. by Bollison. *Otto Forster* (Rex×imperialis). Dwf. habit; lvs. obliquely cordate, dark green, marbled with silvery greyish green; fls. greenish white, inconspicuous. *Miranda* (Rex×imperialis, var. smaragdina). Very similar to above, but marbled with silver. *Domini* (Rex×argentea). *Leopoldi* (Griffithii×splendida). I.H. 6:205. *Prince Troubetzkoi*, double hybrid (Griffithii×Xanthina, var. marmorata and rubrovenia). I.H. 5:158; also, from the same cross, *Madame Wagner*. I.H. 5:161, and *Miranda*. *Comptess Louise Erdody* (Alexander, var. Humboldt×argentea-cupreata). Fig. 221. Lvs. obliquely cordate, ovate-acute, the smaller of the two lobes twisted in a spiral manner, with as many as 4 coils; upper surface silvery, with veins deep green; under surface reddish, pilose. I.H. 31:516. G.C. II. 22:205.—Int. by F. Nemeczik, gardener to Count Erdody, a Hungarian nobleman, in 1884.

108. Other Rex varieties of unknown or uncertain origin: *Louise Closson*. Lvs. ovate-acuminate, lobed, veins deep purple, surface blotched with deep purple bronze, metallic luster very bright. *Lucy Closson* is very similar, but more vigorous, with the blotches more numerous and better distributed. *Marquis de Peralta*. Lvs. small, margins hairy, numerous silvery spots on surface. Compact, dense grower. *Duchesse de Brabant*. Lvs. large, purple, margins and surface hairy, otherwise like B. Rex. *Louise Chretien*. Lvs. green, with a zone of glossy silver toward the center, covered with very small white spots. *Bertha MacGregor*. Lvs. ovate-acuminate, lobed, white, center and margin green. *Count Erdody*. Silver-white, green-striped along the veins, hairy; lobes twisted into a spiral. hairy. *Matilda*. Lvs. silvery white, center and along veins green, margins hairy. *Alice White*. Large, bright silver, center bronze, satin luster.

P. B. KENNEDY.

219. A type of Tuberous Begonia, double-flowered.

BELEMCÁNDA (East Indian name). *Iridàceæ*. BLACKBERRY LILY. LEOPARD FLOWER. A monotypic genus, containing an interesting hardy, herbaceous perennial plant, which is an old garden favorite. The first of the popular names comes from the clusters of shining, black, roundish seeds, and the second from the flower, which is orange, spotted red. It is more commonly sold as a Pardanthus, which also means Leopard Flower. Perianth segments oblong, the 3 inner slightly shorter and spirally twisting as they fade. Prop. by seeds or by division. Of easy culture in rich, sandy loam and in a sunny place. Commonly spelled Belamcanda.

Chinénsis, Leman. (*Belamcánda punctàta*, Moench. *Iris Chinénsis*, Linn. *Pardánthus Chinénsis*, Ker-Gawl. *P. Sinénsis*, Van Houtte). Fig. 222. Height 2–3 ft.; rootstock a short, stoloniferous rhizome: lvs. about 6, in a lax tuft, equitant, striate, 1–1½ ft. long, 1 in. broad; outer spathe valves ½–1 in. long; pedicels 1–2 in. long; capsule 1–1½ in. long; valves reflexing, persistent. China and Jap. B.M. 171. F.S. 16:1632. L.B.C. 19:1854.—The seed-stalks are sometimes used with dried grasses for decoration. It is said that the birds sometimes mistake the seeds for blackberries.

BELLFLOWER. See *Campanula*.

BELLADONNA. See *Atropa*.

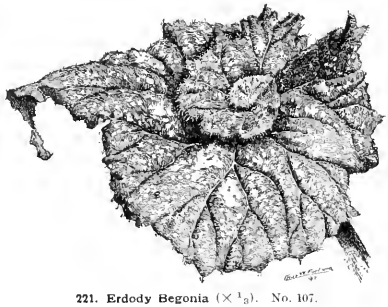
BELLADONNA LILY. See *Amaryllis*.

BÉLLIS (Latin, *bellus*, pretty). *Compósitæ*. English Daisy. The Daisy, as it grows wild in England, has a yellow center, surrounded by numerous rays in a

220. Begonia Rex, in its original form. No. 103. (See Begonia, p. 151.)

single row, but the favorite cultivated forms are double, the rays rising in tier upon tier, and frequently crowding out every trace of a yellow center. The English Daisy is essentially a pink or pinkish fl. in its general effect, the tips of the rays sometimes and the under surfaces usually being pink or red. There are 27 species in the genus, only one of which is American. *B. integrifolia* is found in moist soil from Ky. and Tenn. to Ark. and Tex., but is too rare and sectional to become a general favorite. The plant that is most commonly called Daisy in America is *Chrysanthemum Leucanthemum*. For an illustrated account of the various plants known as Daisies in America, see *Daisy*.

Daisies are favorite border plants, and are much used in spring bedding, especially for edging. They thrive in a cool soil and moist atmosphere, and are, therefore, much better adapted to English than American gardens. A light mulch is desirable for winter protection. In home gardening, the plants, after flowering, are divided into single crowns. These are planted about 6 in. apart in good, rich garden soil. Each crown soon sends out side growths, which, in time, form new crowns. Before winter sets in the young clumps can be moved readily to any place in the garden where they are wanted to bloom. Daisies are also forced by florists for winter bloom. When Daisies are desired for edging



221. Erdody Begonia ($\times \frac{1}{3}$). No. 107. (See Begonia, p. 151.)

spring flower beds, the clumps are divided into single plants during the previous September, or early enough to allow the new plants to get a firm hold before winter, and are placed 3 in. apart in a narrow trench. These edgings must be renewed each year, as the plants, if they grow well, spread too wide, or irregularly. In dry summers many roots fail, and if they remain in the same spot year after year, the fls. will degenerate to the single condition.

The simplest way of propagating and growing English Daisies for spring bedding in this country is to sow the seed in shallow boxes about August 10. As soon as large enough to handle, transplant 5 inches apart into coldframes, and when the winter sets in put on the sash, giving air whenever the weather may be mild. Transplant to the flower beds as early as possible in the spring, where in a very short time they will be a mass of bloom, and will continue to bloom till the beginning of June, when they should be thrown out, and the summer bedding plants planted. Longfellow and Snowball are the two best varieties for this purpose. *Myosotis alpestris* and *Silene pendula* may be grown the same way, using the Daisies as edging when in the beds, and the others as center pieces.

The Daisy is propagated by seeds (which are sown early), and by divisions, the choicest varieties being maintained by the latter method. The main types grown from seed are the white, rose, quilled, and white with red center, all of which are double. A dark red is less common. Of kinds prop. by seed, Longfellow is now the best rose-colored, and Snowball the best white variety, the latter being especially prized by florists for cut-flowers, as it has long, stiff stems. Other varieties are Maxima, Snowflake, and Rob Roy, which is perhaps the best red.

222. Belemcanda Chinensis ($\times \frac{1}{3}$). (See Belemeanda, p. 151.)

perénnis, Linn. True or English Daisy. Hardy herbaceous perennial, 3–6 in. high: lvs. clustered at the root, spatulate or obovate: fls. 1–2 in. across, solitary, on hairy scapes. Apr.–June. W. Eu.; naturalized in Calif.; rarely runs wild in the eastern states. B.M. 228. F. S. 6:584, which shows 11 well marked types.—An interesting but not permanent form, which is a result of overfeeding, is the "Hen-and-Chickens Daisy," in which a number of small fl.-heads are borne on short stalks springing out of the main fl.-head. Cockscomb forms, in which several scapes unite to produce a monstrous flower, are sometimes seen, but cannot be perpetuated. The rays are sometimes wholly incurved, or reflexed, or quilled. Other English names of the Daisy are Herb Margaret, Ewe- or May-gowan, Childing Daisy, Bone- or Bruisewort, Bone Flower, March Daisy, Bairn-wort.

J. B. Keller, E. J. Canning, and W. M.

BELLWORT. In England, any member of the *Campanulàceæ*. In America, *Uvulària*.

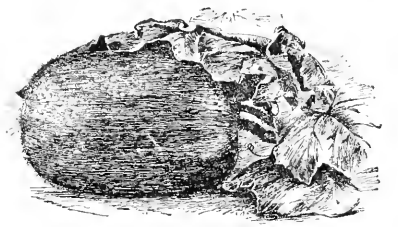
BELVIDERE, or Summer Cypress. See *Kochia*.

BENE. See *Sesamum*.

BENI, JAPANESE. *See Caryopteris Mastacanthus.*

BENINCASA (name of an Italian nobleman). *Cucurbitàceæ.* One species from E. Ind. Annual, running, squash-like herbs, with solitary yellow monœcious fls., the staminate long-pedunculed, the pistillate nearly sessile; corolla deeply lobed; tendrils 2–3-branched.

cerifera, Savi. Fig. 223. WAX GOURD. ZIT-KWA. CHINESE PRESERVING MELON. CHINESE WATERMELON. Vine long, like a muskmelon, hairy, with cordate lobed lvs.: fr. mostly oblong, 10–16 in. long, hairy, white-



223. Benincasa cerifera.

waxy, with solid white flesh and small, cucumber-like seeds. Cult. the same as muskmelon or cucumber. R.H. 1887:540.—Recently int. into the U. S. (Bull. 67, Cornell Exp. Sta.), and used for making preserves and sweet pickles; said to be eaten raw in warm countries.

L. H. B.

BENJAMIN BUSH. *Benzoin odoriferum.*

BENT GRASS. *See Agrostis.*

BENTHÁMIA. Referred to *Cornus.*

BÉNZOIN (of Arabic or Semitic origin, meaning a gum or perfume). Syn., *Lindèra. Lauràceæ.* Trees or shrubs, aromatic: lvs. alternate, usually deciduous, entire or sometimes 3-lobed: fls. polygamous-dioecious, apetalous, small, in axillary, umbel-like clusters; calyx 6-parted; staminate fls. with 9 stamens: fr. a berry. About 60 species in trop. and E. Asia and N. Amer. Some E. Asiatic species yield an odorous oil, used in perfumery. Only a few deciduous species are cult. They are attractive on account of their handsome foliage, which turns bright yellow in fall, and their black or scarlet fr. The hardiest species is *B. odoriferum,* though *B. obtusilobum* and *B. hypoglaucum* may also be grown north in sheltered positions. They thrive best in peaty and sandy soil. Prop. usually by seeds sown after maturity; also by layers, which root best in peaty soil; of greenwood cuttings under glass, one-half may be expected to root. The Benzoin of the druggists is a balsamic resin obtained from *Styrax Benzoin.*

odoriferum, Nees (*Lindèra Bénzoin,* Blume). SPICE BUSH. BENJAMIN BUSH. WILD ALLSPICE. FEVER BUSH. Fig. 224. Shrub, 6–15 ft., nearly glabrous: lvs. oblong-obovate, finely ciliate, bright green, pale beneath, 3–5 in. long: fls. yellow, before the lvs.; berry red, oblong, spicy. N. Eng. southward and west to Kans. Em. 365. —The bark is aromatic, stimulant, tonic, astringent.

B. æstivàle, Nees=B. odoriferum.—*B. grácile,* O. Kuntze (Daphnidium gracile, Nees). Lvs. ovate, 3-nerved, chartaceous. Habitat unknown. Stove plant.—*B. hypoglaúcum,* Rehd. (Lindera hypoglauca, Max.). Lvs. penninerved, glaucous beneath; clusters few-fld., with or before the lvs.; berries black. Japan.—*B. melissifólium,* Nees. Allied to B. odoriferum. Branches pubescent: lvs. oblong, downy beneath. S. states. B.M. 1470.—*B. obtusilobum,* O. Kuntze. Lvs. 3-nerved, ovate or 3-lobed; clusters many-fld.; berries black. Japan. G.F. 6:295. —*B. princox,* S. & Z. Lvs. penninerved, elliptic-oblong; clusters few-fld., before the lvs.; berries brownish, ½in. diam. Japan.—*B. sericeum,* S. & Z. Lvs. penninerved, pubescent beneath; clusters many-fld., with the lvs. Japan.

ALFRED REHDER.

BERBERIDÓPSIS (from *Berberis* and Greek *opsis,* likeness). *Berberidàceæ.* Climbing evergreen shrub: lvs. alternate, petioled, dentate; fls. on long pedicels in terminal racemes; bracts, sepals and petals gradually passing into one another, 9–15, the inner ones concave; stamens 8–9; fr. a berry. One species in Chile. Ornamental low climbing shrub, with deep green foliage and crimson fls. in drooping racemes, for temperate regions or the cool greenhouse, growing in almost any soil. Propag. by seeds sown in spring, by greenwood cuttings in spring, or by layers in autumn.

corallina, Hook. Lvs. cordate, oblong-ovate, coarsely spinulose-dentate, 2–3 in. long; fls. globose, over ⅓ in. long, crimson, in many-fld. leafy racemes. B.M. 5343. F.S. 20:2137.

ALFRED REHDER.

BÉRBERIS (Arabic name). *Berberidàceæ.* BARBERRY. Shrubs, with yellow inner bark and wood, often spiny: lvs. alternate, often fascicuiate, usually glabrous, simple or pinnate, deciduous or persistent, mostly spinulose-dentate: fls. in racemes, rarely umbellate or solitary; sepals, petals and stamens 6: fr. a 1-celled berry with one or several oblong seeds. Nearly 100 species in America from Brit. Col. to Patagonia, Asia, Eu., and N. Afr. Low ornamental shrubs, of which a large number is cultivated. Most of the deciduous species are quite hardy, while the evergreen ones are to be recommended for more temperate regions, except *B. Aquifolium* and *B. repens,* which may be cultivated even north in somewhat sheltered positions. Both evergreen and deciduous kinds are very attractive in spring, with their bright or orange-yellow fls., and in fall with their red, dark blue or nearly black fruits. Some, as *B. Amurensis* and *B. Thunbergii,* while amongst the handsomest in fr., assume a splendid fall coloring. They grow in almost any soil, but prefer drier situations; the evergreen species thrive best in a sandy compost of peat and loam. Prop. by seeds sown soon after maturity, or stratified and sown in spring; even *B. vulgaris,* var. *atropurpurea,* may be increased in this way, as a large percentage comes true. The evergreen species grow from cuttings in September, placed in sand under glass. Most of the deciduous species can be grown from greenwood cuttings, taken from forced plants in spring and put under glass with slight bottom heat. Layers put down in autumn usually remain 2 years before they can be separated. Some species may be propagated by suckers. Rarer kinds and varieties are sometimes grafted on *B. vulgaris* or *Thunbergii,* in August or September under glass, or in early spring in the greenhouse. The root and the inner bark are sometimes used for dyeing yellow. Some species have medicinal properties. In wheat-growing districts, planting of Berberis should be avoided, as it is the host of the *Æcidium*-stage of *Puccinia graminis,* a fungus which causes the wheat-rust. Destroying the Berberis, however, will not check the propagation of the fungus, as it is able to grow and to spread for years without forming the *Æcidium*-stage. Monogr. of spe-

224. Benzoin odoriferum.

cies cult. in England in Flore des Serres, 6:66 and 73 (1850–1).

Index: Amurensis, No. 2; Aquifolium, 21; aristata, 15; asperma, 1; atropurpurea, 1; *Bealii*, 19; buxifolia, 9; Canadensis, 4; *Carabinana*, 4; Darwini, 12; dulcis, 1, 9; emarginata, 3; Fortunei, 24; Fremonti, 17; *Hakodate*, 2; heteropoda, 6; ilicifolia, 11, 14; integrifolia, 7; Jamesoni, 13, 16; Japonica, 2, 19; Maximowiczi, 8;

225. Berberis vulgaris, in fruit.

Nepalensis, 20; nervosa, 22; Neuberti, 14; pinnata, 18; pluriflora, 8; repens, 23; *Sieboldi*, 2, and suppl. list; Sinensis, 5; stenophylla, 10; Thunbergi, 8; vulgaris, 1; Wallichiana, 13.

A. *Lvs., simple, usually fascicled in the axils of spines, deciduous or persistent.*

B. *Foliage deciduous: lvs. membranaceous or chartaceous.*

C. *Fls. in racemes.*

D. *Branches gray, except those of the purple-leaved form.*

1. **vulgàris,** Linn. Common Barberry. Fig. 225, 226. From 4–8 ft., rarely 15; branches grooved, upright or arching; lvs. oblong-spathulate or obovate, setulose-dentate, membranaceous, 1–2 in. long; racemes pendulous, many-fld.; fls. bright yellow; fr. oblong, usually purple. May, June. Eu. to E. Asia; escaped from culture and naturalized in E. N. Amer. Gn. 35:693.—Handsome in spring, with its golden yellow fls. and light green foliage; and in fall, with its bright scarlet fruits, remaining through the whole winter. A very variable species; also the six following species are included by some botanists as varieties. Of the many garden forms, the most effective is var. **atropurpurea,** Rgl., with purple colored lvs. Gt. 9:278, 1. There are also varieties with variegated lvs. and purplish black, whitish or yellow berries, as var. **alba,** white-fruited; var. **asperma,** seedless; var. **dulcis,** less acid; var. **lutea,** yellow-fruited; var. **mitis,** less thorny; var. **nigra,** black-fruited; var. **violàcea** or **fructu-violàceo,** violet-fruited. The spines of the Barberry are, morphologically, lvs., and the lvs. are borne on short branches in their axils (Fig. 226). The stamens are sensitive. Touch the filaments with a pin when the fls. first open, and the stamens fly forward upon the pistil.

2. **Amurénsis,** Rupr. (*B. vulgàris,* var. *Amurénsis,* Rgl.). Three to 8 ft.; branches straight, upright, grooved; lvs. cuneate, oblong or elliptic, densely ciliate-dentate, distinctly veined beneath, 1–3 in. long; racemes upright or nodding, 6–12-fld., about as long as lvs.; fr. oblong, scarlet. Manchuria, N. China. Ging. 5:119. Var. **Japonica,** Rehd. (*B. vulgàris,* var. *Japónica,* Rgl. *B. Sieboldi,* Hort., not Miq. *B. Hakodàte,* Hort.). Lvs. firmer and more chartaceous, prominently veined beneath, shorter petioled, dark green above. Jap. G.F. 3:249 as *B. Sieboldi.* A.G. 18:454.—Vigorous-growing shrubs, standing drought well, with brilliant orange and scarlet fall-coloring, especially the variety.

3. **emarginàta,** Willd. One to 3 ft., in culture usually higher; spines simple to 5-parted, sometimes longer than the lvs.; lvs. cuneate, obovate or obovate-oblong, setulose-dentate, ½–1¾ in. long; racemes short, upright; petals usually emarginate. S. Eu. to Himal.—Low spiny shrub with handsome fall-coloring.

DD. *Branches reddish brown or brown: lvs. usually sparsely dentate, sometimes entire.*

4. **Canadénsis,** Mill. (*B. Carolinìana,* Lond.). One to 3 ft.: spines small, 3-parted; lvs. cuneate-oblong, remotely spinulose dentate, rarely entire, 1–2 in. long; racemes few-fld., nodding, about as long as the lvs.; petals retuse or emarginate; fr. short-oval or nearly globular, coral-red. Alleghanies.—The plant sold under this name is usually *B. vulgaris.*

5. **Sinensis,** Desf. From 4–6 ft., with slender, often arching branches and small, 3–5-parted spines; lvs. cuneate, oblong or obovate-lanceolate, coarsely setulose-dentate, sometimes entire, green or glaucescent beneath, 1–2 in. long; racemes pendulous, slender-peduncled, bright or pale yellow; berries oval or oblong, blood-red. From Caucasus to Himal. and China. B.M. 6573.—A hardy, graceful species, very handsome in fruit.

6. **heteropoda,** Schrenk. Three to 6 ft.; branches stout, spreading, with few short spines; lvs. broadly obovate, entire or remotely serrate, pale bluish green, 1½–2 in. long, some short and some slender-petioled; fls. in long-stalked, few-fld. racemes, orange-yellow, fragrant; fr. oblong, dark blue with glaucous bloom. May. Turkestan, Songaria. G.F. 8:455.—Handsome and very distinct species.

7. **integerrima,** Bunge. In habit and appearance very like No. 6, and difficult to distinguish without fl.-clusters; stems terete and brown; lvs. broad-obovate, remotely dentate or entire, dark bluish green above; racemes dense and upright. Persia, Turkestan, Songoria.

cc. Fls. usually solitary, rarely in few-fld. umbels: lvs. entire.

8. **Thùnbergii,** DC. Figs. 227, 228. Dense, low shrub, 2–4 ft.; branches spreading, deeply grooved, brown, with simple spines; lvs. obovate or spathulate, quite entire, glaucescent beneath, ½–1½ in. long; fls. 1–3, pale yellow; fr. elliptic or nearly globose, bright red. Apr., May. G.F. 2:53. B.M. 6646. R.H. 1894:173. A.G. 18:357. Ging. 4:241; 5:119, 353, 355. Mn. 2:118. A.F. 8:526.—One of the most valuable species, especially remarkable for its low, dense, horizontal growth, its large, brilliant red frs., remaining fresh till the following spring, and for its bright scarlet fall-coloring; hardy. Very valuable for borders of walks and drives. Endures partial shade. Cattle and sheep do not browse it much. Var. **Maximówiczi,** Franch. & Sav., has the lvs. green beneath. Var. **pluriflòra,** Koehne, with 3–10 fls. in short, umbel-like raceme, is perhaps a hybrid with *B. vulgaris;* it has almost gray branches. China, Japan.

226. Berberis vulgaris. Natural size, showing the spines and foliage.

BB. *Foliage evergreen or half-evergreen.*

C. *Lvs. entire, or rarely with few spiny teeth.*

9. **buxifòlia,** Poir. (*B. dúlcis,* Sweet). One to 3 ft.; branches brown, grooved; spines usually 3-parted, short; lvs. cuneate, obovate or elliptic, ⅛–1 in. long; fls. solitary, on long pedicels, orange yellow; fr. nearly

globose, blackish purple. May. Chile to Strait of Magellan. B.M. 6505. S.B.F.G. II. 1:100. P.M. 10:171. —A very graceful, free-flowering shrub; one of the hardiest of the evergreen species; will stand the winter even north if somewhat protected.

10. **stenophylla,** Mast. (*B. Darwinii* × *empetrifólia*). Height 1–3 ft., with slender, arching branches: lvs. narrow-oblong, revolute at the margins, spiny pointed, $^1/_2$–$1^1/_4$ in. long, dark green above: fls. 2–6, in peduncled, pendulous umbels. Of garden origin. May. G.C. III. 7:649. A.F. 6:325.—Handsome shrub, nearly as hardy as the former.

cc. Lvs. coarsely spiny dentate.

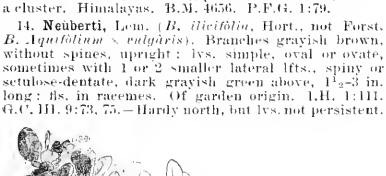
D. Fls. in simple racemes or clusters.

11. **ilicifolia,** Forst. Holly-leaved. Lvs. partially evergreen, persisting till late in winter, shining dark green, ovate, tapering at base, coarsely spiny-toothed: pedicels short, 4-fld., somewhat corymbose: fls. orange-yellow. Terra del Fuego. B.M. 4308. F.S. 3:291.

12. **Darwini,** Hook. Height 1–3 ft.: branches brown, pubescent when young: lvs. sessile, cuneate, obovate, usually 3-fld at the apex, glossy dark green above, $^1/_2$–1 in. long: racemes short, many-fld., pendulous; fls. orange-yellow, often reddish outside: style longer than the ovary: fr. dark purple. Chile to Patagonia. B.M. 4590. F.S. 7:663. P.F.G. 2:46.

13. **Wallichiàna,** DC. (*B. Jàmesoni,* Hort., not Lindl.). Shrub, to 10 ft., with grayish brown branches: spines 3-parted, nearly an inch long: lvs. sessile, oblong-elliptic or lanceolate, remotely spiny serrate, shining on both sides, 1–2 in. long: fls. long-pedicelled, nodding, 3–6 in a cluster. Himalayas. B.M. 4656. P.F.G. 1:79.

14. **Neuberti,** Lem. (*B. ilicifólia,* Hort., not Forst. *B. Aquifólium* × *vulgàris*). Branches grayish brown, without spines, upright: lvs. simple, oval or ovate, sometimes with 1 or 2 smaller lateral lfts., spiny or setulose-dentate, dark grayish green above, $1^1/_2$–3 in. long: fls. in racemes. Of garden origin. I.H. 1:111. G.C. III. 9:73, 75.—Hardy north, but lvs. not persistent.



227. Berberis Thunbergii.

228. Berberis Thunbergii.

DD. Fls. in compound, pendulous racemes.

15. **aristàta,** DC. Bush, 2–6 ft.: lvs. oblong, semi-persistent, usually spinose-dentate, 1–3 in. long: fls. in long-peduncled, compound racemes. Himalayas. B.R. 9:729.

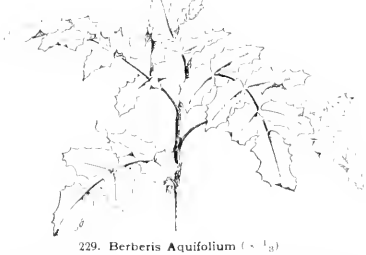
16. **Jàmesoni,** Lindl. Shrub, much branched: lvs. oblong, 2–3 in. long, with few large and strong spines: fls. orange, in drooping panicles or compound racemes. Ecuador. I.H. 6:201.

AA. Lvs. pinnate, persistent: branches spineless. (Mahonia.)

B. Petioles short or almost none.

c. Racemes few-fld., slender, mostly lateral.

17. **Frémonti,** Torr. From 5–12 ft.: lfts. 3–7, rigidly coriaceous, ovate or oblong, with few strong, spiny teeth, glaucous, dull, $^1/_2$–1 in. long: racemes loose, 3–7-fld.;



229. Berberis Aquifolium (× $^1/_3$)

pedicels slender: fr. at least $^1/_2$in. in diam., red, inflated, and rather dry. W. Texas to Utah and Mex. G.F. 1:497.—Remarkable for its pale, glaucous foliage and large berries. Not hardy north.

cc. Racemes many-fld., dense.

18. **pinnàta,** Lag. (*Mahònia fasciculàris,* DC.). Two to 3 ft.: lfts. 5–17, ovate or ovate-lanceolate, coriaceous, undulate at the margin and with few spiny teeth, dark green, somewhat shining: fls. in short, fascicled racemes: fr. blue. Calif., N. Mex. B.M. 2396. B.R. 9:702.—Not hardy north.

19. **Japònica,** Spreng. (*M. Japónica,* DC. *B. Bealii,* Fort.). Height 5–10 ft.: lfts. 9–13, roundish or ovate, coriaceous, usually truncate at the base, with large, remote, spiny teeth, 2–5 in. long: racemes 3–4 in. long, fascicled: fr. bluish black. China, Japan. B.M. 4846, 4852. P.F.G. 1:11. F.S. 6:79.—Very effective by its large foliage, thriving best, like the other Mahonias, in a partly shaded position. Hardy north to New York in sheltered positions.

20. **Nepalensis,** Spreng. (*B. Japónica,* Hort.). Tall, 4–6 ft.: lfts. 5–25, rigid, obovate-oblong, repand-toothed, with few spiny teeth on each edge. India to Japan. N. 1:182. A.G. 18:355.

BB. Petioles prominent or elongated.

c. Lfts. truncate or rounded at the base.

21. **Aquifolium,** Pursh (*Mahònia Aquifólium,* Nutt.). Fig. 229. From 3–6 ft.: lfts. 5–9, oblong or oblong-ovate, shiny dark green above, spinulose-dentate: racemes erect, fascicled: berries blue, small. May. British Columbia to Ore. B.R. 17:1425. L.B.C. 18:1718. P.M.B. 9:5.—Handsome evergreen shrub, hardy north in sheltered positions.

22. **nervòsa,** Pursh. Dwarf evergreen shrub: sts. but a few inches high, tipped with long, husk-like, pointed bud-scales: lfts. 11–21, lance-ovate, 3–5-ribbed, remotely spiny-toothed, borne on a strongly jointed stalk: racemes elongated, erect: fr. oblong, blue. Ore. B.M. 3949. L.B.C. 18:1701. F.S. 2:127. P.M. 7:55, as *Mahonia glumacea.*

23. **repens,** Lindl. (*Mahònia rèpens,* Don). Rarely over 1 ft. high, stoloniferous: lfts. 3–7, roundish ovate or ovate, pale or glaucous and dull above, spinulose-dentate: fls. and fr. like the former. Brit. Columbia to Calif. and N. Mex. B.R. 14:1176. L.B.C. 19:1847.

cc. Lfts. cuneate at base, narrowe-lanceolate.

24. **Fortunei,** Lindl. Dwarf: lfts. 5–9, distant, narrowly lanceolate; spiny teeth numerous, small: racemes erect, fascicled. China. F.S. 3:287 bis.

B. actinacantha, Mart. One to 3 ft., evergreen: spines 5 parted: lvs. small, spiny: fls. in sessile clusters. Chile B.R.

31-55.—*B. Ethaënsis*, Prsl. Allied to B. emarginata. Low, dense shrub, with small lvs. and long spines. Sicily, Sardinia, Corsica.—*B. angulosa*, Wall. Height 4 ft.: lvs. deciduous, small, entire or sparsely spinulose: fls. solitary or few. Himalayas. B.M. 7071.—*B. Asiatica*, Roxb. Three to 10 ft.: lvs. persistent, oblong, entire or with few teeth, whitish beneath, 1-3 in. long: fls. in short, sessile racemes. Himal.—*B. Bealei*, Hort. = B. virescens.—*B. brachybotrys*, Edgew. = B. emarginata, var.—*B. Chitria*, Hamilton = B. aristata.—*B. coriacea*, Hook. Low: lvs. small, semi-persistent, glaucous beneath, spinulose: fls. solitary, pendulous. Himal. B.M. 4744.—*B. congestiflora*, Gay. Five to 7 ft.: lvs. persistent, orbicular, or broad-oblong, spinose, glaucous beneath: fls. in dense, globose clusters. Chile. B.M. 6770.—*B. coriacea*, Lindl. = B. floribunda.—*B. crataegina*, DC. Low: lvs. small, semi-persistent, entire or spinulose: fls. in short, erect racemes: fr. blue. Opposent to ninal.—*B. Cretica*, Linn. Spines 3-parted. lvs. deciduous, small, usually entire: fls. 2-5, in short, sessile umbels. S. Eu., Orient.—*B. dealbata*, Lindl. Lvs. persistent, nearly orbicular, with few spiny teeth: racemes short, dense, nodding. Mex. B.R. 21: 1750.—*B. dasyphylla*, Max. Lvs. deciduous, sparsely spinulose: fls. long-pedicelled, fascicled: fr. translucent. China.—*B. empetrifolia*, Lam. Low: branches slender: lvs. persistent, linear, revolute at the margin: fls. 1-2, slender-pedunceled. Chile to Patagonia. B.R. 26: 27.—*B. fascicularis*, Sims = B. pinnata.—*B. Fendleri*, Gray. Allied to B. Canadensis. Spines 3-5-fid: lvs. obovate-lanceolate, entire or spinulose: racemes dense, pendulous. Colo. to N. Mex. G.F. 1: 462.—*B. floribunda*, Wall. Lvs. deciduous, entire or sparsely spinulose-ciliate: racemes long-pedunceled. Himal. B.R. 27: 46 (as B. coriaria) and 30: 44 (as B. umbellata).—*B. Guimpeli*, Koch = B. Simensis.—*B. heterophylla*, Juss. Lvs. persistent, ovate-lanceolate, entire or with 2-4 spiny teeth: fls. solitary. Straits of Magellan.—*B. Ibérica*, Stev. & Fisch. = B. crataegina.—*B. Iberica*, Hort. = B. vulgaris, var.—*B. Lycensis*, Benth. Lvs. persistent, shining, with few spiny teeth: fls. small, on pedunceled, loose racemes. Peru. F.S. 6, p. 69.—*B. Lycium*, Royle. Lvs. semi-persistent, obovate-lanceolate, entire or spinulose: racemes sessile, much longer than the lvs., drooping: fr. violet. Himal. B.M. 7075.—*B. pallida*, Benth. Lvs. pinnate, persistent: fls. 9-13, ovate or ovate-lanceolate, spinose: racemes compound, loose. Mex. B.R. 30: 16.—*B. ruscifolia*, Lam. Lvs. persistent, oblong, entire or with few coarse teeth at the apex: fls. 4-5 on a short peduncle. Argentina.—*B. serotina*, Lange. Allied to B. Simensis. Lvs. usually entire, bright green: racemes short, dense, pedunceled. Origin unknown.—*B. serrata*, Koehne (B. microphylla, var. serrata, Hort.). Lvs. small, spinulose, deciduous: racemes dense, much shorter than the lvs. Origin unknown.—*B. Sibirica*, Pall. Lvs. deciduous, obovate, remotely dentate-ciliate: fls. short-pedicelled, solitary or 2-3. Siberia. B.R. 6: 487.—*B. Sieboldii*, Miq. Low: branches brown, 2-edged towards the end: lvs. oblong, densely ciliate-dentate: raceme few-fld., nodding. Japan.—*B. Sieboldii*, Hort., not Miq. = B. Amurensis, var.—*B. tenuifolia*, Lindl. Lvs. pinnate, persistent: fls. 3-7, lanceolate, entire: racemes nodding, very long and loose. Mex. B.R. 30: 26.—*B. trifoliolata*, Moric. (B. trifoliata, Hartw.). Lvs. 3-foliolate, persistent: lfts. sessile, pale, coarsely spinose-toothed: racemes short, few-fld. Tex. to Mex. B.R. 31: 10. F.S. 1: 56. P.F.G. 2: 68.—*B. triflora*, Fort. Allied to B. Neilgherensis, and probably a var. Leaflets oblong-ovate, 3-pointed at the apex and with few teeth at the base. China. P.F.G. 3: 57.—*B. umbellata*, Wall. Lvs. deciduous, sparsely serrulate: racemes long-pedunceled, umbel-like. Himal. B.M. 7549.—*B. virescens*, Hook. Lvs. deciduous, small, entire or remotely spinulose, pale green: fls. greenish yellow, fascicled, or in very short racemes. B.M. 7116.

ALFRED REHDER and FRED W. CARD.

BERCHÈMIA (derivation uncertain). *Rhamnàceæ*. Shrubs, mostly climbing, rarely trees: lvs. deciduous, alternate, slender, petioled, entire or nearly so, with minute stipules: fls. inconspicuous, 5-merous, in terminal, usually leafy panicles; fr. a small berry-like drupe with 2-celled stone. Twelve species in E. Asia, N. Amer., E. Afr.—Ornamental climbing shrubs, not quite hardy north, with small, bright green graceful foliage, useful for covering trellis work in sunny positions. They grow in almost any soil. Prop. by seeds and by root-cuttings in spring under glass; also by layering the young shoots and by cuttings of mature wood in fall under glass.

scandens, Koch (*B. volùbilis*, DC.). SUPPLE JACK. Ten to 15 ft.: lvs. ovate or oblong-ovate, acuminate, often undulate, 1-2 in. long, with 9-12 pairs of lateral veins: fls. greenish white: fr. bluish black. June. S. states.

racemòsa, Sieb. & Zucc. Closely allied to the former. Lvs. cordate, ovate, with 6-8 pairs of veins: fls. greenish: fr. first red, becoming black at length. July. Jap., China.—Hardier than the former, not high-climbing; attractive in late summer, with its red fruits.

ALFRED REHDER.

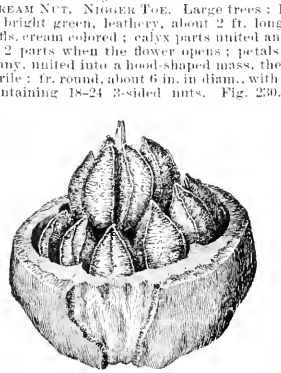
BERGAMOT. Name applied to various aromatic plants, particularly to members of the *Labiàtæ*, as Menthas and Monardas. The Bergamot essence of commerce is made from a citrous fruit. See *Citrus*.

BÉRRIA (after Dr. Andrew Berry, a Madras botanist). Syn., *Berrya*, DC., not Klein. *Tiliàceæ*. A genus of one or two species, with no familiar allies.

Ammonilla, Roxb. High tree: lvs. entire, heart-shaped, long-petioled, smooth, 5-7-nerved, alternate: fls. in racemes, small, white, very numerous: fr. a 3-celled capsule with 6 wings, the 3-12 seeds with stiff hairs, which readily penetrate the skin and produce a painful itching. Growing abundantly in the Philippines and Ceylon, where it is one of the largest and most valuable timber trees. The wood, being light and strong, is used for building, for oil casks, and for boats. It is exported as "Trincomalee wood." Cult. by Dr. Franceschi, Santa Barbara, Calif.

G. T. HASTINGS.

BERTHOLLÉTIA (after Louis Claude Berthollet, French chemist). *Myrtàceæ*. BRAZIL NUT. PARA NUT. CREAM NUT. NIGGER TOE. Large trees: lvs. alternate, bright green, leathery, about 2 ft. long, 6 in. broad: fls. cream colored; calyx parts united and tearing into 2 parts when the flower opens; petals 6, stamens many, united into a hood-shaped mass, the upper ones sterile: fr. round, about 6 in. in diam., with a hard shell containing 18-24 3-sided nuts. Fig. 230. Spe-



230. Bertholletia excelsa.
Cross-section of husk, showing Brazil nuts (× $\frac{1}{3}$).

cies 2, both of which furnish Brazil nuts. Curiously enough, the common trade name of the Brazil nut is Castanea, which is properly the name of the genus that includes the chestnuts.

excélsa, Humb. & Bonpl. Fig. 230. A tree, 100-150 ft.; with a smooth trunk 3-4 ft. in diam.: branches near the top. It forms large forests on the banks of the Amazon and Rio Negro. The natives gather the nuts in large quantities, chopping the fruit open. They are exported in large quantities, chiefly from Para. An oil is expressed from the kernels, and the bark is used at Para for caulking ships. The tree is of little value for decorative purposes, and, according to the Bulletin on Nut Culture of the Division of Pomology, U. S. Dept. of Agr., is too tender for growth anywhere in the United States.—Cult. at Santa Barbara, Calif.

G. T. HASTINGS.

BERTOLÒNIA (after A. Bertolini, Italian botanist). *Melastomàceæ*. Splendid warmhouse foliage plants from Brazil, always dwarf, and sometimes creeping; the garden forms with membranaceous, 5-7-nerved leaves 5-8 in. long, and purple beneath: fls. rose-colored, 5-petaled, in scorpioid racemes or spikes. Within the restricted definition of the latest monographer of the Melastomaceæ (A. Coigneaux, in DC. Mon. Phan. vol. 7), there are only five good species, but some earlier botanists do not separate certain allied genera which usually cannot be distinguished by habit alone. The surest character is the inflated and 3-angled or 3-winged calyx of Bertolonia. In Bertolonia, flower-parts are in 5's, but

the ovary is 3-celled. Gravesia has a 5-celled ovary, and Sonerila is trimerous. In Bertolonia the connective of the anthers has no appendage; in Salpinga there is a spur below and behind the connective; in Monolena there is a spur in front, and the calyx is not hairy.

Bertolonias are essentially fanciers' plants. It is somewhat difficult to bring out their true characteristics under ordinary stove treatment, as they require a more humid atmosphere than can usually be maintained, even in a small house. The additional shelter of a small frame should be provided, where the atmospheric conditions will be much more easily regulated. A plentiful supply of water at the roots is necessary; syringing or sprinkling overhead is not advisable. The most convenient method of propagation is by cuttings, which strike readily, in a moderately close propagating case filled with sharp, clean sand. The pots should be thoroughly clean and drained, and the compost open and porous. Thrive in dense shade. Old plants are not so brilliant as young ones.

Bertolonias and their allies furnish an excellent example of Van Houtte's triumphs in hybridization. The two species described below have probably been important factors in the plant-breeding, and *Gravesia guttata* even more so. Gravesia is a Madagascar plant, and has, perhaps, been crossed with the Brazilian Bertolonias. Unfortunately, the pictures in Flore des Serres show no flowers, and the pedigree is not given. The Bertonerilas figured and described in I.H. 43, pp. 188 and 189, with colored plates 64 and 68, are presumably hybrids between Bertolonia and Sonerila. Excepting *C. maculata* and *C. marmorata*, the following are hybrids.

A. *Veins not lined on both sides with a colored band.*

marmoràta, Naudin. Stem less densely hairy than the above: lvs. more narrowly ovate, or ovate-oblong, acute, sparsely hairy, streaked with white along the veins; calyx sparsely hairy, not glandular; petals somewhat blunter, dilute purple. R.H. 1848: 381, as *Erionema marmorata*, Naudin. F.S. 7: 750, as *B. maculata*, var. *marmorata*, Planchon. Coigneaux recognizes two varieties, var. **genuina**, with lvs. green above, and banded with white along the veins; var. **ænea** (*Erionèma ænèa* and *B. ænea*, Naudin), with lvs. dark green with a coppery cast, but not spotted or only slightly so.

Mirándæi, Van Houtte. Spots red on the lower lvs. and white on the upper or younger ones: lvs. purple beneath. F.S. 21: 2235 (1875).

AA. *Veins lined on both sides with a white or colored band.*

B. *Bands and spots magenta or purple.*

maculàta, DC. Stem short, decumbent, rooting at the base, densely clothed with rusty hairs: lvs. long-petioled, cordate, broadly ovate, obtuse, hispid above and at margins, dark velvety green above, often spotted: calyx densely clothed with glandular hairs: petals obovate, somewhat acute, rose-colored. B.M. 4551.

Houtteàna, Van Houtte (*B. Van Houttei*, Hort.). Lvs. purple beneath. This was the sensational plant of 1874, and Van Houtte refused $2,000 for his stock of it. It was originated by his propagator, Marchand. F.S. 20: 2120.

BB. *Bands and spots silvery white.*

C. *Spots very distinct.*

Hrubyàna, Van Houtte. This has bars of white connecting the veins. The under side of the lvs. seems to be green instead of purple, at least toward the tip. F.S. 23: 2381.

Rodeckiàna, Van Houtte. Distinguished from the above and all others of this group by the abundance of dark red color in the upper surface of the lvs. Veins of the under side prominent and green. F.S. 23: 2382.

CC. *Spots very faint.*

Legrelleàna, Van Houtte (*B. Legrélle*, Hort.). There are a few longitudinal bars, but they do not connect the veins. Referred to *Gravesia guttata* by Coigneaux. F.S. 23: 2407.

Other trade names are *B. guttàta*, Hook. f.=Gravesia guttata.—*B. margaritàcea*, Hort. Bull.=Salpinga margaritacea.—***B. primulæflòra***, Hort.=Monolena primulæflora.—*B. pubescens*, Hort., with long white hairs and a chocolate band down the center. Equador.—*B. punctatissima*, Hort.—*B. superbissima*, Hort. (B. superba? Hort.) with rose-colored spots, which are larger and brighter near the margin. F.M. 15 (1875).—Probably a var. of Gravesia guttata.

WM. SCOTT, Tarrytown, N. Y., and W. M.

BERTONERÌLA. A class of handsome foliage plants, presumably hybrids between Bertolonia and Sonerila. I.H. vol. 43 (1896). For culture, see *Bertolonia*.

BESCHORNÈRIA (after H. Beschorner, German botanist). *Amaryllidàceæ*. Succulent desert plants, allied to Bravoa and Doryanthes. Lvs. in a rosette, glaucous, roughish at the margins, not so thick, firm or fleshy as in Agave (which has a strong end-spine and horny marginal prickles): roots-tock short, tuberous. In Beschorneria, the perianth is usually reddish green, with scarcely any tube and with long, oblanceolate segments; in Doryanthes the perianth is bright red, the segments long, narrowly falcate; in Bravoa the perianth is red or white, the tube curved, subcylindral, and the segments short. J. G. Baker, Amaryllideæ, 161. Culture similar to Agave. The species are very closely allied, and difficult to distinguish. The following are the only kinds well known, and they are all from Mex. They flower at long, irregular periods, as do century plants.

The species succeed best when treated similarly to Agaves, with the exception of the soil, which may be made richer by the addition of crushed bone and a little vegetable mold. All of the species need greenhouse protection in the northern states. Useful for bedding.

A. *Roughish on both surfaces of lvs.*

tubiflòra, Kunth. Lvs. 12 or more, $1\frac{1}{2}$–2 ft. long, 1 in. broad, linear, long-acuminate, narrowest of the genus. B.M. 4642.—The oldest and best known species.

AA. *Roughish beneath and on the margins of lvs.*

B. *Lvs. very glaucous.*

Tonèlii, Jacobi (*B. Tonelliàna*, Jacobi). Allied to *B. tubiflora*, but with looser habit and much broader lvs. Lvs. 15–20, 1–$1\frac{1}{2}$ ft. long, 2–$2\frac{1}{2}$ in. broad, short-acuminate, and more boldly contracted below the middle. B.M. 6091.

BB. *Lvs. less glaucous.*

C. *Base of lvs. thick, about $\frac{1}{2}$ inch*

Dekosteriàna, C. Koch. Lvs. 15–20, 2–$4\frac{1}{2}$ ft. long, 2–$2\frac{1}{2}$ in. broad, oblanceolate, long-acuminate, very gradually tapering both ways from the middle, 1–$1\frac{1}{4}$ in. broad above the base: the bases thickest in the genus. B.M. 6768.

CC. *Base of lvs. thinner.*

D. *Narrowed to less than 1 inch above the base.*

bracteàta, Jacobi. Lvs. 20–30, $1\frac{1}{2}$–2 ft. long, 2 in. broad, short-acuminate; texture thin but firm. B.M. 6641.—In the picture the margins are rougher than in any other species, and they are also wavy or revolute at intervals.

DD. *Narrowed to $\frac{1}{2}$ inch above the base.*

yuccoìdes, Hook. f. Lvs. about 20, 1–$1\frac{1}{2}$ ft. long, 2 in. broad, lanceolate, short-acuminate. B.M. 5203.—The lvs. are broader than in *B. tubiflora*, shorter acuminate, and more boldly narrowed below the middle. In the picture cited, the lvs. seem more spreading and less revolute than in the rest of the genus.

B. Californica is offered by Dr. Franceschi, Santa Barbara, Calif., without description.

As Beschornerias can be certainly identified only when in flower, the following key is added:

A. Inflorescence racemose.
  B. Fls. highly colored, purple and red—*Tonelii*.
  BB. Fls. dull-colored, reddish green—*tubiflora*.
AA. Inflorescence panicled.
  B. Fls. 2 or 3 in a cluster—*Dekosteriana*.
  BB. Fls. more numerous in the cluster, 3–7.
    C. Peduncles bright red—*yuccoides*.
    CC. Peduncle dull reddish brown—*bracteata*.

G. W. OLIVER and W. M.

BESLÉRIA (after Basil Besler, Nuremberg apothecary, and reputed author of the superb Hortus Eystettensis, 1613). *Gesneràceæ*. Tropical plants, mostly subshrubs, with somewhat 4-angled stems, large, membranaceous, opposite, petiolate lvs, prominently veined beneath, and yellow, white or purple fls. *B. Imray* is herbaceous, with serrate lvs, and yellow axillary fls. B.M. 6341. Prop. by cuttings. None are known to be offered in America.

BÉSSERA (after Dr. Besser, professor of botany at Brody). Mexican Coral Drops. An exceedingly pretty summer-flowering bulbous plant, with umbels of pendulous fls., which are vermilion outside, have a white corona or cup within, and long, purple stamens. It is a monotypic genus allied to Androstephium. Perianth cup-shaped, the tube shorter than the oblong-lanceolate segments; stamens 6. Culture simple. Bulbs planted out, and lifted when ripe. Belongs to lily family.

élegans, Schult. f. Bulb globular, 1 in. thick, tunicated: lvs. 2–3, about 10–12 in., or even 2 ft., long; scape 1–2 ft. long, hollow, fragile; umbels 4–10-fld.; pedicels 1–1½ in. long; perianth 9–10 lines long, keeled on the back, variously marked with white within, but usually with vermilion margins and center-band: fls. borne through two months of late summer and early autumn. G.F. 4:425. Gn. 25:423. B.R. 25:34. B.R. 1546, as *Pharium fistulosum*. F.S. 4:424, as *B. miniatum*.—Strong bulbs sometimes throw up 6–10 scapes, with 12–20-fld. umbels. W. M.

BÈTA (Latin name). *Chenopodiàceæ*. Perhaps a dozen or 15 species of herbs, ranging from the Canary Islands to eastern India. One polymorphous species yields the cultivated Beets. This is *B. vulgaris*, Moq., the original form of which is perennial, and grows on the coasts of southern Europe, reaching as far N. as the Straits of Dover. Moquin (DC. Prodr. 13, pt. 2:56) divides the derivatives of this species into three groups: (1) The slender- and hard-rooted, essentially wild forms, including *B. maritima* of Linnæus; (2) Leaf Beet (*B. Cicla*), comprising the various kinds of Chard or Spinach Beet (see *Chard*); (3) the common garden Beets, or Beetroot. The ornamental Beets, grown for their handsome colored lvs., are akin to the Chards. All these races have been developed in comparatively modern times, probably from one original form. Cf. Sturtevant, Amer. Nat. 1887:433. See *Beet*. L. H. B.

BETEL, or BETLE. The leaf of *Piper Betle*, a kind of pepper used in wrapping the pellets of betel-nut and lime which are commonly chewed in the Orient. The pellets are hot, acrid, aromatic, astringent. They redden the saliva and blacken the teeth, and eventually corrode them. The betel-nut is the fruit of *Areca Catechu*, a palm.

BETÓNICA and BETONY. See *Stachys*.

BÉTULA (ancient Latin name). *Betulàceæ*, a tribe of *Cupulifera*. Birch. Trees or shrubs, with the bark usually separating into thin, papery plates: lvs. alternate, deciduous, petioled, serrate; fls. monœcious, apetalous, in catkins, opening in spring with the lvs.; staminate catkins usually long and pendulous, formed in the autumn and remaining naked during the winter, every scale bearing 3 fls., each with 2 stamens divided at the apex; pistillate catkins oblong or cylindrical, bearing in the axil of every scale 3 naked ovaries; fr. a minute nut, often erroneously called seed, with membranaceous wings, dropping at maturity with the bracts from the slender rachis. About 35 species in N. America, Europe, N. and Cent. Asia, especially in the northern regions. No tree goes farther north than the Birch; in N. America *B. papyrifera* reaches 66° N. lat., and in Europe *B. alba* goes to the North Cape, and is still a forest tree at 70°. The hard and tough wood is often used in the manufacture of furniture and of many small articles, in making charcoal, and for fuel; from the bark, boxes, baskets, and many small articles are made; also canoes from that of the *B. papyrifera*; in Russia and Siberia it is used in tanning leather. The sap of some species is used as a beverage. The Birches are very ornamental park trees, hardy, except 2 or 3 Himalayan species, and especially valuable for colder climates. Their foliage is rarely attacked by insects, and turns to a bright or orange-yellow in fall. Their graceful habit, the slender, often pendulous branches, and the picturesque trunks make them conspicuous features of the landscape. Especially remarkable are those with white-colored bark, as *B. papyrifera*, *populifolia*, *alba*, *Ermani*, and also *B. Maximowiczii* with yellow bark. Most Birches prefer moist, sandy and loamy soil; but some, as *B. alba* and *populifolia*, grow as satisfactorily in dry localities and poor soil as in swamps and bogs, and they are especially valuable in replanting deserted grounds as nurses for other trees; both are comparatively short-lived trees. Prop. readily by seeds, gathered at maturity and sown in fall, or usually kept dry during the winter, or stratified; but *B. nigra*, which ripens its fruits in June, must be sown at once, and by fall the seedlings will be several inches high. The seeds should be sown in sandy soil, slightly or not at all covered, but pressed firmly into the ground and shaded. The seedlings must be transplanted when one year old. Rarer species and varieties are grafted, usually on *B. lenta*, *papyrifera*, *nigra* or *alba*. Cleft or tongue-grafting in early spring, on potted stock in the greenhouse, is the best method. Budding in summer is also sometimes practiced. Shrubby forms may also be increased by layers, and *B. nana* by greenwood cuttings under glass. Monographs by Regel: Monographische Bearbeitung der Betulaceæ (1861); and in De Candolle, Prodromus, 16, 2, p. 162 (1869).

Index: alba, 10; atropurpurea, 10; *Bhojpattra*, 2; Carpatica, 10; cordifolia, 8; costata, 6; Dalecarlica, 10; Ermani, 5; excelsa, 4, 10; fastigiata, 10, 13; glandulosa, 12; Japonica, 10; *laciniata*, 10, 9; lenta, 3; lutea, 4; Maximowiczii, 1; minor, 8; nana, 14; nigra, 7; occidentalis, 11; *odorata*, 10; *papyracea*, 8; papyrifera, 8; pendula, 10, 9; persicifolia, 14; *platyphylla*, 8; Pontica, 10; populifolia, 9; pubescens, 10; pumila, 13; *pyrifolia*, 8; *rubra*, 7; tortuosa, 10; urticifolia, 10; utilis, 2; *verrucosa*, 10.

A. *Veins of lvs. more than 7 pairs, usually impressed above. Trees.*

B. *Lvs. large, 4–6 in. long, deeply cordate: cones cylindrical, racemose, 2–4.*

1. **Maximòwiczii**, Regel. Tree, 80–90 ft., with smooth, orange-colored trunk and dark reddish brown branchlets: lvs. long-petioled, broadly ovate, coarsely and doubly serrate, membranaceous, pubescent on younger trees, nearly glabrous on older ones: cones ⅔–3 in. long, slender, nodding; fr. with very broad wings. Jap.—This is probably the most beautiful of all Birches, perfectly hardy north and of rapid growth; its large foliage and the yellow color of the trunk render it a highly ornamental and conspicuous park tree.

BB. *Lvs. 2–5 in. long: cones solitary, erect: wings narrower than the fruit.*

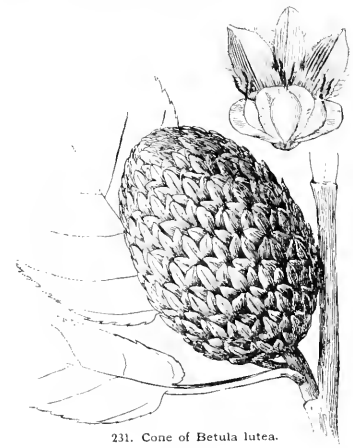
C. *Shape of lvs. ovate or oblong-ovate, rounded and often cordate at the base, broadest about the middle: veins distinctly impressed above, comparatively short-petioled.*

2. **útilis**, Don (*B. Bhojpáttra*, Wall.). Tree, 40–60 ft.: trunk with reddish brown bark: lvs. ovate, rounded at the base, acuminate, densely irregularly serrate, pubescent when young, 2–3 in. long, with 8–12 pairs of veins: cones peduncled, cylindrical, 1–2 in. long; bracts with erect oblong lobes, the middle one much longer. Himal., Jap.—Not quite hardy N.

3. **lénta**, Linn. Cherry, Sweet, or Black Birch. Tree, 60–70 ft.: trunk dark reddish brown, young bark aromatic, of agreeable flavor: lvs. oblong-ovate, usually cordate at the base, sharply and doubly serrate, hairy beneath when young, nearly glabrous at length, 2–5 in. long: cones ovoid-oblong, 1–1½ in. long; bracts with broad lobes, the middle one slightly longer. From Newfoundland to Florida, west to Illinois and Missouri. S.S. 9:448. Em. 232.—Very handsome tree, round-headed, and with pendulous branches when older; attractive in spring, with its long staminate catkins.

4. **lútea**, Michx. (*B. excélsa*, Pursh, not Ait.). Yellow Birch. Fig. 231. Tree, sometimes 100 ft.: bark

silvery gray or light orange, on old trunks reddish brown; young bark aromatic, but somewhat bitter; branchlets usually pilose; lvs. ovate or oblong-ovate, usually rounded at the base, acuminate, sharply and



231. Cone of Betula lutea.
Natural size

doubly serrate, usually hairy along the veins beneath; cones like the last, but thicker, and bracts larger, pubescent outside. From Newfoundland south to N. Carolina and Tenn., west to Minn. S.S. 9:449. Em. 235.—One of the most valuable forest trees in the northern states, much resembling the former in habit. Var. **persicifòlia**, Dipp., has larger and longer lvs., often ovate-lanceolate.

cc. Shape of lvs. ovate, broad and usually truncate, sometimes cordate at the base; veins not impressed above; long-petioled.

5. **Érmani**, Cham. Tree, 60 ft.; trunk white; branches orange-colored; branchlets usually glandular and pubescent when young; lvs. broadly triangular-ovate, acuminate, irregularly coarsely serrate, 2–4 in. long, hairy when unfolding, with 7–10 pairs of veins; cones oblong; bracts pubescent, with linear-oblong lobes, middle one somewhat longer. N. E. Asia, Japan.—Handsome round-headed tree, with slender branches.

6. **costàta**, Trautv. Tree, 50 ft.: bark yellowish brown; branches not or slightly glandular; lvs. ovate, rarely oblong-ovate, irregularly doubly serrate, with 9–12 pairs of veins, long acuminate, 2–3½ in. long, glabrous; cones elliptic; bracts glabrous, with short, rhombic or obovate lateral lobes. Japan, Manchuria.

ccc. Shape of lvs. rhombic-ovate, cuneate at the base; veins slightly impressed above; petioles rather short; cones erect, peduncled, cylindrical.

7. **nigra**, Linn. (*B. rùbra*, Michx.). Red or River Birch. Tree, 50–90 ft.; bark reddish brown, or silvery gray on younger branches, separating into numerous thin, papery flakes; branchlets pubescent; lvs. rhombic-ovate, acute, doubly serrate, pubescent when young, at length only on the veins beneath, pale or glaucescent beneath, 2–3½ in. long; cones 1–1½ in. long, cylindrical, ripening in May or June; bracts pubescent, with erect, linear-oblong, nearly equal lobes. From Mass. south to Fla. and west to Kans. and Minn. S.S. 9:452. —A moisture-loving, graceful tree, with slender, very numerous branches, and remarkable for its torn and ragged bark.

aa. Veins of lvs. 7 or less, not impressed pairs.

B. Wings usually broader than the nut.

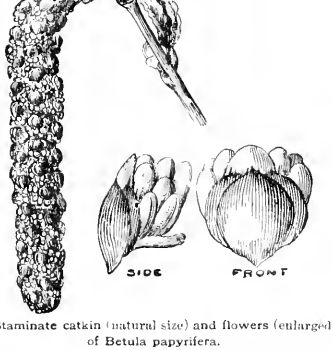
c. Trunk with white bark. Trees; rarely shrubs.

8. **papyrifera**, Marsh. (*B. papyrácea*, Ait.). Paper or Canoe Birch. Fig. 232. Tree, 60–80, exceptionally 120, ft.; branchlets glandular, hairy when young; lvs. ovate, narrowed to cordate at the base, acuminate, coarsely and usually doubly serrate, pubescent on the veins beneath or nearly glabrous, 1½–4½ in. long; cones peduncled, 1–2 in. long; bracts with short and broad divergent lateral lobes. N. states from the Atlantic to Pacific coast. S.S. 9:451. Em. 238. G.F. 8:223. —Ornamental tree, with very white trunk and a loose, graceful head when older. Var. **cordifolia**, Regel. (*B. pyrifolia* and *platyphýlla*, Hort.). Lvs. broadly ovate, usually cordate, large. Var. **minor**, Tuckerm. Low, bushy tree with smaller lvs. and frs. Mts. of N. Eng. and N. York.

9. **populifòlia**, Ait. (*B. álba*, var. *populifolia*, Spach.). White Birch. Small tree, exceptionally 40 ft., with smooth white bark; branchlets with numerous resinous glands; lvs. slender, petioled, triangular or deltoid, long acuminate, coarsely doubly serrate, glutinous when young, glabrous at length and shining; cones slender, stalked, cylindrical, about 1 in. long; bracts pubescent, the lateral lobes divergent, about as long as the middle one. From N. Brunswick to Delaware, west to Ontario. S.S. 9:450. Em. 1:242.—A small, graceful, but short-lived tree, yet thriving in dry and poor soil. Var. **laciniàta**, Hort. Lvs. incised-laciniate. Var. **péndula**, Hort. Branches distinctly pendulous. Var. **purpurea**, Hort. Lvs. purple when young, green at length. *B. populifolia* × *papyrifera* is shown in G.F. 8:356.

10. **álba**, Linn. European White Birch. Fig. 233. Tree, sometimes 80 ft., with white bark; lvs. slender petioled, ovate or rhombic-ovate, acute or acuminate, doubly serrate; cones erect or pendulous, cylindrical; bracts with horizontally spreading lateral lobes about as long as the middle one. From Eu. to Jap.—This very variable species may be divided into 2 subspecies:

(1) **péndula**, Roth (*B. verrucòsa*, Ehrh.). Branches more pendulous, glabrous, usually glandular; lvs. rhombic-ovate, glutinous when young; cones all pendulous. The following varieties belong here: Var.



232. Staminate catkin (natural size) and flowers (enlarged) of Betula papyrifera.

atropurpùrea, Hort. Lvs. dark purple. Var. **Dalecárlica**, Linn. (*B. laciniàta*, Hort.). Fig. 234. Lvs. more or less deeply lobed with incised-serrate lobes. Var. **fastigiàta**, Hort. Of straight, upright, columnar growth. Var. **Japónica**, Miq. (*B. álba*, var. *Taüschi*,

Regel.). Lvs. broad-ovate, usually truncate at the base. Var. **péndula**, Hort. Branches slender, distinctly pendulous; cult. in several different forms, as var. **pendula laciniata**, Hort., with laciniate lvs.; a very graceful form (Fig. 234); var. **péndula élegans**; var. **pendula Youngi**, and others.

(2) **pubéscens**, Ehrh. (*B. odoràta*, Bechst.). Less pendulous or upright, sometimes shrubby; branchlets usually pubescent, not glandular: lvs. ovate, pubescent beneath, at least when young: cones pendulous or erect. The first grows more in dry situations, while the latter is found growing in moist places, often in swamps. To this subspecies belong the following varieties: Var. **excelsa**, Regel. (*B. excélsa*, Ait.). Tree: lvs. ovate, short petioled, pubescent beneath. Var. **pubescens**, Regel. Branches and lvs. pubescent, at least when young; lvs. ovate, acute. Var. **urticifólia**, Spach. Lvs. small, deep green, irregularly incised-serrate, unequal at the base. Var. **Carpática**, Regel, **Póntica**, Dipp., and **tortuosa**, Regel, are small trees, without any horticultural value.

cc. Trunk with dark bronze-colored bark.

11. **occidentàlis**, Hook. Small tree, occasionally 40 ft.; branchlets slender, glandular: lvs. broadly ovate or nearly orbicular, acute or obtuse, sharply serrate, short-petioled, glabrous or sparsely pubescent at the veins beneath, 1–2 in. long: cones $\frac{1}{2}$–$1\frac{1}{4}$ in. long; bracts with erect, oval lobes, the middle one usually longer. Northwest Amer., east to Dakota and Nebraska. S.S. 9: 453.

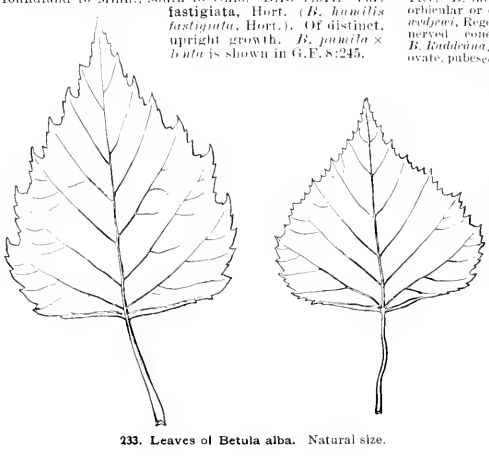
BB. *Wings smaller than the nut: shrubs 1–15 ft.: lvs. small, short-petioled: cones erect.*

c. Branchlets glandular, not pubescent.

12. **glandulósa**, Michx. Only 1–4 ft.: lvs. short-petioled, rounded or cuneate at the base, orbicular or broadly obovate, obtuse, dentate, glabrous, $\frac{1}{4}$–$1\frac{1}{2}$ in. long: cones peduncled, $\frac{1}{2}$–$\frac{3}{4}$ in. long: lobes of bracts nearly equal, slightly spreading. Newfoundland to Alaska, south to Michigan, and in the Rocky Mountains to Colorado. B.B. 1: 510.

cc. Branchlets pubescent or nearly glabrous, not glandular.

13. **púmila**, Linn. Usually 2–8 ft., rarely 15: branchlets tomentose or pubescent, at least when young: lvs. orbicular or oval, acute or obtuse, coarsely dentate, pale and glabrous or pubescent beneath, $\frac{1}{2}$–2 in. long; cones peduncled, $\frac{1}{8}$–1 in. long; lateral lobes of the pubescent bracts spreading, shorter than the middle one. Newfoundland to Minn., south to Ohio. B.B. 1: 511. Var. **fastigiata**, Hort. (*B. humilis fastigiata*, Hort.). Of distinct, upright growth. *B. pumila* × *lenta* is shown in G.F. 8: 245.



233. Leaves of Betula alba. Natural size.

14. **nàna**, Linn. Low, spreading, rarely 4 ft.: lvs. orbicular or cuneate-obovate, crenate, rounded at apex, glabrous, $\frac{1}{4}$–$\frac{3}{4}$ in. long: cones nearly sessile, $\frac{1}{4}$–$\frac{1}{2}$ in. long; the upper bracts usually entire, the lower ones

234. Cut-leaved Weeping Birch—Betula alba.

3-lobed. Arctic N. E. Amer., N. Eu., Siberia. B.B. 1: 511. —A low, graceful shrub for rockeries and rocky slopes.

B. alnoides, Hamilt. (*B. cylindrostachya*, Wall.) Tree, 50–60 ft.: bark brown: lvs. ovate-oblong, doubly cuspidately serrate: cones racemose. Himal. Tender.—*B. alpestris*, Fries = B. intermedia.—*B. carpatolòia*, Ehrh = B. lenta.—*B. coerulifòlia*, Regel. Allied to B. nigra. Lvs. broad elliptic or obovate, coarsely dentate: cones cylindrical. Japan. *B. cylindrostachya*, Wall. = B. alnoides.—*B. Dahurica*, Pall. Tree, to 60 ft.: bark brown: lvs. ovate, pubescent on the veins beneath, 1–2 in. long: cones oblong. Dahur., Manchuria.—*B. fruticosa*, Pall. Shrub, to 15 ft.: lvs. ovate, glabrous at length and usually glandular beneath, 1–2 in. long. Siber., Manchuria.—*B. Gmelini*, Bunge = B. fruticosa.—*B. grandis*. Schrad. = B. papyrifera.—*B. grossa*, Sieb. & Zucc. Allied to B. lenta. Lvs. ovate, unequally serrate, $\frac{1}{2}$–2 in. long: lobes of bracts rounded. Jap.—*B. humilis*, Schrank. Two to 6 ft.: branchlets glandular: lvs. $\frac{1}{2}$–$1\frac{1}{4}$ in. long, crenately serrate, glabrous. M. and N. Eu., N. Asia.—*B. hybrida*, Bechst. Natural hybrid of B. pendula × pubescens. Tree.—*B. intermèdia*, Thomas (B. alba × nana). Shrub: lvs. orbicular or ovate, $\frac{1}{2}$–1 in. long, glabrous. N. Eu.—*B. Middendorfii*, Regel. Tree, allied to B. Ermani: lvs. elliptic, 8–11-nerved, cones cylindrical. Transcaucasia. Gt. 36, p. 384.—*B. Reddèana*, Trautv. Allied to B. fruticosa. Tree: lvs. small, ovate, pubescent on the veins beneath: cones oblong. Caucasus. Gt. 36, p. 384.—*B. utilifòlia*, Sieb. & Zucc. Tree: lvs. ovate, doubly serrate, with 10–14 pairs of veins: bracts of cone with linear oblong lobes. Jap.—*B. Youngi pendula*, Hort = B. alba, var. pendula Youngi.

ALFRED REHDER.

BIÁRUM (old and obscure name). *Araceæ*. Dwarf, tuberous perennials of the same tribe with our native jack-in-the-pulpit. They are hardy in England, but probably are suitable only for pot-culture in the northern U. S. They have a spathe which is tubular at the base, mostly with a long limb, and usually a long tail-like spadix. They grow a few inches high. Odd. Little known in America.

tenuifólium, Schott (*Arum tenuifólium*, Linn.). Lvs. linear-lanceolate or spatulate, appearing after the fls. decay: spathe long-acuminate, at length recurved and twisted spirally, about 10 in. long, outside green, streaked purple; inside dull purple, spotted; margins wavy: spadix 15 in. long. Spain. B.M. 2282.

Pyrámi, Eng. (*Ischarum Pyrámi*, Schott). Lvs. oblong above the middle, narrowing abruptly to a very long petiole, resembling

Calla palustris: spathe green outside, shining, velvety purple within, shorter and broader than in *B. tubiflorum*, at length revolute; tube swelling, connate only at the very base; spadix thicker and shorter. Syria. B.M. 5324.

Bövei, Blume. Lvs. similar to *B. Pyrami:* spathe-tube connate a fourth of its length; blade of spathe longer and more narrowly lanceolate, green outside, dark purple within. Syria, Asia Minor.

BIDENS (Latin, *twice-toothed*, referring to the seed). *Compósita*. Bur Marigold. Mostly American hardy annual and perennial herbs, allied to Dahlia and Coreopsis, and distinguished by the barbed awns of the seed, which, in *B. frondosa*, our common Stick-Tight, or Devil's Bootjack, are very troublesome by clinging to the clothing. **B. grandiflòra,** Balb., from S. Amer., is a yellow-fld. hardy annual, growing 2 ft. high, bearing glabrous pinnatisect lvs.; occasionally cult. For *B. atrosanguinea*, Hort., see *Cosmos diversifolius*.

BIENNIAL. A plant living two years; particularly one which does not bear flowers and fruit until the second year from the seed. Plants vary greatly in their duration, depending upon the climate in which they grow and the treatment which they receive. Comparatively few plants are true biennials. The common mullein and bull thistle (*Cnicus lanceolatus*) are examples. Most cultivated biennials become annuals if grown in a warm or long-season climate, as turnips, celery, cabbage, onion. If the plants are crowded, or not allowed to attain their full development, they tend to run to seed and complete their growth the first year. Gardeners are familiar with this fact in celery, carrots and beets. Plants which are practically annuals under such conditions, but which have the power of carrying themselves over winter by means of bulbs, corms, tubers, and other food-storage parts, have been called *pseud-annuals*. DeCandolle estimates that true or natural biennials comprise 1 or 2 per cent of the total number of species of seed-bearing plants.

L. H. B.

BIFRENÀRIA (Latin for *twice* and *strap*, referring to the connective of the pollinia). *Orchidàcea*, tribe *Vándeæ*. Very like Maxillaria, and distinguished by technical characters of the pollinia. About 25 trop. Amer. species, of which the two following are best known to the horticulturist. These species do well at the cool end of the Cattleya house, and, in general, should be treated like Maxillaria and Lycaste.

aurantiaca, Lindl. Pseudobulbs ovate or ovoid, monophyllous; leaf-blades about 6 in. long, oval or nearly so; fls. about 1 in. across, yellow, dotted with deeper yellow. British Guiana. B.M. 3597.

vitellìna, Lindl. Fls. deeper yellow than in the above, with a brown spot on the labellum. Brazil.

Oakes Ames.

BIGELÒVIA (after Dr. Jacob Bigelow, author of Florula Bostoniensis, Medical Botany of U. S., etc.). *Compósitæ*. The only species in cult. is the original one, which resembles a goldenrod. Prop. by cuttings and by seed. Culture simple.

gravèolens, Gray (*Bigelòwia dracunculoìdes*, DC.). Low shrub, 1–6 ft. high, densely white-tomentose, much branched, very leafy, malodorous only in drying; lvs. linear, 1–2 in. long; fl.-heads, yellow, 5–8 lines high, very numerous, crowded, in terminal corymbose cymes, rayless. Alkaline soils Dak. to B. C. and S. to S. Calif. and Ariz. Var. **albicaùlis** is more permanently and densely woolly, dwarfer, and recommended by D. M. Andrews, Boulder, Colo., for low hedges and edgings.

BIGELOW, JACOB. Botanist, physician, educator, and founder of Mt. Auburn Cemetery, the prototype of all garden and landscape cemeteries, was born at Sudbury, Mass., February 27, 1787, and died at Boston, January 10, 1879. He was graduated from Harvard in 1806, and began the practice of medicine in 1810. His Florula Bostoniensis, 1814 (2d ed. 1824), was the first American local flora of importance, and served for many years as the only popular manual of New England botany. He was Professor of Materia Medica in Harvard from 1815 to 1855, and for twenty years Physician to the Massachusetts General Hospital. His American Medical Botany, 1817–20, was the first work of its kind. Each of the three volumes contained descriptions of 20 species, with a colored plate of each produced by the aqua-tinting process, a method invented by Dr. Bigelow just before lithography. His essay on "Self-limited Diseases," an attack on heroic remedies and a plea for the recuperative processes of nature, marked an epoch in medical reform. Dr. O. W. Holmes said that it probably had more influence on medical practice in America than any work ever published in this country. He also did much to introduce science into colleges that were too exclusively classical. The genus Bigelovia, named after him by DeCandolle, was founded on a western plant resembling goldenrod. He was the one man without whom Mt. Auburn Cemetery would never have existed. This cemetery has been one of the most important factors in the development of landscape gardening in America, and without the revenues derived from it the Massachusetts Horticultural Society could never have played so important a part in American horticulture. Dr. Bigelow was one of the most versatile, useful and interesting men of his day. The popular use of the word "technology" dates from his "Elements of Technology," 1827. For a fuller account, see the sketch by L. H. Bailey, in Botanical Gazette, 8: 217 (1883), and Scientific Papers of A. Gray, 2: 413. See, also, Dr. Bigelow's book on the history of Mt. Auburn.

W. M.

BIGNÒNIA (The Abbe Bignon, librarian to Louis XIV.). *Bignoniàceæ*. Climbing American shrubs, mostly tropical, of more than 100 species. Fls. mostly large and showy, long-tubular, with a contracted base, 5-lobed or -toothed, 2-lipped limb; perfect stamens 4; seeds winged, in a linear, compressed capsule.

Bignonias are strong and rapid-growing evergreen greenhouse climbers, requiring considerable space for their best development, such as the roof of a large conservatory, or the back wall of a lean to greenhouse. If convenient, they should be planted out under the plant stage of the greenhouse, or otherwise in boxes placed on the stage. A box 5 ft. x 1½ ft. and 1 ft. deep will be found a convenient size for them. As with most greenhouse climbing plants, the roots like considerable freedom; but with Bignonias the roots must be somewhat restricted (though not to the limitations of a flower-pot), otherwise an immense growth and few flowers will be the result. They are not very fastidious as to soil. A good, fibrous loam, to which one-third well decomposed cow or sheep manure has been added, suits them admirably. A winter temperature of 45° to 50°, with a gradual rise as the days lengthen, should be given them, admitting air freely whenever the weather is favorable. They like plenty of moisture at the roots—especially during the spring and summer (the growing season)—but perfect drainage should be ensured, as the soil at no time must become saturated or sour. Except when in flower, a good syringing on all fine days will be very beneficial. They should also be sprayed once or twice a week with a moderately strong solution of kerosene emulsion, or kerosene and water, to keep them free from mealy bug, as they are very subject to this pest. The vines should be trained so as to allow a free circulation of air among the branches for the purpose of ripening the wood, as upon this depends the assurance of flowers. All superfluous branches and weak shoots should be removed, and before the growing season begins all the branches should be shortened from 1 to 3 feet, according to their strength; this will throw the energy of the plant into the lateral buds, which will produce the flowering branches, providing the wood has been properly ripened the previous season.

Propagation is effected by cuttings taken in late spring and inserted in sand under a bell glass, or in a propagating box, in a warm temperature. Choose, if possible, stout, short-jointed lateral growths for the purpose. They must be carefully watered until rooted, which usually takes from 6 to 10 weeks.

Cult. by Edward J. Canning.

A. *Lvs. simple, opposite.*

magnífica, Bull. Free-growing and floriferous, needing warm treatment: lvs. ovate-elliptic, stalked, entire:

fls. panicled, large (3½ in. across), ranging from mauve to purple-red, the throat primrose, limb wide-spreading. Colombia. G.C. II. 12:573.

regalis, Hort. Lvs. elliptic-lanceolate: fls. large, yellow and red. Guiana.—Of recent introduction. Requires warm treatment.

argyreo-violáscens, Hort. Lvs. ovate, cordate at base, short-stalked, purple when young, but becoming beautifully veined and blotched with white: fls. purple. S. Amer.? I.H. 13:469.

AA. *Lvs. pinnately compound, the 2 lower lfts. usually foliaceous and the others represented by tendrils.*

B. *Fls. normally from the axils of the lvs.*

c. *Peduncles 1-fld.*

capreolàta, Linn. TRUMPET-FLOWER. CROSS-VINE. QUARTER-VINE. Climbing to great heights (often 50 ft. or more), glabrous, evergreen: lfts. stalked, oblong-acuminate, cordate, entire: fls. in many 2–5-fld. short-peduncled cymes, yellow-red and lighter within, tubular (2 in. long), with a stout limb. Native from Md. S. and W., and often a pest in orchards, climbing on the trees. B.M. 864. Gng. 1:370, 371.—Handsome vine for outdoor use. Good for covering walls. Sometimes grown in conservatories. A cross-section of the stem presents a cross-form appearance, whence one of the common names.

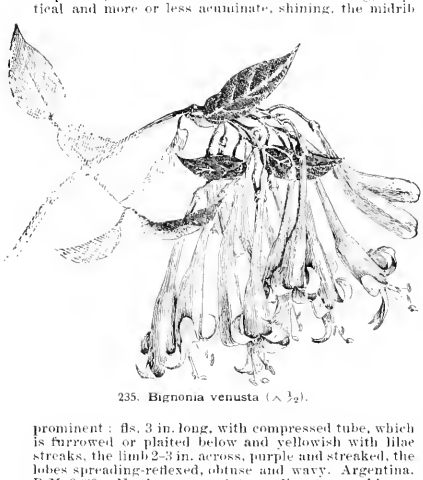
Var. **atrosanguínea,** Hook. f. (*B. atrosanguinea,* Hort.). Lvs. longer and narrower: fls. dark purple, the lobes short and triangular-ovate. B.M. 6501. F.R. 2:27.—Handsome.

Tweedièna, Lindl. Leaflets lanceolate and pointed, cordate, 3 in. or less long: fls. trumpet-shaped, 2 in. long, orange-yellow, the limb of rounded, spreading lobes and from 2–4 in. across. Argentina. B.R. 26:45. Gn. 40:812.—Will stand a little frost if grown in the open in the South.

cc. *Peduncles 2-fld.*

Lindleyi, DC. Glabrous: lfts. oblong or ovate-oblong, cordate, acute, somewhat wavy-margined: fls. pale purple, with spots and stripes, the tube oblong-cylindrical (2 in. long), the limb short and the lobes obovate-rounded and undulate. Argentina.—Blooms when young.

speciósa, R. Grah. Glabrous: leaflets 3 in. long, elliptical and more or less acuminate, shining, the midrib



235. Bignonia venusta (× ⅓).

prominent: fls. 3 in. long, with compressed tube, which is furrowed or plaited below and yellowish with lilac streaks, the limb 2–3 in. across, purple and streaked, the lobes spreading-reflexed, obtuse and wavy. Argentina. B.M. 3888.—Needs warm or intermediate temp.; blooms in spring and early summer. When grown in the open in the S., will stand a little frost.

BB. *Fls. in clusters terminating the branchlets.*

c. *Branches prominently 4-angled.*

buccinatoria, Mairet. (*B. Chevieri,* Lindl. *B. Kerère,* Hort.). Tall: leaflets 2–3 in. long, elliptic or ovate-oblong, obtuse or only cuspidate, pellucid-dotted, the petioles (as the racemes) tomentose: fl. long-tubular (4 in. long), blood-red, but yellow at base, the limb rather narrow, with retuse lobes. Mex. Gn. 26:471. B.M. 7516. R.H. 1898:580.—Needs coolhouse treatment. Strong grower. One of the finest species.

c. *Branches terete or very nearly so.*

æquinoctiàlis, Linn. Glabrous: Leaflets ovate to oval-lanceolate, obtuse or acuminate, shining above: fls. in both terminal and axillary panicles; corolla glabrous, trumpet-shaped, 2½ in. long, purple, with dark rose stripes (but said in garden books to be yellow); fls. sometimes only in 2's. W. Ind. and S. Amer.—Perhaps not the plant known under this name in the trade.

Chamberlaynii, Sims. Glabrous: leaflets ovate-acuminate, glabrous, shining above, paler beneath, more or less tapering at base: fls. tubular, contracted below, 3–4 in. long, the limb comparatively short and spreading, bright yellow; cluster many-fld. Braz. B.M. 2148. —Perhaps a form of the last. This species and *B. æquinoctialis* are referred to the genus *Anemopægma* by some.

venùsta, Ker-Gawl. Fig. 235. Sts. striate or somewhat angular, the young ones pubescent: leaflets usually 3, glabrous, ovate-acuminate, more or less tapering at base: fls. in corymbose, mostly drooping racemes; corolla slender and long-tubular, contracted in the lower half (2–3 in. long), with 2-lipped limb and oblong, obtuse, reflexing lobes, crimson-orange. Braz. B.M. 2050. A.F. 11:1023.—Requires a rather warm house. Profuse bloomer; early winter. One of the best rafter plants.

purpùrea, Lodd. Glabrous, tall-climbing: leaflets often 3, usually 2, lance-obovate, abruptly acuminate, short-stalked, toothed or entire: fls. mauve or rose-purple, with a white eye, the flaring tube 1 in. long, the wide-spreading lobes rounded. S. Amer. B.M. 5800. G.C. III. 24:399.—Requires warm treatment.

B. adenophýlla, Wall = Heterophragma.—*B. álba,* Hort. = Pithecoctenium.—*B. grandiflóra,* Thunb. = Tecoma.—*B. radicans,* Linn. = Tecoma.—*B. sarcódes,* Roxbg. = Stereospermum. —*B. Thunbergii,* Hort. = Tecoma.

L. H. B.

BILIMBI. See *Averrhoa.*

BILLARDIÈRA (after J. J. Labillardière, French botanist and traveler.) *Pittosporàceæ.* Tender Australian climbers, with terminal, solitary, pendulous, tubular, stalked fls., generally yellow, and edible fr. *B. longiflóra* and *B. scandens* are cult. abroad as greenhouse climbers. *B. cymósa,* cult. outdoors at Santa Barbara, Calif., is *Sollya heterophýlla.*

BILLBÈRGIA (for the Swedish botanist, J. G. Billberg). *Bromeliàceæ.* About 40 tropical American evergreen epiphytal herbs, now much cult. by amateurs and in fancy collections. A few kinds are well known to florists. A closely allied genus is Æchmea, which see for botanical differences. The fls. are in a spike or spicate panicle, which rises from the center of the rosette of long, spiny-edged, and usually stiff, pineapple-like lvs.: fls. showy, with 3-parted calyx and 3 long petals, 6 exserted stamens, thread-like style, and berry-like fr. The colored bracts of the fl.-clusters are usually very showy. Cf. Charles Mez, the latest monographer, in DC. Phaner. Monogr. 9. Species confused; but the artificial arrangement given below may aid the gardener.

Billbergias can be cultivated best in greenhouses, planted in pans, pots, wooden cribs, or wire baskets, with loose, light material about their roots, such as pieces of charcoal, roots of very fibrous plants, or fern roots and sphagnum moss, and such material. They require little water at the roots in winter, and nothing but light sprinkling over the foliage is required to keep them alive during that time. But in summer, when the heat is great and they are making their growth, they

can withstand an abundance of moisture, at the roots as well as at the top, most of the time holding water in the funnel-like center or body of the plant. They generally bring their conspicuous, showy flowers in the spring, when moisture overhead or sprinkling should be withheld in order to prolong the beauty of the flowers. They require at night a temperature of from 50°-75°, but, of course, can stand any amount of heat in summer. Billbergias, like all other Bromeliads, make very good house plants, and they will thrive exceedingly well in a living-room temperature. They love plenty of light and sun. All first-class private garden establishments should have at least a few of this class of plants. They are propagated best from suckers or sprouts, which arise from the base of the old plant, generally after it has bloomed and performed its functions. The old plant then gradually deteriorates, sending out from two to five young plants from its base. These can be taken off as soon as they are hardy and substantial enough, and can be mounted or potted into the same kind of material. Then, suspended in the greenhouse, conservatory, or window for an exhibition, they thrive best. Besides their beautiful and attractive flowers, they have very handsome foliage, which is of a tough and leathery texture. Billbergias, Æchmeas, and the like, are natives of the tropics, and, therefore, require a warm temperature. Æchmeas are usually larger than Billbergias and Tillandsias. Cult. by H. A. Siebrecht.

A. *Fls. greenish or yellowish, often tipped with blue.*

B. *Petals curling spirally after fl. expands.* (*Helicòdea.*)

zebrìna, Lindl. (*Bromèlia zebrìna,* Herb. *Æchmèa zebrìna,* Hort.). St. very short, or none: lvs. sheathing, deep green, with blotches and zones of gray-white, strongly spine-margined: fl.-cluster loose, long and drooping: fls. green or yellow-green, the stamens becoming long-exserted: bracts salmon or rose, long-lanceolate. S. Amer. L.B.C. 20: 1912. B.M. 2686.

decòra, Poepp. & Endl. (*Helicòdea Baraquiniàna,* Lem.). Differs from the last in having longer petals, denser spike and longer bracts: lvs. 8–10, from 1–2 ft. long, mealy, white-blotched and banded. Brazil. I.H. 11:421. B.M. 6937.

BB. *Petals not spirally twisting.*

speciòsa, Thunb. (*B. amœ̀na,* Lindl. *B. pállida,* Ker-Gawl). Lvs. strap-shaped, connivent, and forming a tube at the base, 1–2 ft. long, somewhat spine-margined, green above and lepidote and somewhat striped on the back: fl.-cluster large and loose, erect or drooping; bracts rose: fls. pale green or whitish, tipped with blue. Brazil. B.R. 1068.—An old and well known species.

nùtans, Wendl. Stemless, stoloniferous: lvs. linear and long-pointed, 1–2 ft., distantly small toothed, finely striate on the back: fls. 4–8, in a loose, drooping spike; petals green, blue-edged; bracts lanceolate, red. Brazil. B.M. 6423. Gn. 32, p. 107.

AA. *Fls. markedly red or purple.*

B. *Essentially red.*

thyrsoidea, Mart. Lvs. 1–2 ft., broad-ligulate, spine-margined, concave on upper surface, green above and paler beneath, abruptly acuminate: fl.-cluster shorter than lvs., farinaceous, densely red-bracted: fls. numerous, bright red, petals reflexing. Brazil. B.M. 4756.—Showy. Runs into several varieties, some of them with purple-tipped fls. (as vars. **splèndida** and **fastuosa,** André, R. H. 1883: 300). *B. splèndens,* Hort., is evidently one of the forms. Species too near the next.

pyramidàlis, Lindl. (*Bromèlia pyramidàlis,* Sims. *B. Croyiàna,* De Jonghe). A foot high: differs from the last in having more gradually acuminate lvs., which are more strongly and distantly toothed and whitish, or even banded on the back: fl.-cluster less farinaceous, broader and looser, the fls. less numerous. Peru. B.M. 1732.

BB. *Essentially purple.*

Morélii, Brongn. (*B. Moreliàna,* Hort. *B. Wötherellii,* Hook.). Lvs. short (1–1½ ft.), with few weak spines, wide, glabrous and green: fl.-cluster exserted and drooping, with showy, pointed red bracts, the rachis woolly: fls. with red sepals and purple-limbed petals. Brazil. B.M. 4835.—Very showy.

vexillària, André. Fig. 236. Hybrid of *B. thyrsoidea* and *B. Morelii.* Fls. purple: lower bracts long-pointed and red; spike-erect, exceeding the lvs. R.H. 1889: 468.

vittàta, Brongn. (*B. Lèopoldi,* Hort., not Morr.). Vigorous, 2–3 ft.: lvs. long and large, concave above, recurved at the summit, obtuse or abruptly pointed, red-spined, cross-banded on the back: fl.-cluster loose and nodding, shorter than the lvs., red-bracted: fls. deep blue, with recurving limbs. Brazil. Gn. 32: 608. R.H. 1869, p. 87.

236. Billbergia vexillaria.

Libonièana, De Jonghe. Small, 1–1½ ft., producing runners: lvs. long-linear or strap-shaped, spiny, very sharp-pointed, concave and green above and whitish-mealy below: fl.-cluster erect or nearly so, rather slender, the bracts not prominent: fls. with red sepals and erect blue petals. Brazil. B.M. 5090. F.S. 10: 1048.

Quesneliàna, Brongn. (*Quesnèlia Cayennènsis,* Baker). Lvs. numerous, arising from a trunk or stem, rigid and spreading or recurved, concave above, very sharp-spined, more or less white-marked on the back, long-acuminate: fl.-cluster a dense, erect spike, with red and white-blotched obtuse bracts: fls. deep purple. Guiana. F.S. 10: 1028.

In the American trade the following names have been used: *B. elarâta longifòlia,* once offered by Pitcher & Manda, is probably Æchmea bromeliæfolia.—*B. fasciata*=Æchmea fasciata.—*B. maxima*=?—*B. ornata*=?—*B. rhodocyanea*=Æchmea fasciata.—*B. stricta*=?

Any of the following may be expected to appear in the Amer. trade at any time: *B. Andegavènsis,* Hort., is B. thyrsoidea× Morelii; fls. red and blue.—*B. Bàkeri,* Morr. (B. pallescens, Baker). Fls. greenish, tipped purple. B.M. 6342.—*B. Breautèana,* Andre, B. pallescens × vittata, has reddish, purple-limbed fls. R.H. 1885: 300.—*B. Brùanti,* Hort. B. Bakeri × decora; fls. greenish, bracts red.—*B. Enderi,* Regel. Small: fls. very deep blue; bracts coral-red. Brazil.—*B. iridifòlia,* Lindl. Fls. red and yellow, blue-tipped. Brazil. B.R. 1068.—*B. Lietzei,* Morr. Fls. and bracts rose. Brazil.—*B. Porteàna,* Brongn. Fls. green, the petals rolling spirally. Brazil. B.M. 6670.—*B. Saunderiana,* Morr. Fls. green, tipped blue. Brazil.—*B. Saundersi,* Bull. Fls. greenish, tipped blue: lvs. striking, green above, reddish beneath, white-blotched and red-spined. Brazil. Gt. 39: 1316.

L. H. B.

BILSTED. See *Liquidambar.*

BINDWEED, Name applied to various twining, weedy plants, particularly to various kinds of Convolvulus.

BIÒTA. See *Thuya.*

BIRCH. See *Betula.*

BIRD-OF-PARADISE FLOWER. See *Strelitzia.*

BIRD'S-NEST FERN. See *Thamnopteris.*

BIRD'S-TONGUE FLOWER. See *Strelitzia.*

BIRTHWORT. See *Aristolochia;* also *Trillium.*

BISMARCKIA (in honor of Prince Bismarck). *Palmácea*, tribe *Borassea*. A genus nearly related to Latania and Borassus, distinguished by fruit characters. Forms a tree 200 ft. high, with a gigantic crown of palmate lvs. with white streaked petioles and blades 10 ft. in diam.; fr. borne in large, drooping clusters, dark brown, plum-like, 1½ in. in diam., with a thin outer shell and a fibrous inner one enclosing a rounded, wrinkled seed 1 in. in diam., reticulated like a walnut and ruminated, as in the nutmeg. Cult. as for Latania.

nóbilis, Hildeb. & Wendl. Young plants: petiole convex on the back, channelled above, finely serrate on the ridges above, thinly clothed with tufts of fibrous scales, half as long as the blade; blade blue-green, rigid, 3 ft. in diam.; segments 20, 2 in. wide, 1 ft. long, apex blunt, obtuse, with a long curved filament from the base of each sinus. Madagascar. G.F. 6: 246. F.R. 2: 257. Gt. 1224.

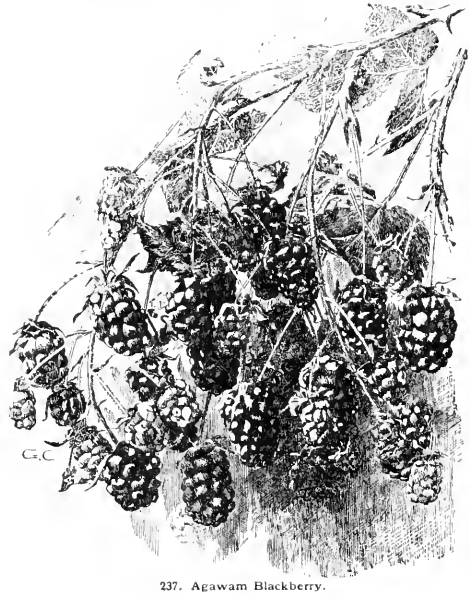
JARED G. SMITH

BITTER-SWEET. *See Celastrus* and *Solanum*.

BIXA (South American name). *Bixácea*. A genus of two species of tropical trees with large, entire lvs. and showy fls. in terminal panicles. *B. Orellana* is cult. in the E. and W. Indies for the Annatto dye which is prepared from the orange-red pulp that covers the seeds. It is the coloring matter chiefly used in butter and cheese. It is also used in dyeing silks, and preparing chocolate.

Orellana, Linn. Height 30 ft.; lvs. cordate; fls. pinkish. B.M. 1456.—It is rarely grown in northern greenhouses as an ornamental. Cuttings taken from a flowering plant will produce flowering plants of a convenient size. Plants from seed usually flower less freely, and must attain a greater size before flowering.

BLACKBERRY. A name applied to various species of Rubus, of which the receptacle remains with the drupelets when fruit is picked. As a commercial fruit, it is known only in America. Although a well-known wild fruit from the earliest times, the Blackberry has only recently made its appearance among the more orderly and promising garden fruits. The type species is *Rubus nigrobaccus*, although it has long been known under the name *Rubus villosus* (see *Rubus*). It is a most variable species, and the number of forms which may be recognized depends only upon the judgment of the botanist who is reviewing them. There are several distinct types or groups in cultivation. (1) The Long-Cluster Blackberries, *Rubus nigrobaccus*. The plants grow tall and upright, the leaflets are long-stalked, rather finely serrate and taper pointed. The flower cluster is long, leafless and open, with the individual flowers standing almost at right angles to the central stem. The fruit is normally oblong or thimble-shaped, sweet, rather dull in color, with drupelets small and closely packed. The Taylor is one of the best representatives of this class. (2) The White Blackberry, *R. nigrobaccus*, var. *albinus*. Similar to the above, but with nearly round, yellowish green canes and pinkish cream- or amber-colored fruit. Many varieties of this type have been introduced, but none have attained prominence. (3) The Short Cluster Blackberries, *R. nigrobaccus*, var. *salinus*. This is the commonest form of cultivated Blackberry, and includes such varieties as the Snyder, Lawton and Agawam (Fig. 237). In this type the clusters are shorter, but leafless, the pedicels more oblique, the fruits shorter and rounder, glossy black, the drupelets large and irregularly set. The leaflets are broader, coarsely and unevenly serrate, or jagged and less tapering at the point. (4) The Leafy-Cluster Blackberries, *R. argutus*. This is a lower and more bushy form, with narrow, coarsely toothed, light-colored leaflets and short cluster, having simple leaves intermingled with the flowers. Its best common representative is the Early Harvest. (5) The Loose Cluster Blackberries, *R. nigrobaccus* × *villosus*. This is a group of hybrid origin, being intermediate between the Blackberry and dewberry (see *Dewberry*). The plants have a low, spreading habit of growth, broad jagged and notched leaves, short dewberry-like clusters, with large, roundish fruits, made up of very large, loosely set drupelets. The Early Wilson and Wilson Junior are its best known representatives (Fig. 238). (6) The Sand Blackberry, *R. cuneifolius* (Fig. 239). A sturdy little shrub, armed with vicious recurved thorns, with thickish, wedge-shaped leaflets, whitened woolly beneath. The clusters are few-flowered, opening from the center outward, the fruit roundish, loose-grained, very black and good. Known in cultivation only as the Topsy, or Tree Blackberry. (7) There is still another type of Blackberry, known as the Thornless or Mountain Blackberry (*R. Canadensis*), but it is not in cultivation. This is characterized by smooth, unarmed canes, narrow, sharp-pointed leaflets, the upper ones borne on long, slender leaf-stalks, an open flower-cluster, a short, roundish, glossy black fruit, with large drupelets. It ripens later than the common Blackberry, and is not so good in quality. For further account of the Blackberry tribes, see Bailey, Evolution of Our Native Fruits.



237. Agawam Blackberry.

The first Blackberry introduced into cultivation was the Dorchester, which was exhibited before the Massachusetts Horticultural Society in 1841. This was followed by the Lawton a few years later, which became much more prominent. The Kittatinny soon divided honors with this, and both now largely have given place to the Snyder, which is undoubtedly the most widely grown variety of the present day. This, like many commercial fruits, is a variety of poor quality, but extremely hardy and productive. The rapid strides made by the Blackberry in cultivation prove that a place was ready and waiting for it in the pomological world, a place which it has proved itself eminently fitted to fill, owing both to its desirable qualities in general and to its ability to rapidly vary and develop new types. At the present time it is one of the most important, most generally liked and most profitable bush-fruits grown.

The Blackberry thrives on almost all soils, but to reach perfection demands a strong loam, retentive of moisture and tending toward clay rather than sand. Soil must be well drained at all times. If too rich in humus and nitrogen, a tendency toward a rank growth of plant, with diminished fruitfulness, appears, while a light, sandy soil will fail to carry the fruit through periods of

The Early Harvest Blackberry

drought, which is usually the greatest obstacle to success with this fruit. For this reason a cool northern exposure is always desirable, and in the region of the Plains, a good windbreak on the south and west is very beneficial. Fertilizers containing a liberal proportion of potash are most suitable. Too much stable manure, or nitrogen in other forms, will induce a rank growth of canes at the expense of fruit.

Plants are propagated either by root-cuttings, or by means of the suckers which naturally spring up about the parent plants. The latter are most commonly used in commercial work. Root-cuttings may be made in the fall and carried over winter in sand, or started under glass toward spring, or the cuttings can be made in spring and sowed in furrows, like peas. Planting is best done in spring, as a rule. If set in the fall, each plant should be covered with a mulch of earth or strawy manure, which should be removed in spring. The rows

238. Wild hybrid of Blackberry and Dewberry.

should be about 8 feet apart, and the plants may be set from 2 to 4 feet apart in the row. At the latter distance, cultivation may be given in both directions for the first year or two. With high culture, good results may be obtained by planting in hills, 7 or 8 feet apart each way.

Pruning the Blackberry is not difficult, yet upon its proper performance depends much of the success of the crop. The old canes should be removed yearly, preferably in summer, as soon as they have borne their crop of fruit. They then no longer interfere with the symmetrical development of the young canes, and if gathered and burned at once, much is gained in keeping the field clear of certain fungi and insects. The young canes should be clipped off when they reach a height of 18 inches or 2 feet, in order to induce early branching and a stocky bush with well developed laterals, capable of producing and holding up a heavy crop of fruit. It is very important that the shoots be not allowed to get higher than 2 feet before this clipping is done. They will then elongate and make the bush high enough. If neglected, and later cut back to 2 feet, the buds will be weak, the growth poor, the bush low, and the crop small. The laterals are usually cut back to about 18 inches in length the following spring, but varieties differ in their habit of bearing fruit-buds, and it is not safe to cut by measure. It should be remembered that this spring pruning is the method of thinning the Blackberry, and judgment must always enter into the question of thinning fruit. In the region of the Plains, where moisture is likely to be deficient, both in soil and atmosphere, it is frequently found better not to cut back the growing shoots in summer, but to let them develop one straight cane, which is cut back to $2\frac{1}{2}$ or 3 feet in spring. This will generally develop all the fruit which the plant can carry to maturity under such conditions. A few growers in other parts of the country train to wires, and in that case the shoots are also allowed to grow at will, but are left much longer in spring and tied to the wires for support. Close-pruned, stocky bushes may be covered with straw as a protection against late spring frosts.

The best of cultivation is always demanded. In a crop in which so much depends upon an abundant supply of moisture in the soil, none should be allowed to go to waste. Hence, the cultivation should be frequent and constant, but always shallow, for deep cultivation disturbs the roots and induces increased suckering. In small garden patches mulching may be substituted. Growers in the middle West have found mulching with green clover in the row, and cultivating between, very beneficial.

In many parts of the country winter protection is absolutely essential to success, and often adds greatly to the yield in other regions, where not considered a necessity. This protection is by no means always called for by reason of extreme cold. The winters of Nebraska and Kansas are nearly always milder than those of central New York; yet during one of the mildest of these, when the mercury reached zero but once, and was then only five degrees below, Taylor Blackberries were killed to the ground, while the succeeding winter, which was decidedly colder, they came through unharmed. It may be as much a matter of moisture as of temperature. The needed protection is best given by loosening the earth on both sides of the plant, carefully turning it down and covering the tips with soil, laying the next plant upon the roots of this, and so on. In mild climates, covering the tips is sufficient; in especially unfavorable ones the whole plant must be covered. The cost of this need not exceed $5 to $8 an acre

The fruit of the Blackberry should be left upon the

plants as long as possible before picking, for it is not ripe when it first turns black. It should never be exposed to the sun after it is removed from the bushes. The Blackberry generally outyields all the other members of this family, and is usually one of the most profit-

239. Sand Blackberry.

able to grow when properly managed, provided the climate and other general conditions are favorable.

There are several formidable enemies of the Blackberry, but they are generally easily mastered by the alert and energetic grower. Cutting out the bearing canes as soon as they are through fruiting will circumvent the borer which sometimes works in the canes, and will aid in preventing the spread of anthracnose and leaf rusts. The orange rust must be fought by digging up and burning infected bushes as soon as detected, for there is no cure. But this trouble is seldom serious.

FRED W. CARD.

BLACKBERRY LILY. See *Belamcanda*.

BLACKWOOD. See *Acacia*.

BLADDER NUT. See *Staphylea*.

BLADDERWORT. See *Utricularia*.

BLANDFÒRDIA (after George, Marquis of Blandford). *Liliàceæ*. Tender bulbous plants from Australia and Tasmania, placed by J. G. Baker (Jour. Linn. Soc. 11:364) between Kniphofia and Funkia, but very different in general appearance from Funkia. Roots tuberous fibers: lvs. in two vertical ranks, narrowly linear, hard, persistent: fls. large, $1^1/_2$–3 in. long, showy, nodding, in short racemes, usually orange-red to crimson, with yellow tips.

Being tenderer than the poker plant, and of more difficult culture, Blandfordias are rarely grown in America. *B. flammula*, var. *princeps*, is the best kind. In New South Wales they grow in peat bogs and on shady mountain sides. During the growing season they must be shaded from bright sunshine, and during the resting season they may be placed in a light pit, where they are not crowded or shaded by taller plants. They like a moist atmosphere and plenty of air, but not draughts. The chief element of the potting soil should be peat; if the peat is heavy, use sand freely; if light, use some loam, and pack firmly; if spongy, add some charcoal. Pot after flowering, in early spring, being careful not to overpot, and plan to leave roots undisturbed for two years at least. A top-dressing each year and liquid manure during growing season, is necessary to produce a good flowering. Prop. by seeds sown in sandy peat with mild bottom heat, or usually by careful and not too frequent divisions of the root, made in early spring, after flowering, at the time of repotting, and preferably when strong offsets are formed.

A. *Margin of lvs. not roughish.*

Cunninghami, Lindl. Lvs. 18–24 in. long, 3–4 lines wide, broader than in *B. flammea*: fls. 10–15, or even 20. Blue Mts. of Australia. B.M. 5734. Gn. 24:411.—This has lately been held to be synonymous with *B. grandiflora*, but it is horticulturally distinct, and the pedicels are shorter.

AA. *Margin of lvs. roughish.*

B. *Fls. golden yellow, without any red.*

aùrea, Hook. f. Lvs. 8–12 in. long, $1^1/_2$–2 lines wide: fls. 3–6, the only ones in the genus not touched with red; perianth wide-swelling, sometimes nearly as wide as long, more bell-shaped than any other species. N. S. Wales. B.M. 5809.

BB. *Fls. red-tubed and yellow-tipped.*

C. *Perianth long, 3–4 times as long as wide.*

nóbilis, Smith. Lvs. 12–18 in. long, $^1/_2$–$^3/_4$ lines wide, dark green, sharply 3-angled: fls. 4–9, smallest of the genus, and narrowest. Near Port Jackson. B.M. 2003. B.R. 286.

flàmmea, Lindl. Lvs. 12–18 in. long, 2–$2^1/_2$ lines wide: fls. 4–12, typically constricted near the base of the tube and much lower down than in *B. Cunninghami*. E. Australia. B.M. 4819. P.M. 16:354. F.S. 6:585. F.S. 18: 1829, as *B. Cunninghami*.

Var. **princeps,** Baker (*B. princeps*, W. G. Smith), has larger and brighter colored fls., and is the best of the genus. The perianth is longer and less spreading than in the type, and swells very gradually from the base, instead of being constricted near the base. B.M. 6209. F.M. 1875:170. F.S. 22:2314. Gn. 47:1013.

CC. *Tube short, scarcely twice as long as wide.*

grandiflòra, R. Br. Lvs. 12–18 in. long, 3–$4^1/_2$ lines wide: fls. 10–30. Distinguished from all others by having the filaments inserted above instead of at the middle, but in var. **intermèdia,** Baker, which connects *B. grandiflora* and *nobilis*, the filaments are inserted at the middle of the tube, the lvs. are narrower, and the fls. smaller. Tasmania. B.R. 924.—The name *grandiflora* is now a misnomer, as the fls. are smaller than in any other species except *B. nobilis*. The rarest species. W. M.

BLANKET FLOWER. See *Gaillardia*.

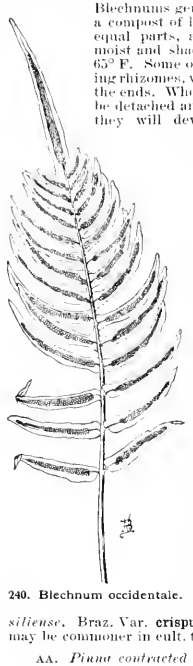
BLAZING STAR. See *Liatris*.

BLÉCHNUM (Greek name for some fern). *Polypodiàceæ*. Rather coarse greenhouse Ferns, with pinnatifid or pinnate lvs., and rows of almost continuous sori parallel to the midvein and close to it, covered with a membranous indusium. Blechnums will thrive in almost any compost, but their lvs. quickly turn brown and then black if watered overhead. Prop. by spores. In Blechnum we have a singular knot in nomenclature. Linnæus described two species in 1753, and to the West Indian one he gave the name *B. orientale*, citing figures, etc., to show that it is the plant that recent writers call *B. occidentale*. His East Indian plant he similarly called *B. occidentale*. The normal or ordinary usage has been followed below, the name *B. orientale* being given to the eastern plant.

Blechnums are very useful to florists for jardinières, and for specimen Ferns. To attain best results, it is necessary to maintain an abundance of moisture at the

roots, with a drier atmosphere than most other Ferns require, to prevent fronds from turning brown during winter months. Average temp. 60–65° F. Soil, equal parts of rich loam and leaf-mold or peat. The spores of most Blechnums germinate very freely if sown on a compost of loam and leaf-mold or peat in equal parts, and placed in a moderately moist and shady position in a temp. of 60–65° F. Some of the species send out creeping rhizomes, which develop young plants at the ends. When of sufficient size these may be detached and potted, and in a short time they will develop into good specimens. Some very attractive species are found among the hardy British Blechnums.

Cult. by N. N. Brückner.



240. Blechnum occidentale.

A. *Pinnæ strongly decurrent at the base, joining with the one next below.*

Brasiliénse, Desv. Growing from a stout, slightly arborescent trunk 1 ft. or more long: lvs. 2–3 ft. long, 1 ft. or more wide, with the pinnæ set at an acute angle with the rachis, the lower much shorter and more distant. Braz. S. 2: 4.

nitidum, Presl. Habit of *B. Brasiliense*, but much smaller: lvs. pinnate; pinnæ oblong-falcate, thickish, 2–4 in. long, serrate. Braz.—Plant 1–2 ft. high.

Corcovadénse, Raddi. Pinnæ not cut to the rachis, much crowded and shorter than the last; longest pinnæ less than 6 in. long, attenuate at the tips; lvs. crimson when young, and gradually turning to a metallic hue before becoming permanently green. By some considered a variety of *B. Brasiliense*. Braz. Var. **crispum,** Hort., with wavy edges, may be commoner in cult. than the type.

AA. *Pinnæ contracted at the base to the midrib, forming a very short stalk.*

occidentàle, Linn. Lvs. from an erect caudex, which is covered with brownish scales; lvs. 9–18 in. long, 4–6 in. wide, with the pinnæ truncate or even cordate at the base and slightly falcate. Mex. and W. Ind. to Braz. See Fig. 240.

serrulàtum, Rich. Growing from an ascending nearly naked rootstock: lvs. 1–2 ft. long, 6–15 in. wide, with numerous narrow pinnæ, which are contracted at the base and of nearly uniform width throughout; margins finely serrulate; texture coriaceous. Fla. to Braz.

B. orientàle, Linn., is a large East Indian and Polynesian Fern, with lvs. often 3 ft. long; well worthy of cultivation

L. M. Underwood.

BLEEDING HEART. See *Dicentra*.

BLÉPHARIS (Greek, *eyelash*; referring to fringed bracts). *Acanthàcea*. An unimportant genus of dwarf, often spiny shrubs and herbs, allied to Acanthus, and of similar culture.

carduifolia, T. Anders. (*Acánthus carduifólius*, Linn. *Acanthódium carduifólius*, Nees). Plant villous: lvs. lanceolate, sinuate-dentate, spiny: spike terminal, cylindrical: bracts roundish, palmately 5-spined at the apex.

BLÈTIA (Louis Blet, Spanish botanist). *Orchidàcea*, tribe *Epidéndreæ*. Terrestrial or epiphytal herbs, widely distributed: lvs. plicate, membranaceous, sheathing the st., erect. This genus lends itself readily to cultivation, but is not showy enough to be popular. They need a long season of rest. The commonly cult. kinds are terrestrial, and thrive in ordinary orchid loam.

hyacinthina, R. Br. Lvs. about 1 ft. long: fls. looking down, in various shades of purple, on a scape about 1 ft. high. China. B.M. 1492, as *Cymbidium hyacinthinum*. —Stands some frost.

verecúnda, R. Br. The first exotic Orchid introduced (1731). Racemes showy and branching, 2–3 ft.: fls. purplish. W. Ind.; also in Middle and E. Fla.

Shépherdii, Hook. Very like the last, and perhaps a form of it: fls. deep purple; center of labellum yellow. B.M. 3319.

Sherratiàna, Bateman. Lf.-blades pointed at both ends; fls. large, more showy than in the above, brilliant lilac or rose color; labellum purple, with 3 golden yellow lines. New Grenada. B.M. 5646.

pátula, Hook. Fls. deep pink-lilac, numerous and large (2 in. across). B.M. 3518.—Requires culture given Cattleyas.

campanulàta, La Llave & Lex. Fls. bell-like, purple, with white center. Mex.—Not common in cult.

B. aphýlla, Nutt., is a native species growing as far N. as N. Carolina.—*B. Tankervillæ*, R. Br., is a Phaius.

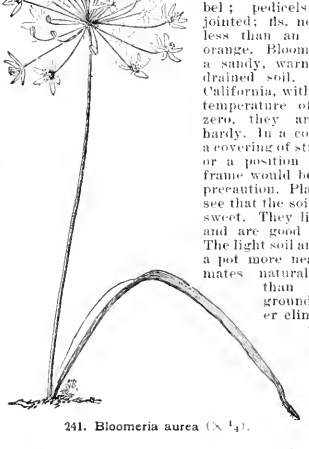
Oakes Ames.

BLIGHT. An indefinite term, popularly used to designate any sudden and inexplicable death of plants. The term is now restricted by botanists to parasitic diseases. These diseases are of two classes,—those due to bacteria or microbes, and those due to parasitic fungi. For an account of these troubles, see *Diseases*.

BLITE. See *Chenopodium*.

BLOODROOT. See *Sanguinaria*.

BLOOMÈRIA (named for Dr. H. G. Bloomer). *Liliàcea*. A genus of two species, natives of southern California. In every way they are closely allied to Brodiæa, but differ in having the perianth parted nearly to the base. Bloomerias have a flattish corm, much like Crocus, covered with fiber, and not often producing offsets. The lvs. are radical, slender, and grass-like; scape slender but stiff, 6 to 18 in. high, naked, except for short bracts beneath the many-rayed umbel; pedicels slender, jointed; fls. nearly rotate, less than an inch across, orange. Bloomerias prefer a sandy, warm and well-drained soil. In northern California, with a minimum temperature of 15° above zero, they are perfectly hardy. In a colder climate, a covering of straw or leaves or a position in the cold-frame would be a judicious precaution. Plant early, and see that the soil is light and sweet. They like the sun, and are good for forcing. The light soil and warmth of a pot more nearly approximates natural conditions than the open ground does in cooler climates. After ripening, it is best to dig and replant in fall. The seeds grow readily, and the plants flower in 3 to 4 years.



241. Bloomeria aurea (× ¼).

aurea, Kellogg. Fig. 241. Scape roughish, 6–18 in.: lf. ⅛–½in. broad; fls. numerous, bright orange, in a

dense umbel: stamens nearly as long as the perianth, the filaments dilated at the base. B.M. 5896 (as *Nothoscordum aureum*). G.C. III. 20: 687.

Clèvelandi, Wats. More slender: lvs. 3–7: fls. smaller, keeled with brown, the stamens shorter. G.C. III. 20: 687. —Less valuable than the other.

CARL PURDY.

BLUEBELL. See *Campanula*.

BLUEBERRY. Species of *Vaccinium*.

BLUE FLAG. See *Iris*.

BLUETS. See *Houstonia*.

BLUMENBÁCHIA (after Dr. J. F. Blumenbach, professor at Göttingen). *Loasàceæ*. A genus of S. American plants allied to Loasa and Mentzelia (Mexican prickly poppy), not cult. in Amer. because of their covering of stinging hairs. The fls. are odd and pretty. The garden forms are mostly treated as tender annuals.

B. Chiapénsis, Hook. f. Lvs. 8–10 in. long: fls. 1½–2 in. long, brick red, tipped yellow without, and yellow within; petals 5–10, boat-shaped. Peru, Equador. B.M. 6143.—*B. grandiflora*, G. Don (*B. contorta*, Hook. f. B.M. 6134). Lvs. 4–6 in. long: fls. 1½–2 in. long, wholly red, scales ¼in. long, cup-shaped, green; stamens in 5 bundles, with long filaments. Peru.—*B. insignis*, Schrad. Stem climbing, 4-sided: petals white, unguiculate. B.M. 2865.

BOCCÒNIA (after Dr. Paolo Bocconi, Sicilian botanist and author). *Papaveràceæ*. PLUME POPPY. A genus of 5 species, of which *B. cordata* is the only one worthy of cultivation. The large, handsome, glaucous lvs. remind one, by their texture and lobing, of bloodroot and Stylophorum, which belong to allied genera. The fls. are very unlike our common poppies, being small and without petals, but they are borne in great feathery or plumy masses, in terminal panicles raised high above the heavy foliage, making the plant unique in its picturesque general appearance. Hence, it is much used for isolated lawn specimens, or for very bold and striking effects, being especially adapted to be viewed at long distances. It is also placed in shrubberies, wild gardens, and at the back of wide borders, as it spreads

242. Bocconia cordata.

rapidly by suckers, any one of which, if detached, will make a strong plant in a single season. The Plume Poppy seems to be much hardier in America than in the Old World. It was popular early in the century, but was neglected, probably because it spread so rapidly. Lately it has become popular again. It deserves to be permanently naturalized in the American landscape. To produce the largest specimens, it is well to plant in very rich soil, give the old clumps liquid manure in spring, and cut off the suckers. Prop. chiefly by suckers.

cordata, Willd. (*B. Japónica*, Hort.). Fig. 242. Hardy herbaceous perennial: height 5–8 ft.: lvs. large, glaucous, heart-shaped, much-lobed, deeply veined: fls. pinkish; stamens about 30. China, Japan. B.M. 1905. Gn. 54, p. 279. Gng. 5: 342.

J. B. KELLER and W. M.

BŒHMÈRIA (G. R. Bœhmer, a German botanist). *Urticàceæ*. Many widely distributed species. *B. nívea*, Gaud., of trop. Asia, is cult. in some countries as a fiber plant, and has been introduced into this country for that purpose. It is a strong-growing, large-lvd. perennial, well suited to the border as an ornamental subject. *B. argéntea*, Lind., a stove plant, is useful for subtropical bedding; but it is not in the Amer. trade.

BOLÁNDRA (H. N. Bolander, Californian botanist). *Saxifragàceæ*. Two species of small west American herbs, with purplish fls. in lax corymbs; petals 5, inserted on the throat of the 5-lobed calyx; stamens 5, alternate with petals. Delicate herbs, suitable for rockwork.

Oregàna, Wats. A foot or two high, pubescent and glandular: lvs. laciniately toothed and lobed: fls. deep purple; tube of the calyx equaling the teeth and a little shorter than the petals: pedicels reflexed in front. Oregon.—Int. by Gillett in 1881.

The first-described species, *B. Califórnica*, Gray, seems not to have been offered in the trade. It is a smaller species, less pubescent, with smaller fls., the lower lvs. round-reniform and 5-lobed: plant 3–12 in. high, the stems weak and slender.

BOLDÒA FRÀGRANS, cult. in S. Calif. See *Peumus*.

BOLÈTUS. Consult *Mushrooms*.

BÒLLEA. See *Zygopetalum*.

BOLTÒNIA (James Bolton, English botanist). *Compósitæ*. FALSE CHAMOMILE. Four or 5 species of aster-like glabrous, often glaucous herbs of the United States and eastern Asia. They are tall and leafy plants, blooming profusely in late summer and autumn, and excellent for the hardy border. Differs from aster in having a convex receptacle, short pappus bristles and awns, and other technical characters. Boltonias are of easiest culture. They take care of themselves when once established. Prop. by division. Should be better known to gardeners. They stand without staking.

asteroìdes, L'Her. (*B. glastifólia*, L'Her.). Sts. 2–8 ft., simple below and branching at the top: lvs. broadly lanceolate or the upper narrower: heads short-peduncled, numerous, the rays varying from white to violet and purple; involucre bracts lanceolate and acute, greenish; scales of the pappus numerous and conspicuous, the two awns sometimes missing. Pa. to Ill. and S. B.M. 2381, 2554. Mn. 1: 33.—Perennial.

latisquàma, Gray. A handsomer plant, with larger and more showy heads with blue-velvet rays: involucre bracts oblong or obovate and obtuse (often bearing a minute point); pappus scales small, the awns present and conspicuous. Kans. and Mo. G.F. 5: 271. Perennial.

B. Cantoniénsis, Franch. & Sav., is native to Japan, where the young plants are used for greens. See Georgeson, A.G. 13, p. 8, fig. 4. It is annual. Has not yet appeared in the Amer. trade. Gray restricts Boltonia to the U. S., and regards this species as of another genus.

L. H. B.

BOMÁREA (derivation doubtful). *Amaryllidàceæ*. Tender South American plants allied to Alstrœmeria, and with similar fls., but a twining habit. Lvs. parallel-veined, usually borne on short, twisted petioles: fls. in pendulous umbels, variously colored and spotted, borne in early spring and summer: perianth funnel-shaped: tube none. See Baker, Amaryllideæ.

Bomareas delight in a rich, fibrous soil, and require plenty of water during the growing season, which com-

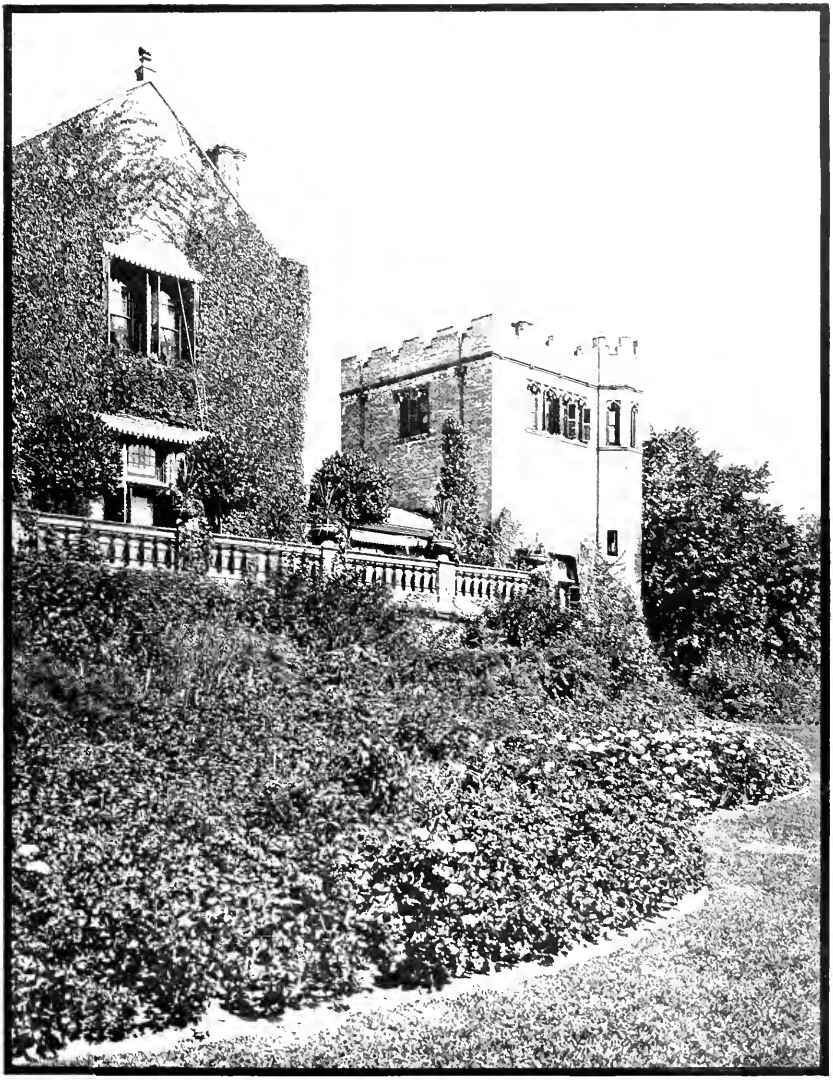
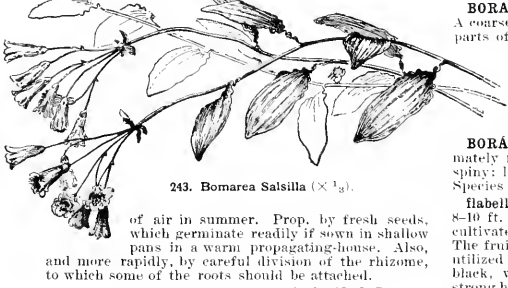


Plate III. A hardy border

A permanent plantation of woody and herbaceous plants, well grown and well placed. John Sloane estate, Lenox, Mass.

mences early in spring. Late in fall the stems are cut down to the ground and the roots are kept in the soil in a dry state. While they often make satisfactory pot plants, they do best when planted out in an open, sunny position in a cool conservatory, where they have plenty



243. Bomarea Salsilla (× 1/3).

of air in summer. Prop. by fresh seeds, which germinate readily if sown in shallow pans in a warm propagating-house. Also, and more rapidly, by careful division of the rhizome, to which some of the roots should be attached.

Cult. by N. J. Rose.

A. *Perianth segments equal.*

B. *Umbel simple: fls. medium-sized.*

oligántha, Baker. Lvs. 3–4 in. long, oblong, acute, lax, thin, densely pubescent beneath: fls. 6–8 in an umbel: bracts large, leaf-like; segments 1–1¼ in. long, outer dull red, inner bright yellow with reddish brown spots. Peruvian Andes.

BB. *Umbel compound.*

C. *Fls. small.*

Salsilla, Herb. (*B. oculàta*, M. Roem. *Alstrœmèria oculàta*, Lodd.). Fig. 243. Lvs. 2–4 in. long, ½ in. broad, lanceolate or oblong-lanceolate, moderately firm, glabrous beneath: umbel 4–15-rayed; rays 1–3 in. long, 1–3-fld.; bracts small; fls. pink or red, marked with blue and dark purple within. Chili. L.B.C. 19: 1851. B.M. 3344.

CC. *Fls. large.*

Cárderi, Mast. Lvs. 4–6 in. long, 1½–3 in. broad, oblong, acute: umbel 1 ft. long, 6–9-rayed; rays 1–4-fld.: bracts large, leafy; perianth-segments 2 in. long, outer pale pink, spotted brown near the top, inner greenish white, much spotted. F.M. 1876: 239. G.C. II. 5: 793.

Shuttleworthii, Mast. Lvs. 5–6 in. long, oblong, acute, glabrous: umbel 1 ft. long, 5–10-rayed; rays usually 3-fld.: perianth segments 2 in. long, outer reddish, inner greenish yellow. Colombian Andes. G.C. II. 17: 77 and 85. The curious egg-shaped tubers terminate unbranched roots, which spring from a rhizome about 1 in. wide. Having no eyes or buds, they cannot be used for propagating.

AA. *Perianth segments not equal, the inner longer than the outer.*

B. *Umbel simple.*

Patacocénsis, Herb. (*B. conférta*, Benth.). Stems purple-tinted, pubescent: lvs. 5–6 in. long, oblong-lanceolate, pubescent beneath: fls. 20–30; outer segments 1½ in. long, bright red, inner ones 2½ in. long, bright red, yellow-keeled, with a few spots. Andes of Equador and Colombia. G.C. II. 17: 187. B.M. 6692.—When well-grown, the umbel is very dense and many-fld.

BB. *Umbel compound.*

vitellina, Mast. Lvs. 3–4 in. long, ovate-oblong; umbel about 12-rayed: perianth segments bright yellow, outer 1½ in. long, inner 2 in. long: bracts large, leafy. Peruvian Andes. G.C. II. 17: 151. W. M.

BÓMBAX (a Greek name for *raw silk*, alluding to the cottony contents of the pods). *Malvàceæ.* Silk Cotton Tree. Ten or 12 tropical trees, with digitate 5–9-foliolate lvs., 1-fld. axillary or clustered peduncles, and usually large white or scarlet fls. Specimens are rarely seen in cult. in fine glass-houses, and none of the species appear to be in the Amer. trade. The bark of some species produces commercial fiber.

BONESET. *Eupatorium perfoliatum.*

BORAGE (*Borâgo officinàlis*, Linn.). *Boraginàceæ.* A coarse annual plant grown for culinary use in some parts of Eu., as in Germany. Used as a pot-herb and sometimes with salads. Only the young lvs. are palatable. Mostly known in this country as a bee-plant and for its handsome blue or purplish racemed fls. It is a hairy plant, 1½–2 ft. high, with oval or oblong lvs. Eu., North Africa.

BORÁSSUS. *Palmàceæ.* Tall palms, with large palmately flabelliform plicate lvs.: sheath short: petiole spiny: ligule short, rigid: fr. large, subglobose, brown. Species 1. Trop. Africa.

flabellíformis, Linn. Fig. 244. St. 30–100 ft. high: lvs. 8–10 ft. long: lf.-segments bifid at the apex.—Widely cultivated. One of the most useful palms of India. The fruits are very large. Many parts of the plant are utilized by the natives as food and in the arts. Wood black, very hard. This plant requires rich soil and strong heat for its best development, and is rather slow-growing under cultivation, especially while young. The illustration (Fig. 244) is adapted from Martius' Natural History of Palms.

Jared G. Smith and W. H. Taplin.

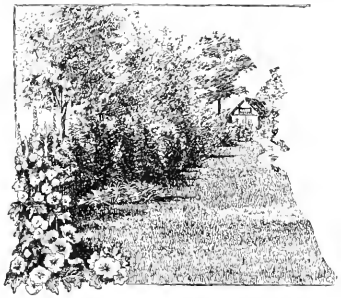
BORDER. A narrow planting, particularly if it is alongside a walk, drive, fence, or other boundary. Plate III. Figs. 245, 246. The term border may be taken to have meant originally a line of plants set out to mark the edge or dividing line, or termination of a part of the grounds, in many instances still to be seen in the most ancient gardens of castles and other residences. These are formed on the terrace, where no other form of floral decoration would be possible. In these places are often herbs, shrubs and trees that are grand old specimens of very rare or tender subjects, that would not thrive in any other location.

244. Borassus flabelliformis.

There are three distinct types of border: (1) the shrubbery border, in which various forms of garden plants of fruticose habit are blended so as to make a harmonious whole. (2) Another form of border, now happily almost obsolete, is the "ribbon border," in which plants of dwarf habit and bright coloring are used to produce geometrical designs on the greensward. This form of gardening was very common in parks and public spaces until recent years, but public taste has been educated to see and to like the old-fashioned border, or (3) the border proper,—the one that was used when gardening had to be done without the aid of glass structures, all the occupants being hardy by nature, whether of annual, biennial or perennial duration. It may be said that we are in the renaissance of the flower border; but much has been added to it, and

the greater possibilities we have are due largely to our greater wealth in plants.

To have a good flower border is by no means an expensive undertaking if a few essentials are regarded.



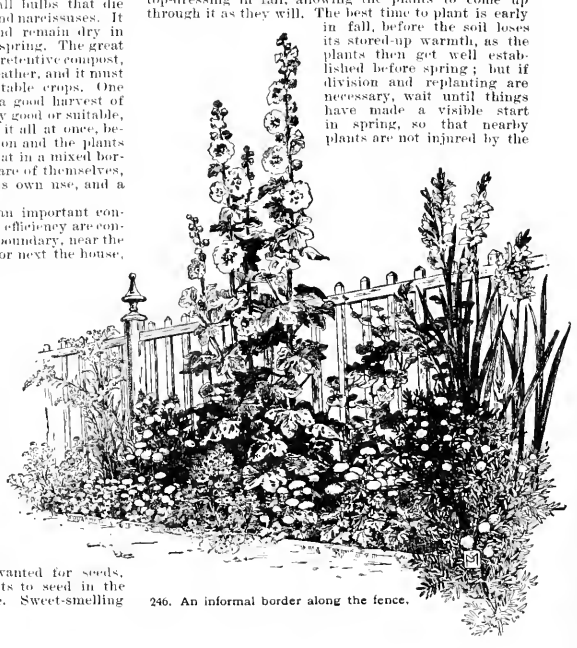
245. Border on the side of a lawn, the body of the plantation being made of shrubbery.

The first and most important requisite is a good depth of soil; it matters little what the kind of soil, if good, but it is better, if possible, to vary the texture and be able to control the quantity of moisture. Lilies are among the most beautiful of border flowers, but they like a soil that is light, cool and moist; hence decayed humus, as leaf-mold, is valuable. Many other subjects, as annuals from warmer climates, like a soil that absorbs heat rapidly and retains it, such as a soil of a sandy texture. In this will thrive all bulbs that die down early in summer, such as tulips and narcissuses. It enables the bulbs to mature well and remain dry in winter, and to make an early start in spring. The great majority of plants, however, require a retentive compost, that will not dry out readily in hot weather, and it must be made rich enough to grow vegetable crops. One cannot starve the plant and expect a good harvest of bloom. If the natural soil be not really good or suitable, make it so. If it is not possible to do it all at once, begin well, and add to it as time goes on and the plants need the space, for it will be found that in a mixed border of plants which practically take care of themselves, there will always be plenty for one's own use, and a quantity of roots to spare.

The location of such a border is an important consideration so far as general effect and efficiency are concerned. Along the line of a fence or boundary, near the margin of a walk, drive, or avenue, or next the house, are good locations. The front line may be straight, curved or irregular in outline, according to the situation or fancy of the owner. The plants will lend themselves kindly to one or all forms, oftentimes forming a line of their own by outgrowing their allotted space. The number of subjects suitable for this kind of work are many. Begin with the old-fashioned flowers, such as peonies, dicentras, larkspurs, perennial poppies, pyrethrums, iris, hemerocallis, and a host of others. Hollyhocks are most excellent, but in the East the disease or rust must be kept off by thorough spraying. The perennial garden phlox must be added, but see to it that it does not seed the bed and produce a tiresome crop of poor, weedy sorts. The same may be said of the larkspur. In fact, unless some specially marked flowers are wanted for seeds, it is best not to allow border plants to seed in the soil, for they speedily make trouble. Sweet-smelling plants are very desirable, such as bergamot, monarda, the perennial fennel, with its graceful foliage for blending with cut-flowers, a little bush of rue, one of marjoram, a plant of the lemon-scented verbena or aloysia (which may be wintered over indoors), the scented geraniums, southernwood, and many others that have old associations, and help to take the memory back of self and friends. Spring flowers must not be neglected, as they "come before the swallow dares." Narcissuses in many kinds are hardy and permanent; so, also, are the Darwin tulips, even though unlike the florists' ideal. This recent race of tulips and those of the Gesneriana type live year after year and grow better, besides giving fine blooms for cutting. Crocuses may be placed near the margins in warm corners, planting over them or sowing a few seeds of annuals to cover the soil that hides them in summer. Stocks, zinnias, asters and mignonette are all admissible and most suitable, with a clump or row of sweet peas near the back at intervals. Gladioluses are excellent. The lilies ought to be planted in a group, to do them justice, and the bulbs can then be covered in fall with a coat of dry leaves or pine needles to protect them. The regal Japan iris needs much water, and may be given a special bed, where it can be supplied freely, other semi-aquatic plants being placed with them, provided the one border does not give the desired variety of soils; but the whole of the above-named plants may be made to grow in a mixed border if it be properly prepared.

One of the best uses of a border is to make it a repository or catch-all for hardy plants. Here plant wild asters and goldenrods, wild lilies and buttercups, and anything and everything which interests you in the woods or fields. These plants may be dug even in summer. Cut off the tops, leaving a few leaves just above the ground, plant them firmly, and most of them will live. The border reflects the personality of its maker.

One caution must be given,—never spade up or fork over such a border. Let all enrichment be given as a top-dressing in fall, allowing the plants to come up through it as they will. The best time to plant is early in fall, before the soil loses its stored-up warmth, as the plants then get well established before spring; but if division and replanting are necessary, wait until things have made a visible start in spring, so that nearby plants are not injured by the



246. An informal border along the fence.

spade or fork. The border is an important conception in landscape gardening (*see Landscape Gardening*).

E. O. ORPET.

THE HARDY BORDER may be made a most attractive feature of any planting. A good model to follow may often be found along a country road which has not been "cleaned up" into formality and monotony. The charm of the hardy border lies as much in its happy faculty of change as in its beauty; every day of the growing season, and every week of the year, there appear new points of interest. It is apparently nature's workshop, and the changing habits of plants are of vital interest. It is always crowded, never full; the shy beauty found on a ramble takes its place promptly among the older friends. With a little care and previous observation, and reasonable preparation of the soil, the hardy border can be made to reflect the preferences and personality of the planter. The available material is so rich and plentiful that there need never be duplication. Nor is the best hardy border an expensive luxury; it requires no rare exotics, and its chief members may well be the common plants of the neighborhood, brought together under conditions which give each a chance for development. A border is recalled which shows as its chief glory in September an enormous boneset; visitors who exclaim at its beauty do not recognize the roadside weed. This particular border is most catholic in its hospitality to all American plants—no foreigners are allowed admission. In early spring the great fiddle-heads of the uncurling cinnamon ferns mate with the trilliums, and the moss-pink carpets the edge, alternating with the spring beauty and bluet. The columbines hang their bells against a rocky point, which later is a glory of wild roses. Shady corners have the laurels and the rhododendrons, and the warmth of early summer brings out the yarrow and the rudbeckia, just before the happy succession of asters and goldenrods start on their procession toward winter. No two days show the same blooms; often a visit in the afternoon gives a totally different impression from the morning view.

Artistically treated, and with care to keep out any of the formal and comparatively artificial plants (geraniums, coleus, verbenas, and the like), the hardy border may be a source of much enjoyment and edification, whether it be in a city back yard or a great park. Often an existing cluster of shrubs or bed of lilies in the home grounds may serve as a starting for the border; and some fine examples are remembered as incidental adjuncts to the farm vegetable patch, while one which has a most distinct individuality of beauty unobtrusively flanks a unique Connecticut grass garden.

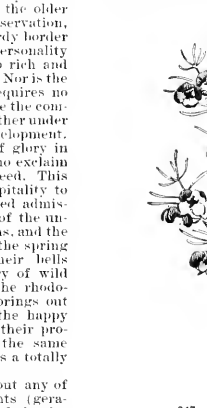
To create an individual hardy border, the planter must divest himself of prejudice, and cheerfully start a burdock where its richness of foliage is needed, backed up with a skunk cabbage for greater breadth of green, if need be. He should estimate plants for their beauty, their individuality and their season of bloom, as members of his general plan. He should be prepared to consider any plant a prize in the border if it fits, and any plant a weed if it is inharmonious.

J. HORACE MCFARLAND.

BORECOLE. See *Kale*.

BORÒNIA (after Francis Borone, an Italian who lost his life at Athens in the service of Dr. Sibthorp). *Rutàceæ*. A genus of Australian shrubs with numerous fls. having a rue-like fragrance: lvs. opposite, odd-pinnate, or simple, *B. megastigma* and its allies, *B. elatior* and *B. heterophylla*, are remarkable for their very large stigma (which is 4-lobed at the base), and their curious stamens, 4 of which are small, yellow, pollen-bearing, and hidden under the stigma, while the 4 large, conspicuous ones are dark purple or black, and bear no pollen.

The chief value of Boronias is their delicious fragrance. A small specimen will perfume a whole house for two or three weeks. Boronias are cultivated like Cape heaths in a cool greenhouse. After flowering they should be cut back, in order to make compact, bushy specimens. The leading shoots may be frequently pinched, to prevent a straggling growth. As most of them are natives of barren, sandy places, not bogs, good drainage is necessary. Sour soil is very disastrous to them. The English florists set their young plants in the open ground during summer, being careful to shade them with lath frames. Plants that have flowered two seasons are thrown away and replaced by younger specimens. Robert Cameron propagates them by cuttings from half-ripened wood inserted in 4-inch pots, which are filled to within an inch of the top with a compost of finely sifted loam, peat and sand, over which is spread a layer of sharp sand. After a thorough watering, they may be placed under a bell-glass in a greenhouse where the temperature ranges from 45–50° F., and shaded from bright sunshine. Seeds germinate readily in the same temperature, and make good flowering



247. Boronia megastigma (×½).

plants in one season. Seeds can be obtained from German or Australian dealers, large quantities being collected in the wild. Boronias belong to a large class of hard-wooded Australian plants that were popular along with the Cape heaths in the early part of the 19th century. These were largely replaced by quicker-growing, soft-wooded plants. The renewed interest in Boronias is largely due to the more recently introduced species, of which the first three described below are the best. American florists have lately grown them somewhat for Easter, especially *B. heterophylla*. Many species are likely to be introduced, as these shrubs are very brilliant in Australia, blooming when very young, and remaining attractive for two or three months.

A. *Stigmas large.*

B. *Lvs. less than 1 in. long; leaflets in 1 or 2 pairs, plus an odd one.*

C. *Fls. borne singly*

megastigma, Nees. Fig. 247. Height about 2 ft.: lvs. very sparse, ⅛–⅜ in. long, sessile, the upper with one pair, the lower with two pairs of lfts. beside the end one; lfts. narrowly linear: fls. maroon-purple outside, yellow within, borne less densely than in *B. elatior*. At times some fls. are chiefly brown, others chiefly purple. B.M. 6046.—The best species.

CC. *Fls. borne in whorls of 4 or 6.*

heterophylla, F. Muell. Height 5–6 ft. in Australia: lvs. 1–1½ in. long, sometimes simple, usually with 1 pair, rarely 2 pairs of lfts.: fls. bright scarlet, but usually pictured as purplish crimson. Differs from *B. elatior* and *B. megastigma* in its larger leaves, fewer lfts., more brilliant fls. and longer filaments. Cult. only in its var. **brevipes,** Hook. f., which differs merely in the shorter peduncles. B.M. 6845. Gn. 32: 622.—Of late years it has been grown for Easter by florists to a considerable extent.

B. *Lvs. more than 1 in. long: leaflets in 2-6 pairs, plus an odd one.*

elátior, Bartl. Height about 4 ft.: pubescence variable: lvs. close-set, 1-2 in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad, petioled, with 11fts. in 2-6 pairs: lfts. broader and shorter-acuminate than in *B. megastigma*: fls. dark red-brown, or rosy red, or purple, sometimes showing groups of widely different colors on the same branch, and borne so densely as to hide one side of the branch. B.M. 6285. Gn. 10:39. F.E. 9:491.

248. Botrychium obliquum. (× $\frac{1}{2}$.)

AA. *Stigmas small.*

pinnàta, Smith. Lfts. in 2-4 pairs, very smooth, acute: peduncles dichotomous, 5-7-fld.: stamens 8. B.M. 1763. L.B.C. 5:473.

tetrándra, Labill. Lfts. in 4-5 pairs, obtuse, glabrous; branches pilose: pedicels short, 1-fld.: stamens 4.

W. M.

BOSTON FERN. See *Nephrolepis.*

BOTANY. The science which treats of plants; plant-knowledge. In its widest sense, and properly, it includes much that, by common consent, is usually included in horticulture,—as amelioration of plants by domestication, hybridizing, and the like.

BOTRÝCHIUM (Greek, in allusion to the grape-like sporangia). *Ophioglossàcea*. Native Ferns of woods and pastures, with fleshy roots, broad ternate lvs., and sporangia borne in a panicle, which branches from the common st. Grown in the hardy border, or against a building on the shady side. They require no special treatment, and are little cultivated.

A. *Lf. simple, sessile near the middle of the stem.*

Virginiànum, Sw. Moonwort. Six in. to 2 ft. high, with a broad, triangular leaf, with 3 main tri-quadri-pinnatifid divisions; sporophyll long-stalked. Eastern U. S. —The only species which is large enough to make a display.

AA. *Lf. stalked from near the base of the common stem.*

obliquum, Muhl. Fig. 248. Plant, 6-15 in. high, with a ternate lf. 2-6 in. wide; segments obliquely ovate or oblong, $\frac{1}{2}$–$\frac{3}{4}$ in. long; sporophyll long-stalked. (*B. ternatum*, Authors, not Sw., which is a very different Japanese species.) Eastern U. S.

dissectum, Spreng. Plant, 6-18 in. high, with a ternate, finely dissected lf., 3-8 in. wide, the ultimate divisions $\frac{1}{10}$ in. or less wide. Eastern U. S.—Evergreen; delicate and graceful. Grows in woods.

L. M. Underwood.

BOTTLE-BRUSH. See *Metrosideros.*

BOTTOM HEAT. Said of soil temperature which is higher than that of the superincumbent air. Most tender plants require to have the roots warmer than the tops, particularly when grown under glass.

BOUGAINVÍLLÆA (De Bougainville, 1729-1811, a French navigator). *Nyctagináceæ*. A half dozen or more species of S. American shrubs, with alternate petiolate entire lvs. The fls. are small and inconspicuous, tubular, the margin 5-6-lobed; stamens 7-8, on unequal capillary filaments; ovary stipitate. Fls. in 3's, each one subtended by a very large colored bract. These bracts are very gaudy, and constitute the decorative value of the plants. Two more or less scandent species are chiefly known in cultivation. Bougainvilleas are just now receiving much attention in this country.

glàbra, Choisy. Fig. 249. Growing 10-16 ft. high and wide, when planted in the ground and allowed to have its way; glabrous: lvs. ovate and acuminate, glabrous and bright green: bracts cordate-ovate, bright rosy red, distinctly veined. Brazil. G.C. III. 23:168. Gn. 54, p. 257. R.H. 1889:276. A.G. 16:15. A.F. 11:137. F.E. 10:106.—Free-flowering and handsome; often grown in pots and kept dwarf. Var. **Sanderiàna,** Hort. Very floriferous, blooming even in very small pots: bracts deeper colored. Gn. 45:962. A.F. 10:307; 11:977; 12:1185. Gng. 4:281; 5:345.—A very worthy plant.

spectábilis, Willd. (*B. speciòsa*, Lindl. *B. splèndens*, Hort.). Taller and stricter, with larger and thicker lvs., hairy: fls. in large panicles; bracts larger, deep rose color, but varying to purple and greenish. Brazil. B.M. 4810, 4811. P.M. 12:51. I.H. 42:30.—Variable; known also as *B. Brasilicensis*, *B. bracteata* and *B. Peruviana*. Var. **lateritia,** Lem. (*B. lateritia*, Hort.), has brick-red bracts. I.H. 14:466. More showy than the last when in full bloom, but more difficult to grow, and, therefore, not so desirable. Int. to cult. earlier than *B. glabra*.

refúlgens, Bull. Lvs. pubescent; racemes long and drooping, and bracts purple. Brazil.—Perhaps a form of *B. spectabilis*.

L. H. B.

There is much confusion in species and varieties of Bougainvilleas in the trade. They seem to vary considerably. *B. spectabilis* and its varieties seem to be unpromising. Our experience with thousands of plants of *B. glabra* and var. *Sanderiana* leads us to say that we cannot think of any class of plants so readily handled.

249. Bougainvillaea glabra (× $\frac{1}{2}$).

They are easily propagated, are not particular as to soil or treatment, their growth is strong and rapid, they can be flowered with ease and certainty, and they are but little subject to insect attacks. Their flowering character is so persistent that a small stock of plants will afford

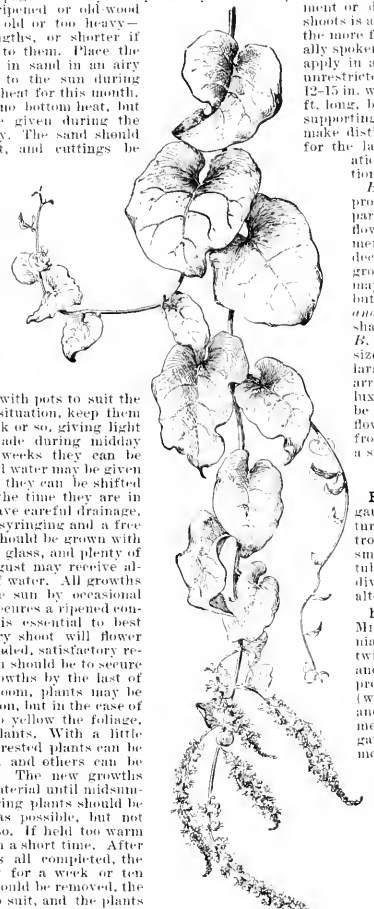
cutting material for almost six months. The bloom-bracts are extremely durable. They harmonize well with some of the popular orchids, and also go well with American Beauty roses. Entire heads of plants produce very decorative results, and are very satisfactory on account of their durability.

Bougainvilleas are propagated easily in April, May and June. Secure half-ripened or old-wood cuttings—no wood is too old or too heavy—and cut into 6–12-in. lengths, or shorter if more attention is given to them. Place the lower part 2–4 in. deep in sand in an airy situation, fully exposed to the sun during April, with some bottom heat for this month. In May and June give no bottom heat, but slight shade should be given during the brighter hours of the day. The sand should be kept moist, not wet, and cuttings be syringed several times every day in bright weather. The foliage will drop mainly at the end of the first week; after the second week, roots may be seen. The time of rooting varies from 12 to 30 days, according to conditions. In propagating in quantity, it is advisable to grade the wood according to ripeness, enabling the removal of the same from sand with less trouble and loss of time. For first potting, use a light, sandy loam, with pots to suit the roots; place in a sunny situation, keep them on the dry side for a week or so, giving light syringing daily, and shade during midday hours. In four or five weeks they can be shifted to larger pots, and water may be given more freely; after this they can be shifted almost monthly. From the time they are in 5-in. pots they should have careful drainage, as they will want daily syringing and a free supply of water. They should be grown with full sun exposure under glass, and plenty of air, and in July and August may receive almost daily drenchings of water. All growths should be exposed to the sun by occasional turning of plants; this secures a ripened condition of wood, which is essential to best results. So grown, every shoot will flower freely. If crowded or shaded, satisfactory results are risked. The aim should be to secure strong, well-ripened growths by the last of October. For earliest bloom, plants may be held drier from this time on, but in the case of *B. glabra* not enough to yellow the foliage, unless in very strong plants. With a little experience, the earliest rested plants can be flowered for Christmas, and others can be brought in successively. The new growths will afford cut-flower material until midsummer. In June, the flowering plants should be held as cool and airy as possible, but not shaded or only slightly so. If held too warm or dry, the bracts drop in a short time. After the flowering season is all completed, the plants may be held dry for a week or ten days; then all old soil should be removed, the roots and tops pruned to suit, and the plants repotted to smallest suitable pots, with perfect drainage. Then treat exactly as for a rooted cutting. As an excess of water is injurious at this stage, shade for a few days and syringe frequently. Keep on the dry side until the foliage indicates that water may be given more freely. Hundreds of eyes will push from strong plants; and the plants will soon make rapid growth, when they may be syringed and watered daily. A yellowish foliage is evidence of too much water, but this will hardly occur with plants thoroughly drained and exposed to the full sun. Growths may be pinched according to the end in view.

Strong, well-ripened shoots of *B. glabra*, tied horizontally, produce numerous laterals, whose inflorescence is very distinct in character from the earlier bloom, clusters of intense mauve bracts crowding the shoots, offset by the dark green, glossy foliage. The arrangement or disposition of the bracts on such shoots is a revelation of beauty compared with the more familiar form. *B. glabra* is generally spoken of as a climbing plant, which may apply in a large state or when the plant is unrestricted as to root room. In pots up to 12–15 in. we have frequently seen shoots 20–25 ft. long, but these always prove mainly self-supporting. Both *B. glabra* and its variety make distinct and extremely showy subjects for the lawn. In a partially sheltered situation they could be held in fair condition for at least a month.

B. glabra, var. *Sanderiana*, has proved valuable as a decorative plant, particularly for Easter, as it can be flowered unerringly, and possesses the merit of being durable for weeks,—a decided advantage over most subjects grown for that season. *B. glabra* also may be grown into showy specimens, but, being less compact than *Sanderiana*, requires more attention to secure shapely plants. It should be noted that *B. glabra*,—on account of the larger size of the bracts (fully three times as large as those of *Sanderiana*) and their arrangement on the branches, offset by luxuriant glossy foliage,—appears to be the most desirable variety for cut-flower material; while *Sanderiana*, from its elegant, compact habit, affords a splendid subject for pots.

THEO. F. BECKERT.



250. Madeira Vine, or Boussingaultia. (×⅛.)

BOUSSINGAULTIA (J. B. Boussingault, born in 1802, a famous agricultural chemist). *Chenopodiàceæ*. A few tropical American climbing herbs. Fls. small, perfect, with a 5-parted, short-tubed perianth, 5 stamens, and 3-divided style, in long racemes. Lvs. alternate, thick, entire.

baselloides, HBK. MADEIRA VINE. MIGNONETTE VINE. Fig. 250. Perennial, root tuberous: stems smooth and twining, reaching 10–20 ft. in a season, and in late summer or fall bearing profusely of the fragrant white fls. (which become nearly black with age), and producing little tubercles, by means of which the plant is propagated. Ecuador. B.M. 3620.—A common vine, prized for porches and arbors. The roots are stored in the winter, and planted out after danger of frost is past. The plant will not endure frost. Sometimes grown in the conservatory and window garden.

L. H. B.

BOUVÁRDIA (Dr. Charles Bouvard, physician to Louis XIII., and superintendent of the Royal Gardens in Paris). *Rubiàceæ*. Between 20 and 30 American (chiefly Mexican) shrubs or perennial herbs. Mostly tropical, but some of them range as far N. as Texas. They have entire and mostly sessile, opposite or verticillate lvs. with small stipules interposed, and terminal cymes of long-tubular fls. with 4-parted limb (lobes becoming more numerous in cult.), 4 stamens, and 1 style with a slightly 2-lobed stigma.

Bouvardias are very useful late fall or early winter-

flowering greenhouse plants. Though they may be propagated by cuttings inserted in sand in a propagating frame with bottom heat, yet a better and more expeditious way is to cut up the largest roots of a healthy plant into pieces about 1 inch in length, placing them thickly in pans of light, peaty soil and covering them to the depth of 1 inch with the same mixture. If the pans are then placed in a warm temperature with bottom heat, every piece will quickly develop one or more buds and grow into a young plant. March is perhaps the best time for propagating. As soon as the young plants are well rooted they should be potted singly into small pots and grown along in a temperature of about 60°. By the end of May the plants may be planted out, either in spent hotbeds or frames prepared with a goodly proportion of leaf-mold mixed with the soil, if fine pot plants is the ultimate aim; or if grown for cut-flowers only, they may be planted out in the greenhouse benches about 15 inches apart, giving all the air possible and a plentiful supply of moisture. In both cases, the plants must be kept well pinched back to induce a bushy habit, and also to insure a greater profusion of flowers. Towards the end of September those intended for pot plants should be lifted and potted and placed in a close frame for a week or ten days, keeping them moist and well shaded until they have recovered from lifting. Before the approach of frost they should be removed to the greenhouse and given a temperature of 50°. They are very subject to the attacks of mealy bug and green fly. They therefore should be sprayed once a week with an insecticide, with a vaporizer sprayer, choosing fine mornings for the operation. After flowering, the plants should be rested by keeping them almost dry. Towards the end of April they should be well pruned back, and in May again planted out for the summer. The same plants may be grown in this way for several years, when in 4 or 5 years' time they will make very fine specimens.

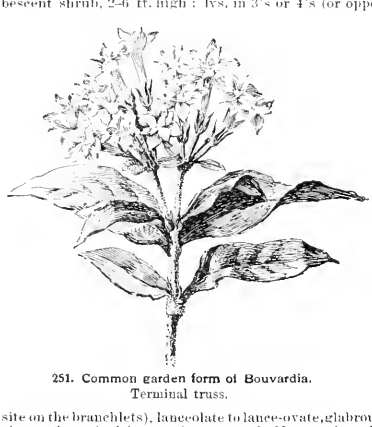
Cult. by EDWARD J. CANNING.

The Bouvardias of florists do not represent any of the type species. They are sports, hybrids, and other types of variations. The Latin-form names in American trade catalogues nearly all belong to these garden forms. The species which are of most import to the horticulturist are mentioned below:

A. *Fls. in shades of red.*

B. *Lvs. normally in 3's (except, perhaps, on the branchlets).*

triphylla, Salisb. (*B. Jacquini*, HBK.). Small pubescent shrub, 2-6 ft. high: lvs. in 3's or 4's (or opposite on the branchlets), lanceolate to lance-ovate, glabrous above: fls. an inch long, pubescent, red. Mex., and reaching N. to Ariz. B.M. 1854; 3781 as *B. splendens*, Grah.



251. Common garden form of Bouvardia.
Terminal truss.

—The genus Bouvardia was founded upon this species, which was introduced into England about 100 years ago. It is evidently the most important parent strain, although it is probably not in cult. in its original form. Figs. 251 and 252 partake very strongly of this species. In fact, Fig. 251 compares well in botanical characters

252. Bouvardia.
Cluster from a side growth.

(except less long-pointed lvs.) with the early pictures of *B. triphylla*.

leiantha, Benth. Much like *B. triphylla*; more bushy and better grower: stems hairy: lvs. hairy above: fls. glabrous. Mex. R.H. 1851: 81.—Perhaps only a form of the preceding.

Other red-fld. 3-lvd. species are: *B. angustifolia*, HBK. Lvs. lanceolate, revolute, glabrous above and fine-pubescent below: branches nearly glabrous. Mex. *B. hirtella*, HBK. Very similar: lvs. pubescent on both surfaces. Mex. *B. scabra*, Hook. & Arn. Lvs. ovate, short-stalked: fls. large, in dense clusters, pink: stem hairy. Mex.

B. *Lvs. opposite.*

Cavanillesii, DC. (*B. multiflora*, Schult.). Hairy: lvs. ovate-acuminate, broad at base, short-stalked, edges hairy: fls. 1½ in. long, very slender, glabrous. Mex.

AA. *Fls. yellow.*

flava, Decne. Lvs. opposite, ovate-lanceolate or lance-elliptic, very short-stalked, ciliate: fls. very long, drooping, in 3-5-fld. racemes, bright yellow. Mexico. F.S. 1: 43.

AAA. *Fls. white.*

longiflora, HBK. Glabrous, branching shrub: lvs. opposite, ovate-acuminate, stalked: fls. 1½–2 in. long, with a very slender tube and a wide-spreading, large limb, 2 or 3 together and aggregated into a terminal cyme. Mex. B.M. 4223. F.S. 2:123.—Gray supposes (Proc. Amer. Acad. Arts and Sci. iv., p. 314) that this species belongs to the genus Houstonia. Not known to be in the American trade.

Humboldtii, Hort. Lvs. opposite, ovate-acuminate: fls. very large, fragrant, in a large, terminal cluster. G.C. 1873:717.—This is a choice conservatory plant, and is in the Amer. trade. It is usually catalogued as *B. Humboldtii corymbiflora*. Blooms from summer to winter. Probably a derivative of *B. longiflora*. *B. candidissima*, Hort., white-fld., is said to be a hybrid, with *B. Humboldtii* as one of its parents.

jasminiflora, Hort. Compact and dwarf, very floriferous, the fls. in close, terminal clusters. G.C. 1872:215.—Probably a derivative of *B. longiflora*.

L. H. B.

BOWIEA (after J. Bowie, collector for Kew). *Liliàceæ*. A monotypic genus containing one of the most curious plants in the vegetable kingdom. A round, green bulb 4–5 in. thick throws up yearly a very slender, twining flower-stem 6–8 ft. high, with many compound, forked, curving branches below, and numerous small green fls. above. The st. is somewhat asparagus-like. There are

no lvs, except two small, linear, erect scales at the apex of the bulb, which quickly vanish. The lvs. show its relation to Drimia and Scilla.

volùbilis, Harv. Fig. 253. Perianth 6-cleft to the base; segments incurved at the tips. S. Afr. B.M. 5619.—Sold by Reasoner Bros., Oneco, Fla., and cult. in botanic gardens with cactus-like Euphorbias and other curiosities. W. M.

Bowiea volubilis is a useful plant for twining on the supports of a moderately warm greenhouse, and is of the easiest possible culture. Propagation is effected by

253. Bowiea volubilis.

seeds, or occasionally by the natural division of the bulbs. The season of growth usually begins about the first of October, when the bulbs should be repotted in any light, rich soil, and kept well watered until the stems begin to mature, which usually occurs in May, when water should be gradually withheld, and the plants stored away in some shaded part of the greenhouse and kept quite dry until the season of growth begins again. EDWARD J. CANNING.

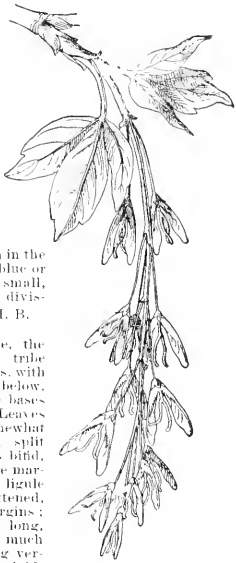
BOX. See *Buxus*.

BOX ELDER (*Acer Negundo*, which see). Fig. 254. A very popular small native tree for planting on the prairies and in trying climates. It propagates most readily from seeds. It is an excellent nurse tree for other species. The wood is of inferior quality. It grows with great rapidity for a few years.

BRACHYCHÆTA (Greek, *short bristle*). *Compósitæ*. One species, growing in open woods from Ky. to N. C. and Ga. Closely allied to Solidago, from which it differs in the very short pappus (the bristles shorter than the akene), and the lower lvs. cordate. **B. cordàta,** Torr. & Gray, which has been int. by dealers in native plants, is 2–3 ft. high, soft-pubescent, with thin, serrate lvs.; fls. golden yellow, in small heads, which are borne on raceme-like secund branchlets. Recommended for the native border.

BRACHYCÒME (*short hair*, from the Greek, alluding to the pappus). *Compósitæ*. Australian herbs, with membranaceous involucral bracts, naked receptacle, very short pappus bristles, and diffuse leafy growth. One species in cult.:

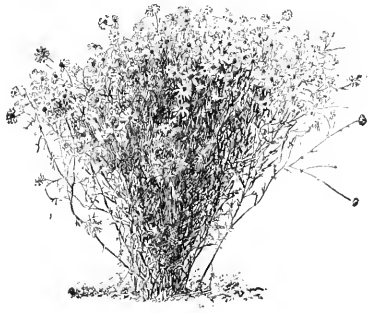
iberidifòlia, Benth. SWAN RIVER DAISY. Figs. 255, 256. A very graceful little annual (6–12 in. high) from Austral., suited to borders, and also attractive in pots; seeds may be sown in the open or under glass. Fls. blue or white, an inch across; lvs. small, pinnate, with very narrow divisions; glabrous. L. H. B.



254. Raceme of young fruit of Box Elder.

BRÁHEA (Tycho Brahe, the astronomer). *Palmàcea*, tribe *Corýpheæ*. Spineless palms, with medium caudices, ringed below, and clothed above with the bases of the fibrous sheaths. Leaves terminal, orbicular, somewhat peltate, flabellate-plicate, split down the middle, the lobes bifid, infolded, filamentous on the margins; rachis short, narrow; ligule subtriangular; petioles flattened, dentate along the margins; sheaths fibrous; spadices long, pendulous, paniculately much branched, the ultimate long vermiform obtuse branches rigid, spreading, very densely velvety tomentose; spathes many, long-linear, firm, coriaceous, split, glabrous; bracts and bractlets minute; fls. smaller than the diameter of the branches, hidden in the tomentum; frs. ½ in. long, obliquely ellipsoidal, minutely pubescent, laterally keeled, pale when dry. Species 4, Mex. to the Andes. Of simple culture in a fibrous compost, with an admixture of sand. Prop. by seeds.

dúlcis, Mart. PALMA DULCE. Stem 10–20 ft., 6–8 in. thick, cylindrical; lvs. 4–5 ft. long; petiole plano-convex, green, with pale margins; ligule short, subtriangu-



255. Brachycome iberidifolia.

lar, green, the scarious villous margin at length deciduous: fr. edible. Mex.

B. filamentòsa, Hort = Washingtonia filifera — *B. filifera*, Hort. W. filifera. — *B. glauca*, Hort. = Washingtonia filifera. — *B. robusta*, Hort. = Washingtonia — *B. Roezlii*, Lindl (B. glauca, Hort.) = Washingtonia filifera. JARED G. SMITH.

256. Brachycome iberidifolia. Natural size.

BRAKE. A name applied to various coarse ferns, particularly to *Pteris aquilina*.

BRAMBLE. Thorny plants of the genus Rubus, — raspberries, blackberries, dewberries.

BRASÈNIA (meaning unexplained). *Nymphæàceæ*. WATER SHIELD. One species of aquatic plant widely distributed (in N. Amer., Asia, Afr., Austral.). Lvs. oval and entire, floating, centrally peltate: fls. axillary near the summit of the stem, small, purple; sepals 3 or 4; petals 3 or 4, linear; stamens 12–18, on filiform filaments; pistils 4–18, forming indehiscent follicles. **B. peltàta**, Pursh, is not a showy plant, but is interesting for ponds. It is catalogued by dealers in native plants. Grows in 1–6 ft. of water. L. H. B.

BRASSÁVOLA (A. M. Brassavola, Venetian botanist). *Orchidàceæ*, tribe *Epidéndreæ*. About 20 Trop. Amer. epiphytes, closely allied to Lælia, and demanding similar treatment. Suspend on blocks. The fls. are large, solitary or racemose, the sepals and petals narrow and greenish, the lip white: lvs. thick, solitary. For the cultivator, the treatment of Brassavola is identical with that of the Mexican Lælias. Plenty of sun to mature the young growths, and water when growing, with a somewhat drier atmosphere when resting, will be found to suit them. *B. Digbyana*, Lindl., is *Lælia Digbyana*; *B. glauca*, Lindl., is *Lælia glauca*.

A. *Flower solitary.*

cucullàta, R. Br. (*R. cuspidàta*, Hook.). Leaf terete and subulate, grooved above; scape very short but bearing a very long-tubed fl., so that the blossom seems to be elevated on a stem: sepals cream-colored, tinged red; petals white; lip 3-lobed, fimbriate, the middle lobe beak-like. S. Amer. B.M. 543, 3722.

AA. *Fls. in racemes or corymbs.*

acaùlis, Lindl. & Paxt. Low: lvs. very narrow; fls. large, greenish white; lip cordate; tube red-spotted at base. Cent. Amer.

cordàta, Lindl. Lvs. linear, rigid, recurved: fls. corymbose; sepals and petals lance-linear, acuminate, pale green; lip roundish-cordate, cuspidate, entire, scarcely as long as the claw. Jamaica, Braz. B.M. 3782.

nodòsa, Lindl. (*B. grandiflòra*, Lindl.). Lvs. lanceolate, acuminate, channeled above: fls. few and large, corymbose; sepals and petals linear-acuminate; lip round-ovate, long-cuspidate, entire, longer than the claw. Jamaica, Mex., S. B.M. 3229, of this name, is *B. subulifolia*. L. H. B.

BRÁSSIA (William Brass, botanical collector of last century). *Orchidàceæ*, tribe *Vandeæ*. About 30 Trop. Amer. plants, closely allied to Oncidium. Distinguished from that genus by the very long and pointed sepals and the wingless column. The fls. are odd and spider-like in form, and are cultivated chiefly for that reason. They can be grown with Cattleyas. They bloom in summer, and during that time should have liberal supplies of water. Keep them quiet in winter, but do not dry them off completely. Grow in pots with thorough drainage, in a soil of fibrous peat and sand. Prop. by division.

The Brassias succeed well in the Orchid house devoted to Cattleyas, one that is not too warm in winter and furnishes plenty of air during the warm months. They have not been popular in gardens, as their flowers lack brilliant coloring, but their shape is weird, and to the collector they have charms that are almost as alluring as the Odontoglossums. Pot culture is best, as the plants make fine specimens, and are vigorous root-producers. *B. Lawrenceàna* and its variety *longissima*, with *B. verrucòsa*, are the best known in gardens, and are most desirable from a cultivator's standpoint.

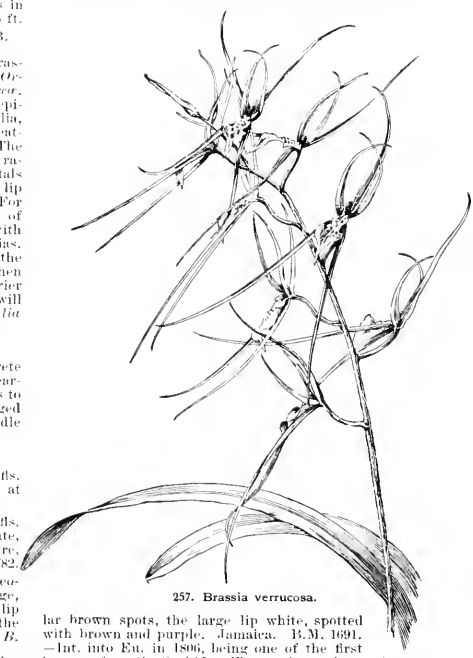
Cult. by E. O. ORPET.

A. *Sepals and petals whitish or greenish.*

verrucòsa, Batem. Fig. 257. Strong: foliage deep green: fls. many and large, the greenish white petals and sepals blotched with dark purple, the lip white and warty. Guatemala. Var. **grandiflòra**, Hort., has fls. twice larger than in the type.

AA. *Sepals and petals greenish yellow.*

maculàta, R. Br. Sepals and petals pale or greenish yellow, short for the genus, marked with large, irregular brown spots, the large lip white, spotted with brown and purple. Jamaica. B.M. 1691. — Int. into Eu. in 1806, being one of the first known of exotic Orchids. Flowers large, but not very showy.



257. Brassia verrucosa.

Var. **guttàta**, Lindl. (*B. Wràyæ*, Skinner). Fls. greener, much spotted, lip yellowish: spikes 2–3 ft. high. Guatemala. B.M. 4003.

AAA. *Sepals and petals clearer yellow.*

caudàta, Lindl. Spikes drooping, 12–18 in.: sepals and petals very long (4–6 in.), barred with brown; lip yellow and broad spotted. W. Ind. A.F. 6:609.

Lanceàna, Lindl. Robust, with 2 dark green leaves from each pseudobulb: fls. large and numerous, very fragrant, lasting 2 or 3 weeks; sepals and petals bright yellow, long and tapering, blotched with brown or red, the lip yellow and wavy, spotted at the base. S. Amer. B.M. 3577.—A handsome species. There are two or three varieties.

Lawrenceàna, Lindl. Sepals and petals bright yellow, spotted with brown and green; lip yellow tinged with green; otherwise much like the last. Braz. J.H. III. 30:275.

Var. **longíssima**, Reichb. f., has a spike 18–20 in long, and very slender sepals, which are 6 or 7 in. long, the lip purple-spotted near the base. Costa Rica. B.M. 5748.—A remarkable plant.

Gireoudiàna, Reichb. f. & Warsc. Large, with many-fld. scapes: fls. larger than in *B. Lanceàna*, the sepals and petals very long, they and the lip bright yellow, blotched with deep red. Costa Rica. L. H. B.

BRÁSSICA (old classical name). *Cruciferæ*. Probably 100 species of annual, biennial and perennial herbs, natives of temperate regions of Europe, Africa, and Asia. Petals and stamens 4; pod long, beaked; seeds not winged (Figs. 258, 259). Includes all the mustards, cabbages, turnips, and the like; and to these plants the reader should refer for other information.

In common with nearly all cultivated plants, especially those which are perplexing, the Brassicas have received too little attention from botanists. The inevitable outcome of such neglect or of any superficial study is a reduction of species, and in this direction Brassica has suffered greatly. It is usually confusing to reduce types. The most perplexing species in our manuals are those which contain the greatest number of old types or synonymous names. It is true that this is supposed to

258. Flower of Mustard. (×3.)

259. Pod or silique of Mustard—Brassica juncea (×2).

be primarily due to the variation of the species or groups, but it is often to be charged to superficial study or insufficient material. Our manuals contain too few rather than too many species of Brassica; at all events, the miscellaneous dumping of rutabagas, turnips, rape and other plants into *Brassica campestris* is unnatural, and, therefore, unfortunate. One of the best presentations of the true Brassicas is that of De Candolle's Prodromus, as long ago as 1824 (also in Trans. Lond. Hort. Soc. vol. 5, and in Systema, 2:582–607), and the following scheme closely follows that outline. Some of the forms which are here kept separate as species may be derived from their fellows, but the evidence of such origin is lost, and perspicuity demands that they be kept distinct in a horticultural treatise.

The confusion into which our Brassicas have fallen is

260. Flowers of Cabbage—Brassica oleracea (× $\frac{1}{2}$).

in some measure due to the different vernacular names which they bear in different countries. The French use the word chou generically to include all forms of *B. oleracea* and the rutabaga—that is, all the blue, thick-leaved Brassicas—while in England the rutabaga is called the Swedish Turnip. A tabular view of the different vernaculars may be useful:

French.	*English.*	*American.*
Chou Cabus,	Cabbage,	Cabbage.
Chou de Milan,	Savoy,	Savoy Cabbage.
Chou de Bruxelles,	Brussels Sprouts,	Brussels Sprouts.
Choux-verts,	Borecole or Kale,	Borecole or Kale.
Chou-rave,	Turnip Cabbage or Kohlrabi,	Kohlrabi.
Chou-navet,	Turnip-rooted Cabbage or Swedish Turnip,	Rutabaga.
Chou-fleur,	Cauliflower,	Cauliflower.
Navet (or Chou-navet),	Turnip,	Turnip.

A. *Whole plant glaucous-blue when in flower; lvs. of the flower-stems clasping; fls. various.* (*Brassica proper.*)

B. *Lvs. from the first more or less fleshy throughout, and glaucous-blue even when young; fls. large and creamy yellow, the petals conspicuously long-clawed, and the sepals usually erect.*

oleràcea, Linn. CABBAGE, CAULIFLOWER, BRUSSELS SPROUTS, KALE. Fig. 260. Lvs. smooth from the first, and the root never tuberous. Sea shores of the Old World, and naturally perennial. See *Cabbage*.

Nàpus, Linn. RAPE. Lvs. smooth from the first; differing from *B. oleracea* chiefly in habit and more deeply scalloped lvs. The botanical position of the Rapes is open to doubt.

campéstris, Linn. RUTABAGA. Fig. 261. First lvs. hairy, the root usually tuberous.

BB. *Lvs. (except upon the flower-stem) thin and green: fls. smaller and bright yellow, less prominently clawed.*

C *Plant potentially biennial (that is, the root hard and thickened, often distinctly tuberous): foliage firm in texture.*

D. *Foliage distinctly hairy.*

Rapa, Linn. COMMON TURNIP. Lvs. prominently lyrate or interrupted below, the root tuberous.—Whatever the origin of the Rutabaga and Turnip may be, the two plants show good botanical characters. The tubers of the two are different in season, texture and flavor. In the Rutabaga, the small leaves immediately following the seed-leaves are sparsely hairy, but all subsequent leaves are entirely smooth, densely glaucous-blue, thick and cabbage-like, with a fleshy petiole and midrib. In the Turnip, the radical leaves are always more or less hairy, and they are green and radish-like, thin, with slender petiole, and the leaves are much more lyrate, with interrupted leaflets on the petiole; the small leaves following the seed-leaves are also thinner and narrower and more deeply scalloped. In the Rutabaga, the flowers are large and more cabbage-like, whereas in the Turnip they are small, yellow and mustard-like, with shorter claws and more spreading calyx. The Turnips vary in hairiness, but the cone of expanding leaves, or the "heart-leaves," always shows the hairs distinctly, while the heart-leaves of the Rutabagas are entirely glaucous, fleshy, and remind one of the young shoots of sea-kale. The Turnip usually produces seed freely if the bottoms are left in the ground over winter; and thereby the plant spreads, becoming a true annual and a bad weed, with a slender, hard root.

261. Flowers of Rutabaga—Brassica campestris (× ½).

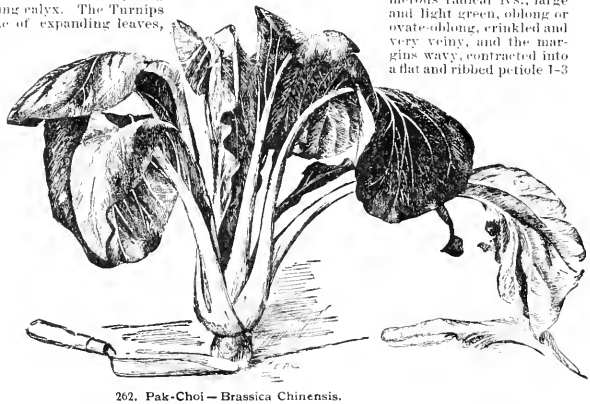
DD. *Foliage not hairy.*

Chinensis, Linn. PAK-CHOI CABBAGE. Figs. 262, 263. Radical lvs. wavy and ample, glossy green, obovate or round-obovate in general outline, either entire or obscurely wavy or even crenate, tapering to a distinct and thick, strong petiole, which is generally not prominently margined; pod large and tapering into a beak half an inch long; root sometimes tuberous.—This plant is grown by the American Chinese, and is occasionally seen in other gardens (see Bailey, Bull. 67, Cornell Exp. Sta.). It is impossible to determine if this particular plant is the one which Linnæus meant to distinguish by his *Brassica Chinensis*, but it best answers the description in his Amœnitates (vol. 4). In Linnæus' herbarium is a Brassica marked "Chinensis" in his own handwriting, but it is purple-fld. and has lyrate-lobed lvs., whereas Linnæus described his plant as having yellow fls. and Cynoglossum-like lvs.

napiformis, Bailey (*Sinapis juncea*, var. *napiformis*, Paill. & Bois). TUBEROUS-ROOTED CHINESE MUSTARD. Fig. 264. Radical lvs. comparatively few, the blade thin and oval in outline, and on long and slender, slightly feathered petioles, sharply and irregularly toothed, with a thin bloom; beak of the pod more abrupt; root distinctly hard and tuberous.—This vegetable appeared in France in 1882 from seeds sent by Dr. Bretschneider, of the Russian legation, Pekin. It was offered by Amer. seedsmen as early as 1889. The plant is a biennial, with thin, bluish foliage, and a small tuberous root like a conical turnip. These roots reach a diameter of 3 or 4 inches, and are scarcely distinguishable from white turnips in appearance, texture and flavor. In China the tubers are used as a winter vegetable, the seeds being sown in summer. The plant is native to China. It does not appear to have been brought to the attention of botanists until Bretschneider published an account of it in a French journal in 1881. Paillieux and Bois (Le Potager d'un Curieux) regard it as a variety of *Brassica juncea*, to which the Chinese mustard belongs, but it is very different from that plant. It is nearly related to Pak-Choi, and it may have sprung from the same species; but it is clearly distinguished by its sharply toothed lvs., one of which is shown in Fig. 264.

CC. *Plant truly annual: foliage profuse, loose and soft.*

Pe-tsâi, Bailey. PE-TSAI CABBAGE. Fig. 265. Numerous radical lvs., large and light green, oblong or ovate-oblong, crinkled and very veiny, and the margins wavy, contracted into a flat and ribbed petiole 1–3 in. wide, which is provided with a wide, thin, notched or wavy wing; stem lvs. sessile and clasping; pod of medium size, with a short cone-like beak.—The Pe-tsai, or Chinese Cabbage, is no longer a novelty in Amer. gardens, although it does not appear to be well known, and its merits are not understood. Its cultivation and peculiarities were described in France as long ago as 1840, by Pépin, who says that, while the plant had been known in botanic gardens for 20 years, it was brought to notice as a culinary vegetable only three years before he wrote. It appears to have attracted little attention in Europe until very recent years, however, and it is still included in the second edition of Paillieux & Bois' Le Potager d'un Curieux, 1892. It began to attract attention in the United States probably about 15 years ago. The leaves tend to form an oblong, loose head, like Cos lettuce. See *Cabbage*.



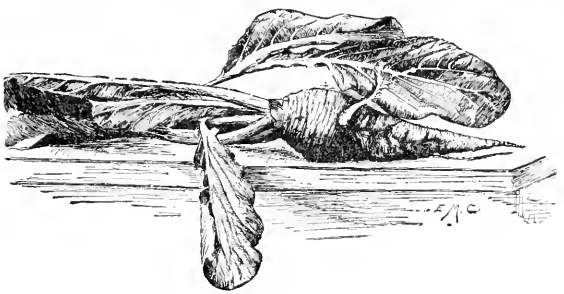
262. Pak-Choi—Brassica Chinensis.

Japónica, Sieb. CALIFORNIA PEPPER-GRASS. POTHERB MUSTARD. Fig. 266. Rather numerous radical lvs., oblong or oblong-obovate, the margins either crisped or cut into many very fine divisions, the petiole distinct at its lower end; stem lvs. all petioled; pod very small, with a slender beak.—The soft, thin lvs. make excellent "greens." Long known, but with no designative name, in old gardens in this country, and occasionally runs wild. Int. in 1890 by John Lewis Childs as California Pepper-grass. A very worthy plant (see Bull. 67, Cornell Exp. Sta.).

AA. *Whole plant green or but slightly glaucous when in flower: lvs. on the fl.-stems not prominently clasping: fls. small and yellow. Annuals.* (*Sinapis* or *Mustard.*)

B. *Pod terete or nearly so.*

juncea, Coss. (*Sinapis juncea*, Linn.). CHINESE MUSTARD. Figs. 259, 267. Rank and coarse grower, in the common forms making great tufts of root-lvs. if sown early: radical lvs. generally abundant and often very large, oval or oboval in outline, the blade angled or toothed, tapering into a narrow petiole, which generally bears leafy appendages; lower stem-lvs. more or less toothed and petiolate, the upper ones oblong or oblong-lanceolate, entire and usually sessile or clasping: flowering stems and lvs. more or less lightly glaucous: fls. bright yellow: pod slender, of medium size, tapering into a short beak. Asia.—This much abused species is held by Hooker and Thomson (Journ. Linn. Soc. v. 170 to include a great variety of forms, as *Sinapis lævigata*, Linn.; *S. integrifolia*, Willd.; *S. ramosa*, *rugosa*, *patens*, *cancifolia*, Roxbg.; *S. lanceolata*, DC., and others. There are two types of it in cultivation in our gardens, one with the radical lvs. somewhat sharply toothed and nearly smooth below (sometimes grown as *Brassica* [or *Sinapis*] *rugosa*), the other with root-lvs. obtusely toothed and spinescent on the veins below (comprising Chinese Mustard, Chinese Broad-leaved Mustard, and Brown Mustard). Linnæus founded his *Sinapis juncea* upon a figure in Hermann's Paradisus (Hermann, Paradisus Batavus, t. 230, 1705), which represents a plant



263. Tuberous Root of Pak-Choi.

very like the former type mentioned above, and which Hermann described as "lettuce-leaved."

alba, Boiss. WILD MUSTARD. Tall: lvs. pinnatifid and rough-hairy: pods spreading, hairy, the lower part thick and few-seeded: seeds pale brown, large. Weed, from Europe.

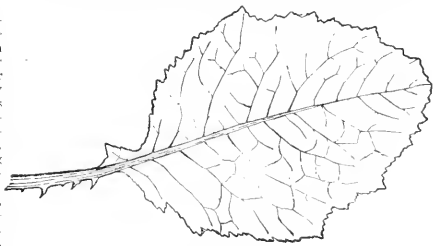
Sinapistrum, Boiss. CHARLOCK. Tall: lvs. strong-toothed, or sometimes nearly lyrate: pods knotty, glabrous or hairy, the upper third indehiscent and 2-edged, usually 1-seeded. Weed, from Europe.

BB. *Pod distinctly 4-angled.*

nigra, Koch. BLACK MUSTARD. Fig. 268. Wide-spreading and loose grower: lvs. pinnatifid, somewhat hairy: pods short and erect, glabrous; seeds small and dark brown, pungent, supplying the mustard of commerce. Cult. in Eu., but a weed in this country.—Commercial mustard is the flour of the seeds of this species chiefly, but the seeds of *B. alba* and probably of *B. juncea* are sometimes used.

L. H. B.

BRAVOA (Bravo, Mexican botanist). *Amaryllidàceæ*. A small genus, much resembling in some of its species the tuberose (Polianthes), and considered by the writer as hardly distinct from it. Stems slender, from small thickened rootstocks: lvs. mostly basal: inflorescence a lax spike or raceme: fls. always in pairs more or less bent or curved; stamens 6, included within the perianth-tube: fr. 3-celled, many-seeded. Native of the mountain and table land region of Mex.—Five species have been described, but recent explorations have brought to light some 5 or 6 additional species. While



264. Lower stem-leaf of Tuberous-rooted Mustard — Brassica napiformis.

the flowers are not as showy as the common tuberose, yet the genus should be found in every choice bulb collection. Only one species has been cultivated to any extent, and even this species is not well known. As the species often grow in the high mountains of Mexico, they ought to be hardy in the southern stretches of the temperate zone.

geminiflòra, Llav. & Lex. MEXICAN TWIN FLOWER. Stems 1–2 ft. high: bulbs small, 1–1½ in. long, the outer scales cut into fine fibers at the top: basal lvs. linear, erect, 6 lines or less broad, smooth: fls. in a slender raceme, reddish or orange-colored; lobes minute, rounded. B. M. 4741.—Handsome, and worthy of more attention.

B. Bulbana, Baker. Basal lvs. described as lanceolate, 1-1½ in. broad: fls. in 5 or 6 pairs, white. Seemingly too near the little known Polianthe Mexicana. Not in cult.—*B. sessiliflora*, *B. densiflora*, and *B. sanguiflora* are rare species, only known from herbarium specimens. The latter two, however, should probably be excluded from this group.

J. N. ROSE.

BRAZIL NUT. See *Bertholletia*.

BREAD FRUIT. See *Artocarpus*.

BREAD NUT is *Brosimum Alicastrum*.

BRECK, JOSEPH (1794–1873). Plate II. Boston seedsman, and author of "The Flower Garden, or Breck's Book of Flowers," first published in 1851, and reissued in 1866

265. Pe-Tsai Cabbage — Brassica Pe-Tsai.

as the "New Book of Flowers." This was preceded, in 1833, by "The Young Florist." In 1822, he founded the seed business now conducted at 51 North Market St., under the name of Joseph Breck & Sons. He was one of the original members of the Massachusetts Horticul-

266. Brassica Japonica.

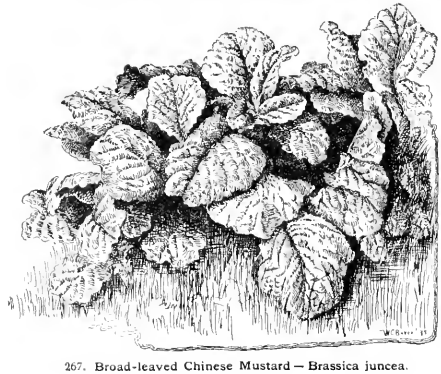
tural Society, and its president from 1859–1862. He edited the old New England Farmer for many years, but discontinued it in 1846, when he turned over his list of subscribers to Luther Tucker, of Albany, N. Y., at the time of the founding of The Horticulturist, which was edited by the illustrious A. J. Downing. He also edited The Horticultural Register from 1836–1838, in company with Thomas Fessenden. The revision of his book in 1866 was undertaken when the author was 70 years old. It was a popular book in its day. A portrait of Joseph Breck is seen in the catalogues of the present firm.

W. M.

BREVOÒRTIA (J. Carson Brevoort, Regent N. Y. State University). *Liliàceæ*. Differs from Brodiæa in the long-tubular and 6-saccate corolla. One species.

Ida-Màia, Wood. (*B. coccínea*, Wats. *Brodiæa coccínea*, Gray). Floral Fire-Cracker. Lvs. slender, grassy; scapes slender, 1–2 ft. high, with 3–60 pendulous tubular-saccate fls. 1–2 in. long, which are brilliant crimson-red, tipped with pea-green. N. Calif. to Ore. B.M. 5857. G.C. III. 20: 687. Gn. 46, p. 503.— The flowers are very lasting and beautiful. Half-hardy. Needs partial shade and a deep, loose soil, thoroughly drained, and with some leaf mold. Bulb the size of a nutmeg. Grows 2–3 ft. high.

Carl Purdy.



267. Broad-leaved Chinese Mustard — Brassica juncea.

BREWÈRIA (Samuel Brewer was an English botanist of last century). *Convolvulàceæ*. Herbs, rarely somewhat woody: fls. much like those of Convolvulus, but style 2-cleft, the divisions simple, with capitate stigma, the corolla pubescent outside in the bud: lvs. simple. Trailing plants of 30 or more species in warm climates.

grandiflòra, Gray. Root tuberous: stem pubescent: lvs. broad-ovate and very short-stalked: peduncles 1-fld.: fl. very large (3 in. long), bright blue and showy, funnel-shaped; stigmas large and globose. S. Fla.—Int. by Reasoner Bros.

BRIAR. In America, commonly applied to brambles or thorny plants of the genus Rubus, especially blackberries. In the Old World, it is applied to large, wild-growing roses.

BRICKÉLLIA (Dr. John Brickell, an early American naturalist). *Compósitæ*. About 40 species of herbs or small shrubs in the warmer parts of the U. S. and Mex., only one of which seems to be in the trade. Somewhat allied to Eupatorium. Lvs. veiny, either opposite or alternate: fls. white, cream-colored or flesh-colored, small, with pappus either scale-like or somewhat plumose: akenes striate.

grandiflòra, Nutt. Tassel Flower. Nearly glabrous, 2–3 ft., branchy above: lvs. triangular-cordate or triangular-lanceolate above, coarsely toothed: heads about 40-fld., drooping, in large panicles, tassel-shaped and yellowish white. Rocky Mts. —Recommended for moist, shady borders.

BRIDAL WREATH. See *Spiræa prunifolia*.

BRIDGEMAN, THOMAS, Plate II. Gardener, florist, seedsman and author; was born in Berkshire, Eng., came to America in 1824, and established the business which is now conducted under the name of his son, Alfred Bridgeman, at 37 E. 19th St., New York. An historical account of this business may be found in the catalogue of the present firm. In 1829, Thomas Bridgeman published "The Young Gardener's Assistant," which was many times reprinted and eventually enlarged to five times its original bulk. It was copyrighted in 1847, when it appeared as a large-sized work in three parts, covering fruit, vegetable, and ornamental gardening. Two of these parts were published separately in the same year as "The Kitchen Gardener's Instructor," and "The Florist's Guide." The first-named work was revised by Sereno Edwards Todd, and republished in 1866 by Alfred Bridgeman. Thomas Bridgeman died in 1850.

268. Brassica nigra. Natural size.

W. M.

BRINCKLÉ, WILLIAM DRAPER, Plate II. Physician and amateur pomologist, was born in Delaware, began the practice of medicine at Wilmington in 1820, moved to Philadelphia in 1825, where he passed most of his life as a busy physician, and died at Groveville, N. J., in 1863, at the age of sixty-four. In a room of his Philadelphia home he hybridized strawberries, and had fruit at every season of the year. He also had a little garden about the size of a parlor. He produced the Cushing strawberry, the Wilder, President Cope, Cushing, and Orange raspberries, and the Wilmington and Catherine Gardette pears. Unfortunately, most of his work with raspberries was done with *Rubus Idæus*, the Old World species, which is not hardy in America, but his yellow-fruited variety of raspberry is still regarded by many as

the acme of quality. He was for many years vice-president of the Pennsylvania Horticultural Society, and was regarded as a leader of American pomology. In raising pear seedlings, he was wont to graft and regraft annually, after the second or third year from seed. He thus produced new fruits in half the time required by Van Mons, many of whose novelties did not fruit within twenty years from seed. Dr. Brinckle gave away thousands of grafts to amateurs and tradesmen everywhere, and always prepaid the carriage. In 1860 he edited "Hoffy's North American Pomologist," a high-class periodical with colored plates, which, unfortunately, did not survive. Some sprightly anecdotes of Dr. Brinckle are reprinted from the Gardener's Monthly for 1863, in Bailey's "Evolution of Our Native Fruits." W. M.

BRITISH COLUMBIA. See *Canada*.

BRÍZA (Greek name of a grain). *Gramineæ*. QUAKING GRASS. A genus of grasses cultivated for the graceful panicles, which tremble in the slightest breeze. Lvs. flat or convolute; panicles loosely flowered and open; spikelets many-flowered, triangular or heart-shaped, nodding; glumes membranaceous and rounded on the back; awnless. Species, 12 in Eu., N. Afr., S. Amer. About 5 are considered to be ornamental and useful for dry bouquets.

geniculàta, Thunb. Fig. 269. Plant 12–18 in. high: culms geniculate at the base: lvs. 3–5 in. long, smooth above, slightly rough below: spikelets showy, nodding, oblong-cordate, $\frac{1}{5}$ in. long, 9–12-fld., with a striking ribbed appearance.

máxima, Linn. (*B. májor*, Presl.). Annual, 14–18 in. high: lvs. long and linear-acuminate: panicles nodding: spikelets oblong-cordate, 15–17-fld. Eu.—A handsome ornamental grass.

mèdia, Linn. COMMON QUAKING GRASS. Plant 6 in. to 2 ft. high: lvs. short, linear-acuminate: spikelets triangular, $\frac{1}{2}$ in. long, 5–12-fld. Eu.

minor, Linn. (*B. grácilis*, Hort. *B. minima*, Hort.). Plant 4–15 in. high: lvs. 1–5 in. long: panicle with hairlike branches; spikelets triangular, 3–6-fld.; empty glumes longer than the flowering glumes. Eu., N. Afr.—An exceedingly pretty little ornamental grass.

P. B. KENNEDY.

269. Briza geniculata. (×¼.)

BRIZOPŸRUM. See *Desmazeria*.

BROCCOLI. See *Cauliflower*.

BRODIÆA (J. J. Brodie, a Scotch botanist). *Liliàceæ*. West American cormous plants of low growth, some of which are now becoming popular in cult. The flS. are several on a scape, the perianth mostly funnel-form, and either saccate or non-saccate, ranging from purple to red, white and yellow; stamens 6, 3 of them sometimes reduced to staminodia. In Bot. of Calif., Watson includes under Brodiæa a number of genera erected by previous authors. Baker, in his latest revision of Brodiæa, still further enlarges the genus by including some species of South American bulbs heretofore separated under Milla and Triteleia. Brodiæa, as thus outlined, includes Hookera, Triteleia, Milla, Calliprora and Hesperoscordum. For horticultural purposes, it is better and more convenient to merge all into Brodiæa. In this broad sense Brodiæa includes about 30 species, which must be divided into several groups. The species differ so widely in every way that cultural directions must follow the group. For *B. volubilis*, see *Stropholirion*; for *B. coccinea*, see *Brevoortia*. Monogr. by Baker, in G.C. III. 20, pp. 213, 238, 459, 687; also Watson, Proc. Amer. Acad. Arts and Sci. 14: 236.

Index to the species: Bridgesii, 4; californica, 11; candida, 2; congesta, 19; Douglasii, 22; erecta, 6; filifolia, 16; gracilis, 9; grandiflora, 10; Hendersonii, 5; Howellii, 23; hyacinthina, 7; ixioides, 6; lactea, 8; laxa, 1; lilacina,

270. Brodiaeas.
At top, B. candida; at bottom, B. ixioides, var. splendens; at left, B. Bridgesii.

8, 23, and supplementary list; major, 8; minor, 6, 12; multiflora, 20; Orcuttii, 15; parviflora, 20; peduncularis, 3; Purdyi, 18; rosea, 17; splendens, 6; stellaris, 14; terrestris, 13.

Group 1.

In this group, which contains some of the best species in cultivation, the plants have a fibrous-coated flattened corm, resembling that of the crocus; not usually bulbiferous. The lvs. are few, all radical and grass-like; the scapes are slender but stiffly erect, naked except for bracts below the many-fld. umbel; the flS. are oftener broadly tubular, borne on slender pedicels, and are in purples, white and yellow. All are hardy, but a protection of straw or leaves is advisable in the colder regions. A light, loose, well-drained, sandy or loamy soil best meets their needs, and an excess of moisture and very rich soils are to be avoided.

1. **láxa,** Wats. Strong, with many broadly tubular purple flS.: tube very narrow, and equaling or exceeding the segments; filaments very slender; stamens in 2 rows. N. Cal. G.C. III. 20: 241.—Showy, and one of the best. There are many variations.

2. **cándida,** Baker. Fig. 270. Much like *B. laxa* in characters of bloom, but segments white or bluish with a green vein, and the flS. set at an angle on the pedicel, so that they all face one way: further distinguished by early flowering and the very broad and glossy, scarcely carinate lvs. Calif.

3. **pedunculàris,** Wats. Still stouter (1–2 ft.), with smaller and fewer white flS. on pedicels a few inches to a foot long; filaments short or none. N. Calif. G.C. III. 20: 243.—This species grows in wet, heavy ground close to water, and is very bulbiferous.

4. **Bridgesii,** Wats. Fig. 270. Similar to *B. laxa*, but stamens in one row, corolla with a spreading limb, and color reddish purple; filaments deltoid. Cent. Calif. G.F. 1: 126.—Grows a foot or more high.

5. **Héndersonii,** Wats. Resembles *B. Bridgesii*: yellow, banded purple: filaments somewhat winged, but not deltoid: small-fld. Central and N. Calif. to Ore.

6. **ixioides**, Wats. Allied to *B. laxa*, but dwarfer (3 in. to 2 ft.). Fls. few to many, on pedicels 1–4 in. long, in shades of yellow and often purple-tinged; filaments winged, 2-toothed above. S. Calif. to Ore. B.R. 1590. B.M. 3588(as *Calliprora lutea*). G.C. III. 20: 159.—Many handsome varieties. The best is var. **splèndens**, Hort. (Fig. 270), with large, bright yellow fls., the limb wheel-shaped. Var. **minor**, Hort. Dwarf: fls. yellow, with dark band and blue anthers. Var. **erecta**, Hort. Dwarf.

7. **hyacinthina**, Bailey, Ann. Hort. 1891, 267 (*Tritelèia hyacinthina*, Greene). From 1–2 ft.: lvs. linear: fls. 10–30, 1 in. or less long, milky white or purplish. Calif. —Probably a form of the next.

8. **láctea**, Wats. In the type, has the habit of *B. laxa*, but the fls. have a short tube with a rotate corolla, and are white, with green midvein; filaments deltoid. Calif. to Brit. Columbia, in many forms. B.R. 1639 (as *Hesperoscordum lacteum* and *H. hyacinthinum*). G.C. III. 20: 459.—Var. **lilacina**, Wats., is much stronger, very bulbiferous, grows in wet, heavy soils, and has a larger fl., which is usually lilac-colored. Var. **màjor**, Purdy. Like var. *lilacina*, but fls. white.

9. **gracilis**, Wats. A tiny species, with small yellow fls. Scape 2–4 in. and purplish: lf. 1: fls. $^1/_2$in. long, on pedicels of equal or greater length; filaments elongated and very slender. N. Calif., in Sierras.

Group 2.

In this group the corm is not flattened, and bears many strong offsets; the coating is hairy and reddish. The lvs. are linear and grassy; the scapes stiff, few-fld.; the fls. of a thick, waxy texture, funnel-form (except *B. Purdyi*), very lasting, usually purple. These Brodiæas are native to a heavy soil, in rather moist situations, and are hardy. They will thrive under conditions recommended for Group 1. (*Hookera.*)

10. **grandiflòra**, Smith (*Hookèra coronària*, Salisb.). Scape 4–10 in. high: lvs. nearly terete, dying before the fl.-st. appears: fls. 3–10, blue, of good size (1 in. long), very lasting; staminodia obtuse; anthers linear. Calif. to Brit. Col., Ore., and Wash. B.R. 1183. B.M. 2877. G.C. III. 20: 213.

11. **Californica**, Lindl. (*Hookèra Californica*, Greene). Very like *B. grandiflora*: scape longer (12–30 in.): fls. 10–20, $1^1/_2$–2 in. long, rose to deep purple: staminodia linear and cuspidate. N. Calif. G.C. III. 20: 215.—"The finest species for garden purposes," acc. to Baker.

12. **minor**, Wats. Very slender, 3–6 in.: fls. $^1/_2$–1 in. long: staminodia broad and usually emarginate: anthers oblong. Calif. to Ore.

13. **terréstris**, Kellogg. Scape short or practically none, the umbel sitting on the earth: lvs. nearly terete: fls. $^3/_4$–1 in. long; staminodia emarginate, yellowish: anthers sagittate-oblong. Central Calif., along the coast.

14. **stellàris**, Wats. Low: scape with long pedicels and 3–6 bright purple fls., with white centers: lvs. nearly terete: anthers winged behind: staminodia white, longer than the stamens, emarginate. N. Calif. G.C. III. 20: 213.—Very pretty.

15. **Órcuttii**, Bailey, Ann. Hort. 1891, 267 (*Hookèra Orcuttii*, Greene). Plant rather stout, a foot or more high: lvs. linear, flat or nearly so: fls. 5–15, less than an inch long, short-tubed, lilac; staminodia a small, triangular scale or none. S. Calif. G.C. III. 20: 215.

16. **filifòlia**, Wats. (*Hookèra filifòlia*, Greene). From 6–12 in.: lvs. slightly flattened: fls. 3–6, $^3/_4$ in. or less long, dark colored; staminodia triangular, twice shorter than the anthers. S. Calif.

17. **rósea**, Baker (*Hookèra rósea*, Greene). About 3–6 in.: lvs. nearly terete: fls. 5–8, under 1 in. long, rose-red; filaments dilated; staminodia white, obtuse and entire, longer than the anthers. N. Calif. G.C. III. 20: 213.—A pretty species.

18. **Púrdyi**, Eastw. Different from others in having a short-tubed fl. with broadly spreading, declinate segments, the throat constricted. Cent. Calif., in Sierras.

Group 3.

In these pretty Brodiæas the corm is long and bulbiferous. Lvs. grassy; the scape tall, slender and flexuous; the fls. in a close, head like umbel, the separate fls. waxy and narrowly tubular. They like a loose, perfectly drained, loamy soil, with some humus. Hardy. The species are not readily distinguished. All are from Cent. Calif. to Wash. Known as "California Hyacinths."

19. **congésta**, Smith. Tall (2–3 ft.), with a globular head of purple fls.: lvs. somewhat terete: fls. 6–12, sessile or nearly so, $^3/_4$ in. long; filaments 0; staminodia purple, 2-toothed. N. Cal. G.C. III. 20: 213.—Blooms late.

20. **multiflòra**, Benth. Similar to *B. congesta*: fls. 6–20, sessile or short-stalked, umbellate, $^3/_4$ in. long, blue; staminodia lanceolate, entire. Calif., Ore., Utah.

21. **capitàta**, Benth. Lower (1–2 ft.): lvs. narrow-linear: fls. many, in a capitate umbel, $^1/_4$ in. or less long, lilac (a var. *alba*); three inner anthers winged. Calif., Utah, N. Mex. B.M. 5912. G.C. III. 20: 238.—Early blooming.

Var. **parviflòra**, Torr. Dwarf (3–6 in.), very early.

Group 4.

Bulb as in Group 1: fls. many, in a dense umbel, the tube about as long as the segments.

22. **Douglasii**, Wats. Lvs. linear: scape $1^1/_2$–2 ft.: fls. few, in a close umbel, saccate as in *Brevoortia coccinea*, blue; segments as long as the tube, the inner ones wavy: filaments winged. Ore. and Wash. B.M. 6907.

23. **Howellii**, Wats (*Tritelèia Hówellii*, Greene). Fls. bell-shaped, white; differs from *B. Douglasii* in smaller fls., and segments not more than half as long as tube. Wash. B.M. 6989.

Var. **lilacina**, Hort. One of the handsomest of all Brodiæas, and a good grower. Fls. porcelain-blue, suggestive of *Brevoortia coccinea*. Wash. G.C. III. 19: 767; 20: 239. Gn. 46: 992.—Large and strong.

B. crócea, Wats. 1 ft. or more: fls. 6–15, yellow. N Calif.—*B. insulàris*, Greene. Like B. capitata, but more robust and larger fld. Islands off Calif.—*B. Lémmonæ*, Wats. 1 ft.: fls. small, deep orange. N Ariz.—*B. leptandra*, Baker. 1 ft. or less: fls. 2, purple. Calif.—*B. lilacina*, Baker. 1 ft. or less: fls. 10–15, lilac-purple. Calif.—*B. bigelo*vii, Baker. Like B. ixioides, but fls. saffron-color within and brown-black on tube and ribs. Calif.—*B. Palmeri*, Wats. Lvs. linear: fls. many, blue. S. Calif. G.F. 2: 245.—*B. pulchélla*, Greene. Probably the same as B. congesta.—*B. scabra*, Baker. Like B. ixioides, but scabrous: fls. bright yellow. Calif

CARL PURDY and L. H. B.

BROMÈLIA (Bromel, a Swedish botanist). *Bromeliàceæ.* About two dozen species of tropical Amer. herbs, with stiff, pineapple-like lvs., and fls. in panicles; corolla 3-parted; calyx of 3 ovate-oblong sepals. Differs from Billbergia and Ananas in technical characters, particularly in the deeper-cut calyx. Less popular as stove plants than Æchmea and Billbergia. *B. bracteata* and *B. macrodontes* of trade lists belong to Ananas. Culture as for Billbergia, which see. Monogr. by Mez, in De Candolle's Monogr. Phaner. 9.

Pinguin, Linn. PINGUIN of Jamaica. WILD PINE. Three or 4 ft. high: lvs. broad-toothed and spiny, bright green, but becoming pink and red with age: fls. reddish, pubescent, in a dense panicle, with a mealy rachis, the sepals acute: fr. as large as plums, acid. W. Ind.—Makes a good hedge in tropical countries, and the fr. yields a cooling juice.

Binòti, Morr. Panicle lax: sepals rounded at the top: habit open and spreading. Braz.

L. H. B.

BROMPTON STOCK. See *Matthiola.*

BRÒMUS (Greek, *food*). *Gramíneæ.* BROME GRASS. Annual or perennial grasses, with large spikelets, usually over 1 in. long. Lvs. flat, the sheaths often closed: panicle branched, somewhat spreading; spikelets several-fld., erect or drooping, awned, rarely awnless; empty glumes 2, unequal, acute; flowering glumes usually rounded on the back (except *B. unioloides*). Species about 40, most abundant in the North Temperate zone, some also in temperate S. Amer.; a few on the mountains of the tropics. A number of kinds used as forage grasses. The common Chess is *B. secalinus.*

A. *Spikelets 10-flowered or more.*

brizæfòrmis, Fisch. & Mey. (*B. squarrósus*, var. *mùticus*, C. A. Mey.). An elegant biennial grass with droop-

ing panicles of spikelets about as large as those of *Briza maxima*: lvs. 5–7, soft-pubescent, blades 2–3 in. long; spikelets 10–15-fld., nodding, awn short. Int. from Eu. —Very useful in the mixed border, and for drying for winter decoration.

macróstachys, Desf. (*B. lanceolátus*, Roth. *B. divaricátus*, Rohde). An erect, smooth annual: lvs. soft, covered with hairs; sheaths slit; panicles erect, narrow, the branches very short or the lower ones somewhat long; spikelets large, lanceolate, 10–16-fld. Mediterranean, Siberia.

AA. *Spikelets from 1-10-flowered.*

Madritensis, Linn. (*B. polystáchyus*, DC.). LONG-AWNED BROME GRASS. Fig. 271. A soft, erect, slender annual, geniculate at the base: sheaths longer than the internodes; blades $2\frac{1}{2}$–3 in. long; spikelets dull green, 7–10-fld.: flowering glume linear-lanceolate, about $\frac{3}{4}$ in. long, including the two slender points; awn about 1 in. long.—Pretty ornamental grass. Int. from Eu.

271. Bromus Madritensis. ($\times \frac{1}{4}$.)

unioloides, H B K. (*B. Schráderi*, Kunth). RESCUE GRASS. A stout, erect annual, 2–3 ft. high: sheaths shorter than the internodes; blades flat, smooth on the lower side, scabrous on the upper; panicle variable, about 8 in. long; rays stout, bearing 1 to few spikelets along the upper part. N. Amer.

B. inérmis, Leys. (B. giganteus, Hort.). An erect perennial 2–5 ft. high. In Europe classed among the best forage plants. Int. from Eu.—*B. mollis*, Linn. An erect annual 1–3 ft. high. Resembles chess (B. secalinus), from which it differs by its more erect panicle and hairiness.—*B. secálinus*, Linn. CHESS. CHEAT. A well-known weedy annual grass, with spreading and more or less drooping panicles. As it very often occurs in wheat fields, it is erroneously regarded as degenerated wheat. Int. from Eu.

P. B. KENNEDY.

BROOM. See *Cytisus* and *Genista*.

BROOM CORN. Brooms are made of the rays or peduncles of the flower-cluster of *Andropogon Sorghum* (*Sorghum vulgare*), the species which in other forms is known as Sorghum, Kaffir Corn, and Guinea Corn. Broom Corn is grown in various parts of the U. S.

BRÓSIMUM (Greek, *edible*). *Urticáceæ*. A few large trees of Trop. Amer., yielding edible fr. *B. Alicástrum*, Swz., is the Bread-nut of Jamaica, but it is not grown within the U. S. It bears round yellow fr., about an inch in diameter, containing a single large, edible seed. The tree has shining lance-elliptic lvs.

BROUGHTÒNIA (Arthur Broughton, English botanist). *Orchidáceæ*, tribe *Epidendrea*. Two or three W. Indian Orchids much like Lælia and Cattleya. Several species which have been referred to this genus are now distributed in Epidendrum, Maxillaria, Phajus, etc. Plant producing pseudo-bulbs, and sending up a bracted scape bearing several or many showy fls.: calyx of 3 equal lanceolate sepals; two lateral petals broad-ovate and somewhat crisped, the labellum round-cordate and somewhat 2-lobed, crenate, with a spur at the base adnate to the ovary. Require warmhouse treatment. Culture like that for Lælia. Do not dry off enough to shrink the bulbs. Prop. by division.

sanguínea, R. Br. (*B. coccínea*, Hook.). Pseudo-bulbs clustered, roundish-ovate and somewhat flattened, often brown-marked: scape 1 ft. high. fls. stalked, in a loose, erect raceme, bright crimson, lasting a long time in perfection. Jamaica. B.M. 3076, 3536.

L. H. B.

BROUSSONÈTIA (after T. N. V. Broussonet, a French naturalist). *Urticáceæ*. Trees or shrubs: lvs. deciduous, alternate, petioled, large: fls. dioecious, inconspicuous, apetalous, the staminate in cylindrical, nodding catkins, with 4-parted calyx and 4 stamens, the pistillate in globular heads: collective fr. globular, consisting of small fleshy nutlets. Three species in E. Asia, and there often cultivated, the bark being used for paper-making. Ornamental trees with broad, round heads, but under culture often shrubby, of vigorous growth when young, and effective by its large, often deeply lobed foliage, not hardy north or only in very sheltered positions. They thrive best in rich, somewhat moist soil and sheltered positions. Prop. by seeds, sown after maturity or in spring, by greenwood cuttings under glass, or by cuttings of ripened wood, kept in colder climates during the winter in the greenhouse; also by root-cuttings and layers. Budding in summer or grafting in early spring in the greenhouse is sometimes practised. Known as Paper Mulberries.

papyrífera, Vent. Tree, 30–50 ft., with thick, pubescent branches: lvs. long-petioled, usually cordate-ovate, acuminate, coarsely dentate, often deeply lobed, especially on younger plants, rough above, pubescent beneath, 3–8 in. long; fr. heads $\frac{3}{4}$ in. across, red. May. China, Jap. B.M. 2358.—Many varieties. Var. **cucullàta,** Ser. (*B. navicularis*, Lodd.). Lvs. small, curled upward. Var. **laciniàta,** Ser. Lvs. deeply lobed and incised. Decorative form, but more tender than the type. Var. **macrophylla,** Ser. Lvs. large, usually undivided.

Kazinòki, Sieb. (*B. Kæmpferi*, Hort.). Branches slender, glabrous at length: lvs. short-petioled, ovate or ovate-oblong, nearly glabrous, only somewhat rough above, entire or 2–3-lobed, 2–8 in. long; fr.-head less than $\frac{1}{2}$ in. in diam. China, Jap.—This species is more tender than the former, which is also cultivated sometimes as *B. Kæmpferi*, while the true *B. Kæmpferi*, Sieb., with the lvs. resembling in shape those of *B. Kazinoki*, but much smaller and pubescent, and with very small fr.-heads, seems not to be cultivated.

ALFRED RENDER.

BROWÁLLIA (after John Browall, Bishop of Abo, Sweden). *Solanáceæ*. A genus of about 10 South American annuals, with abundant blue, violet or white flowers. The seeds can be sown in the open border, but for the sake of the earlier bloom it is better to start them indoors in early spring and transplant into the open about May 15, where they will bloom profusely all through our hot, dry summers, and until frost. They can be grown in poorer soil than most half-hardy annuals, and make excellent bedding plants. They are also used for winter decoration, the seeds being sown in midsummer, earlier or later according to the size of the specimens desired. They should be placed near the glass and frequently stopped, in order to produce compact plants. Large specimens are excellent for cutting, and small potted plants should be grown more commonly by florists for home decoration at Christmas. It is even possible to lift flowering plants from the open before the first frost of autumn and pot them for conservatory decoration, though the flowers are likely to become successively smaller. Blue flowers are rare in winter, and Browallias are especially desirable for their profuse bloom all through winter and early spring. The flowers are, however, likely to fade, especially the purple ones. In the names of the early species, Linnæus commemorated the course of his acquaintanceship with Browall: *elata*, reflecting the exalted character of their early intimacy; *demissa*, its rupture; and *alicuata*, the permanent estrangement of the two men.

A. *Corolla segments long, acuminate: fls. large.*

speciosa, Hook. Lvs. sometimes opposite, sometimes alternate: fls. thrice as large as in *B. grandiflora*, all solitary, axillary: peduncle shorter than the lvs.: corolla-tube thrice as long as the calyx, and abruptly swelled at the top into a globular form: limb of 5 ovate,

striated, dark purple segments, pale lilac beneath. Colombia. B.M. 4339. P.M. 16: 290.—There are blue, violet and white-fld. varieties. Var. **major**, Hort., has violet fls. 2 in. across. R.B. 20: 240. **B. gigantea**, Hort., is a florist's variety, with very deep blue fls. and long-blooming habit. Int. into Amer. trade in 1899.

AA. *Corolla-segments short, 2-lobed or notched: fls. smaller.*

B. *Upper lvs. not stalked: fls. all in loose racemes: calyx not hairy.*

grandiflòra, Graham (*B. Rúizii*, Hort.). Stem and lvs. glabrous, or in the upper part of the plant minutely clammy-pubescent: lvs. ovate, the lower petioled: calyx-teeth oblong, somewhat obtuse, equal, scarcely shorter than the tube, spreading: corolla white or pale blue, the limb wider than in *B. demissa*. Peru. B.M. 3069. In *B. Rúizii*, from Rocky Mts., some fls. are white, some pale blue. No dark blue or violet colored forms are known.

BB. *Upper lvs. stalked: fls. solitary and axillary below, racemose above.*

c. Calyx hairy.

demissa, Linn. (*B. elàta*, Linn.). Fig. 272. Stem and lvs. pubescent or glabrous: lvs. ovate, with longer stalks than in *B. grandiflora*: calyx-teeth acute, unequal, much shorter than the corolla-tube. The lvs. are variable, cuneate, rotund, or rarely cordate. S. Amer. B.M. 34 and 1136. The following are now referred to the above: *B. Americàna*, *elàta*, *elongàta*, *nervòsa*. This species is the commonest, and is usually known as *B. elata*. Blue, violet, white and dwarf forms are cult.

cc. Calyx sticky or clammy.

viscòsa, HBK. (*B. pulchélla* and *B. Czerniakowskiàna*, Hort.). Plant viscous-pubescent: lvs. short-petioled, ovate, rough-hairy on both sides: pedicels a little shorter than the calyx: calyx teeth very clammy, oblong, shorter than the corolla tube. The lvs. are similar to *B. demissa*, but the habit is stiffer and the fls. more numerous. The calyx teeth spread less than in *B. grandiflora*. So. Amer.

272. Browallia demissa (× $\frac{2}{3}$)

B. Americàna, Linn., is considered by some a separate species from the above, but in Germany, where most seeds of annual flowers are grown, it is used by Siebert and Voss (in Vilmorin's Blumengartnerei) to include *B. demissa*, *B. elata*, and other forms.—*B. Jamesonii*, Benth. = Streptosolen Jamesonii.—*B. pulchella*, Hort., is likely to be either *B. grandiflora* or *B. viscosa*. W. M.

BROWNEA (Patrick Brown wrote a history of Jamaica). *Leguminòsæ*. Several small evergreen trees of trop. Amer., allied to Amherstia, but little known in the Amer. trade. Lvs. alternate and pinnate: fls. showy, red, in dense terminal or axillary clusters. Cult. in hothouses. **B. Ariza,** Benth. (*B. Princeps*, Lind.) has drooping heads of scarlet fls. **B. grándiceps,** Jacq., fls. red, in capitate spikes: lfts. about 12 pairs, lance-oblong. **B. Rosa-de-Monte,** Berg., fls. scarlet, in dense heads: lfts. 2–3 pairs, oval, acuminate.

BRUCKENTHÁLIA (after S. von Bruckenthal, an Austrian nobleman). *Ericàcew*. Low, heath-like, evergreen shrub, 5–8 in. high, with small, linear, whorled lvs.: fls. rosy pink, nodding, in short, terminal racemes. Only one species—**B. spiculiflòra,** Reichb., in the mountains of S. E. Europe. A pretty little plant for rockeries, quite hardy, and requiring the same treatment as hardy Ericas. ALFRED REHDER.

BRUGMÁNSIA. Consult *Datura*.

BRUNÉLLA (probably from old German *brëune* or *braune*, quinsy, which it was thought to cure). Often written *Prunella*. *Labiàtæ*. Low-growing, hardy, herbaceous perennials, with fls. usually violet or purple, produced all summer on heads an inch or more high. They are best suited for the rockery and slightly shaded parts of the border, succeeding in almost any soil that is not excessively dry.

vulgàris, Linn. SELF-HEAL. HEAL-ALL. Lvs. ovate-oblong, entire or toothed, usually pubescent: corolla violet or purple, rarely white, $\frac{1}{2}$–$\frac{3}{4}$ in. long, not twice as long as the purplish calyx. Amer., Eu., Asia. D. 255.—One of the most cosmopolitan of all plants, being too common in the wild to be cult. A form with variegated lvs. is rarely found wild.

grandiflòra, Jacq. (*B. Pyrenàica*, Phillipe). Lvs. often toothed, especially at the base: corolla over 1 in. long, more than twice as long as the calyx. Eu. B.M. 337.—The best of the garden kinds.

Webbiàna, Hort. Lvs. shorter than in *B. grandiflora*, and not so pointed: fls. very freely produced, more than twice as long as the calyx, bright purple. June–September. J. B. KELLER and W. M.

BRUNFÉLSIA (Otto Brunfels, physician and botanist of the 16th century). Syn., *Franciscea*. *Solanàcew*. More than 20 trees and shrubs of tropical America, a few of which are grown in warm glasshouses. Lvs. entire, oblong, often shining: fls. in terminal cymes or clusters, or solitary, large and showy, fragrant; corolla with 5 rounded and nearly equal spreading lobes (or two of them a little more united); stamens 4, in the throat of the corolla, the anthers all alike: fr. berry-like. Brunfelsias are usually winter-flowering plants. The wood must be well ripened before flowering begins. Grow in a rather sandy compost. Of easy culture. Require a night temperature of 50°. They bloom best when pot-bound. Prop. by cuttings from the new growth in spring.

Hopeàna, Benth. (*Franciscea Hopeàna*, Hook. *F. uniflòra*, Pohl.). Compact and dwarf: lvs. lance-oblong, alternate, paler beneath: fls. solitary or in 2's, with a whitish tube and a bluish violet or purple limb. Brazil. B.M. 2829.—Grows 12–18 in. high. One of the least worthy species.

pauciflòra, Benth. (*F. calycìna*, Hook.). Branches terete and glabrous, with abundant evergreen foliage: fls. in large trusses, purple, with a lighter ring about

the mouth of the tube; calyx large, as long as the curved tube of the corolla. Brazil. B.M. 4583. Gn. 40:815. —A handsome plant, flowering in succession most of the year. The commoner species in cult.

B confertiflora, Benth.=B. ramosissima.—*B. eximia*, Bosse =B. macrophylla.—*B. grandiflora*, Don. Fls. large (2 in. across), greenish, in terminal corymbs.—*B. Lindeniana*, Nicholson. Fls. 3 in. across, violet-mauve.—*B. macrophylla*, Benth. Fls. 2–2½ in. across, deep purple: lvs longer and duller than those of *F. calycina*.—*B. ramosissima*, Benth. Fls. large, in crowded corymbs, deep violet-purple: foliage luxuriant. One of the best, may be grown cooler in winter than the other species.

L. H. B.

BRUNSVÍGIA (after the Duke of Brunswick). *Amaryllidàceæ*. Tender flowering bulbs from S. Afr., with umbels of large, numerous, brick-red fls. The bulbs must be thoroughly rested from the time the lvs. fade until the scape appears, or from May to Aug. Brunsvigias are hard to flower. They require rich, sandy soil, plenty of heat and sunlight. When growing, give water and liquid manure freely. They propagate by offsets. J. G. Baker, Handbook of the Amaryllideæ, p. 96.

A. *Lvs. strap-shaped.*

Josephinæ, Ker-Gawl. Bulb 5–6 in. thick: lvs. 8–10, strap-shaped, glaucous or greenish, thick, closely ribbed, 2–3 ft. long, 1½–2 in. broad: scape 1 in. thick, 1½ ft. long: fls. 20–30, rarely 50–60, in an umbel: pedicels ½–1 ft. long: capsules smaller than in *B. gigantea*, less conical and less strongly angled. B.M. 2578. F.S. 4:322. —Named after the Empress Josephine, who purchased the original bulb after it flowered at Malmaison.

AA. *Lvs. tongue-shaped.*

gigantèa, Heist. (*Amarýllis gigantèa*, Van Marum. *A. orientàlis*, Ecklon). Bulb very large: lvs. about 4, tongue-shaped, closely ribbed, 3–5 in. broad, usually under 1 ft. long: scape red or green, a finger's thickness: fls. 20–30 in an umbel, paler than in *B. gigantea*, and less numerous: pedicels stout, strongly ribbed, 4–6 in. long. B.M. 1619 as *B. multiflora*.

B falcàta, Ker-Gawl=Ammocharis falcata.

H. A. Siebrecht and W. M.

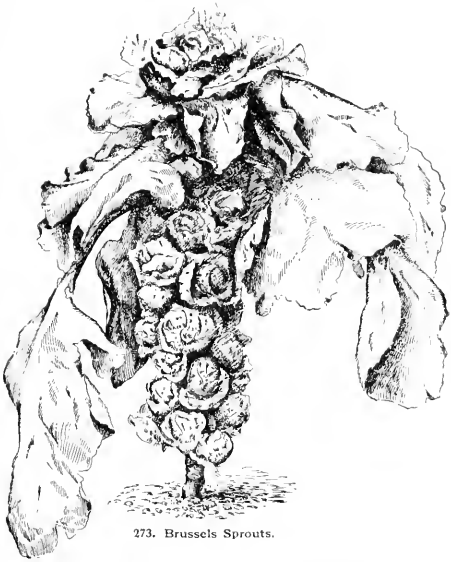
BRUSSELS SPROUTS. Fig. 273. Although this vegetable is popular in England and on the Continent, and is extensively grown there, it is infrequent in American home gardens; it is also but little grown as a market-garden crop. The edible part of the plant consists of the little "sprouts" or diminutive heads which form along the stalk in the axils of the lvs. These small heads may be boiled like cabbage or cooked in cream the same as cauliflower. This is considered by many to be one of the most delicately flavored vegetables of the whole cabbage family. The requirements of the crop and its general treatment differ but little from those of cabbages and cauliflowers. Any soil which will produce good crops of these vegetables is well adapted to the growing of Brussels Sprouts—a good, rich, well-drained soil being the best.

For early fall use, the seeds should be sown in April (in the North), in a mild hotbed, or if the weather is sufficiently warm the open ground will suffice. As soon as the first true leaves have developed, the seedlings should be transplanted to a coldframe or some protected place, being set 2–3 in. apart each way. These plants will be ready to transfer to the field or garden in June. June-set plants should be ready for use in September.

For field-culture, the plants should be set in rows about 3 ft. apart and 18 in. to 2 ft. asunder in the rows. Ordinarily good cultivation should be given during the growing season. As soon as the sprouts become large enough, so that they crowd at all, the leaves should be cut or broken off as close to the stalk as possible, in order to give the sprouts more room to develop. A tuft or rosette of leaves only should be left at the top of the stalk. These early-set plants will continue to develop sprouts for some weeks.

The crop for late fall and winter use requires the same general treatment, up to the time of severe freezing, as the earlier crop does, except that the seeds should be sown in June. The plants will be ready for setting out in August. These plants will make much of their growth in the cool fall days, and by the time of freezing weather they will be in condition for storing.

The late crop is usually less troubled by aphis, and more profitable. Where the climate is not too severe the



273. Brussels Sprouts.

plants may be left in the field undisturbed, and the sprouts gathered from them during the winter as they are desired. This method is followed by some of the Long Island growers. But where the climate is too rigorous, the plants may be dug, with considerable soil remaining on the roots, and packed as closely together as they will stand in some sheltered place, as in a vacant coldframe or some similar place where they can be sufficiently well protected, to prevent repeated freezing and thawing. The essentials for good storage are the same as for cabbages. Frosts improve the quality of the sprouts. They are hardier than cabbages.

In marketing, the sprouts are cut from the stalk and shipped in crates. They are usually sold by the quart. To bring the best prices, much care must be taken in preparing the sprouts. All discolored leaves should be removed, and it is also well to have them as uniform in size as possible.

Although a dozen or more sorts are catalogued by the seedsmen, there is but little difference between those of the same type or form, they being little more than different strains of the same thing. There are two forms,—the tall and the dwarf. The former grows to a height of 2½ ft. or more, and the sprouts are smaller and less closely packed along the stalk than the dwarf ones are. The latter seldom exceed 18 or 20 in. in height.

For the botany of Brussels Sprouts, see *Cabbage*.

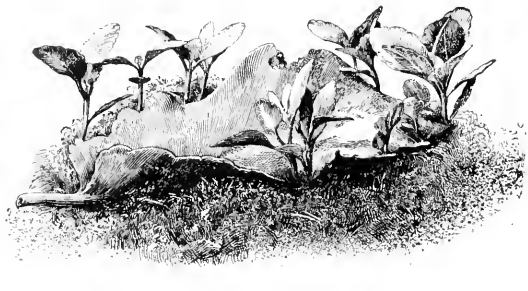
H. P. Gould.

BRYANTHUS (Greek, *bryon*, moss, and *anthos*, flower; growing among mosses). Syn. *Phyllódoce*, *Ericàcea*. Low evergreen shrubs; lvs. small, linear, alternate, crowded; fls. in terminal umbels or short racemes, nodding, on slender pedicels; corolla urceolate or rotate-campanulate, 5-lobed; stamens 8 or 10; fr. a many-seeded capsule. Eight species in arctic regions

of N. Eu. and N. Asia, in N. Amer. in the Rocky Mts. southward to California. Heath-like prostrate shrubs, quite hardy, with handsome, delicate fls., but rarely cultivated. They thrive best in peaty and sandy soil, and can only be grown successfully in localities where the air is moist and cool, but *B. erectus* is less particular. Prop. by seeds, sown in spring in peaty soil or cut

monœcious, fascicled: fr. about the size of a cherry, spherical, green, with pretty white markings. Asia, Afr., Austral. F.S.12: 1202.

Var. **erythrocárpa**, Naud. (*B. erythrocárpa*, Naud.). Has red fr. with white marks. I.H. 12: 431. F.S. 21: 2237. Gn. 6, p. 193.—A warmhouse plant, rarely grown in pots and trained to rafters. Prop. by seeds. W. M.



274. Sprouting leaf of Bryophyllum.

275. Flowers of Bryophyllum (× ½).

sphagnum and kept moist and shady, by cuttings in August under glass, and by layers.

empetriformis, Gray. Five to 8 in.: lvs. ¼–½ in. long, finely serrate: fls. campanulate, 6 or more on slender, glandular pedicels, in short racemes: corolla rosy purple, about ½ in. broad. Brit. Columbia to Calif. B.M. 3176 (as *Menziesia empetriformis*).

erèctus, Lindl. (*B. empetriformis* × *Rodothámnus Chamæcistus*). Six to 10 in. high: lvs. slightly serrate: fls. 2–10, rosy pink, rotate-campanulate, about ½ in. broad. F.S. 7: 659. P.F.G. 1: 19.—Of garden origin.

B. Brèweri, Gray. Allied to B. empetriformis. Fls larger: stamens exserted. Sierra Nevada.—*B. glandulíflorus*, Gray. Fls urceolate-ovate, sulphur-yellow. Sitka to Brit Columb.—*B. Gmelíni*, Don. Fls small, rosy, 3–10, in slender pedunculed racemes. Kamschatka, Behring's Isl.—*B. taxifólia*, Gray. Fls. oblong-urceolate, purple. High Mts. of N. E. Amer., Greenland, N. Eu., N. Asia, N. Jap. ALFRED REHDER.

BRYÓNIA (Greek, *to sprout*, referring to the annual growth from the tuber). *Cucurbitàceæ*. A genus of 7 species of perennial cucurbits, natives of Europe and W. Asia. They are herbaceous perennial climbers, with the staminate fls. in racemes, while Bryonopsis is an annual plant, with the staminate fls. in fascicles. All species of Bryonia are dioecious except *B. alba*. Bryonopsis is monœcious. See Cogniaux, in DC. Mon. Phan. 2: 469.

A. *Fls. diœcious: stigmas rough: fruits red.*

dióica, Jacq. BRYONY. Height 6–12 ft.: root long, fleshy, branching, white, a finger's thickness: lvs. ovate or roundish in outline, 5-lobed, margin wavy-toothed, rough with callous points, paler beneath: pistillate fls. greenish white, corymbose, short-pedunculed. Common in Eng. and in central and S. Eu. Rarer in W. Asia and N. Afr. Not sold in Amer., but a common sight along English highways. It grows rapidly over hedges and fences.

AA. *Fls. monœcious: stigmas smooth: fruits black.*

álba, Linn. Height 6–12 ft.: roots thick, tuberculate, yellowish outside, white within: lvs. long-petioled: pistillate fls. in long-pedunculed racemose corymbs. Eu., Caucasus, Persia.

B. laciniòsa, Linn.=Bryonopsis laciniosa. W. M.

BRYONÓPSIS (Greek, *Bryony-like*). *Cucurbitàcea*. A genus of two species of annual climbers. Consult *Bryonia* for generic differences.

laciniòsa, Naud. (*Bryònia laciniòsa*, Linn.). Lvs. deeply 5-lobed, rough, light green above, paler beneath; segments oblong-lanceolate, acuminate, serrate: fls.

BRYOPHYLLUM (Greek, *sprouting leaf*). *Crassulàceæ*. A small genus of succulent plants in the same order with stonecrops, houseleeks and Cotyledon. The only species in cult. is a rapid-growing window-plant, and, like the Begonias, a familiar example of plants that are propagated by leaf-cuttings. It is hardly a decorative plant, but is very odd and interesting. It is only necessary to lay the leaves on moist sand or moss, and at the indentations new plants will appear after a time (see Fig. 274). It is even possible to pin leaves on the wall, and without water new plants will come. Useful in botanical demonstrations.

calycínum, Salisb. Fig. 275. Height 2–4 ft.: stem reddish, with raised, oblong, whitish spots: lvs. oppo-

276. Flowers of Buckwheat. Natural size

site, fleshy, simple or ternate, ovate, crenate, obscurely veined above: fls. pendulous, in terminal-compound panicles: calyx and corolla cylindrical, reddish green, spotted white; calyx 1½ in. long; corolla 2½ in. long,

with 4 slightly curving tips (Fig. 275). Mex. B.M. 1409, LBC. 877.—It is said that the lvs. are sour in the morning, tasteless at noon, and somewhat bitter towards evening. This change has been attributed to the absorption of oxygen at night and its disengagement in daylight.

W. M.

BUCKEYE. Consult *Æsculus*.

BUCKTHORN. *Rhamnus*, particularly *R. catharticus*

281. Apple twig, showing an expanding flower-bud.

BUCKWHEAT (*Fagopyrum esculéntum*, Moench). *Polygonàceæ*. A tender annual grain plant, flour being made of the large 3-cornered fruit. It is much grown in the northern U. S., usually being sown about the first of July. It is also a favorite for bee forage. Buckwheat is native to central Siberia and Manchuria, and is now widely cult., although it is a grain of secondary importance. The flower-cluster is shown in Fig. 276. The Tartarian Buckwheat (*F. Tatáricum*, Gærtn.) is occasionally seen. It has smaller and yellowish fls., and a smaller, roughish, wavy-angled fruit.

BUD. The undeveloped or embryo state of a branch. As commonly known to the horticulturist, the bud is a more or less dormant organ; that is, the horticulturist does not recognize the bud until it has attained sufficient size to be obvious or to suggest some practice in the treatment of the plant. In this state the bud usually represents a resting stage of the plant. The bud-covering protects the growing point in the cold or dry season. The bud is a shortened axis or very condensed branch.

277. Apple buds—fruit-bud on the left, leaf-bud on the right.

278. Pear twigs—fruit-buds on the left, leaf-buds on the right.

The dormant or resting bud (as the winter bud of all trees) is covered with protective scales which are modified leaves; and the core of it is the nascent or embryo branch or flower-cluster, with rudimentary leaves. Since the bud is an embryo branch, it follows that disbudding is a most efficient means of pruning. A bulb is a form of bud; and a dense rosette of leaves (as in the common house-leek) is intermediate in structure between a bulb and a normal branch. A cabbage head is essentially a gigantic bud.

Horticulturists speak of buds as leaf-buds and flower-buds, according as they give rise to barren, leafy branches or to flower branches (for flower-clusters are modified branches). True flower-buds or fruit-buds are those which produce only flowers, as those of the apricot (Fig. 116) and the peach. Mixed flower-buds or fruit-buds are those which contain both flowers and leaves, as those of the apple (Fig. 281) and pear. On dormant plants, leaf-buds and flower-buds are distinguished by position, size and shape. The position of the flower-bud varies with the kind of plant, but is commonly terminal, either on a branch of common length or on a very abbreviated branch or spur. The flower-bud is commonly larger and thicker than the leaf-bud, because it contains the embryo flower. Illustrations of flower-buds and leaf-buds are shown in Figs. 277–280. With Fig. 279 compare Fig. 298, showing a section of cabbage head. The reader is referred to The Pruning Book for detailed discussion of the subject.

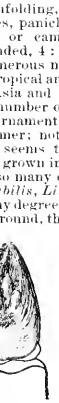
Of all the buds which form, very many do not grow, being crowded out in the struggle for existence. These buds often remain alive and dormant for several years, each succeeding year decreasing their chances of growing even if favorable conditions occur. It is a common opinion that these dormant buds become covered by the thickening bark, and grow when large limbs are removed; but this is an error. The shoots which arise from a wound on an old limb are from true adventitious buds, or those which are newly formed for the occasion in the cambium. Buds are normally formed in close proximity to leaves, usually in their axils; but adventitious buds form under stress of circumstances, without reference to leaves.

L. H. B.

BUDDING. See *Grafting*.

BÚDDLEIA (after Adam Buddle, an English botanist). Syn., *Buddlea*, *Loganiàceæ*. Shrubs or trees, with usually quadrangular branches; lvs. opposite, short-petioled, deciduous or semi-persistent, usually tomentose when unfolding, entire or serrate; fls. in racemes, panicles or clusters; corolla tubular or campanulate, 4-lobed; stamens included, 4; fr. a 2-celled capsule, with numerous minute seeds. About 70 species in tropical and temperate regions of America, Asia and S. Africa, of which only a small number of hardier species is cultivated. Ornamental shrubs, flowering freely in summer; not quite hardy north; the hardiest seems to be *B. Japonica*, which may be grown in sheltered positions north, but also many of the others, as *B. globòsa*, *variabilis*, *Lindleyana*, *Colvillei*, will stand many degrees of frost, and, when killed to the ground, they freely push forth young shoots, which will flower mostly the same season, especially *B. Japonica*, *Lindleyana* and *intermedia*. The handsomest in flower are *B. Colvillei*, *variabilis*, *globosa* and *Lindleyana*. They grow best in a light, well-drained soil, in a sunny position. Prop. readily by seeds sown in spring in gentle bottom heat,

279. Sections of pear buds—fruit-bud on the left, leaf-bud on the right.



280. Buds of the peach. The middle bud is a leaf-bud and the large side buds are fruit buds.

by greenwood-cuttings under glass, or by hardwood cuttings taken off in fall and kept during the winter in a frost-proof room.

A. *Fls. in panicles.*

B. *Corolla small, with long, narrow tube, ½–¾ in. long.*

C. *Color violet or lilac.*

Japonica, Hemsl. (*B. curviflora*, Hort., not Hook. & Arn.). Three to 6 ft., with quadrangular, winged branches: lvs. ovate-lanceolate, acuminate, remotely denticulate, slightly tomentose or nearly glabrous beneath, 3–6 in. long; fls. in dense, terminal, pendulous racemes, 4–8 in. long; corolla slightly curved, lilac outside, with grayish tomentum. Japan. I. H. 17: 25. R. H. 1870, p. 337, and 1878, p. 330.

Lindleyàna, Fort. Three to 6 ft.: lvs. ovate or oblong-lanceolate, acuminate, remotely denticulate, pale green beneath, and slightly pubescent or glabrous, 2–4 in. long; racemes dense, erect, 3–5 in. long; corolla purplish violet, slightly curved, pubescent outside. China. B.R. 32: 4. F.S. 2: 112. P.M. 14: 5.

intermèdia, Carr. (*B. Japónica* × *Lindleyàna*). Hybrid of garden origin, similar in habit to *B. Japonica*. Lvs. ovate-oblong, dark green above, 4–5 in. long: fls. violet, in slender, arching or pendulous racemes, 10–20 in. long. R. H. 1873: 151. Var. **insignis,** Hort. (*B. insignis*, Carr.), has the upright habit of *B. Lindleyana*. Branches distinctly winged; lvs. oblong-lanceolate, often in 3's; racemes erect, rather dense, 4–6 in. long, usually panicled at the end of the branches, with rosy violet fls. R. H. 1878: 330.

variàbilis, Hemsl. Three to 8 ft.: lvs. nearly sessile, ovate-lanceolate or lanceolate, acuminate, coarsely serrate, whitish-tomentose beneath, 4–10 in. long: fls. in dense, terminal, erect panicles, 4–6 in. long; corolla lilac, with orange-yellow mouth, glabrous outside. China. B.M. 7609. R.H. 1898: 132. G.C. III, 24: 139.—A newly introduced, very handsome species, with showy and fragrant fls.

CC. *Color yellow.*

Madagascariénsis, Lam. Shrub, 6–12 ft., with densely tomentose branchlets: lvs. ovate-oblong, rounded or slightly cordate at the base, acuminate, entire, dark green and lustrous above, whitish or yellowish tomentose beneath: fls. tomentose outside, in large terminal panicles, appearing during the winter. Madagascar. B. R. 15: 1259. B. M. 2824.—Hardy only in subtropical regions.

BB. *Corolla with broad cylindrical tube, limb over 1 in. broad.*

Cólvillei, Hook. & Thoms. Shrub, occasionally tree, to 30 ft.: lvs. elliptic-lanceolate or lanceolate, serrate, pubescent, and pale or grayish green beneath, 5–7 in. long: panicles broad, pendulous, 12–18 in. long; corolla purple or crimson, with white mouth. B. M. 7449. R.H. 1893: 520. I. H. 41: 10. F. S. 14: 1487. J. H. III, 31: 85.—The most beautiful of all Buddleias, and a very desirable shrub for warmer temperate regions; only older plants flower freely.

AA. *Fls. in globular heads.*

globósa, Lam. Three to 10 ft., with the branches and lvs. beneath yellowish-tomentose: lvs. ovate or ovate-lanceolate, acuminate, crenate, rugose above, 3–7 in. long: fls. orange-yellow, in dense, long-pedunceled, axillary heads at the ends of the branches; fragrant. Chile. B. M. 174.—A graceful and very distinct shrub, standing some degrees of frost.

B. Americana, Linn. Eight to 12 ft.: fls. in globular clusters, forming terminal panicles. Peru. Tender.—*B. Asiatica*, Lour. Three to 15 ft.: fls. white, in long, usually panicled spikes, fragrant. S. Asia. B. M. 6323.—*B. capitata*, Jacq.=B. globosa.—*B. crispa*, Benth.=B. paniculata.—*B. heterophýlla*, Lindl.=B. Madagascariensis.—*B. Neémda*, Roxb.=B. Asiatica.—*B. paniculàta*, Wall. (B. crispa, Benth.), 6–15 ft.: fls. lilac, in rather dense panicles: branches and lvs. tomentose. B. M. 4793. F. S. 9: 958.—*B. salicifólia*, Jacq.=Chilianthus arboreus.—*B. salicifólia*, Hort.=B. Lindleyana.—*B. saligna*, Willd.=Chilianthus arboreus.

ALFRED REHDER.

BUEL, JESSE. American agriculturist and editor, was born at Coventry, Conn., Jan. 4, 1778, and died at Danbury, Conn., Oct. 6, 1839. He lived at Albany from 1813 until 1821, when he retired to his farm near by. He was one of the founders, in 1834, of The Cultivator, a monthly, "to improve the soil and the mind," the subscription price of which was fifty cents a year. In 1866, The Cultivator was merged with The Country Gentleman, a weekly founded in 1853, and The Cultivator and Country Gentleman is, therefore, the oldest surviving American agricultural paper.

BUFFALO BERRY. Fig. 282. *Shepherdia argéntea*, Nutt. (*Lepargyræa argéntea*, Greene), *Elæagnàceæ*. The

282. Buffalo berry (× ⅔).

Buffalo Berry has been long before the public, but it is only within the last few years that it has attained any prominence as a fruit plant. In Hovey's Magazine of Horticulture for 1841, page 251, it is mentioned as frequently cultivated, indicating that it found its way into our gardens earlier than the blackberry. Its position today bears evidence that no such place was awaiting it as stood ready for the blackberry, or that if there were, it has lamentably failed in attempting to fill it. The plant did not find its place as a cultivated shrub until the settlement of the West created a demand for hardy and drought-resisting fruits. The plant belongs to the Oleaster family, and now bears the name of *Lepargyræa argentea* (Nutt.), though more commonly known as *Shepherdia argentea*. It occurs commonly throughout the Rocky Mountain region and the dry plains to the eastward, from Saskatchewan to Colorado, and even New Mexico. Its fruit is frequently used for jelly, and is sprightly and agreeable, but small, with a single large seed, and borne among numerous thorns, so that it is far less promising than most of our other garden fruits. Apparently its chief value lies in its adaptability to regions where more desirable bush-fruits can not be grown. Where the currant thrives, there is little need for the Buffalo Berry, except as a novelty or for ornament. It possesses ornamental qualities of value, and may well be planted for that purpose. It is often recommended as a hedge plant for the Northwest. There are two forms, one bearing bright red and the other yellow fruit. The plant propagates readily, either by seeds or cuttings, and also by the suckers which sometimes spring up about the base of the plants. It is dioecious, and both staminate and pistillate plants must be grown together, or no fruit will result. These may be distinguished by the buds in winter, those of the pistillate

plant being more slender, less numerous, and arranged in less compact clusters, those of the staminate plants being rounded, and borne in dense clusters.

FRED W. CARD.

BUGBANE is *Cimicifuga*.

BUIST, ROBERT. Florist, seedsman, and author, was born at Cupar Fyfe, near Edinburgh, Scotland, Nov. 14, 1805, and died in Philadelphia, July 13, 1880. He was trained at the Edinburgh Botanic Gardens, came to America in August, 1828, and was employed for a time by Henry Pratt. In 1830 he became the partner of Hibbert, who had established the first notable florist's business in Philadelphia. He became noted for his successes with roses, which were at that time second in popular favor to the camellia with the Philadelphians. The great improvement of the verbena was largely due to him, and was immediately followed by the introduction into America of a distinct class of bedding plants. He introduced *Poinsettia pulcherrima* to the trade, and his sale of the double form is said to have been the first transaction of the kind accomplished by ocean telegraph. He was the author of The American Flower-Garden Directory, in 1832, The Rose Manual, 1844, and The Family Kitchen-Gardener (copyrighted, 1847), all of which were frequently reissued, and enjoyed a considerable sale for many years. An excellent account of his life may be found in The Gardener's Monthly 22:372 (1888). The frontispiece of the bound volume for the year is his portrait. W. M.

BULB, BULBS. A bulb is a thickened, fleshy, and usually subterranean bud, generally emitting roots from its under side. The function of the bulb is to carry the plant over an unpropitious season, as over winter or a dry period. True Bulbs are either tunicated, formed in rings or layers, like those of hyacinths and onions (Fig. 283), or scaly, like those of liliums (Fig. 284); but as popularly understood and in commercial parlance, the term Bulbs applies to a large class of flowering and ornamental bulbous-like plants in their

283. Onion bulbs.

284. Scaly bulb of Lilium pardalinum.

285. Corm or solid bulb of Gladiolus.

dormant condition, during which period they are collected, dug, stored, shipped, sold and planted, like so many potatoes. This class includes, in addition to the true bulbs, many that are botanically known as corms, which are solid, as crocus and gladiolus (Fig. 285); tubers which are succulent and have the buds or eyes near the surface, as the dahlia and potato (Fig. 286); rhizomes, fleshy, creeping underground stems like cer-

286. Potato—Example of a tuber.

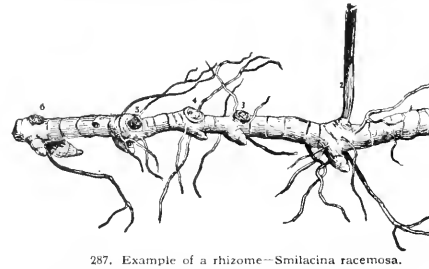
tain iris, ginger, and many wild plants (Fig. 287; also, Fig. 53, p. 37); pips, the flowering crowns of lily-of-the-valley; and certain other dormant fasciculated fleshy roots like those of peonies, ranunculus, etc. A variety of bulbs is shown in Fig. 288. The true or feeding roots grow generally from the base of the bulb, the stems, flowers and foliage from the crown of the bulb, or the eyes. There is an exception to this in certain lilies, which throw out roots above the bulb also (Fig. 289). The bulb is a storehouse for the plant, wherein is formed, after flowering, new stems, leaves and flowers. In fact, the bulb contains a new plant, which is protected and sustained within the bulb by the reserve food and energy collected therein during one season for the plant's successor. After the flowering period, the plant above the bulb and the roots beneath it ripen off and die away. The bulb is then in a dormant condition. It is during this state of rest, lasting approximately from three to six months, that bulbs are taken out of the ground and transported easily and safely from continent to continent, if required; after which the incipient roots, stems, foliage and flowers develop with as much luxuriance and perfection—conditions being congenial—as if the bulb had remained in its original environment.

Bulbous flowering plants (bulbs) are very popular with flower-loving people. There is a particular charm and interest in growing them. As a rule, they produce flowers of remarkable beauty, unsurpassed by any other class of plants, and many of them are deliciously fragrant. They comprise an endless variety in habit, form, size and color, are adaptable for many purposes, and many of them flower equally well under either garden or house culture. Soon after their beauty fades they hide away, or may be removed; and in the interval, their places may be occupied by other seasonable flowering plants. Not the least among the merits of bulbs is their ease of culture, and the great certainty and perfection with which their flowers are produced, under suitable conditions.

Among bulbous plants are many that are sufficiently hardy to withstand the severity of our northern winters. The kinds that are suitable are nearly all dormant in the fall, which is the proper time for planting them, and they will flower the coming season. In March or earlier, spring is ushered in with the blooming of snowdrops, chionodoxas, anemones, scillas, crocus, winter aconites, bulbocodiums, etc., followed in April with brilliant hyacinths, tulips, narcissus and hosts of others. In April appear the unapproachable late tulips, poet's daffodils, dicentras, etc., followed in succession until frost, notably with peonies, irises, hemerocallis, lilies, montbretias, tritomas, etc. All these are useful for gardens, lawns, and parks.

Gardeners usually think of bulbs as divided into two classes,—hardy and tender, or those which stand freezing and those which do not. There is a class from South Africa known as Cape bulbs, which usually bloom in the fall. There are now so many improved hybrids and breeds that are crowding out the types, that the term

"Cape bulb" has lost its significance in this country. In the present article, bulbs are treated under the following general heads: hardy spring bulbs for design bedding; hardy bulbs in the herbaceous garden, mixed flower border or lawn; summer- and autumn-flowering tender bulbs for spring planting; bulbs for flowering



287. Example of a rhizome—Smilacina racemosa.

in the house and greenhouse; keeping dormant bulbs, tubers, etc.; hints on buying and selecting bulbs; catalogue of bulbs.

Hardy Spring-flowering Bulbs for Design Bedding.—The only bulbs adapted for geometrical beds are Dutch hyacinths and tulips. It is not best to use both in the same bed for really fine effects. While there are hundreds of varieties in both hyacinths and tulips with colors, gradations and variegations innumerable, yet for this style of bedding only solid, bright, contrasting colors should be used. This limits the selection in hyacinths to dark crimson, rose-red, pink, purple, blue, lavender, white and yellow (the latter is seldom satisfactory), and in tulips to dark blood-red, scarlet, rose, blush-pink, yellow, white, and a bluish claret, which last is seldom used. In ordering the bulbs for this style of bedding, it is important to select kinds that bloom at the same time and are of uniform height. The bulb catalogues give this information; or, deal with a reliable firm and leave the selection to them. In planting bulbs in "design beds," it pays for the extra trouble to first remove the soil to a depth of 6 inches, spade up the lower soil, using well-rotted manure and plenty of bone dust worked in. Then level off, smooth, and cover with an inch of sand. This prevents the manure from touching the bulbs, allows the water to drain away from immediate contact with them, thus removing causes which may lead to their decay. Bulbs set in this manner on the sand may be placed in their exact position, after which the top soil is carefully replaced. It is a difficult matter to set bulbs just 4 inches deep and 4 to 6 inches apart with an ordinary trowel. The planter is almost sure occasionally to chop off a piece of a neighboring bulb or displace it. Bulbs planted in the manner advised, being all of an even depth, will flower uniformly; often, when planted with a trowel, some bulbs will be an inch too high and some an inch too low, which in early spring makes considerable difference in the time of blooming. Besides, when bulbs are planted with a trowel or dibble, there is danger of "hanging" a bulb occasionally, where it may perish on account of not touching bottom.

Hardy Bulbs in the Herbaceous Garden, Mixed Flower Border, or Lawn.—The mixed border is a favorite place for most hardy bulbs. They should be planted in little colonies here and there among the hardy plants and shrubs; and it is here that bulbs seem to thrive and give the most pleasure. As spring approaches, the sombre winter browns and dull greens of the deciduous and evergreen plants are suddenly transformed into an unrivaled setting, studded with brilliantly colored and fragrant flowers, the contrasts being exceedingly effective and cheery; and besides, from the border one does not hesitate to cut a few flowers for the house for fear of spoiling the effect, as would be the case in formal bedding. Furthermore, bulbs seem to do better and last longer in a border because the flowers are cut freely in bud or when just approaching their prime, which is the best possible time for the benefit of the bulb, for the efforts of any bulb to form seeds weakens the bulb. A hyacinth bulb that matures seed is virtually destroyed. Then, again, in an herbaceous border the bulbs are not disturbed. The foliage remains uninjured until ripe, thus fulfilling its duty of recharging the bulb with new energy for the next season's display.

Bold clumps of the taller bulbous plants are very effective on the lawn, where beds of one kind should be isolated, and be given a position not too prominent nor too near. The object desired is a mass of one color, which at a little distance is more striking on account of the contrast with the surrounding green grass and trees. Among the best hardy bulbous plants for this purpose are: hemerocallis, such lilies as candidum, tigrinum, speciosum and auratum; also dicentra, crown imperials, montbretias, tritomas, peonies, Kæmpferi and Germanica irises, etc.

Bulbs planted right in the sod on the lawn make a very pleasing picture when in bloom in the early spring. Make patches here and there of golden, white and purple crocus, the little chionodoxas, snowdrops, *Scilla amœna*, winter aconite, snowflakes, bulbocodium and tritelcia. These grow, increase, bloom and ripen the foliage before it is necessary to use the lawn mower, so that the surface of the lawn in summer is not marred. The bulbs may be dibbled in when the ground is moist and soft during the fall rains, but it is better to cut and turn back the sod here and there, plant the bulbs under it, then press the sod back again.

For parks, groves and wild outlying grounds beyond the closely clipped lawn, a very happy style of "naturalizing" bulbous and other plants is coming much into vogue. Such bulbs should be used as can be planted in quantity, twenty-five to a hundred or more of a kind in a patch, and only those should be used which are hardy, and will flower and thrive and increase under neglect. Fortunately, there are many bulbous plants that succeed even better in such rough places than in the prim garden. Among them are hardy anemones, camassia, convallaria, dicentras, erythroniums, funkias, certain iris, liliums, poet's narcissus, Von Sion narcissus, trilliums, and numerous others.

In regard to the preparation of beds for hardy bulbs, planting and treatment, we can only generalize. Detailed directions suited to the different species, and also varieties where treatment varies, will be found under their respective headings in this Cyclopedia. As a rule, well-rotted manure (mind that it is well rotted, not fresh

288. Various types of bulbs and tubers.

1 Tuberose. 2. Colocasia Antiquorum (*Caladium esculentum*). 3, Easter Lily. 4, Jonquil 5 Gladiolus. 6, Lilium pardalinum. 7. Hyacinth. 8. Lily-of-the-Valley.

and heating) should be liberally applied and dug into the ground deeply. It must be where the long, feeding roots can get at it, and yet not touch the bulbs, nor be too near their base. This is easily accomplished by removing a few inches of the top soil first, as described under "Design Bedding," above. If it is impracticable to

Bulb-growing in the Puget Sound country. An Easter Display

do this, then it is not advisable to use manure at all, for the bulbs are liable to come in contact with it and become diseased. Bone meal alone is then the safest fertilizer to use, and it should be applied lavishly. Most bulbs like rich food if properly applied. Although the embryo flowers were formed within the bulb the season

289. The Easter lily throws out feeding roots both below and above the bulb.

before, yet their size, luxuriance and brilliancy this season depend largely upon the nutrition the roots receive. Liberal applications of manure water, when the bulbs are in bud, often produce excellent results.

The proper depth to plant bulbs varies according to the kinds. It is a common fault to plant them too near the surface. Some kinds, notably the Californian Humboldtii and Washingtonianum lilies, do best when 10 to 12 inches deep; hyacinths, tulips, narcissus, and similar large bulbs from 4 to 6 inches deep; smaller bulbs somewhat shallower. Hardy bulbs root during the fall and early winter, and if planted too near the surface the freezing, thawing and heaving of the upper crust of soil in mild winters often causes the bulbs to break from their roots, and, in consequence, only inferior flowers are produced. When good, cold weather has set in and a light crust has been frozen on the soil, then cover the bed with leaves, straw, marsh hay or reeds to a depth of from 4 to 6 inches. This protects not only from severe freezing, but from equally injurious unseasonable thaws. Do not put the covering on too early, for it might warm the soil so that the bulbs would commence to grow and afterward be injured from freezing. Gradually remove the covering in the spring.

The general run of bulbous plants thrive in a loamy soil, inclining to sand. This soil attracts moisture, allows free drainage, and admits air. If the soil is cold and stiff, a liberal admixture of leaf-mold and sand, with the addition of manure applied as above described, will be beneficial. The texture of the soil should be such that stagnant water will not remain around the bulbs, as it tends to rot them, particularly when dormant. An excess of humus is, therefore, to be guarded against for most bulbs. While the majority of bulbous plants thrive under the soil conditions advised above, yet there are many notable exceptions. Happy should be the man on whose grounds can be found a variety of soils and exposures, shade and sun. A small wooded valley or ravine, with a brook flowing through it into an open, moist meadow, affords conditions suitable for growing to perfection the greatest variety of bulbous and other plants, many of which cannot be enjoyed in the average monotonous garden.

The sooner bulbs can be put in the ground after they are ripe the better for the bulbs; for, no matter how long they will keep, they do not improve when out of the ground, but tend to dry out and lose vitality. There are, however, many reasons why bulbs cannot be planted as soon as ripe; and when they are to be kept for certain purposes, they should be stored as advised below. Hardy spring-flowering bulbs should be planted in the open ground in the fall, not earlier than six weeks before regular frosty and freezing nights are expected. Plant as much later as necessary, providing the bulbs are keeping sound, but it is not advisable to plant them earlier. Cool weather is necessary to cater top growth, which is very liable to start after four to six weeks of root development; and young, succulent top growth is apt to be injured by the succeeding freezing. In Maine, Ontario, Wisconsin, and all other northern points (about 45 degrees north latitude) such hardy bulbs as hyacinths, tulips, narcissus, etc., may be planted in September. In New Jersey, Pennsylvania, Ohio, etc. (from 40 degrees), plant about the middle of October. In the latitude of Richmond, Louisville, St. Louis, etc., the middle of November is early enough. In the latitude of Raleigh, Nashville, and south, do not plant until middle of December; and for the latter section let the selection of bulbs run to late-flowering varieties, such as Bizarre, Darwin and late double tulips, late hyacinths, late narcissus, etc., for they are not so likely to be caught by the occasional freezing weather in January and February. In this southern latitude, however, very early-flowering bulbs, such as Roman hyacinths, Due van Thol tulips, Paper White narcissus, etc., if planted in September, are usually through blooming before freezing weather begins. South of the freezing belt, hardy spring-flowering bulbs are not very successful, as a rule, there being no sufficiently cool weather to defer top growth and force root action first, without which the flowers and foliage will not develop beyond such sustenance as the bulb can supply; and this sustenance is usually exhausted by the time the flower-spikes are half grown. But there are many half hardy and tender bulbs that are more easily grown and flowered in the South than in the North.

The treatment of bulbs after flowering is important when the bulbs are to be used again, for it must never be forgotten that the flowers and resources for the next season are garnered within the bulb after blooming, through the agency of the roots and foliage. Imperfectly developed and matured foliage this year means poor flowers or none at all next year; so it is best to leave the bulbs alone until the leaves have died down. When summer bedding plants are to be substituted, it is sometimes necessary to remove bulbs before ripe. In such cases, the bulbs should be carefully taken up with a spade. Disturb the roots as little as possible, and do not cut or crush the leaves. Heel-in the plants in a shallow trench in some half-shady out-of-the-way place until ripe.

Summer- and Autumn-flowering Garden Bulbs for Spring Planting.—This class (Tender) includes some of our showiest garden flowers, which are almost indispensable. They are of the easiest possible culture. Planted in the spring, after danger from frost is over, in a sunny position in good, rich, loamy soil, they will flower with great certainty the same season. After flowering and ripening of the foliage, they should be taken up and stored for the winter as advised below, under "Keeping Dormant Bulbs," until wanted the next spring. Among the more important species of this class of bulbs are the undermentioned (those marked F must be kept in a semi-dormant condition in a coldframe or greenhouse): Agapanthus (F), alstroemeria (F), amorphophallus, anomatheca (F), antholyza (F), tuberous begonia, bessera, colocasia (caladium), cooperia, crinum, cypella, gladiolus, galtonia; Hyacinthus candicans), homsingaultia (madeira vine), montbretia, nemastylis, border oxalis, ornithogalum (F), pancratium, richardia (calla), schizostylis (F), sprekelia, tigridia, tuberose, watsonia zephyranthes.

Bulbs for Flowering in the House and Greenhouse.—There is no class of plants that gives more satisfaction for this purpose, with so little skill, than

the various bulbs. Perhaps the most important class of all bulbs for winter-flowering and forcing are certain hardy and half-hardy kinds. They are the most easily managed of all, and need occupy no space in the window or greenhouse, excepting when in bud and bloom. Under suitable treatment, they flower with great certainty, and their flowering period may be hastened (forced) or retarded at pleasure, so as to "bring them in" for certain occasions, or to give a continuous succession of bloom. There is a great variety of kinds of bulbs to select from for this purpose (see list of species at end of this article), yet the great demand, at this writing, has centered on the following leaders, especially for forcing purposes: *Allium Neapolitanum*, *A. Heroultgrandiflorum*, *Anemone fulgens*, convallaria (Lily-of-the-Valley), *Freesia refracta alba*, gladiolus "The Bride," early single-flowering Dutch Hyacinths and "Romans," Campernelle Jonquil, *Lilium candidum*, *L. Harrisii* and *L. longiflorum*. Several narcissuses are in demand, notably among the large trumpet varieties: Emperor, Empress, Golden Spur, Horsfieldi, Maximus and Trumpet major; among the medium and small trumpets: Sir Watkins, Barrii conspicuus and Poeticus ornatus; of the doubles are Von Sion and Orange Phœnix; of the Polyanthus narcissus: Paper White grandiflora (Totus albus), and Double Roman (Constantinople). Of other species of bulbs, *Ornithogalum Arabicum*, *Spiræa astilboides floribunda* (Armens), and single and double tulips of the early varieties are in demand. The principles of culture for hardy bulbs for winter flowering are the same, whether only a few are grown in pots for the window garden, or whether they are to be forced by the thousand by the florist. The first essential is to secure the strongest bulbs. Remember that the flowers were formed within the bulbs the previous season. If you buy bulbs of narcissus containing only one flower, or hyacinths with only ten bells on a spike, the best culture possible cannot make them produce more; but good culture will develop such flowers larger and better. The next most important essential—we might say the secret of success in flowering bulbs in the house or greenhouse—is perfect root development before the tops begin to grow. To aid the uninitiated in this important matter, we will illustrate: When hardy bulbs are planted in the open ground in the northern states in the fall, the weather above them is cool or cold, the ground beneath them is warmer, and the conditions are congenial for root action but deterrent to top growth. This results in the perfect development of such flowers as the bulbs contain. On the other hand, when hyacinths, tulips, narcissus, and most other hardy spring-flowering bulbs are planted in fall in our extreme southern states, they usually prove disappointing, because the weather is warm, causing the flowers and foliage to begin to grow before the roots; and as soon as such sustenance as the bulb could supply has been exhausted, the plant stops growing and dwindles. When we grow bulbs under artificial conditions, we must make them produce roots first. Failure to do this is responsible for nine-tenths of the disappointments.

When hardy bulbs are to be grown in pots for winter blooming in the house or conservatory, the bulbs should be potted as soon as they are procurable, between August and November. Some writers recommend that bulbs be planted in successional lots to give later and continuous flowers, but we think such advice is at fault, as the bulbs tend to dry out and lose vitality when kept dry too long. It is no trouble to retard the flowering of hardy bulbs in winter, as hereafter described, without keeping them out of the ground.

The soil should be rich loam. Fresh manure cannot be used. Of thoroughly rotted manure, some may be pulverized and worked into the soil, but it is safer to use pure bone meal, one part to fifty of soil. If the soil is stiff and heavy, mix it with sand and leaf-mold or peat. The size of pots depends upon the kinds of bulbs. A 5-inch pot is best for a first-sized hyacinth, or large-bulbing narcissus, particularly the Polyanthus type. Tulips, small narcissus, and bulbs of a similar size, while they can go individually into a 4-inch pot, are better when put three or more of one variety together in a larger pot, as the soil retains a more even temperature and moisture; and for this reason some prefer earthen bulb-pans, which come in various sizes, from 8 to 18 inches in diameter. In potting, place a little broken pottery or lumps of charcoal in the bottom for drainage, then fill the pot with soil and shake it down, but do not pack it. Neither must the bulb be pressed or screwed into the soil, else the soil will be packed under it so that when the roots start they often raise the bulb out of the pot. Plant the bulb just deep enough that its top will not show. Large and soft bulbs, which are liable to rot, may be set in a cushion of sand, and the bulb not covered with soil until it has taken root and become established (Fig. 290).

290. Bulb with a cushion of sand beneath it to prevent decay.

When planting mixed bulbs in the same pot, pan or box, care should be used in selecting different varieties that will flower at the same time. An early-flowering Due van Thol and a double Tournesol tulip would flower a month apart under the same treatment. Some varieties of hyacinths, of narcissus, and of most species of bulbs vary greatly in time of blooming, which, of course, would spoil the effect.

When florists force bulbs in quantity for cut-flowers, they seldom use pots, but shallow boxes, or flats, of a size to economize bench room. Usually these boxes are cut down from soap boxes to a depth of 3 or 4 inches. The bulbs are planted closely in these, from an inch to 2 inches apart, according to the kind. The tops of the bulbs (excepting lilies) are kept about even with the top of the soil. Do not water them unless the soil is very dry, for bulbs in a dormant condition resent an excess of moisture. After the bulbs are potted, or boxed, as described, they should be placed in a coldframe or cold-pit to root. This is the most important detail in flowering bulbs under artificial conditions. Cover the pots, boxes or pans with 4 inches of sand, ashes, rotted leaves, tanbark or similar substance, and do not put the sashes on until freezing weather, and even then remove the sash on pleasant days. When no coldframes or pits are available, the pots may be covered as advised in a cool cellar. It is preferable, however, to sink them in the open ground. The writer never had finer flowers on hardy bulbs than when treated as follows: A trench a foot deep is dug in the garden where water will not settle on it, and it is protected from the north and west cold. Three inches of coal ashes is first placed in the trench, to allow drainage and keep the worms out. The pots are then placed on the ashes, the earth is filled in about the pots, filling the trench rounding over. No further attention is required, as everything is congenial to perfect root development, while the weather is cool enough to check top growth. When the weather gets cold enough to freeze a crust on the soil, an additional covering of about 4 inches of rough stable manure, leaves or straw, is put over. Some early bulbs, such as Roman hyacinths, Paper White narcissus, Due van Thol tulips, etc., will root sufficiently in five or six weeks to be taken up for first flowers, which should be out by Christmas or earlier, but it is safer to allow all bulbs not less than eight weeks for rooting. Every two weeks after the first removal of pots, or as needed, further relays of rooted bulbs may be taken out for a continuous display of bloom. When the pots of hardy bulbs have been taken up, place them in a cool greenhouse or cool, light store room, with temperature not over 50°. This temperature will allow the flower stems and foliage to grow, and at the same time prevent the opening of the flowers until the stems have attained their proper height, after which the pots may be taken to a sunny, warm window, or wherever they are wanted to flower. Bulbs treated in this manner will produce perfect spikes of flowers. A good rule to keep in mind in flowering hardy bulbs is: Temperature, 40° for roots, 50° for foliage and stems, 60° for best flowers, 70° for quick development, 80° to rush bloom with loss of substance and risk of "going blind" (producing no flowers).

The exceptions to the above advice are liliums and lily-of-the-valley. *Lilium Harrisii* and *Lilium longiflorum* bulbs particularly, in addition to throwing out roots from the base of the bulbs, usually form roots from the new stem just above the bulb, and the plants and flowers derive much strength from these top roots. So in potting lily bulbs, it is best to put them down so deep that there will be sufficient soil above the bulbs to entice and sustain the stem roots. In other respects treat the bulbs after potting as just advised. Winter-flowering lily-of-the-valley forms no new roots. The thick, fleshy, fibrous old roots should be trimmed at the bottom, leaving them from 2 to 3 inches long. This allows them to absorb the abundant moisture with which they should be supplied while the flowers and foliage are developing. They flower just as well in sand or moss, or anything that retains an even moisture and temperature, as they do in soil, but lily-of-the-valley for flowering in the house or greenhouse requires freezing before it can be successfully brought into flower. Without freezing, many pips will "come blind," or produce malformed spikes. So it is just as well for amateurs to plant their pips an inch or two apart in pots or bulb-pans, and plunge them in the garden, as recommended for other hardy bulbs. Florists generally freeze their pips in refrigerators, or have them placed, just as they arrive from Germany, 2,500 pips in a case, in cold storage, in a temperature of from 28 to 30°.

After being forced or flowered in the greenhouse or window, hardy bulbs are of little value, for most bulbs suitable for the purpose have attained their maximum size, and, in consequence, are ready to break up. Florists usually throw these bulbs away. Still, if space can be spared for the bulbs to complete their growth after flowering and ripening, many of them can be utilized for planting in the mixed border or garden, there to remain, where some of them will eventually recuperate and flower.

Half-hardy bulbs for winter-flowering and forcing should be treated the same as hardy bulbs, excepting that after potting they should be placed for rooting where they will not freeze. Yet they can go pretty close to it and be all the better for it. In northern states, a coldframe or pit or cold greenhouse to root them in is, therefore, almost indispensable. For tender winter- and summer-flowering greenhouse bulbs, the culture varies with almost every species, and as no general instructions would suit all kinds, the reader may refer to their individual cultures given under their respective headings in this Cyclopedia. (See list of species at the end of this article.)

The flowering of bulbs in glasses, bowls, unique pots, etc., is always interesting. Among the most successful and interesting are hyacinth bulbs in glasses of water. Use early-flowering single varieties only. The seedsmen and dealers in bulbs supply special hyacinth glasses for the purpose. They come in various shapes, colors and decorations, and vary in price from 20 cts. to $1.50 each. These are simply filled with fresh, pure water. A lump of charcoal thrown in absorbs impurities, but it is not absolutely necessary. The bulb rests in a cup-shaped receptacle on top of the glass. In filling, the water should not quite touch the bottom of the bulb. Put in a cool, dark, airy place until the roots have reached the bottom of the glass, which should be in about six weeks. Do not place them in a close, warm closet. They must have fresh air. As the water evaporates, fill the glasses, and change the water entirely when needed to keep it sweet and clear. After rooting, place the glasses in a light storeroom where the temperature averages about 50°, until the stems and foliage have developed; then remove to a warm, sunny window for flowers to open. There are other kinds that do equally well when rooted in water, providing the largest healthy bulbs are chosen. Among them are sprekelia (Jacobæan lily), Trumpet narcissus Horsfieldi and Golden Spur, polyanthus narcissus Grand Monarque and Gloriosa, large bulbs of Roman hyacinths, early single tulips, and Mammoth Yellow crocus, etc. We have flowered hyacinths on a piece of virgin cork floating in an aquarium, a hole being cut through the cork for the roots to reach the water. The so-called "Chinese Sacred Lily," a variety of Polyanthus narcissus, grows and flowers luxuriantly in bowls of water, provided they are not placed in a dry, furnace-heated room, which will cause the buds to blast before opening. Sufficient pebbles or shells should surround the bulbs to prevent them from toppling over.

Crocus, Roman hyacinths and lily-of-the-valley pips are very pretty when nicely flowered in columnar, hedgehog- or beehive-shaped hollow pots with holes for the reception of the bulbs. A bulb is placed in front of each hole from the inside, with the crown of the bulb looking outward. The pot is then filled with soil through the large opening in the bottom, moss being pressed in last to hold the contents in place, after which the pots are put outside for the bulbs to root, as explained for other hardy bulbs for the house.

KEEPING DORMANT BULBS, TUBERS, ETC.—Bulbs and tubers of the various species, as well as their varieties, vary greatly in size. Some, like oxalis, snowdrops, chionodoxas, etc., often do not exceed half an inch in diameter, while other bulbs, such as those of *Caladium esculentum*, certain aroids, crinums, etc., attain great size, frequently weighing several pounds each. Such solid bulbs as those of tulips, hyacinths, narcissus, etc., will remain out of the ground solid and plump, in a suitable place, for three or four months. The larger the bulb the longer it will keep, as a rule. Large crinum bulbs have been kept for fifteen months. Still, it is always better to plant the bulbs as soon as possible, for, although they keep, they do not improve, and their tendency is always towards drying out and loss of vitality.

Never keep bulbs packed up air-tight. They are apt to generate heat or sweat, mold or rot, or to start. When solid bulbs are to be kept dormant for any length of time, they should be stored away from bright light in baskets, shallow boxes or slatted trays, in a room or cellar where there is a circulation of fresh air and the temperature is as cool as possible. Forty degrees is the desideratum for all excepting tender bulbs. Scale-like bulbs, as liliums, soon dry out and shrivel if exposed to the air for any length of time; therefore, they are best kept in open boxes packed with some substance that will retain a slight and even moisture, such as sphagnum moss, rotted leaf mold, cocoanut fiber refuse, or moist sand, but they must be kept cold to check any efforts to start. Fleshy roots, like those of peonies, certain irises, astilbes, etc., should be treated like the lily bulbs. When a cold-storage room, with an average temperature of 36° to 40°, is available, it is the safest place to carry over hardy bulbs and roots for spring planting.

Lily-of-the-valley pips are carried in rooms of about 28° to 30°. The pips and packing freeze solid; and here they are kept for months until wanted for forcing. When they are removed from this arctic chamber, they must be thawed out gradually and as soon as possible, by plunging in cold water, before they are subjected to any heat; otherwise, they are likely to rot. For this reason, "cold-storage pips" cannot be safely shipped any distance in warm weather, this often being the cause of the country florists' disappointment in results.

Tender dormant bulbs, as begonias, gloxinias, amaryllis, paneratiums, tigridias, tuberoses, etc., must be kept in a warm, dry atmosphere, not below 50°. The cause of tuberoses not flowering is often that the bulbs have been kept below 40°, which destroys the flower germ, although the foliage grows just as vigorously. Tender tubers, such as dahlias, cannas, etc., should be stored in dry sand in a warm, dry cellar or under the greenhouse bench.

HINTS ON BUYING AND SELECTING BULBS.—As already said, bulbs can develop only the flowers which were formed within them before they were ripened. A bulb may be poor because not full grown or too young, or because grown in impoverished soil or under unorganic conditions, or because it may not have been matured when dug; or it may be injured from heating, sweating, rotting or moldiness in storage or transit, caused by improper curing or packing, or it may be dried out from having been out of the ground too long. In the majority of cases in which poor bulbs are planted, however, it is the buyer's fault in procuring cheap bulbs, which in many cases are second grades, lacking age and

proper size. The commoner varieties of a species usually propagate the fastest, and it is generally these less salable varieties and inferior seedlings and cullings from the named bulbs that go to make up most "mixed colors" and "mixed varieties." Therefore, for best results, it is advisable to expend a given amount of money for the first size named varieties, rather than for a larger quantity of cheaper seconds and mixtures, unless, of course, the bulbs are wanted for large permanent plantings, as in promiscuous borders for naturalizing, etc., where best flowers the first season are of secondary consideration.

The best named hyacinths—"top roots," as they are called in Holland—require from four to six years to attain full size and give best flowers. Such bulbs, according to the variety, should measure from 20 to 24 centimeters (8 to 10 in.) in circumference. These naturally cost more to grow than the younger second or "bedding" grade of bulbs, measuring from 18 to 20 centimeters (6 to 8 in.). There is a third size, ranging from 16 to 18 centimeters (4 to 6 in.), that goes in mixtures, and a fourth size (12 to 14 centimeters) that goes out as "Dutch Romans," "Pan Hyacinths," "Miniatures," etc. Some growers even scale their sizes a centimeter or two less than mentioned, to enable them to quote lower prices. Crocus, narcissus, tulips and many other bulbs are also sorted into sizes, enabling the grower to catch all classes of buyers.

A first-size crocus bulb should measure 10 centimeters (4 in.) in circumference, and such bulbs produce from 6 to 12 flowers each. A small, cheap bulb produces only two or three flowers. A narcissus bulb of maximum size will produce from 3 to 5 flowers (sometimes more), and an inferior size usually but a single flower. A White Roman hyacinth bulb 14- to 16-centimeter size (5-6 in. circumference) will produce 3 and often 4 spikes of firsts and several seconds, while an 11- to 12-centimeter size will average only one first grade spike and a couple of seconds, or perhaps nothing but seconds. The best lily-of-the-valley pips bear from 12 to 16 bells on a spike, usually all firsts. Cheaper inferior grades of pips have seldom more than 7 to 10 bells. If the florist or planter wants the best bulbs, he must pay more money for them, but they are cheapest in the end, for second-grade stock takes up just as much room and requires as much care, fire, and other expenses. It is the grade of flowers called firsts that sell and pay a profit. The supply of seconds is often so abundant that the market price for them does not pay the cost of the bulbs.

CATALOGUE OF BULBS.—To aid in the selection of bulbs for particular purposes, we append a list of the leading species that are procurable while dormant (between the months specified) from seedsmen and bulb dealers, and we affix a sign to each to indicate the purpose for which the species—or certain varieties in it—are adapted. Some kinds are useful for more than one purpose, and such have a corresponding number of signs. For example: if a selection of bulbs is to be made for winter-flowering in the house, make a note of those to which an asterisk (*) is affixed, then turn to their respective headings in this Cyclopedia, where will be found full descriptions of the varieties as well as species—and cultural instructions—which will enable any one to make an intelligent selection.

For winter-flowering bulbs for greenhouse or window, select from species marked *

For summer- and fall-flowering bulbs for pots for greenhouse and other decoration, select from species marked †.

For spring-flowering hardy bulbs for gardens, lawns, etc., select from species marked ‡.

For summer- and fall-flowering hardy bulbs for gardens, lawns, etc., select from species marked ‖

For summer- and fall-flowering (not hardy) bulbs for spring planting in garden, etc., select from species marked ♯.

For climbing bulbous plants, select from species marked ¶.

Those marked H *are hardy;* H.H, *half-hardy;* T, *tender.*

GENERA, ETC.	HARDINESS.	DORMANT.
Abobra ¶ ♯	H H	Oct. to April
Achimenes †	T	Oct. to April
Agapanthus † ♯	H H	Oct. to April
Albuca †	T	Oct. to April
Allium * ‡	H & H.H	Aug. to Dec.
Alstræmeria † ♯	H H	Sept. to Nov.
Amaryllis * †	T	Oct. to April
Amorphophallus ♯	T	Oct. to April
Anemone * ‡	H & H.H	Aug. to Nov.
Anomathera ♯	H H	Oct. to April
Antholyza ♯	H H	Oct. to April
Apios ¶ ‖	H	Oct. to April
Arisæma †	H H	Oct. to April
Arum * †	T	Aug. to April
Babiana *	H H	Aug. to Nov.
Begonia, Tuberous † ♯	T	Oct. to April
Bessera ♯	H H	Oct. to April
Blandfordia *	T	Aug. to Nov.
Bloomeria ‡	H	Aug. to Nov.
Bomarea †	H H	Aug. to Oct.
Boussingaultia ¶ ♯	T	Oct. to April
Bowiea ¶ †	H H	Oct. to March
Brayoa †	H H	Oct. to April
Brodiæa * ‡	H H	Aug. to Oct.
Bulbocodium ‡	H	Aug. to Oct
Caladium † ♯	T	Oct. to April
Calochortus * ‡	H H	Aug. to Nov.
Camassia ‡	H	Aug. to Nov.
Canna ♯	T	Oct. to April
Chionodoxa * ‡	H	Aug. to Oct.
Childanthus ♯	H H	Oct. to April
Colchicum	H	Aug. to Sept.
Commelina ♯	H.H	Oct. to April
Conopodium * ‡	H	Aug. to Oct.
Cooperia ♯	H H	Oct. to April
Corydalis ‖	H	Aug. to April
Crinum † ♯	T	Nov. to April
Crocus * ‡	H	Aug. to Oct.
Crocosmia ♯	H.H	Oct. to April
Crocus hyperials †	H	Aug. to Oct.
Cummingia †	H	Aug. to Oct.
Cyanella †	H H	Aug. to Oct.
Cyclamen Persicum *	T	Aug. to Nov.
Cyclobothra ♯	H H	Aug. to Nov.
Cypella ♯	T	Oct. to Dec.
Cyrtanthus †	T	Oct. to April
Dahlias ♯	T	Oct. to April
Dicentra ‡	H	Oct. to March
Dioscorea ¶ ‖	H	Oct. to April
Eranthis ‡	H	Aug. to Oct.
Eremurus ‖	H H	Oct. to April
Erythronium ‡	H	Aug. to Nov.
Eucharis †	T	Sept. to Dec.
Eurycles †	T	Oct. to March
Freesia * †	T	Aug. to Nov.
Fritillaria * †	H. & H.H	Aug. to Oct.
Galanthus * ‡	H	Aug. to Nov.
Galtonia ♯	H.H	Oct. to April
Geissorhiza †	H H	Aug. to Nov.
Gesnera * †	T	Oct. to April
Gladiolus ♯	H H	Sept. to April
Gloriosa * †	T	Oct. to April
Gloxinia †	T	Oct. to April
Griffinia †	T	Oct. to April
Hæmanthus †	T	Aug. to Nov.
Helleborus ‡	H	Oct. to April
Hemerocallis ‖	H	Oct. to April
Homeria ♯	H H	Aug. to Nov.
Hyacinth * ‡	H	Aug. to Nov.
Hymenocallis ♯ †	T	Oct. to April
Imantophyllum †	T	Oct. to April
Iris, Bulbous * ‡	H. & H.H	Aug. to Nov.
Iris, Rhizomatous, etc. ‡ ‖	H	Oct. to April
Ismene ♯ †	T	Oct. to April
Ixia *	H H	Aug. to Nov.
Ixiolirion ‡	H	Aug. to Nov.
Jonquils * ‡	H	Aug. to Oct.
Lachenalia *	H.H	Aug. to Oct.
Leucojum ‡ ‖	H	Aug. to Oct.
Lilium * †	H	Sept. to April
Lycoris ♯ †	H.H	Oct. to April
Milla ♯	H H	Oct. to April
Montbretia ‖	H.H	Oct. to April
Muscaria ‡	H	Aug. to Nov.
Nagelia * †	T	Oct. to April
Narcissus * ‡	H	Aug. to Oct.
Nemastylus ♯	T	Oct. to April
Nerine †	T	Aug. to Nov.
Ornithogalum * ♯	H. & H.H	Aug. to Nov.
Oxalis, Winter-flowering * †	H H	Aug. to Nov.
Oxalis, for borders ♯	H H	Sept. to April
Pæonias ‖	H	Oct. to April
Paneratium † ♯	T	Oct. to April
Phædranassa *	T	Oct. to April
Polygonatum ‖	H	Oct. to April
Puschkinia ‡	H	Aug. to Oct.
Ranunculus *	H.H	Aug. to Nov.
Richardia * † ♯	T	Sept. to Dec.
Rigidella ♯	T	Oct. to April
Sanguinaria ‡	H	Oct. to April
Schizostylis * ♯	H.H	Oct. to April
Scilla ‡ *	H & H.H	Aug. to Nov.
Sparaxis *	H.H	Aug. to Nov.

GENERA, ETC	HARDINESS	DORMANT
Spiræa (Astilbe) *	H	Oct to April
Spreckelia *†♀	T	Sept. to April
Sternbergia	H	Aug. to Oct.
Tecophylea *	H H	Aug to Oct.
Tigridia ♀	T	Oct to April
Trillium	H	Oct. to March
Triteleia ♀	H H	Oct to April
Tritonia *	H H	Aug. to Nov.
Tritoma †	H	Oct to April
Tropæolum, Tuberous *¶	H H	Aug. to Dec.
Tuberoses ♀	T	Nov to May
Tulip *♀	H	Aug to Nov.
Tydæa *♀	T	Oct to April
Ureeolina †	T	Oct to April
Vallota †	T	Oct to April
Watsonia *♀	H H	Sept. to Dec.
Zephyranthes *♀	H H	Aug to April

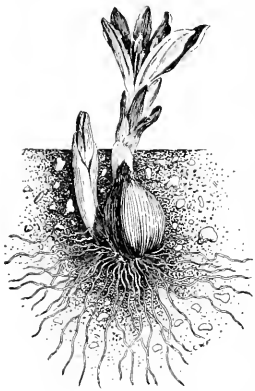
PETER HENDERSON & Co.

BULBÍNE (Greek, *bolbos*, a bulb). *Liliàceæ*. Half-hardy African plants, of several species, allied to Antherieum, but practically unknown in this country. Some of the species are bulbous, and require the general treatment given Cape bulbs (see *Bulbs*).

BULBINÉLLA. See *Chrysobactron*.

BULBOCÒDIUM (Greek, *woolly bulb*). *Liliàceæ*. A half dozen low, crocus-like bulbous plants of the Mediterranean region and eastward, some spring-flowering and others autumn-flowering. The spring-flowering species, *B. vernum*, is the only one in our gardens. It is hardy, and demands the same soil and location as crocuses.

vérnum, Linn. Fig. 291. Blooms in earliest spring, before the lvs. appear, the fls. resting nearly on the ground: fls. rosy purple, white-spotted on the interior, 1–3 from each bulb; lvs. broad and channelled. B.M. 153 (cf. Fig. 291). F.S. 11: 1149.—Bulbs should be taken up and divided every 2 or 3 years. Plant in the fall. Usually blooms in advance of the crocus.



291. Bulbocodium vernum.

L. H. B.

BULBOPHÝLLUM (Greek, *bulb-leaf*). *Orchidàceæ*, tribe *Epidéndreæ*. Many species of trop. orchids, mostly of the Old World, more odd than ornamental. Very few are known to cultivators. They are plants with a stout, creeping rhizome, small pseudobulbs bearing one or two stiff lvs.; lip jointed, moving when touched, sometimes hairy: fls. in racemes or spikes, or solitary. Require warm temperature and much water. Do not dry them off. They thrive on blocks or trunks of ferns. *B. Becarii*, Reichb. f., is one of the largest of orchids, its rhizomes twining about trees, and its fls. emitting the vilest conceivable odor; see G.C. II. 11: 41, and 14: 326, 525; B.M. 6567.

Lóbbii, Lindl. Leaf solitary, broadly lance-elliptic: scape 1-fld., arising from the side of the pseudobulb, shorter than the lf.: fls. large and spreading (2 in. across); sepals lanceolate and acuminate, yellow, more or less marked with purple; petals smaller, streaked purple; lip cordate-ovate, yellow and orange-dotted, not bearded. Java. B.M. 4532.—Flowers in early summer. Once catalogued by Pitcher & Manda.

BULL, EPHRAIM W. The introducer of the Concord grape lived a long, quiet, and useful life in Concord, Mass., where he died Sept. 27, 1895, in his ninetieth year. In commercial importance, the greatest event in the early history of American grapes was the introduction, early in the fifties, of this variety of the northern fox-grape. The first fruit of this grape was obtained in 1849. Its exact origin is obscure. In 1840, Mr. Bull bought the house in which he lived until his death. That year some boys brought from the river some wild grapes, and scattered them about the place. A seedling appeared from which Mr. Bull obtained a bunch of fruits in 1843. He planted seeds of this bunch, and a resulting plant fruited in 1849. This variety was named the Concord. It soon became the dominant grape in all eastern America, as it was the first variety of sufficient hardiness to carry the culture of the vine into every garden in the land. It is a pregnant type, and has given rise to no less than fifty honorable seedlings, which range in color from greenish white to purple-black. The quality of the fruit is excelled by many varieties, but the latter usually demand more careful cultivation. The Concord is the one most important type of American grape, and the really successful commercial viticulture of the country dates from its dissemination; and yet this grape is a pure native fox-grape, and evidently only twice removed from the wild vine.

Ephraim W. Bull was loved of his neighbors and honored by every countryman who grows or eats a grape. He made very little money from his variety, and died in extreme poverty. The original vine is still preserved. It is a sprout from the old root.

L. H. B.

BULLACE. A small wild or half-domesticated plum, standing midway between the cultivated European sorts (*Prunus domestica*) and the wild sloe (*P. spinosa*). This plum is usually referred to *P. insititia*, but it is so closely related to the Damsons as to be best classified with them. The Bullace would then take the botanical name of the Damsons, *P. domestica*, var. *Damascena* (see Bot. Gaz. 27:481). This plum is rather common in parts of Europe, but is very seldom seen in America.

F. A. WAUGH.

BUMÈLIA (ancient Greek name for an ash-tree). *Sapotàceæ*. Small trees or shrubs, usually spiny, with rather small, entire, deciduous or persistent lvs. and small white fls. in axillary clusters: fr. an oblong black drupe. About 20 species from S. N. America to Brazil. None of them is of much horticultural value, but as they grow naturally, mostly on dry, rocky or sandy soil, they may be used sometimes with advantage for planting in similar situations. Prop. by seeds.

lanuginòsa, Pers. Tree, sometimes 50 ft.: lvs. oblong-obovate or cuneate-obovate, rounded and often apiculate at the apex, dark green and lustrous above, tomentose beneath, sometimes nearly glabrous at length, 1–2½ in. long: clusters many-fld.; pedicels slender hairy: fr. oblong or obovate, ½in. long. S. S. 5: 247. S. states north to S. Illinois, west to Texas.—This species and *B. lycioides*, Pers., are the hardiest. They have proved hardy in very sheltered positions even in Massachusetts; besides these, *B. angustifólia*, Nutt., and *B. lènax*, Willd., are the most common species in the S. states. *B. Pitmeri*, Rose, from Mex., is illustrated in G.F. 7:196.

ALFRED REHDER.

BUPHÀNE (Greek, *cattle-destroyer*, alluding to poisonous properties). *Amaryllidàceæ*. Two or three South African bulbs, practically unknown in this country. They are large plants, with many red fls. in an umbel. Perianth tubular, segments equal and narrow, spreading: stamens 6, exserted: lvs. long and sword-like, thick. See Baker, Amaryllideæ.

disticha, Herb. (*B. toxicària*, Herb., *Hæmánthus toxicárius*, Thunb.). Bulb, 6–9 in. in diam.: lvs. several, distichous, 1–2 ft. long: peduncle or scape stout (6–12 in. high) and solid, compressed, glaucous, bearing a dense umbel. B. M. 1217.—Sparingly offered in this country. Lvs. said to be very poisonous to cattle in S. Afr.; bulb furnishes arrow poison for the natives.

Another species is *B. ciliàris*, Herb., with fewer, shorter lvs., and shorter peduncle, bearing 50–100 fls. Not known to be in the Amer. trade.

L. H. B.

BUPHTHÁLMUM (Greek for *ox-eye*). *Compósitæ*. A few European and W. Asian perennial herbs, sometimes grown in the hardy border. Heads large, with long yellow rays: lvs. alternate, entire or dentate: pappus short, often connate into a corona: akenes glabrous. Showy plants of easy culture.

speciosissimum, Ard. Lvs. cordate and clasping, the upper ones oval and acuminate: heads solitary on the ends of the stems: 2–5 ft., flowering in July and later.

salicifòlium, Linn. (*B. grandiflòrum,* Linn.). Lvs. oblong-lanceolate, 3-nerved, somewhat pubescent and slightly serrate: fls. solitary and terminal, large: lower than the last.

speciósum, Schreb. (*B. cordifòlium,* Waldst. & Kit.). Lvs. very large, cordate, coarse-serrate: fls. very large and showy, on an upward-thickened peduncle: 3–4 ft., blooming in June and later. B. M. 3466, as *Telèkia speciósa*.

L. H. B.

BUPLEÙRUM (Greek, *ox* and *rib*: of no obvious application). *Umbellífera*. Weedy plants of the Old World, of which one (*B. rotundifolium,* Linn.), is naturalized in the Eastern states, and another (*B. falcatum,* Linn.), is cult. in Japan for greens (A.G. 13: 9).

BURBIDGEA (after F. W. Burbidge, who discovered it in Borneo). *Scitamináceæ*. A monotypic genus allied to Hedychium, but with no lateral perianth segments and the lip reduced to a small blade. The showy orange-scarlet fls. rival cannas in brilliancy. For culture, see Alpinia and Hedychium.

nítida, Hook. f. Tender herbaceous perennial: height 2–3 ft.: rootstock creeping, matted: stems tufted, slender: leaf-blades glossy, 4–6 in. long, eared at junction with the sheath: panicle terminal, 4–6 in. long, many-fld.; inner perianth tube 1–1½ in. long; outer segments 1½–2 in. long, orange-scarlet, the dorsal one shorter and more roundish than the 2 lateral ones. B. M. 6403. Sold by Siebrecht & Son.

BURCHÉLLIA (W. Burchell, botanical traveler). *Rubiàceæ*. One species from S. Afr., an evergreen shrub, with opposite short-petioled lvs. and dense terminal clusters of sessile scarlet fls.: corolla tubular, bell shaped; stamens 5, inserted in the tube: fr. a 2-celled, many seeded berry. **B. Capénsis,** R. Br., is in the Amer. trade, being cult. for its rich, dark foliage and brilliant fls. It is very variable, and has received several names. 3–10 ft. Prop. by cuttings. Grown under glass. B. M. 2339. R. H. 1886: 420. J. H. III. 34: 81.

BURDOCK. See *Arctium*.

BURLINGTÒNIA. See *Rodrigue̊zia*.

BURNET (*Potèrium Sanguisórba,* Linn.). A hardy rosaceous perennial, the piquant lvs. of which are sometimes used in flavoring soups and salads. The dried roots are occasionally used as a family remedy. Burnet is little known in this country as a condimental herb. It is worthy a place in the hardy border for the ornamental character of its odd-pinnate lvs. and its little heads of fls. with drooping stamens. The leaflets are very dark green, ovate and notched. Stems 1–2 ft. high, bearing oblong or globular monœcious heads. Of easiest culture, either from seeds or by division of the clumps. Native of Europe.

L. H. B.

BURNING-BUSH. See *Euonymus*.

BURRIÉLIA. See *Bueria*.

BURSÀRIA (*Bursa,* a pouch, alluding to the shape of the pods). *Piltosporàceæ*. Two species of shrubs with white fls. in clusters; sepals, petals and stamens each 5: fr. a 2-loculed capsule, in shape like that of the Shepherd's Purse.

spinósa, Cav. An elegant spiny shrub or small tree, with drooping branches and pretty white fls., produced in summer: lvs. small, oblong-cuneate, alternate and nearly sessile: fls. small, lateral or terminal, mostly terminal. Australia, Tasmania. B. M. 1767.—Cult. in S. California.

BURSÈRA (Joachim Burser, a disciple of Caspar Bauhin). *Burseràceæ*. Generally tall trees, with simple or pinnately compound lvs.: fls. small, in clusters, 4–5 parted, with twice as many stamens as petals or sepals, and a 3-parted ovary containing 6 ovules: fr. a 3-parted drupe with usually only 1 seed. About 40 species of trees in tropical America. For *B. serràta,* see *Protium*.

Simarubra, Sarg. (*B. gummífera,* Jacq.). Lvs. odd-pinnate, with 3–5 pairs of lfts.: lfts. ovate, acute, membranous, smooth on both sides, entire, the netted veins prominent on the under side: fls. in a very knotty raceme, 4–6 parted: fr. a drupe, with a 3-valved succulent rind and 3–5 nuts. A tall tree with a straight trunk and spreading head, found in Florida, Mexico, and Central America and the West Indies.—It yields a sweet, aromatic balsam, which is used in tropical America as a medicine for internal and external application; dried, it is known in the trade as Chibou, or Cachibou resin, or Gomart resin. It is a hardy greenhouse plant, and thrives in a compost of loam and peat. Prop. by cuttings under glass, with bottom heat.

G. T. Hastings.

BUSH-FRUITS. A term used to designate those small fruits which grow on woody bushes. It includes all small-fruits—as that term is used in America—except strawberries and cranberries. Bush-fruits is an English term, but it has been adopted lately in this country, notably in Card's book on "Bush-Fruits." The common bush-fruits are currants, gooseberries, raspberries, blackberries, and dewberries.

BÙTEA (Earl of Bute). *Leguminòsæ*. Three or four species of trees or woody vines of India and China, with deep scarlet papilionaceous fls. in racemes and pinnate lvs. In the Old World rarely grown in stoves. In this country, one is cult. in S. Calif.

frondósa, Roxbg. A leafy tree, yielding gum or lac: lfts. 3, roundish, pubescent beneath, the lateral ones unsymmetrical: fls. 2 in. long, orange-crimson, very showy; stamens 9 together and 1 free. India.—Reaches a height of 50 ft.

BUTÒMUS (Greek, *bous,* ox, and *temno,* to cut; the leaves too sharp for the mouths of cattle). *Alismàceæ*. Hardy perennial aquatic of easy culture on margins of ponds. Prop. by division. All the species are referred by DC., in Mon. Phan., vol. 3, to *B. umbellatus,* or to the Australian Butomopsis, which is also a monotypic genus.

umbellàtus, Linn. Flowering Rush. Rhizome thick: lvs. 2–3 ft. long, iris-like, sheathing at the base, 3-cornered: fls. rose-colored, 25–30 in an umbel, on a long scape; sepals 3; petals 3. Summer. Eu., Asia.

BUTTERCUP. Species of *Ranunculus*.

BUTTERFLY WEED. *Asclepias tuberosa*.

BUTTERNUT. See *Juglans*.

BUTTON-BUSH is *Cephalanthus*.

BUTTONWOOD. Consult *Platanus*.

BUTTERWORT. See *Pinguícula*.

BÙXUS (ancient Latin name). *Euphorbiàceæ*. Box Tree. Evergreen shrubs or small trees: lvs. opposite, short-petioled, entire, almost glabrous, coriaceous and rather small: fls. monœcious, in axillary or terminal clusters, consisting usually of one terminal pistillate flower, with 6 sepals, and several lateral staminate fls. with 4 sepals and 4 stamens: fr. an obovate or nearly globular 3-pointed capsule, separating into 3 valves, each containing 2 shining black seeds. About 20 species in the mountains of Cent. and E. Asia, N. Afr., and S. Eur., also in W. India and C. Amer. Ornamental evergreen shrubs of dense but rather slow growth, with shining, small foliage and inconspicuous fls. and fr. The common Box Tree and *B. microphýlla* may be grown in sheltered positions even north, while *B. Wallichiana* and *B. Balearica,* two very distinct and hand-

some species, grow in the warmer temperate regions only. *B. sempervirens* stands pruning very well, and in the old formal gardens of Europe was formerly much used for hedges, and sometimes trimmed into the most fantastical shapes; the dwarf variety is still often planted for bordering flower beds. The very hard and close-grained wood is in great demand for engraving and finer turnery work. The Box Tree thrives in almost any well-drained soil, and best in a partially shaded position. Prop. by cuttings from mature wood early in

292. **Buxus sempervirens.** (× $\frac{1}{2}$)

The lower spray shows the under surface

fall, kept during the winter in the cool greenhouse or under handlights in the open; in more temperate regions they may be inserted in a shady place in the open air; 4–6 in. is the best size for outdoor cuttings. Layers will also make good plants. The dwarf variety is usually propagated by division. In planting borders, it is essential to insert the divided plants deeply and as firmly as possible, and to give plenty of water the first time. Seeds are sown soon after maturity, but it takes a long time to raise plants of good size from them.

sempérvirens, Linn. Common Box Tree. Fig. 292. Shrub or small tree, to 25 ft.: branches quadrangular, sparingly pubescent: lvs. oval-oblong or oval, rarely roundish oval or lanceolate, usually obtuse, $\frac{1}{2}$–$1\frac{1}{2}$ in. long: fls. in axillary clusters; staminate fls. sessile, with a gland half as long as the calyx in the center. S. Eur., N. Afr., Orient, China. Very variable in size, color and shape of the lvs.; some of the most cultivated forms are the following: Var. **angustifólia,** Loud. (var. *longifólia*, Hort.; var. *salicifólia*, Hort.). Lvs. narrow, oblong-lanceolate, usually shrubby. Var. **arborescens,** Linn. Tall shrub or small tree; lvs. usually oval. Var. **argenteo-marginâta,** Hort. Lvs. edged white. Var. **aúrea,** Hort. Lvs. yellow. Var. **aureo-marginâta,** Hort. Lvs. edged yellow. Var. **suffruticosa,** Linn. (var. *nána*, Hort.). Dwarf. lvs. small, oval or obovate: flowering clusters usually only terminal.

Japónica, Muell. Arg. (*B. obcordáta*, Hort. *B. Fórtunei*, Hort.). Shrub, 6 ft.: lvs. cuneate, obovate or roundish obovate, obtuse or emarginate at the apex, $\frac{1}{2}$–$1\frac{1}{2}$ in. long, with usually pubescent petioles; clusters axillary; staminate fls. sessile, with a central gland as long as the calyx. China, Japan.—Nearly as hardy as the former. There are also some variegated forms.

microphýlla, Sieb. & Zucc. (*B. Japónica*, var. *microphýlla*, Muell. Arg.). Dwarf, often prostrate shrub, quite glabrous: lvs. obovate or obovate-lanceolate, $\frac{1}{4}$–1 in. long: clusters mostly terminal; staminate fls. sessile, with a central gland, like the former. Japan.

Balearica, Willd. Shrub, 6–15 ft.: lvs. elliptic or oblong, acute or obtuse at the apex, 1–2 in. long, light green: clusters axillary; staminate fls. pedicelled. S. Spain, Balear.—Handsome shrub, but less hardy than the former.

B. Californica, Lk. = Simmondsia Californica.—*B. Fórtunei*, Hort. = B. Japonica.—*B. Harlandi*, Hance. Branches pubescent. lvs. narrow obovate, emarginate, $\frac{3}{4}$–$1\frac{1}{4}$ in. long. China.—*B. longifólia*, Boiss. Lvs. narrow-elliptic or lanceolate, 1–$1\frac{3}{4}$ in. long. Orient, China.—*B. longifólia*, Hort. = B. sempervirens, var. angustifolia.—*B. Wallichiana*, Baill. Branches pubescent: lvs. linear-elliptic, 1–$2\frac{1}{2}$ in. long. Himalayas.

Alfred Rehder.

C

CABBAGE. *Brássica oleràcea*, Linn., is a cruciferous plant which grows wild on the sea-cliffs of western and southern Europe. Figs. 293 and 294, from nature,

293. Wild Cabbage on the cliffs of the English Channel.

show the common form as it grows on the chalk cliffs of the English Channel. It is a perennial plant, or perhaps sometimes a biennial, with a very tough and woody root, a diffuse habit, and large, thick, deep-lobed leaves in various shades of green and reddish, and more or less glaucous. The leaves of this plant were probably eaten by the barbarous or half-civilized tribes; and when history begins, the plant had been transferred to cultivated grounds and had begun to produce dense rosettes or heads of leaves. It appears to have been in general use before the Aryan migrations to the westward. There were several distinct types or races of the Cabbage in cultivation in Pliny's time.

From the one original stock have sprung all the forms of Cabbages, Cauliflowers, Brussels Sprouts and Kales. For this family or group of plants the English language has no generic name. The French include them all under the term *Chou*, and the Germans treat them under *Kohl*. These various tribes may be classified as follows (cf. De Candolle, Trans. Hort. Soc. London, 5, 1–43; Prodr. 1. 213):

Var. **acéphala**, DC. The various headless Cabbages. It comprises the Kales, in many types and varieties, as the tall or tree Kales, Curled or Scotch Kales, and Collards. The Georgia Collards, grown in the south and shipped to northern markets, is shown in Fig. 295. Its likeness may be found wild on the cliffs of the southeastern coast of England to-day. A Curled Kale is shown in Fig. 296. The thick, tender leaves of the Kales are used as "greens." See *Collards* and *Kale*.

Var. **gemmífera**, Hort. The bud-bearing Cabbage, or Brussels Sprouts (see Fig. 273). In this group, the main stem or axis is tall and erect, and the axillary buds are developed into little heads.

Var. **capitàta**, DC. The head-bearing, or true Cabbages. In this tribe, the main axis is short and thick, and the leaves are densely packed into a gigantic bud or head (Figs. 297, 298). The varieties of Cabbage are very numerous and various. A serviceable classification of them might follow this order;

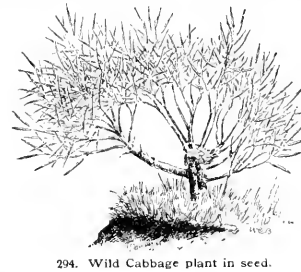
A. Lvs. plain (not blistered).
  B. Head oblong or conical (Fig 299).
    C. Green
    CC. Red
  BB. Head oblate or flattened (Fig 299), including C and CC, as above.
AA. Lvs. blistered or puckered. The Savoy Cabbages, Fig. 300 (*B. oleracea*, var. *bullàta*, DC.), to be further divided, as in A

Var. **botrytis**, DC. Cauliflower and Broccoli, in which the head is formed of the condensed and thickened flower-cluster. See *Cauliflower*.

The Chinese Cabbage is a wholly different species from the common Cabbages (see *Brassica*). It does not form a compact and rounded head, but a more or less open and soft mass of leaves, after the manner of Cos Lettuce. It is of easy culture, but must be grown in the cool season, for it runs quickly to seed in hot and dry weather.

L. H. B.

Culture of Cabbage.—The Cabbage is a gross feeder. It endures much abuse. We may cover its leaves with dust, dose it with all sorts of substances, mutilate its leaves or roots as we choose, plant it in heavy clay, black muck or pure sand, and it will do fairly well in spite of all conditions if we but supply an abundance of easily secured food and the right quantity of water to enable the plant to take it in and make it available. Next to plenty of food, its great requisite is a proper supply of water, and, though its native home seems to be near the ocean, it is by no means an aquatic, and suffers as much from an over-supply of water as from any untoward condition. Cabbages cannot endure hot sunshine and dry air, and do best at all stages of growth in a cool, moist atmosphere, and while young plants do fairly well in a higher one, provided there is plenty of light and air, the older ones cannot be made to form perfect heads in such weather as prevails in most parts of the United States during the summer months. They are quite hardy, and will endure a too low temperature better than one which is too high, their hardiness in this respect depending largely upon the condition of the plant. The leaves of one rapidly grown in a greenhouse will be killed by 2° or 3° of frost, while it will take 20° to 25°, continued for some time, to kill one grown slowly out-of-doors. It is clear that if the plant is to be grown successfully in our southern states, it must be during the cooler winter and spring months; and at the north seed-sowing must be so timed as to avoid bringing the plants to a heading condition during hot weather. Cabbages can be grown without protection at the south



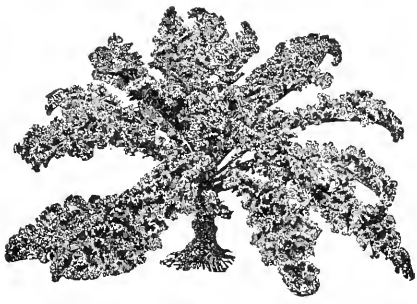
294. Wild Cabbage plant in seed.

wherever a minimum temperature of about 15° above zero is the coldest that may be expected, and at the north well-grown and hardened plants for early crop may be set out as soon as danger of a temperature below about 20° above zero is passed. The earliest maturing

varieties, when grown without check, will come into heading condition in about ninety days from the seed, and the time necessary for the different sorts to perfect heads varies from that to some 200 days for the latest. In about sixty days from the seed the plant will be as large as can be profitably transplanted, so that when plants can be safely set out-of-doors early in March the seed should be sown early in February, the date of sowing to be determined by the local climatic conditions. We think the best plan is to sow the seed in boxes, about 3 inches deep, and of convenient size to handle, filled with rather heavy but very friable soil. We plant the seed in drills, about 2 inches apart, dropping about ten seeds to the inch. The seedlings need abundant light and air, and the great danger to be guarded against is their becoming soft and spindling through too high temperature and the want of light. They should be fully exposed whenever the weather will permit. In from fifteen to twenty days after sowing the seed the plants should be "pricked out," setting them about 2 inches apart, in a rich and somewhat heavier soil than was used in the seed boxes, and as soon as well established they should be given all the light and air possible. A few degrees of frost for a night will be an advantage rather than an injury. It was formerly the custom, and one still followed by some successful growers, to sow the seed in the open ground in September, transplanting into coldframes in late October or November, and carry the plants through the winter in a dormant or slowly growing condition. Such plants, being very hardy, can be set out early, and, if all goes well, will mature somewhat earlier than spring-grown plants, but this method is now generally thought to be more expensive, less profitable and certain than spring planting. For the later or general crop at the north, and for those parts of the south where no protection is necessary, seed is sown in beds out-of-doors. For this purpose, select a well-drained, level spot, of rich, friable soil, as near the field where the crop is to be grown as practicable, and get it into the best possible condition as to tilth and moisture by repeated cultivation. In the latitude of New York, the latter part of May or the first of June is considered the best time for sowing seed for the general crop, but fine yields are often obtained there from seed sown as late as the middle of July, and many of the most successful growers wisely make several sowings, one as early as May 10, and one or two later, so as to be sure to have plants in the best condition for transplanting at the time when the condition of the field and weather is favorable. The seed should be sown in drills, about a foot apart, at the rate of about fifty to the foot, or, if thicker, the plants should be thinned to about one-fourth inch apart, as

295. Georgia Collards.

soon as fairly up. Some growers sow the seed and leave the plants much thicker, but we think it pays to give them plenty of room. The seed should be lightly covered, and the soil pressed firmly over it with the hoe, a small roller, or, best of all, the foot; this firming of the soil is often quite essential to success. It is sometimes the case that, in spite of all our efforts, the seed-bed becomes so dry that seed will not germinate. In such cases one can often get a good stand by watering the ground before planting, filling the drills two or three times with



296. Curled Kale. Brassica oleracea, var. acephala.

water, and when it has settled away sow the seed and cover with dry earth, well pressed down. In most cases an attempt to wet the bed by sprinkling, either before or after the seed is planted, will do more harm than good. As soon as the starting seed breaks ground the surface should be carefully stirred with a rake, and this should be repeated at least as often as four times a week until the plants are taken to the field.

A full stand of healthy, well-established plants is of great importance, and does much towards assuring a profitable crop. So important is it, that many growers wait for damp weather before setting, regardless of the season. We think they often make a mistake in doing so, and, while a cloudy or damp day is desirable, it is of far greater importance that our plants are set at the proper time, and the moisture of the soil conserved by cultivation before and stirring of the surface immediately after setting. Careful attention should be given to so arrange the work that the young plants should be taken up so as to save all the root possible, protected from the sun, and set as soon as practicable. Just how this can be best done will depend upon each planter's circumstances and the help he has at his command. There is one point in transplanting which is of especial importance with Cabbage plants, that is that the roots are not doubled back upon themselves. This is often done by careless men, and some of the transplanting machines are worthless because of this fault. A Cabbage plant so set never does well, and seems to suffer much more than if the root had been cut off instead of folded back.

The Cabbage is very dependent upon a proper supply of water, and suffers more from the want of it than most of our garden vegetables. Its roots, though abundant and of quick growth, are comparatively short, and less capable of gathering moisture from a dry soil than those of such plants as the bean. On the other hand, it is quickly and seriously injured by an over-supply of water at the root. Want of consideration of these characteristics is a frequent cause of failure. Men seem to think that, because the plant is a rank feeder, all that is necessary is an abundant supply of food, and set them on rich, black soils, made up chiefly of vegetable matter, but so open that they quickly dry out during summer droughts and the plants die or fail to do well, or on lands so poorly drained that in a wet time the ground is flooded and the plants drowned out. Not only should we select ground where the natural water supply is good, but one where the physical conditions are such that we can conserve the soil moisture by frequent and thorough cultivation, both before and after setting the plants.

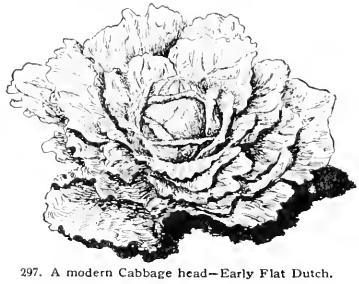
For the highest possible development, the evenness of

distribution and the degree to which the plant-food has become immediately available is of equal or greater importance than the quantity. Land can be put into the best condition for raising a maximum crop by a heavy dressing of stable manure, thoroughly worked into a well-drained, loamy soil, and repeating the process yearly for several seasons. A much heavier dressing of manure can be profitably applied to a soil which has been well fertilized in previous years than to one which has received little or none. The most successful growers use large quantities of manure, often as high as one hundred tons to the acre. When stable manure cannot be readily obtained, it may be supplemented by commercial fertilizers, so made up as to contain about seven parts of nitrogen to eight of available phosphoric acid and about six of potash. If we depend entirely upon fertilizers, we should use from 2,000 to 3,000 pounds to the acre, and we should not forget that upon all ordinary soils the yield and profitableness of a crop of Cabbage is largely dependent upon the amount of available and evenly distributed plant-food and the degree to which the soil is kept always moist, and more with conditions which can only be secured by frequent and thorough cultivation.

Diseases and Some of the Most Common Insect Pests.—*Club-root.*—This is the effect of a fungus (*Plasmidiophora Brassicæ*), which develops within the cells of the root, causing them to become distorted and the plant to develop imperfectly or die. On the death of the plant, the spores of the fungus become mixed with the soil, where they lie dormant until roots of some other host-plant come in contact with them, and the conditions are favorable for their development. They develop within several of our common weeds, and we believe that the spores are to be found in most of our cultivated fields, and need only favorable conditions to develop. We have found that the disease is seldom troublesome except where the cultural conditions, particularly as to moisture, are unfavorable to the Cabbage, and that the best preventive is careful attention to the health and vigor of the plant. We know of no practical remedy where a plant or field is badly affected.

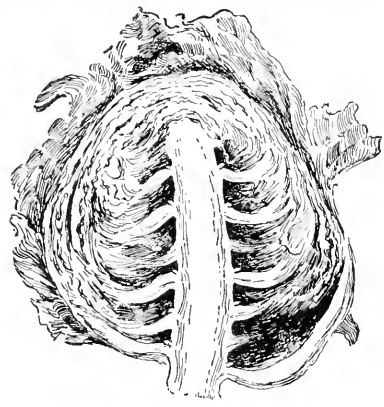
Flea Beetle.—A small, quick-moving black insect (*Phyllotreta vittata*), which sometimes destroys the seedlings before they have formed true leaves. By attending to them promptly, we have always succeeded in protecting our plants by dusting them with tobacco dust, used liberally and as often as necessary, which may be twice a day. A great deal depends upon using the tobacco as soon as the first beetles appear. It is a great deal easier to keep them off than to dislodge them after they are once there.

Cabbage Root Maggot (*Phorbia Brassicæ*).—This is the larva of a fly very much like the common house fly, though a little smaller. They appear in the latitude



297. A modern Cabbage head—Early Flat Dutch.

of Detroit early in May, and the female deposits her eggs in the ground at or close to the plant, usually putting her abdomen into the opening in the soil formed by the movement of the plant by the wind. The eggs hatch in a few days, and the maggots feed upon the roots and soon destroy them. An effective but costly preventive, only practicable for use on early plants of high prospective value, is to surround the plants with shields formed of octagon pieces of tarred paper about three inches across, and having a small hole in the center, from which there is a slit to one edge, by means of



298. Section of Cabbage head.
Showing the thickened rachis and leaf-stalks, and the buds in the axils.

which the guard can be slipped around the plant and pressed down on the ground, so that the fly is prevented from laying her eggs in the earth, and, laid on the surface, they will perish for want of moisture. We have also done much to prevent injury by scattering among the plants bits of sticky fly-paper, by means of which a great many of the flies are caught and killed. It is important that the paper should be put out early, so as to catch as many as possible before they have laid their eggs. In the seed-bed, the maggot can be destroyed by injecting bisulfide of carbon about the roots from a syringe, or pouring it into a hole and quickly closing the hole (cf. Slingerland, Bull. 78, Cornell Exp. Sta.).

The Green Cabbage Worm (*Pieris Rapæ*).—We have succeeded best in protecting our young plants from worms by spraying with Paris green and water in about the proportions used for potato bugs. As the plants become larger, and the use of the poison objectionable, we dust the plants with pyrethrum powder, which, if pure, will be very effective.

Harvesting, Storing and Marketing.—Nearly all of a well-grown crop of Cabbage of a good stock will mature at about the same time, and, while the earlier sorts remain in prime condition but a few days, the later ones remain so for two or three weeks, and can be stored so as to be salable for several months. Often the maturing of the crop can be delayed to advantage by partially pulling the plants and pressing them over to the north. The southern crop is usually marketed from the field as soon as it is fit, being sent forward in open crates containing from two to ten dozen heads. The early fall market is usually supplied by local growers, who deliver direct to retailers. The late fall crop is often shipped long distances in open or well ventilated cars. At the north they may be stored till spring. We have tried more than a score of highly praised methods of storing, and found that each, under certain conditions, had advantages, but we have found that generally the best and most certainly successful plan, at least for the latitude of Detroit, is to store in trenches, as follows: Plow and replow several times a strip of well-drained sandy land, where there is no danger from surface water, and open a trench some 10 inches deep and about 20 inches wide. Then pull the Cabbages, remove a few of the outer leaves, stand them on their heads for

a few hours, that any water at the base of the leaves may escape, and set them in the trench, heads up and as compactly as possible, throwing a little earth over the roots as we do so. We have found it profitable to build a roof of four rough boards over them, but this is not essential, and they may be slightly covered with corn-stalks or other coarse litter, or even the refuse leaves of the

299. Jersey Wakefield Cabbage.

Cabbage may be used. As soon as there is danger of frost, cover with earth, to protect them from it and the rain. If the boards are used, they should be covered with earth in the same way, and in both cases the covering should be increased as the weather grows colder, and if it should be very cold, a covering of straw or coarse manure is desirable. The aim is to protect the heads from rain, but to keep them moist and at an even temperature—one of about 32° is best, and one somewhat lower is less objectionable than one much higher. The cost of growing an acre of general crop or late Cabbage on good ground, not including ground rent, is about as follows: Fertilizer, $20 to $40; preparation of the ground, $10; growing and setting about 8,000 plants, $13; cultivating and hoeing, $10; harvesting and marketing, $10. The yield should be about 7,500 heads, making the cost of growing about one cent a head.

Varieties.—The Cabbage has been made more valuable to man by the development of a tendency to form more and larger leaves, and thickening them with thick-walled cells deposited both in the blade and the ribs. There has also been a shortening of the stem, particularly at the top, until the upper leaves are crowded and folded over each other and form a bud or head, the inner portion of which becomes blanched, tender and sweet, and, through the loss of much of the naturally strong taste, well-flavored. The thicker the leaves and the more solid the head, the sweeter, more tender and better flavored the Cabbage. If the leaves are long and narrow, with large midrib and little blade at the base, the upper part of the head may be solid; but the lower part, being made up chiefly of the thickened midribs, will be open and coarse. If the leaves are broad and proportionately too short, they will not lap well over each other, and the head will be soft and even open at the center. Many varieties have been developed, differing in season of maturity, shape of head, etc., and adapted to different cultural or market conditions. Many of them, though differing in some point, are essentially identical, and, as the list is an ever-increasing and constantly changing one, we would refer our readers to the various seedsmen's catalogues for descriptions, only speaking of a few representative sorts of the different types, between which there are many intermediate forms.

Jersey Wakefield (Fig. 299), *Express, New York.*—These are small-growing, early-maturing and small-headed sorts. Under favorable conditions they become fit for use in from 90 to 110 days from seed, and continue in edible condition but a comparatively short time. The plants are compact and erect-growing, with very thick, smooth and smooth-edged leaves, and are very hardy. The hearts are small, as compared with the later sorts, more or less conical in shape, quite solid, and of good quality. Owing to the hardiness and compact habit of the plants, they are the best sorts for forcing under glass and early spring planting at the north, and for winter culture at the south.

Winnigstadt is in some respects much like the above, but is larger in plant and head, somewhat later, and a much better keeper. The heads are sharply conical, with the leaves convolute rather than overlapping at the top, and very hard; of good quality, and remain a long time in condition for use. The type is very sure heading and hardy, and will form good heads under circumstances where most others would fail.

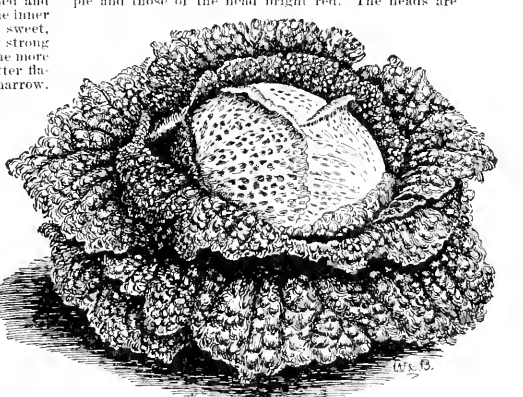
Henderson's Early Summer, Early Flat Dutch (Fig. 297), *All-Head*, are strong-growing, vigorous sorts, becoming fit for use in from 100 to 140 days, and continuing in condition much longer than the Wakefield type. The plants are large, spreading, with large, broad, smooth, thick leaves, and form a more or less flattened, oval head of good size; solid, and of good quality. They are best adapted to early fall use.

Late Flat Dutch, Stone Mason, Late Drumhead.—Strong-growing, spreading plants, forming very large, solid heads in from 120 to 180 days, and remaining a long time in usable condition. They are the best type for general crop, will give the largest yield, and keep well through the winter.

Hollander, Luxemburg.—A type of Danish origin, which has become quite popular of late years, particularly for shipping long distances. The plants are strong-growing and the hardiest of all, enduring with but little injury frost or drought which would ruin other sorts. They come to maturity slowly, and form a comparatively small but very hard round head of good quality, which keeps well and which, because of its shape and solidity, can be handled in shipping better than most sorts.

Savoy (Fig. 300).—A class of Cabbage in which the leaves of both the plant and head are crumpled or savoyed instead of smooth, as in the preceding. There are varieties of all the types found in smooth-leaved sorts, though generally they are less certain to form good heads, and the heads are smaller. As a class they are very hardy, particularly as to cold. They are extensively grown in Europe, where they are esteemed to be much more tender and delicate in flavor than the smooth-leaved sorts.

Red Cabbage.—A class of which there are many varieties, and in which the leaves of the plant are dark purple and those of the head bright red. The heads are



300. Savoy Cabbage.

small, but usually very solid, and are especially esteemed for use as "cold slaw."

Seed-growing.—It is only through the constant exercise of the utmost care and skill in the growing of the

seed that this or any other vegetable can be improved, or even its present good qualities maintained. It would seem to be an easy matter to save and use only the seed of a few of the most perfect Cabbages, for the plant is capable of enormous seed production. We have known a single plant to yield 35 ounces of seed, enough, if every seed grew, to furnish the plants for 50 acres; but it is not quite so easy as this showing would make it—first, because the yield mentioned is an exceptional one, and, secondly, because it is very seldom that an isolated plant yields a crop of seed. The flower of the Cabbage is sexually perfect, and I think there is no discovered reason why individual plants are self-impotent, but we have never succeeded in getting more than a very few seeds from an isolated plant, either in the open air or when enclosed in an insect-tight structure of glass and cloth, in which a number of bees were confined. Again, we have repeatedly isolated the best plant of an hundred, setting the rest in a block, and the few seeds obtained from the isolated one produced plants showing more variation, and quite inferior in evenness and type, than those from the block. At least one of our popular varieties is made up of the descendants of a single isolated plant, but it is a curious fact that in the second and subsequent generations the stock was very different in type from that of the selected plant from which it was descended. The originator of one of our best varieties maintains that it is essential to the production of the best seed of that sort that seed-plants of very different types should be set together, and by crossing they will produce and give plants of the desired type. In spite of those facts, we believe that the general rule and practice which give the best results with other plants are equally desirable for the Cabbage, and that in this, as with other plants, we should first form a distinct and exact conception of the plant we wish to produce, and then raise seed from the one which comes nearest to that ideal. It would seem that the necessity of a distinct and well defined ideal of exactly what we want to produce would be self-evident, but some seed-growers have a very vague idea of the exact type wanted. Some years ago we visited the originator of one of our best varieties, for the purpose of learning what he considered the type of the variety. He was an intelligent man, a good cultivator, and had been growing this strain for over twenty years. He took us into a field of as handsome Cabbages as we ever saw, but which were far from uniform. We asked him to select an ideal plant of his strain, and carefully noted its every characteristic. Going to another part of the field, we asked him to select another, and he picked out one which in color, shape, and general character of the crop, was very different from the first. Both were fine market Cabbages, but so different that if either were taken as the true type of the variety, the other should be thrown out of a seed crop as being a different sort. Third and fourth selections were intermediate between the first two, and the fifth very nearly like the first. This man had been growing this strain for twenty years, and was intent upon developing a strain of superior quality for marketing, and in his selection and breeding had looked solely to the selling quality of the heads. His course was as unwise as it would be for a breeder of Jersey cattle to breed from black, red, white, big or little cows, regardless of anything but the quality of their milk. Having formed a carefully considered ideal, we should select from 10 to 100 of the plants which come nearest to it, and from these make an extra selection of about one-tenth of the best. We would set the whole lot in a nearly square block, with the extra selections in the center. We would save and plant seed from each extra select plant by itself, and having, by very careful examination, ascertained which lot adhered most closely and evenly to our ideal type, would select our plants for next year's seeding from it, rather than use the best individual plants found in all the lots. Experience has satisfied us that by this method we can gradually fix and improve our stocks, and grow seed much better than that usually produced.

In commercial seed-growing, they aim to so time the planting that the crop will be just coming to maturity at the time of storing for winter. Mixtures and inferior plants can be detected and thrown out then as well as when the plants are fully matured, and the younger plants will go through the winter and seed better than those which are fully ripe when put away for the winter. The plants are usually wintered in the manner described for storing for market use, except that the trench is usually narrower. The plants are set out for seed-bearing as early as possible in the spring. It is usually necessary to carefully open the head by two cross-cuts with a knife in order to let the tender seed-stalk break through. The plants are given double or treble the space which they required the first year. It is generally true that the more developed and better the stock, the smaller the yield of seed. W. W. Tracy.

CABÓMBA (aboriginal name). *Nymphæàceæ*. Half a dozen aquatics of the western hemisphere, with small flowers having persistent sepals and petals, each 3 or 4, and stamens few; carpels 2–3, free and distinct, and submerged lvs. finely dissected and mostly opposite.

Caroliniàna, Gray (*C. aquática*, DC., not Aubl. *C. viridifolia*, Hort.). Floating lvs., green, oblong-linear: fls. white, with 2 yellow spots at base of each petal; stamens 6. N. Car., S. and W. A.G. 15:157.—*C. rosæfólia*, Hort., is a form with reddish lvs. A.G. 15:157.

The true *C. aquática*, Aubl., of trop. Amer., with yellow fls. and nearly orbicular floating lvs., is shown in B.M. 7090. L. H. B.

Cabomba Caroliniana is very largely used by growers of aquatics. It is one of the indispensable plants for the aquarium. It is grown largely in North Carolina, District of Columbia and Maryland, where it can be obtained in quantities during the year for persons in the large eastern cities, where it is commonly called Fish Grass, Washington Grass, etc. It is tied in bunches with a metallic fastening, which acts as a weight, thus retaining the same in a natural position in water. In a moderate temperature it soon emits roots and grows freely. It is a submerged plant, except in midsummer, when the flowers are borne above the water, accompanied by a few floating leaves. It is one of the best plants for domestic fish. It also grows in New Jersey, where it is quite hardy. *C. rosæfolia* is tender, does not retain its delightful carmine coloring under confinement, and is not so often met, except in Florida.

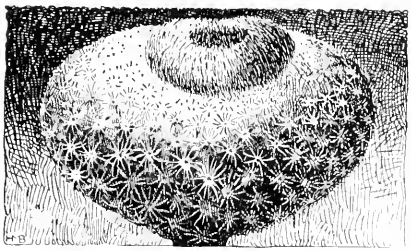
William Tricker.

CACÀLIA (ancient Greek name). *Compósitæ*. Perennial herbs, of which 9 or 10 are native to the U. S. Florets all hermaphrodite, with white or flesh-colored corollas, each of the 5 lobes with a midnerve: akenes

301. Cactus forms.

glabrous: lvs. petioled. None of the species are known to be in the Amer. trade, but some of the native kinds may be expected to appear in commerce. For an account of the N. Amer. species, see Gray, Syn. Fl., vol. 1, p. 2, pp. 394–6.

CACÀLIA of the florists. See *Emilia*.



302. Showing the remarkable condensation of the plant body in a cactus—Mamillaria micromeris.

CACALIÓPSIS (*Cacalia-like*). *Compósitæ*. One species, with discoid, very many-fld. heads of perfect yellow florets, and palmate lvs.

Nardósmia Gray. Strong perennial, 1–2 ft. high, loose, woolly, but becoming nearly glabrous; lvs. nearly all radical, long-stalked, 5–9-cleft or parted, the lobes dentate or cut; heads an inch high, in a loose cluster at the summit of the nearly naked stem, fragrant. Pine woods, Calif. to Wash.—Int. by Gillett in 1881 as a border plant.

CACAO, COCOA. See *Theobroma*.

CACTUS, CACTI. The peculiar forms included under this name constitute the family *Cactàceæ*. They are especially characteristic of the warm and dry regions of America, their display being greatest in Mexico, although extending from the plains of North America and eastward southward through the West Indies and Mexico to southern South America. Aside from certain African species of Rhipsalis, this great family, containing about 1,000 known species, is absolutely restricted to America. The common prickly pear (*Opuntia Ficus-Indica*) has long been naturalized throughout the Mediterranean region, and its pulpy fruit is eaten under the name of "Indian fig." The chief display of Cacti in the United States is in the Mexican border states, representing the northern edge of the still more extensive Mexican display.

The peculiar habit of the family seems to be the result of perennial drought conditions, to which they have become remarkably adapted. The two-fold problem presented by such conditions is the storage of water and the regulation of its loss. As a result of water storage, the plant bodies are characteristically succulent. Loss of water by transpiration is reduced to a minimum by heavy epidermal walls and cuticle, and other anatomical devices, but perhaps still more by reducing the surface exposure of the body in comparison with its mass (Figs. 301, 302, 303). For the most part, foliage leaves have been abandoned entirely, and their peculiar work has been assumed by the superficial tissues of the stem. The stem itself is flat or columnar or globular, the last form representing the least exposure of surface in proportion to the mass. The laterally developed leaves and branches common to ordinary stems are generally replaced by various ephemeral or abortive structures, the most notable of which are the bristles and remarkably varied spines. The real nature of Cactus spines is a disputed question, and not a very important one. When rudimentary leaves appear, as in Opuntia, they are found subtending the cushion or area in connection with which the spines are developed. This area is clearly an aborted branch, and the spines represent lateral members upon it; and most probably these lateral members represent leaves. The Cactus forms are not always leafless or compact, for the species of Pereskia are climbing, woody forms, with well-developed petiolate leaves (Fig. 309); and even the well-known prickly pears (Opuntia) are more or less expanded, and have very evident ephemeral leaves.

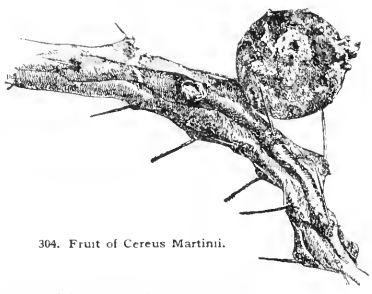
The flowers are usually conspicuous, in many cases remarkably large and brilliantly colored. The sepals and petals are numerous, arranged in several imbricating series; the stamens are indefinite in number and inserted at the base of the corolla; the style is prominent, with spreading, stigmatic lobes (Fig. 305). The inferior ovary contains numerous seeds, ripening into a smooth or bristly or spiny fleshy fruit, often edible (Figs. 304, 306).

The largest forms are species of Cereus, with huge, columnar and fluted, spiny bodies, bearing a few clumsy ascending branches, said to sometimes attain a height of 50 or 60 feet. These arborescent forms are especially developed in the drainage basin of the Gulf of California. On the western slopes of Mexico proper, and on the eastern slopes of Lower California, these Cactus trees occur in extensive forests, forming the so-called "cardon forests."

In Bentham and Hooker's Genera Plantarum, 13 genera of *Cactaceæ* are recognized, while in Engler and Prantl's Pflanzenfamilien, recently published, Schumann recognizes 20 genera. Of these 20 genera, 15 are included in trade catalogues, and five of them are represented in the United States. Generic and specific lines among the *Cactaceæ* are very indistinct, and the greatest diversity of opinion in reference to them exists. The group seems to be a very modern one geologically, and unusually plastic, responding readily to varying conditions, so that forms that have been described as distinct species will undoubtedly prove to be but different phases of a single species. The confusion has been further intensified by the description of numerous garden forms. As a result, many catalogue names are very uncertain, being applied differently in

303. Extreme condensation of the plant body—Pelecyphora aseliformis.

different garden collections. In addition to forms which appear normal, various so-called "monstrosities" are apt to arise, both in nature and in cultivation. These



304. Fruit of Cereus Martinii.

abnormal forms are of two general types: one, in which the body takes the form of a fan or contorted ridge, is designated by the varietal name *cristatus* and its gender equivalents; the other, in which there is an irregular bunching of branches, is designated in the same way as var. *monstrosus*.

A brief synopsis of the 15 genera announced in trade catalogues is as follows:

A. *Calyx tube produced beyond the ovary: stems with tubercles or tuberculate ribs.*

B. *Stems short: fls. in axils of tubercles or ribs.*

1. **Melocactus.** Nearly globular, strongly ribbed and spiny, easily recognized by the distinct flower-bearing crown. About 30 species, found chiefly in W. India and Brazil.

2. **Mamillaria.** Fig. 302. Globular to short cylindrical, not ribbed, but with prominent tubercles bearing terminal clusters of spines, and fls. usually in zones. The largest genus, nearly 300 species being recognized, ranging from northern U. S. into S. Amer.

3. **Pelecyphora.** Fig. 303. Like the last, but the spirally arranged tubercles are flattened, and bear two rows of flat, overlapping, horny scales instead of spines. A single Mexican species.

4. **Anhalonium.** Low, flat-topped forms, the tubercles spineless and resembling thick, imbricate scales. About

305. Flower of Phyllocactus.

5 species, all Mexican, one of which is found in the U. S. The proper name of this genus is *Ariocarpus*. By many it is considered as belonging to *Echinocactus*.

BB. *Stems short: fls. terminal, on tubercles which are often confluent into ribs.*

5. **Echinocactus.** Globular to short cylindrical, strongly ribbed forms. The second genus in the number of its species, 200 being recognized, ranging from the U. S. to Chile and Brazil.

6. **Malacocarpus.** Closely resembling the last, and often included under it. Distinguished by the woolly tuft at the very apex of the stem. About 8 species are recognized, restricted to Brazil and Uraguay.

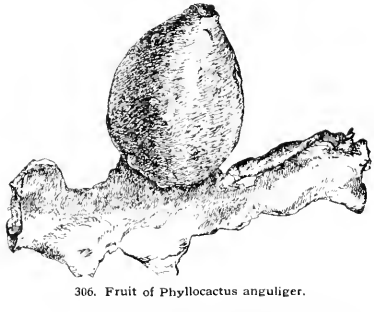
BBB. *Stems mostly elongated, erect or climbing, branching, ribbed or angled.*

7. **Cereus.** Fig. 304. From almost globular to stout columnar, or slender, climbing, creeping or deflexed. A genus of about 100 species, extending from the U. S. into South America.

8. **Pilocereus.** Distinguished from the large, columnar forms of Cereus by the development of abundant white hairs instead of rigid spines. About 45 species are recognized, ranging from Mexico to Brazil.

9. **Echinopsis.** Like columnar species of Cereus, but very short (sometimes globose) and many-ribbed, with remarkably elongated calyx tubes. About 10 species, restricted to southern S. Amer.

10. **Echinocereus.** Like cylindrical species of Cereus, but small, and with weak spines and short calyx tubes. About 30 species, found in both N. and S. Amer.



306. Fruit of Phyllocactus anguliger.

BBBB. *Stems flattened or winged, jointed.*

11. **Phyllocactus.** Figs. 305, 306. Mostly epiphytic, the joints flat, becoming thin and leaf-like upon cylindrical stems. About 12 species are recognized in Cent. and S. Amer.

12. **Epiphyllum.** An epiphyte, with numerous hanging, many-jointed stems. A single S. American species, the other species usually referred to this genus belonging to Phyllocactus.

AA. *Calyx tube not produced beyond the ovary: stems branching and jointed.*

13. **Rhipsalis.** Small, epiphytic forms, with joints ribbed, cylindrical or flat, with or without bristles. A genus of 50 species, chiefly developed in Cent. and S. America.

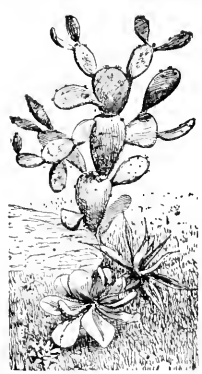
14. **Opuntia.** Figs. 307, 308. Branching, jointed forms, the joints flat or cylindrical, usually bristly and spiny. A large genus of 150 species, ranging from central N. Amer. to Chile. The cylindrical forms belong to the more desert regions, while the flat-jointed forms, or "prickly pears," as a rule occupy conditions not so extremely dry.

15. **Pereskia.** Fig. 309. Climbing, woody forms, with perfectly developed lvs. About 15 species are known, ranging from Mexico to Argentine. The name is ordinarily written Pereskia.

The completest monograph of Cacti, with descriptions of species, is Schumann's Gesammtbeschreibung der Kakteen, Berlin, 1899. JOHN M. COULTER.

CULTURE OF CACTI.—To enable one to hope to be fairly successful in the cultivation of a collection of Cacti, it may be well to observe the following suggestions: Always endeavor to secure plants in May or early June, as at that time any wounds caused by packing or in transportation become quickly healed, and a perfect callus is formed, which generally prevents further decay. Again, always be sure that the plant is in perfect condition before it is potted. Plants collected from their native habitats are usually received without roots; or, if they have roots, they will be found, in most cases, to be so injured that, for the safety of the plant, they would better be taken off close to the plant with a sharp knife. This done, proceed to closely examine the plant, and be sure that every part of it is perfectly free from all signs of sickness or rot. Plants which have been on the road only a few days may arrive with a certain percentage dead. Such plants undoubtedly looked good while being packed, but a careful examination would have shown them to be unfit for sale. If, on examination, any sign of sickness or decay should be found, let the bad parts be at once taken out until healthy tissue is reached, after which place the plants in full exposure to sun and wind, allowing them to so remain until every atom of the treated part has become covered with a dry and perfect callus. It may sometimes be found necessary to use a hot iron where decay is doing very rapid work. When the plant received is very large and old, or the bottom has become hard, dry and woody, or the roots injured, then at once cut off the woody bottom up to living tissue; and plant only after the wound has been dried thoroughly. Treated thus, the plant will produce, in most cases, an abundant supply of new roots in a very short time, and thus give a virtually young plant; but if any old, woody part is left on, the chances will be against the forming of new roots. Never take the hard trunk of a plant for propagating purposes, but choose the active, growing part, in which the cells are full of life.

In preparing soil for Cacti, it will be found advisable to use one-half good, fibrous loam and one-half very old lime rubbish, secured from some old, torn down brick building, taking care to sift from it the fine, dusty particles to ensure material of perfect drainage. To this may be added good, clean sand. In potting Cacti, it is generally supposed that a pot as large as the body of the plant is sufficient; but it is better to select pots of a rather larger size, for during the season of growth the plant must be supplied with water, and when pots are too small this cannot be done. In such case the plant has to depend upon its own resources. In the process of potting, fill the pot one-third with rough lumps of coke or other such material, on the top of which place a liberal supply of finely broken crockery. Now add the soil, taking care to put the coarsest soil directly on top of the crocks, and then the finer, on which to place the cuttings or plants. Take care to plant very little below the surface. Be sure that the soil is fairly dry, and carefully abstain from watering for some time; but if the weather is very warm and bright, a very light syringing may be given once each day. If pots are plunged in open ground, this light daily syringing will be sufficient until the plant shows signs of growth.



307. Opuntia.

308. Leaf-like branches of Opuntia—Opuntia, or Nopalea, coccinellifera, the cochineal plant.

It is a mistake to repot Cacti very often, unless the roots have become infested with mealy bug or other pest. Should this occur, the plant must be turned out of the pot, roots thoroughly washed, and planted in a new pot and in new soil. The condition of the soil in each pot should be constantly and carefully examined, and if the slightest sign of imperfect drainage is manifest, the case should receive prompt attention.

In the summer season, some persons turn their plants out of pots into the open borders. They may do well during the season, but, as there is more or less danger of bruising or injuring them in taking them up from open ground and repotting, the practice is unwise. Avoid inflicting any injury on the plants in the late fall or winter. It will be found a much safer practice to plunge the plants, in their pots, in late spring or as soon as the cold spring rains are over. Any warm, well-drained bed or border may be selected for this purpose, where they may receive sunlight and perfect ventilation.

For winter protection, select a naturally damp house,—one with floor sunken two feet or more. It should not be made wet by constant syringing or by a leaky roof, but by keeping the floor of the house damp, thus rendering it unnecessary to be constantly watering the plants. Let the temperature of the house be kept as close as possible to 50°, promptly ventilating when the heat begins to increase. Avoid all severe changes. Use as mild a fire heat as possible to be safe from cold.

Cacti may be propagated from seed, by division of large clumps, and by cuttings or offsets. The most interesting, instructive and permanently successful method is from seed. Plants grown in this way will furnish the grower, in two or three years, with a fine stock of thrifty plants which will be a permanent source of satisfaction. Raising seedlings is better than importing the plants from their native habitats if one desires to secure a fine collection of Cacti. There would be many more amateur collections of Cacti if persons would start by raising plants from seed. The most

desirable Cacti to be raised from seed are Pelecyphora, Mamillaria, Cereus, Echinopsis and Echinocactus. When raised from seed, any of these may be successfully grown as window plants, with little danger of loss.

Perhaps the most easily grown of the Cactus family are Opuntias, but these are not to be recommended for

309.
Pereskia Bleo.

window culture, on account of their full equipment of barbed spines. *Cereus flagelliformis*, Rhipsalis, and Epiphyllums on their own roots, flourish well and are exceedingly attractive. But the best of all are the Phyllocacti; these are without spines, grow vigorously, and produce an abundance of blooms if they are given a sunny window and the necessary amount of water. Cactuses generally are subject to insects and fungous troubles. One of the most common pests is a scale insect. The safest way to rid the plants of these is to clean them off with a small brush which has bristles of only moderate stiffness. The mealy bug may be easily disposed of by dissolving 5 grams castile soap in hot water, and adding 1½ quarts of alcohol; then add 100 grams of fusel oil; apply with a very fine spray.

JAMES GURNEY.

CÁDIA (Arabic name, *Kadi*). *Leguminòsæ*, tribe *Sophoreæ*. About 3 species of small evergreen trees of Arabia and Africa, remarkable for their regular mallow-like fls.: lvs. pinnate: fls. axillary, mostly solitary, drooping; stamens 10, free.

purpùrea, Forsk. (*C. cària*, L'Her.). Lfts. 20–40 pairs, very narrow: fls. bell-shaped, pedunculate, rose-red, pretty; not spiny. Arabia.—Cult. in S. Calif.

C. Ellisiàna, Baker, has few large lfts. and rose-colored fls. Madag. B.M. 6085.—*C. pubèscens*, Bojer. Lfts. 8–10 pairs, broad-oblong. Madag.

CÆSALPÍNIA (Andreas Cæsalpinus, 1519–1603, Italian botanist). *Leguminòsæ*. BRASILETTO. Shrubs or trees, with bipinnate lvs. and racemes or panicles of red or yellow fls., with obovate more or less clawed petals, 10 stamens, and a very long style. The fls. are not papilionaceous. The species, all tropical, are nearly 50. The genus yields tanning materials and dye stuffs; and most of the species are very showy in flower and are favorites in tropical and semi-tropical countries. They are grown rarely in warm glass houses. The botanical status is confused. L. H. B.

In Cæsalpinia, propagation is readily effected by seeds, which should be well soaked in warm water for some hours before sowing. A sandy soil should be chosen for the seed-bed, and lightly shaded. After the plants show the first true leaf, they should be potted off into small pots of ordinary garden soil, not too rich, made light by the addition of sand if of a clayey nature. The plants grow very rapidly, and must be shifted into larger pots as their size requires for greenhouse culture, but in tropical climates may be transplanted into permanent positions outdoors after they reach a fair size in pots. The dwarf species are elegant subjects for subtropical gardening during the summer months in temperate climates, provided a sunny location is given them, as they revel in rather dry, very warm soil, and do not require artificial watering after being established. A rocky, sunny situation may be given *C. pulcherrima* and its variety *flava*, where they will bloom during many weeks of summer, until frost checks them, if strong plants about a foot high are selected in early summer. Care should be taken to gradually harden off plants in the house, so that they may not be chilled when transplanted outdoors. While they will do well in a poor soil, an application of manure or chemical fertilizer may be given them to advantage, causing them to make a more vigorous growth and give better and larger heads of flowers. In the tropics, and also in subtropical climates, these shrubs and trees are always admired and are commonly planted for ornament. The Royal Poinciana (*C. Regia*, but properly *Poinciana Regia*, which see), and also the Dwarf Poinciana, or Flower-fence (*C. pulcherrima*), will thrive in close proximity to the sea, and are valuable for planting in exposed coast situations. E. N. REASONER.

A. *Stamens long-exserted: fls. very showy: trees, unarmed or nearly so.*

Gilliesii, Wall. Shrub or small tree, with very many small, elliptic pinnules: fls. light yellow, with brilliant red stamens protruding 3–5 in., in terminal racemes; sepals hairy-fringed. S. Amer. B.M. 4006, as *Poinciana Gilliesii*, Hook. F.S. 1:61. R.H. 1893, 400. G.C. III. 15:73.—Endures mild winters. A very showy and worthy plant.

pulcherrima, SWTZ. BARBADOES PRIDE. BARBADOES FLOWER-FENCE. DWARF POINCIANA. Shrub, with delicate, evergreen, mimosa-like lvs., few scattered prickles, and very gaudy red and yellow crisped fls. on the ends of the new growth: stamens and style red, and long-exserted. Generally distributed in the tropics. B.M. 995.—One of the most popular shrubs in warm climates, as S. Fla. and S. Calif. There is a var. **flàva,** with yellow fls.

AA. *Stamens not much exceeding the petals, or shorter.*

B. *Lfts. small, ⅛–1 in. long, very obtuse.*

C. *Shrub, unarmed.*

pannòsa, Brandegee. Shrub, 2–4 ft., with slender branches clothed with white, deciduous bark: lvs. decompound; pinnæ 2–4, each with 4–6 oblong and retuse lfts.: fls. yellow, showy; pod glandular, 1–2-seeded. Lower Calif.—A rapid-growing species, recently discovered and introduced to the trade.

CC. *Shrubs or trees, prickly.*

D. *Pod smooth: shrubs.*

sepiària, Roxbg. Pinnules about 10 pairs, oblong, rounded on both ends: fls. yellow. India.—Furnishes dye wood; also used as a hedge plant.

Japónica, Sieb. & Zucc. Loose, spreading shrub, armed with stout, recurved prickles: pinnules 7–9 pairs, oblong, very obtuse: fls. in large, panicle-like clusters, canary-yellow, the stamens bright red. Japan. Gn. 40:837. J.H. III, 34:531.—Endures the winters in some parts of England. The hardiest species of the genus, probably hardy as far north as Washington, D.C.

DD. *Pod prickly: tree.*

echinàta, Lam. Tree, with prickly branches, blunt, elliptic, shining, alternate lfts., yellow fls., and spiny pods; stamens shorter than the petals. Brazil.—Yields dye wood.

BB. *Lfts. 1–3 in., long, acute or muconulate: pod prickly.*

Minax, Hance. Diffuse shrub, thorny: pinnæ 10, with 12–20 ovate-lanceolate glabrous lfts., 1–1½ in. long: racemes panicled, many-fld., with very large bracts: fls. white and purple: pods 7-seeded (seeds large and black), spiny. China.

Bonduc, Roxbg. Climbing shrub, with prickly, pubescent lvs., oblong-ovate mucronate lfts., 1½–3 in. long, yellow fls., and a few large yellow seeds in a short, prickly pod. Tropics; S. Fla.

C. bijuga, Swtz. (Acacia Bancroftiana, Bert.). Spiny shrub, with ultimate lfts. in 2 pairs: fls. paniculate. Jamaica.—*C. Regia,* Dietr.=Poinciana Regia.

L. H. B. and ALFRED REHDER.

CAHOUN. Consult *Attalea Cohune.*

CAJÀNUS (aboriginal name). *Leguminòsæ.* Tropical shrub with pinnate, 3-foliolate lvs., yellow papilionaceous fls., and a small, hairy pod bearing edible seeds. Several species described, probably all derivatives of the following:

Indicus, Spreng. A shrub with yellow and maroon fls., blooming all through the year, and bearing a continuous crop of highly nutritious peas. Lfts. elliptic-oblong. Plant more or less hairy. Grows from 4–10 ft. high, very diffuse and spreading. Much cult. in the tropics for the seeds or pulse. It varies greatly in stature and in character of seeds: *C. flavus,* DC., has yellow fls. and 2–3-seeded pods which are not spotted; *C. bicolor,* DC., has red-striped fls., and 4–5-seeded pods which are spotted: see B.M. 6440 and R.H. 1874: 190. Usually treated as an annual. Probably native to Chinese territory. Known under many local names, as Pigeon Pea, Congo Pea, Dhal, Toor, and others.

L. H. B.

CALABASH GOURD. See *Lagenaria.*

CALÀDIUM (origin of name obscure). *Aròideæ.* Herbaceous perennials, arising from large rhizomes or tubers, acaulescent, with beautifully marked, long-petioled lvs. with a deep basal lobe. Differs from Colocasia in floral characters. A dozen or less species in Trop. Amer. Two of the species are immensely variable, and many named horticultural varieties are in the trade. Engler in DC. Monog. Phan. 2: 452 (1879); also F.S. 13.

In Caladium, propagation is effected by division of the tubers at the beginning of the growing season, which is about the first of March. The soil best suited to them is a mixture of fibrous loam, leaf mold, peat, and well-rotted cow or sheep manure in equal parts, with a sprinkling of sand added. The tubers should be potted at first in as small pots as will conveniently accommodate them, and shifted on into larger pots as they require it. But little water must be given at the roots till active growth commences, when, as the plants develop, they require an abundance. A warm, humid atmosphere, such as is recommended for Alocasias, is necessary for their best development. They must also be shaded from bright sunlight. As the leaves mature in the fall, water should be gradually withheld, though at no time must the tubers be allowed to become quite dry. Caladiums should be kept for the winter in the pots in which they have been grown, and stored away in some convenient place in a temperature not less than 50° or more than 60°.

E. J. CANNING.

FANCY-LEAVED CALADIUMS.—As soon as the plants begin to lose their leaves in the fall, water should gradually be withheld until the leaves are all gone. The pots should then be removed to a position under a bench, and laid on their sides, or taken from the soil and placed in sand. During the resting period they should not be subjected to a lower temperature than 60° F., and kept neither too wet nor too dry. About the beginning of March the tubers should be started for the earliest batch to be grown in pots. Arrange the tubers in their sizes, and keep each size by itself. The largest sized tubers will start quickest, and it is desirable to begin with these for pot plants. Start them in chopped moss in boxes. The tubers may be arranged pretty close together in the box, and merely covered over with the moss to the depth of about an inch. The new roots are made from the top part of the tuber, so it is important that this part should be covered to encourage the roots. For starting, a heat varying between 70° and 85° will suffice. As soon as a healthy lot of roots make their appearance, the plants should be potted, using as small sized pots as possible. The soil for this potting should be principally leaf-mold, with a little sand. In a short time they will need another shift; the soil should on this occasion be a little stronger; give a position near the glass, and shade from strong sunshine. New forms are raised from seed, this operation being an exceedingly easy one with the Caladium, as they cross-fertilize very readily. The flowers, unlike those of the Anthurium, are monœcious, the females ripening first. To pollinate them, part of the spathe must be cut away. Seedlings at first have the foliage green, and it is not until the fifth or sixth leaf has been developed that they show their gaudy colorings. Propagation of the kinds is effected by dividing the old tubers, the cut surfaces of which should be well dusted with powdered charcoal to prevent decay. As bedding plants, the fancy-leaved Caladiums are gradually getting more popular. To have them at their best for this purpose, the ground should be worked for some time previous to planting out, with a goodly quantity of bone meal incorporated with the soil. The tubers are best put out in a dormant state, as then they make very rapid progress, and eventually make finer plants than when they are first started in the greenhouse, as by this system they are too apt to sustain a check in the hardening-off process, and lose their leaves. The fine, highly colored kinds are not so well suited for outdoor work as those having green predominating in the foliage, but some of the kinds, such as Dr. Lindley and Rosini, do remarkably well. Frequent watering with manure water is absolutely necessary to the development of the foliage, both outdoors and in.

G. W. OLIVER.

The following species and varieties, most of which are in the American trade, are here described, the synonyms being in italic: *albinervium,* 55; albomaculatum, 16; albostriatulum, 51; *Alfred Blen,* 16; *amœnum,* 17; *Appunianum,* 56; *argyrites,* 57; argyroneuron, 5; argyrospilum, 36; Baraquinii, 12; Bellevmei, 49; bicolor, 8, 11; Brongniartii, 32; Chantinii, 17; *Connaræi,* 17; *cordatum,* 3; *cupreum,* 53; Curwadlii, 37; *Devosianum,* 28; Devosianum, 28; *discolor,* 29; Duchartrei, 35; Eckhartii, 23; elegans, 54; Enkeanum, 45; erythræum, 3; *esculentum*=Colocasia Antiquorum esculenta; *firmulum,* 9; *Gærdtii,* 15; *griseo-argenteum,* 39; *Hangeanum,* 17; hæmatostigmatum, 29; *hæmostigmatum,* 29; hastatum, 50; Hendersoni, 24; Houbyanum, 26; Houlletii, 18; Humboldtii, 57; Ketteleri, 13; Kochii, 38; Kramerianum, 20; Laucheanum, 43; Lemaireanum, 55; Leopoldii, 15; Lindeni, 46; macrophyllum, 39; marginatum, 19; marmoratum, 7; marmoreum, 2; *Marterstreigianum,* 17; mirabile, 33; *Mooreanum,* 18; myriostigma, 58; Neumanii, 40; Ottonis, 28; Osyanum, 52; *pallidinervium,* 30; pellucidum, 27, 29; Perrierii, 22; pictum, 4, 34; picturatum, 48; poecile, 30; porphyroneuron, 53; *punctatissimum,* 17; *Purdieanum,* 9; *pusillum,* 9; regale, 31; *Reichenbachianum,* 41; *Rogierii,* 15; *roseum,* 14; rubellum, 41; rubicundum, 11; *rubronervium,* 42; rubrovenium, 42; *sagittæfolium,* 31; *Schmitzii,* 3; *Schalleri,* 5; Schomburgkii, 1; Sieboldii, 25; splendens, 14; *Spruceanum,* 9; Stangeanum, 21; subrotundum, 6; *Surinamense,* 31; *thripedestum,* 7; transparens, 10; Troubetskoyi, 56; Vellozianum, 9; Verschaffeltii, 47; *viridissimum,* 55; *Wegneri,* 31; *Wallisi,* 28; Wightii, 44.

It will be seen that most of the cultivated Caladiums are considered to be forms of *C. bicolor* and *C. picturatum.* Only 5 species are concerned in the following list: *Schomburgkii,* 1; *marmoratum,* 7; *bicolor,* 8; *picturatum,* 48; *Humboldtii,* 57. *C. odoratum,* Lodd.=Alocasia macrorrhiza.

A. *Blade not at all peltate, obliquely elliptical-ovate.*

1. **Schómburgkii,** Schott. Petiole slender, 4 times longer than the blade, sheathed ⅓ its length; blade obliquely elliptical-ovate; midrib and 4–5 acutely ascending primary nerves silvery, pale, or red; sparsely spotted above, paler beneath. French Guiana to Para.—Runs into the following forms:

(1) *Veins red.*

2. Var. **marmóreum,** Engl. Blade dull green, with brownish red nerves, bordered with yellow.

3. Var. **erythræum,** Engl. (*C. Schmitzii*, Lem. *C. cordátum*, Hort.). Midribs and nerves red. I.H. 8: 297.

4. Var. **pictum,** Engl. With white or red spots between the red veins. S. Amer.

(2) *Veins silvery or green.*

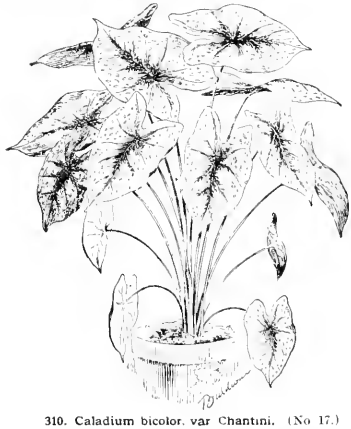
5. Var. **argyroneúrum,** Engl. (*C. argyraneúron*, C. Koch. *C. Schóllerí*, Lem.). Midrib and veins silvery. I.H. 8: 297.

6. Var. **subrotundum,** Engl. (*C. subrotúndum*, Lem.). Leaf-blade rounded at the base, or shortly cordate, with white or red spots. Brazil.

AA. *Blade distinctly peltate.*

B. *Leaf sagittate-oblong-ovate.*

7. **marmorátum,** Mathieu (*Alocásia Rézlii*, Bull. *C. thripedístum*, Lem.). Petiole cylindrical, 12–16 in. long, twice as long as the blade, variegated; blade dark green, with irregular gray, yellowish green and snow-white spots, glaucous-green beneath, sagittate-oblong-ovate, the upper lobe semi-ovate, slightly cuspidate, the basal ones unequal, $\frac{1}{3}$ or $\frac{1}{2}$ as long as the upper, connate $\frac{3}{3}$–$\frac{3}{4}$ their length. Equador. I.H. 5, p. 59.



310. Caladium bicolor. var Chantini. (No 17.)

BB. *Leaf ovate-triangular, or ovate-sagittate.*

8. **bicolor,** Vent. (*Arum bicolor*, Ait.). Fig. 310. Petiole smooth, 3–7 times as long as the blade, pruinose toward the apex; blade ovate-sagittate, or ovate-triangular, variegated above, glaucous beneath; upper lobe semi-ovate, narrowing gradually to a cuspidate point, the basal ones $\frac{1}{2}$ to but little shorter than the upper, oblong-ovate, obtuse, connate $\frac{1}{5}$–$\frac{1}{3}$ their length. S. Amer. Introduced into cult. in 1773. B.M. 820.—Very common in cult., furnishing many of the fancy-leaved Caladiums. The marked varieties are as follows:

(1) *Leaf-blade and veins of one color.*

9. Var. **Vellozianum,** Engl. (*C. Velloziánum*, Schott. *C. Pardiánum*, Schott. *C. pusillum*, C. Koch. *C. Spruceánum*, Schott. *C. tirsulum*, Schott). Leaf-blade dark green above; basal lobes connate past the middle. Brazil, Peru. R.B. 10: 169.

(2) *Leaf-blade more or less variegated.*

(a) *With a colored disc.*

(b) *Disc transparent.*

10. Var. **transparens,** Engl. (*C. transparéns*, Hort.). Blade with a pale green, nearly transparent disc; midrib and primary veins red-purple.

11. Var. **rubicundum,** Engl. (*C. bicolor*, Kunth). Petiole green, or variegated green and violet; blade green, with a red, transparent, central disc, and a very narrow red line between the disc and the margin.

(bb) *Disc opaque.*

(c) *Purple disc.*

12. Var. **Baraquinii,** Engl. (*C. Baraquinii*, Hort.). Petiole violet; blade with a purple-red disc; beautiful green between the disc and margin; nerves and midrib red-violet. Para. I.H. 7: 257. F.S. 13: 1378.

13. Var. **Ketteleri,** Engl. (*C. Kétteleri*, Hort.). Petiole crimson, variegated toward the base; blade with purple disc, midrib and primary veins, sparsely marked between the veins with many small, rosy spots.

(cc) *Red disc.*

14. Var. **splendens,** Engl. (*C. róseum*, Hort. *C. spléndens*, Hort.). Petiole green below, red above; blade with a red disc at the middle; midvein and primary veins red-purple; green between the nerves and along the margin. L. 4.

15. Var. **Léopoldi,** Engl. (*C. Léopoldi*, Hort. *C. Gardéltii*, C. Koch. *C. Rogiéri*, Ch. & Lem.). Petiole violet beneath, red-purple above; blade with a broad, reddish disc; margin green, red spotted; midrib and primary veins dark red-purple. Para, 1864.

16. Var. **albomaculátum,** Engl. (*C. Alfred Bleu*). Petiole green; blade green, with red disc, midrib and primary veins, and marked clear to the margin with many large, white spots between the nerves.

(ccc) *Rose disc.*

17. Var. **Chántini,** Engl. (*C. Chántini*, Lem. *C. Comartii*, Hort. *C. amánum*, Hort. *C. Marterstejgiánum*, Hort. *C. punctatissimum*, Hort. *C. Haageánum*, Hort.). Fig. 310. Petiole more or less violet; blade broadly red-purple along the midrib and primary nerves, rosy at the center, and with very numerous, unequal spots between the nerves clear to the marginal vein. I.H. 5: 185. F.S. 13: 1350, 1351. B.M. 5255. B.L. Pl. 19 (1891). Para, 1858. A.F. 8: 129.

(ccc) *Light green disc.*

18. Var. **Houlletii,** Engl. (*C. Houllétii*, Lem. *C. Moorediánum*, Hort.). Petiole green, the sheath and a little of the base violet-variegated; basal lobes of the blade somewhat introrse, rounded, connate $\frac{1}{3}$; blade obscurely green toward the margin, the midrib and primary veins slightly reddish, and with a pale disc marked with many irregular white spots.

(aa) *Without a colored disc.*

(b) *Margins colored throughout.*

(c) *Red margin.*

19. Var. **marginátum,** Engl. (*C. marginátum*, C. Koch). Blade dark green, with a red line on the outer margin.

(cc) *Yellow margin.*

20. Var. **Kramerianum,** Engl. (*C. Kramerián um*, Hort.). Veins purple; yellow margin.

21. Var. **Stangeanum,** Engl. (*C. Stangeánum*, C. Koch). Blade reddish; green along the narrow margin, yellowish toward the margin.

(ccc) *Solid white margin.*

22. Var. **Perrierii,** Engl. (*C. Perriéri*, Lem.). Petiole violet-black; blade dull green, with many red-purple spots, and white along the margin. Brazil, 1861.

(cccc) *Spotted margin.*

23. Var. **Eckhartii,** Engl. (*C. Eckhartii*, Hort.). Petiole violet-blotched at the base, green above the middle; blade green, with few rosy spots along the margin, and small white ones in the middle.

24. Var. **Hendersoni,** Engl. (*C. Hénderson i*, Hort.). Petiole variegated violet and green, reddish toward the apex; blade mostly green, reddish next the lower parts of the nerves; midrib and primary veins red-purple spotted; small red spots along the margin.

25. Var. **Sieboldii,** Engl. (*C. Sieboldii*, Hort.). Petiole violet and green, reddish toward the apex; basal lobes of the leaf somewhat introrse, connate $\frac{1}{3}$ their

length, dark green; midrib and primary veins beautifully red-purple spotted, and a very narrow white border, marked with small, purple-red spots. A.F. 8: 127.

(cccc) *Purple margin.*

26. Var. **Houbyànum,** Engl. (*C. Houbyànum,* Hort.). Petiole dirty green on the lower surface, bright red above; blade bright green, with large pale spots, and small red-purple ones between the midrib and primary veins; a red-purple spot above the insertion of the petiole, and a pale purple line around the margin.

27. Var. **pellùcidum,** Engl. (*C. pellùcidum,* DC.). Petiole reddish, variegated with violet; blade broadly reddish purple spotted along the midrib and primary veins, and more or less marked with transparent, reddish purple spots between the primary veins; a continuous purple line along the outer margin.

(bb) *Only the margin of the basal sinus colored.*

28. Var. **Devosiànum,** Engl. (*C. Devosiànum,* Lem. *C. Wàllisi,* Hort. *C. Ottònis,* Hort.). Petiole green; blade bright green, with small, irregular white spots between the midrib and primary veins, and a narrow crimson border at the sinus. Para. I.H. 9: 322.

29. Var. **hæmatostigmatum,** Engl. (*C. hæmatostigmatum,* Kth. *C. pellùcidum,* DC.). *C. discolor,* Hort.). Petiole violet; blade dark green, with a purple line on the basal sinus, and sparsely marked with blood-red spots. Para.

30. Var. **pœcile,** Engl. (*C. pœcile,* Schott. *C. pallidinérvium,* Hort.). Petiole reddish brown, or closely streaked-variegated; blade dark green; midrib and primary veins paler, often whitish; a red-purple spot where the petiole joins the blade, narrowly purple-margined in the sinus. Brazil.

31. Var. **regàle,** Engl. (*C. regàle,* Lem. *C. Wàgneri,* Hort. *C. Surinaméuse,* Miq. *C. sagittæfòlium,* Sieb.). Blade bright green, purple-margined at the sinus, everywhere marked with small, confluent white spots. West Indies, 1710. I.H. 9: 316.

(bbb) *No colored disc or colored margin.*

(c) *Variegated green blade.*

32. Var. **Brongniartii,** Engl. (*C. Brongniàrtii,* Lem.). Very large; petiole variegated violet and green, reddish toward the apex; blade green, except along the nerves below, where it is colored reddish, paler green between the primary nerves, deep green toward the margin; veins and nerves red-purple. Brazil–Para, 1858. F.S. 13: 1348, 1349. I.H. 5, p. 58.

33. Var. **mirábile,** Engl. (*C. mirábile,* Lem.). Petiole green; blade bright green, densely covered with large and small irregular pale green spots between the primary nerves and midvein. Para. I.H. 10: 354.

(cc) *Blue-green blade.*

34. Var. **pictum,** Kunth (*C. pictum,* DC.). Petiole greenish, variegated beneath; basal lobes connate 1-5 their length; blade thin, blue-green, marked with large, irregular, usually confluent, pale yellowish semi-transparent spots. L. 43.

(ccc) *Colorless blade.*

35. Var. **Duchàrtrei,** Engl. (*C. Duchàrtrei,* Hort.). The long petiole green above, variegated below the middle with violet-black; blade colorless, except the midrib and all the veins, or here and there pale rosy or red spotted, or even more or less dirty green. A.F. 8: 129.

(cccc) *Solid green blade.*

(d) *Dark green.*

36. Var. **argyróspilum,** Engl. (*C. argyróspilum,* Lem.). Petiole grayish red, sparsely and finely streaked; blade a most beautiful green, with a crimson spot at the middle, and with many small white spots between the primary veins. Para. F.S. 13: 1346, 1347.

37. Var. **Curwàdlii,** Engl. (*C. Curwàdlii,* Hort.). Petiole greenish, slightly violet-blotched toward the base; blade reddish purple along the midrib and primary veins, marked between the veins with large white spots, otherwise dark green.

38. Var. **Kòchii,** Engl. (*C. Kòchii,* Hort.). Leaf-blade more rounded, dark green, with small white spots midway between the midrib and margin. Para, 1862.

39. Var. **macrophyllum,** Engl. (*C. macrophýllum,* Lem. *C. grisco-argéntum,* Hort.). Petiole green; blade dark green, marked everywhere with many small, scarcely confluent white or slightly rosy spots. Para, 1862. I.H. 9: 316.

40. Var. **Neùmannii,** Engl. (*C. Neùmannii,* Lem.). Petiole green; blade very beautiful dark green, with scarcely paler veins, marked between the primary veins with large and small white-margined, reddish purple spots. F.S. 13: 1352, 1353. B.M. 5199.

(dd) *Light green.*

(e) *Not spotted.*

41. Var. **rubéllum,** Engl. (*C. rubéllum,* Hort. *C. Reichenbachiànum,* Stangl.). Blade green, with reddish purple midrib and primary veins.

42. Var. **rubrovénium,** Engl. (*C. rubrovènium,* Hort. *C. rubronérvium,* Hort.). Petiole variegated green and violet; blade small, oblong-ovoid, the basal lobes somewhat introrse, obtuse, connate almost to the middle, pale caulescent or red-green along the midrib and primary veins; veins pale red or scarlet. Para, 1862.

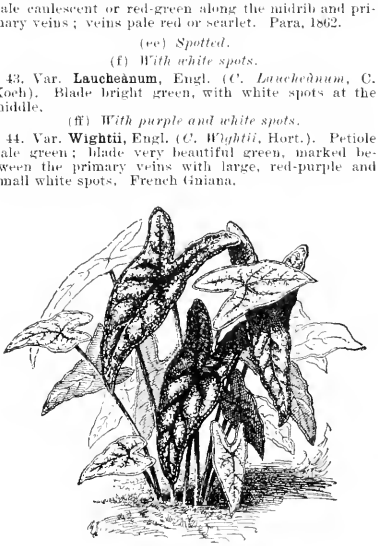
(ee) *Spotted.*

(f) *With white spots.*

43. Var. **Lauchеànum,** Engl. (*C. Lauchеànum,* C. Koch). Blade bright green, with white spots at the middle.

(ff) *With purple and white spots.*

44. Var. **Wightii,** Engl. (*C. Wightii,* Hort.). Petiole pale green; blade very beautiful green, marked between the primary veins with large, red-purple and small white spots. French Guiana.



311. Caladium picturatum, var. Belleymei. (No. 49.)

(fff) *With red or crimson spots.*

45. Var. **Enkeànum,** Engl. (*C. Enkeànum,* C. Koch). Blade bright green, marked with large and small red spots.

46. Var. **Lindeni,** Engl. (*C. Lindeni,* Hort.). Blade bright green, with confluent small red spots.

47. Var. **Verschaffèltii,** Engl. (*C. Verschaffèltii,* Lem.). Petiole pale green; blade very beautiful green, with few irregular crimson spots. I.H. 5: 185. B.M. 5263. L. 46.

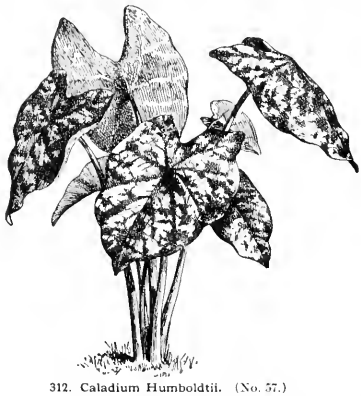
BBB. *Blade lanceolate-sagittate.*

48. **picturatum,** C. Koch. Petioles usually green, variegated below, elongated; blade lanceolate-sagittate, cuspidate and submucronate at the apex, the upper lobe nearly triangular, oblong or ovate-lanceolate, basal lobes over half as long, lanceolate subacute, connate 1-6–¼ their length, separated by a triangular sinus; primary

lateral veins 4–7, erect-spreading or spreading. Brazil.—Variable, furnishing many of the fancy-leaved Caladiums.

(1) *Transparent white blade.*

49. Var. **Belleymei**, Engl. (*C. Belleymei*, Hort.). Fig. 311. Petiole greenish above, variegated violet beneath; blade slenderly hastate-sagittate, white, translucent except the green veins and nerves, with small green spots along the margin; basal lobes 1-5, or rarely $\frac{1}{4}$ or $\frac{1}{3}$ connate. Para. I.H. 7:252. A.F. 8:127.



312. Caladium Humboldtii. (No. 57.)

(2) *Pale green blade.*

(a) *With transparent blotches.*

50. Var. **hastatum**, Engl. (*C. hastátum*, Lem.). Petiole long, stout, white, violet-spotted; blade hastate-sagittate, slightly contracted above the lobes; dull, pale green, very irregularly marked with transparent blotches; basal lobe $\frac{1}{4}$ connate, crimson margined in the sinus. Para.

(aa) *Opaque.*

51. Var. **albostriátulum**, Engl. Blade greenish white along the midrib and veins, white-striped and dotted between the nerves.

52. Var. **Osyánum**, C. Koch. Blade white along the midrib and primary veins, with purple spots between the veins.

53. Var. **porphyroneûron**, Engl. (*C. porphyroneûron*, C. Koch. *C. cúpreum*, Hort. *Alocásia porphyroneûra*, Lem.). Petiole pale reddish, variegated with dull violet; blade broadly hastate-sagittate, dull, pale green, slightly reddish on the veins, opaque basal lobes 1-6-$\frac{1}{3}$ connate. Peru and Brazil. I.H. 8:297.

(3) *Dark green blade.*

54. Var. **élegans**, Engl. Petiole rosy, greenish below, variegated; blade narrowly hastate-sagittate, slightly contracted above the lobes, dark green above, broadly red or purple next the midrib and primary lateral veins; basal lobes 1-5 connate.

55. Var. **Lemaireánum**, Engl. (*C. Lemaireánum*, Barr. *C. picturátum albinérvium*, C. Koch. *C. picturátum viridissimum*, C. Koch). Blade shaped like preceding, dark green; midrib and primary veins pale green or white. S. Amer., 1861. I.H. 9:311.

56. Var. **Troubétskoyi**, Engl. (*C. Troubétskoyi*, Chantin. *C. Appunidnum*, Hort.). Petiole red, variegated; blade very narrowly hastate-sagittate, slightly contracted above the lobes, dark green above, broadly marked with pale red along the midrib and primary veins, and with scattered, transparent, small white or rose spots. F.S. 13:1379.

bbbb. *Blade oblong-ovate, or oblong: plant small.*

57. **Humboldtii**, Schott (*C. argyrites*, Lem.). Fig. 312. Petiole slender, variegated, 2–3 times longer than the blade; sheath slender, narrow; blade oblong-ovate, or oblong, green along the margin, midrib and primary veins, with many large and small transparent spots between; shortly and very acutely acuminate, the apical lobe oblong-ovate, twice as long as the oblong or ovate-triangular, obtuse basal ones; basal lobes $\frac{1}{3}$ connate, separated by an obtuse triangular sinus, the 3–4 primary veins of the apical lobe uniting in a collective nerve remote from the margin. Brazil. I.H. 5:185. F.S. 13:1345. Gng. 3:279. A.F. 10:197. L. 22.

58. Var. **myriostigma**, Engl. (*C. myriostígma*, C. Koch). Blade marked everywhere with small white spots.

JARED G. SMITH.

CALAMAGRÓSTIS (Greek for *reed grass*). *Gramíneæ*. REED BENT-GRASS. A genus of perennial grasses with running rootstocks. Very similar to Agrostis, but spikelets usually larger. Can be distinguished from it by the tuft of long hairs at the base of the fl.-glume, and the flowering axis continued beyond the palet. Spikelets 1-flowered (rarely an aborted or second flower present). Glumes 3, the first two nearly equal and empty, the third, or fl.-glume, awned on the back, usually below the middle. Species about 120, very widely distributed over the world in the temperate and arctic zones and on the high mountains of the tropics. For *C. brevipilis*, see *Calamovilfa*.

Canadensis, Beauv. BLUE-JOINT GRASS. Very common in the northern and northwestern states, usually growing in moist meadows and swales. Under such conditions it yields a large amount of indifferent hay, which is used in some places. It is not used for horticultural purposes. This species grows 3–5 ft., and has flat, glaucous-blue lvs.: panicle oblong, becoming open; upper glume weak-awned near the middle.

stricta, Beauv. (*C. neglécta*, Gærtn.). PONY GRASS. A rather slender, erect perennial, with narrow leaves and a contracted, densely-flowered panicle, 3–6 in. long; fl.-glume about $\frac{3}{4}$ as long as the second empty glume, and nearly twice the length of the basal hairs; awn bent, exceeding the glume. Northern U. S.—A variegated form has been brought into cultivation for ornamental purposes.

P. B. KENNEDY.

CALAMÍNTHA (Old Greek name, meaning *beautiful mint*). *Labiátæ*. Various species of herbs or very small shrubs, 2 or 3 of them occasionally grown in borders for their fls. and aromatic fragrance. Calyx 2-lipped, oblong or tubular; corolla with a straight tube, and generally exceeding the calyx, the throat commonly enlarged; stamens parallel under the upper lip: fls. in whorls, which are usually arranged in a long interrupted spike. Plants mostly of temperate regions, and of easy culture. The cult. kinds are perennial, more or less hairy, mint-like herbs, 1–3 ft. high.

grandiflora, Moench. Lvs. ovate, serrate; stems decumbent, branching from the base: fls. in axillary whorls, quite large, $1\frac{1}{2}$ in. long, with a straight tube; upper lip flattened, purple; June–July; h. 9–12 in. Europe; this and *C. alpina*, Lam., which is smaller in all its parts, are the two best species for garden use. *C. officinalis*, Moench, the common Calamint of Eu., is sometimes seen in gardens, being an old domestic medicinal plant. It has long, ascending branches, ovate crenate-serrate lvs., and few-fld. cymes: 1–3 ft.

J. B. KELLER.

CALAMOVÍLFA (*Calamos*, reed, and *Vilfa*, a kind of grass). *Gramíneæ*. A genus recently separated from Calamagrostis. Distinguished from it only in that the flowering axis is not produced beyond the flower. Tall grasses, with stout, horizontal lvs. and paniculate inflorescence. Spikelets 1-flowered, with a ring of hairs at the base of fl.-glume. Three known species, natives of the temperate and subtropical regions of N. America.

brevipilis, Hack. (*Calamagróstis brevipilis*, Gray). PURPLE BENT-GRASS. Culms hard, wiry, 2–4 ft. high: lvs. flat, with an open, purplish panicle.—A rare grass,

apparently limited to the sandy swamps and pine barrens of New Jersey. Now in cultivation as an ornamental grass.
P. B. Kennedy.

CALAMPÈLIS is *Eccremocarpus*.

CÁLAMUS (Greek for *reed*). *Palmàceæ*, tribe *Lepidocàrpæ*. Slender, cespitose or climbing palms, with pinnatisect lvs.; lfts. with reduplicate sides, acuminate, entire, with parallel nerves; fr. of many carpels, clothed with reflexed, shining, closely imbricated appressed scales; spathes tubular, persistent, flowering annually. Species about 150. Tropical Asia.

ciliàris, Blume. Stem slender, climbing by means of long, axillary, leafless branches, covered with hooked spines; lvs. 1 ft. long, 6 in. wide; lfts. numerous, hairy; petiole 2 in. long, with few hooked spines. Malaya. F. R. 1: 667. G. C. III. 21: 86.—Introduced into cultivation in 1869.

C. Andromanus, Hort., P. & M.=?*C. calicàrpus*, Griff.=Dæmonorops calicarpus, Mart.—*C. Lewisiànus*, Griff.—Dæmonorops Lewisianus, Mart.
Jared G. Smith.

Calamus is an easily grown group of palms, very ornamental, even in a young state. Some of the species have stems several hundred feet long, which enable them to unfold their leaves at the tops of the tallest trees. The leaves are peculiarly well adapted to assist the plant in climbing, having numerous hook-like processes arranged on a long continuation of the midrib of the leaf. Where accommodations can be given these plants should be selected, as their growth is rapid, and they are capable of furnishing a large conservatory quickly. Numerous suckers are produced, so that when the main stem ascends the lower part is clothed in foliage. *Calamus tenuis* (or *C. Roxburghianus*) and *C. Rotang* furnish the rattan canes. Malacca canes are furnished by *C. Scipionum*. Young plants thrive best in a rooting medium containing a considerable quantity of leaf-mold. Older plants need soil of a more lasting nature; a quantity of ground bone and charcoal in the soil may be used to advantage. Old, well-furnished plants need enormous quantities of water. All of them require stove temperature.
G. W. Oliver.

CÁLAMUS or **SWEET FLAG.** See *Acorus Calamus*.

CALANCHÒË. See *Kalanchoë*.

CALANDRÍNIA (J. L. Calandrini, Genevan botanist of last century). *Portulacàceæ*. Fleshy, spreading or nearly trailing plants, with mostly alternate lvs. and red fls. of short duration. Petals 3–7; stamens 3–5 12. A number of species in N. and S. America and Austral. Sometimes cult. in borders and rockeries or used for edgings in sunny places. Prop. from seeds, and usually treated as annuals (which some of them are).

umbellàta, DC. Four to 6 in.; lvs. linear and hairy; fls. in a corymb, or umbel-like terminal cluster, bright crimson. Peru. R.H. 1853: 5.—This species is hardy in many parts of the U. S., in our northern climate, it should be planted in a well-sheltered position, or provided with ample protection in winter; sometimes it acts like the biennials, but, as seeds are produced very freely, young seedlings spring up constantly between the old plants, and one does not miss the few which may decay during the second year; the plant forms a very neat, slightly spreading tuft; flowers are produced in many-flowered umbels, terminal numerous, and large, glowing crimson-magenta, saucer shaped, very showy. June to November. Full exposure to sun, and light sandy soil, are needed to bring out the rare beauty of these plants. The flowers close up when evening comes, like the annual portulacas, but they reopen on the following day. In the sunny, sloping part of a rockery, even when quite dry, or among other low plants in a bed or border, they are highly satisfactory. This is the only species which we have found to be tolerably hardy with us in the north as a perennial; it may also be treated like the annuals, as it flowers the first summer just as freely as afterwards. Can be prop. by cuttings.

discolor, Schrad. (*C. élegans*, Hort.). One to 2 ft.; lvs. fleshy and obovate, purple beneath; fls. bright rose, with yellow stamens. Chile. B.M. 3357.

cauléscens, HBK., var. **Ménziesii,** Gray (*C. sanciòsa*, Lindl.). Three to 12 in. high, with green herbage, glabrous, or nearly so; lvs. linear, or spatulate-oblanceolate; fls. rose-red or purple, rather large and long-peduncled (petals ½ in. long). Calif., N. B.R. 1598.—Variable. There is a white-fld. var. advertised.
J. B. Keller and L. H. B.

CALÁNTHE (Greek for *beautiful flower*). *Orchidàceæ*, tribe *Vándeæ*. A genus of sub-epiphytal or terrestrial orchids found in the eastern hemisphere, and sparingly in the western hemisphere. Scapes erect, many-flowered; lvs. broad, plaited; fls. white or rose-colored, rarely yellow; pseudobulbs angulate, with greyish green sheaths in the Vestitæ section, but absent in the Veratrifoliæ section. Many species are known to orchid fanciers.

vestita, Lindl. (*C. oculàta*, Hort.). Lvs. broadly lanceolate, nearly 2 ft. long, from greyish green pseudobulbs; fls. nearly 3 in. across, numerous, in racemes; petals and sepals whitish, all more or less overlapping, the former oval-oblong, the latter obovate-oblong; labellum flat, large, three-lobed, the midlobe cleft; a yellow or crimson blotch in front of the short column; scapes from 2–3 ft. high, hairy. Blooms in winter. Malaya. B.M. 4671. F.E. 9: 325. A.F. 6: 655. F.S. 8: 816.—A most popular orchid. There are many forms, of which the following are the most important: Var. **gigantèa,** Hort. Larger in all parts: fls. white, with red eye. Var. **nivàlis,** Hort. Fls. pure white. Var. **Türneri,** Hort. (*C. Türneri*, Reichb. f.). Fls. more numerous, labellum with a crimson blotch; blooms later in the season than the next. Var. **rùbro-oculàta,** Hort. Labellum with a crimson-purple blotch. October–February. Var. **lùteo-oculàta,** Hort. Yellow-blotched. Var. **Regnièri,** Hort. (*C. Regnièri*, Reichb. f. *C. Stevensiàna*, Regnier). Pseudobulbs more elongated, with a depression above the middle, labellum rose-colored, with a purple blotch in front of column, less deeply lobed than in the type. A.F. 6: 655.

313. Calanthe Veitchii. (×⅓.)

veratrifòlia, R. Br. Lvs. oblong-lanceolate, about 2 ft. long, from a creeping rhizome; fls. white, in dense

corymbose racemes; petals obovate-spatulate, sepals obovate oblong; labellum 4-parted, the anterior lobes usually broader than the posterior or basal lobes. Blooms from May to July. Malaya. B.M. 2615.

Veitchii, Lindl. Fig. 313. A hybrid between *C. rosea* and *C. vestita*: fls. rose-colored; labellum with white spot near the base. Winter-flowering. There is also a white variety. This hybrid was raised by Veitch, in 1856. B.M. 5375. Forms of this are var. **bélla**, Hort., with pink fls.; var. **Sandhurstiàna**, Hort., with crimson fls.; var. **Sedeni**, Hort., with deep rose fls. *C. Eyermanii*, Hort. (G.F. 4:17), is a hybrid of *C. Veitchii* and *C. vestita*. Var. **supérba**, Hort., has richer color.

Masùca, Lindl. Scape 2 ft. long, with large, many-ribbed, dark lvs.; fls. 1 in. across, the segments overlapping; deep violet, fading to lilac, the lip deep violet-purple. Summer and autumn. N. India. B.M. 4541. Var. **grandiflòra**, Hort., is of greater size throughout.

C. discolor, Lindl., and *C. Japónica*, Blume, both of Japan, have been offered by dealers in Japanese plants; but they are unknown to general cultivation. OAKES AMES.

CALATHÈA (Greek for *basket*, the application not agreed upon). *Scitaminàceæ*. Perennial foliage plants which are commonly cult. as Marantas. From Maranta the genus differs chiefly in technical characters. In Maranta the fruit is 1-seeded, in Calathea usually 3-seeded; in the former the fl.-clusters are branched and few-fld., in Calathea usually capitate or cone-like. Of Calatheas there are 70 or 80 species, mostly of trop. Amer., but a few of trop. Afr. The lvs., for which the plant is grown, are variously marked with shades of green, red, brown, yellow, and white. The lvs. spring from the very base of the short stem, just above the rhizome. Sepals 3, free and equal; corolla tubular, with 3 spreading lobes; stamens 3, petal-like, 2 sterile and 1 bearing an anther on its side (compare *Canna*). L.H.B

Calatheas are among the handsomest of ornamental leaved stove plants. They may be propagated by division of the crowns, or in those species which make secondary growths, by cuttings taken just below the node and inserted in sharp silver sand in thumb-pots and plunged in a propagating box with bottom heat. About the beginning of April, or just before active growth commences, is the best time for propagating and also for repotting. The soil best suited to them is one-third good, fibrous loam in small lumps, one-third fibrous peat or chopped fern-root, and one-third leaf-mold and clean silver sand, to which may be added a few nodules of charcoal to keep the mixture sweet. In repotting, the old soil should be shaken from the roots, and the plants potted loosely in the new mixture, using clean, well-drained pots, or for the creeping and shallow-rooting species, pans are preferable. All matured leaves should be removed at this time, and after repotting they should be placed in a close, warm, moist atmosphere and kept shaded, to induce active root growth. As the leaves develop they require an abundant supply of water at the roots, frequent spraying with a fine syringe, and to be well shaded from direct sunlight. These conditions should be reduced on the approach of winter, but at no season must the plants be allowed to become dry. The temperature during winter should not fall below 60°. Strong-growing species, as *C. zebrina*, do best planted out in a palm house under the shade of palm trees, while the low-growing or creeping species are excellent subjects for inside rockeries, where a warm, humid atmosphere can be maintained. Cult. by EDWARD J. CANNING.

There are many species of Calathea in fancy collections, but the following list includes those which are known to be in the Amer. trade. Since the plants are often named and described before the flowers are known, it is not always possible to determine the proper genus. Consult *Maranta*, *Phrynium*, and *Stromanthe*. For horticultural purposes, botanical characters cannot be used in classification of the species; the following scheme, therefore, is based on evident leaf characters.

Index: C. albo-lineata, 3; Bachemiana, 9; Chimboracensis, 10; crotalifera, 20; eximia, 21; fasciata, 4; Lageriana, 7; Lagrelliana, 19; Lietzei, 11; Lindeniana, 12; majestica, 3; Makoyana, 13; *Marcelli*, 25; medio-picta, 22; micans, 23; nitens, 14; *olivaris*, 13; ornata, 3; Princeps, 15; pulchella, 2; *regalis*, 3; *rosea-lineata*, 6; *rosea picta*, 6; smaragdina, 5; tubispatha, 8; Vandenheckii, 24; Veitchiana, 16; virginalis, 25; *Wagneri*, 6; Warscewiczii, 17; Wiotiana, 18; zebrina, 1.

A. *Lvs. marked only by transverse bars.*

1. **zebrina**, Lindl. (*Maránta zebrina*, Sims). Large, free-growing plant: lvs. 2–3 ft. long, purple beneath, satiny green above, with alternating bars of deep and pale green: fls. dull purple, on a very short scape. Braz. B.M. 1926. L.B.C. 5:494. R.H. 1865:90. S.H. 1:164. L. 1.—The commonest species, occurring in nearly all collections of warm greenhouse plants.

2. **pulchella**, Kœrn. Weaker grower than *C. zebrina*, the lvs. lighter colored, with two series (large and small) of broad green bars. Braz.—By some considered to be a form of *C. zebrina*.

3. **ornàta**, Kœrn. (*Maránta regàlis*, Hort.). Dwarf: lvs. oblong-acuminate, the stalks 1 ft. long and blades usually shorter, red beneath, green above and marked with two bars between each of the transverse veins. Colombia.—The transverse markings are usually bright red, and this form is taken as the type of the species (I.H. 2:74. L. 20). In var. **álbo-lineàta**, Hort. (*Calathèa* and *Maránta álbo-lineàta*, Hort.), the lines are white (F.S. 4:413. L. 55). Var. **majéstica**, Hort. (*M. majéstica*, Lindl.), attains a height of 4–5 ft. It has red-striped lvs. I.H. 41:1.

4. **fasciàta**, Regel & Kœrn. Dwarf: lvs. long-cordate, the blade 10–12 in. long, pale green and purple-tinged below, green above, with white bands running off to the margin. Braz. Gn. 2, p. 3. L. 23.

5. **smaragdina**, Lind. & André. Two ft.: lvs. wide-spreading, oblong-lanceolate and acuminate, silvery green below, dark green above, with prominent bands of different shades of green, the midrib prominent. S. Amer. I.H. 17:16.

AA. *Lvs. variously marked and blotched, often margined, or only the midrib colored.*

B. *Markings red, parallel with the margin.*

6. **rósea-picta**, Regel (*C. rósea-lineàta*, Hort.? *M. Wagneri*, Hort.). Dwarf: lvs. nearly orbicular, purple beneath, the upper side dark green, the midrib red, and an irregular red zone (sometimes two zones) two-thirds of the distance from the midrib towards the margin. Amazon. F.S. 16:1675–6. Gn. 2, p. 3

BB. *Markings in shades of brown or bronze.*

7. **Lageriàna**, Hort. Lvs. large, dark red beneath, the prominent veins rich bronze.

8. **tubispàtha**, Hook. f. Two feet or less high: lvs. obovate-elliptic, short-acuminate or cuspidate, thin, greenish beneath, lively green above, and marked midway between the rib and the margin with lighter green and squarish patches of brown. W. Afr. B.M. 5542.

BBB. *Markings in shades of yellow and green.*

9. **Bachemiana**, Morr. Lvs. unequilateral, cordate at the base, long, smooth, finely striate, with parallel greenish or whitish markings along the primary nerves, purplish beneath. Brazil.

10. **Chimboracénsis**, Lind. Dwarf: lvs. oblong-ovate, 8–12 in. long, acuminate, green above and below, with a very dark green white-margined band running lengthwise the blade midway between the rib and each margin. Neighborhood of Mt. Chimborazo. I.H. 17:6.

11. **Lietzei**, Morr. Lvs. oval-lanceolate, truncate or shallow-cordate at base, undulate, purple beneath, deep green and shining above, with feather-like blotches of deeper green. Brazil.

12. **Lindeniana**, Wallis (*C. Lindeni*, Wallis & André). Lvs. elliptic-oblong, short-acuminate (12 in. or less long), deep green above with an olive-green zone either side of the midrib, and beyond which is a darker zone of green, the under side counterfeiting the upper side, but with purplish zones. Peru. I.H. 18: 2.—By some considered to be a form of *C. rosea-picta*.

13. **Makoyàna**, Morr. (*Maránta olivàris*, Hort.). One to 4 ft.: lvs. broad-oblong, obtuse or somewhat short-pointed, the stalks red, the leaf olive-green or cream-colored above but marked against the midrib

with outspreading, dark green blotches of oblong, oval or pyriform shape, the under surface similarly marked, but in red. Brazil. F.S. 20:2048–9. G.C. 1872:1589. Gn. 4, p. 87.

14. **nitens,** Hort. Dwarf: lvs. oblong, glossy green, on each side of the rib marked with oblong, pointed greenish bars, which alternate with dark green lines. Brazil.

15. **princeps,** Regel. Leaf elongated or elliptical-lanceolate, 7–10 in. long, 3–3½ in. broad, light green above, with broad black-green, flaming, broken band along the middle nerve, violet-purple below. Amazon.

314. Calathea Veitchiana.

16. **Veitchiàna,** Veitch. Fig. 314. Very handsome, 3–4 ft.: lvs. large, ovate-elliptic, obtuse or nearly so, rather thin, glossy, purplish below, dark, rich green above and marked with one or two rows of light yellow-green irregular blotches running the length of the blade (often shading into white). Tropical Africa. B.M. 5535. G.C. 1870:924. Gn. 2, p. 545. F.S. 16:1655–8.—Common; one of the handsomest and most serviceable species. The darker parts of the blade are often bronze-brown.

17. **Warscewiczii,** Kœrn. Rather large: lvs. 2 ft. long, oblong-lanceolate, acuminate, purple beneath, dark, velvety green above, but the midrib broadly feathered with yellow-green. Trop. Amer. F.S. 9:939–940. Gn. 17:238. L. 17.—One of the best.

18. **Wiotiàna,** Makoy (*C. Wiòti*, Hort.). Lvs. bright green, with two rows of olive-green blotches. Brazil.

BBBB. *Markings white or very nearly so.*

19. **Legrelliàna,** Regel. Leaf elliptical, pointed, 5–6 in. long, 2–3½ in. broad, above shining green, with broad, white, flaming, broken middle band along the middle nerve and numerous broken white linear small bands between the side nerves; lower surface whitish green and marked with red and green. Equador.—Neat species.

20. **crotalifera,** Wats. Rattlesnake Plant. Lvs. oval, abruptly acute at each end, 2 ft. or less long and half as broad, yellowish green, with a white-margined midrib; petiole 2–3 ft. long, curved, sheathing; peduncles 1 or 2 and 8–10 in. high, bearing distichous yellow-fld. spikes. Guatemala.—Offered in Fla.

21. **eximia,** Kœrn. (*Phrynium eximium*, Koch). Petiole grooved, greenish, closely covered with soft hair and naked only on the somewhat thickened end. Leaf surface somewhat long-elliptical, pointed, in full-grown lvs. 8–10 in. long and 4–5 in. broad, lightly shining blue-green, and marked with broad white cross bands; the under side of the lvs. covered with short, velvety hair, and of a brownish purple color. S. Amer. Gt. 686.

22. **mèdio-picta,** Makoy. Lvs. oval-lanceolate and tapering to both ends, dark green, with the rib feathered with white from base to summit. Brazil.

23. **micans,** Kœrn. Very small: lvs. 2–3 in. long, oblong-lanceolate, somewhat acuminate, green and shining above, the rib in a feathered white stripe. Brazil. L. 49.

24. **Vandenhéckei,** Regel. Lvs. dark green, shining, red-purple beneath, the upper surface marked with two concentric zones of white, and the rib margined with white. Brazil?

25. **virginàlis,** Lind. Lvs. soft-hairy below, broad-oval, rather blunt, 7–9 in. long, 4–6 in. broad, upper surface light green, and below, in the common form, whitish green and lighter zones shown, as on the upper surface, —or in another form, which has been distributed in gardens as *C.* (Maranta) *Marrelli*, under side shaded a light violet and without zones. Brazil. A.F. 7:611.

C. argyræa, Kœrn. Has been offered in the American trade. —*C. arrecta*, Lind. and Andre. Tall: lvs. oblong, red beneath, green above, with the nerves all prominent. Equador. I.H. 18:77. —*C. Bornaquini*, Regel. Lvs. oval-lanceolate, green, with bands of white. Brazil.—*C. Fascinator*, Hort. Dwarf: lvs. broad-ovate-oblong, purplish beneath, green above and with blotches of lighter color and transverse narrow bars of red. Brazil. I.H. 41:104, as Maranta Fascinator.—*C. hieroglyphica*, Lind. and Andre. Dwarf: lvs. short-ovate, short-pointed, purplish beneath, green above and marked by many oblique bands or bars of silvery white. Colombia. I.H. 20:125–3.—*C. illustris*, Hort. (Maranta illustris, Lind.). Dwarf: lvs. broad-ovate or somewhat obovate, purple beneath, green above, with oblique bars of lighter green and an encircling zone of shaded white. Equador. I.H. 14:515.—*C. leopardina*, Regel. Medium to large: lvs. oblong, olive-green, with blotches of deep green. Brazil.—*C. Massangeana*, Hort.=Maranta Massangeanu.—*C. pardina*, Planch. & Lind.=C. villosa.—*C. rubibarba*, Hook. f. Brown-hairy: lvs. long-oblong or linear-oblong, bright green above, and bluish green and violet-tinged beneath: fls. yellow. Brazil? B.M. 7560. —*C. splèndens* and *splèndida*, Hort.=Maranta splendida.—*C. villòsa*, Lindl. Large: lvs. 10–20 in. long, oblong-ovate, pale green, with dark brown angular blotches: fls. yellow. S. Amer. F.S. 11:1101–2, as C. pardina: also, L. 32.—*C. vittata*, Kœrn. Lvs. ovate-acuminate, less than 1 ft. long, light green, with many transverse bars of yellow-white. Brazil. L. 38.

L. H. B.

CALCEOLÀRIA (Latin *calceolus*, a slipper, alluding to the saccate fl.). *Scrophulariàceæ*. Many species of herbs and shrubs, chiefly natives of S. Amer., but some in Mexico and New Zealand. Corolla 2-parted nearly to the base, the lower part or lip deflexed and inflated-slipper-like, the upper lip smaller and ascending, but usually saccate; stamens 2 or rarely 3, and no rudiments (A, Fig. 315): fruit a many-seeded capsule: lvs. usually hairy and rugose, mostly opposite. Calceolarias are grown for the variously colored and usually spotted lady's-slipper-like fls. The colors are often very rich and intense. The genus falls into two horticultural sections, the herbaceous kinds, and the shrubby kinds. The former are the only ones generally known in this country. They are grown from seeds. They are often known as the hybrid Calceolarias (*C. hybrida*, Hort.), since the common varieties are evidently the products of inter-crossing and plant-breeding.

L. H. B.

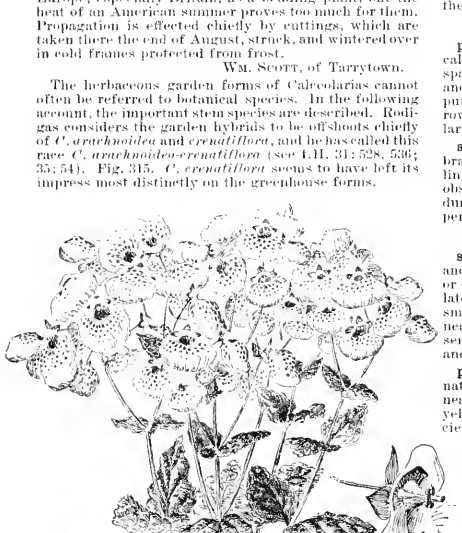
Of the hybrid section, seeds are best sown at the end of June or beginning of July, in pans. Care should be taken to have the pans thoroughly clean. Good drainage is essential. A good soil is one composed of equal parts of sand, leaf-mold and sod soil. This should be finely sifted. After filling the pans, thoroughly dampen, and allow to drain before sowing. It is unnecessary to cover the seeds with soil, but a close-fitting pane of glass should be placed over the pan until the little plants are well started, when the glass should be gradually removed. In the early stages, watering is best done by immersion, but it is not advisable to keep the pans standing in water.

Prick off, when large enough to handle, into pans or shallow flats one inch apart. Same compost as for seeds will suit. When plants begin to crowd, pot into thumb-pots. This time the compost should have the addition of a sixth part of finely sifted dried cow-manure. Subsequent shifts should be given as required, the last being into 7-inch pots. Shade is necessary all along, but should not be so heavy as to induce the plants to become drawn. A house or frame with a northern elevation is most suitable for their culture, keeping the temperature as low as possible during the warmer months. Later on, provide a night temperature of 40° and a day temperature of 50° to 55°. Water carefully, avoiding extremes, and when the flower spikes begin to show, weak liquid manure may be frequently used with advantage. Green-fly is the only really troublesome insect enemy. This can be kept in check by the free distribution of tobacco stems around the benches where the plants are set. If it gets thoroughly established, evaporate tobacco extract in the house.

The shrubby Calceolarias are grown extensively in Europe, especially Britain, as a bedding plant, but the heat of an American summer proves too much for them. Propagation is effected chiefly by cuttings, which are taken there the end of August, struck, and wintered over in cold frames protected from frost.

Wm. Scott, of Tarrytown.

The herbaceous garden forms of Calceolarias cannot often be referred to botanical species. In the following account, the important stem species are described. Rodigas considers the garden hybrids to be off-shoots chiefly of *C. arachnoidea* and *crenatiflora*, and he has called this race *C. arachnoideo-crenatiflora* (see I.H. 31: 528, 536; 35: 54). Fig. 315. *C. crenatiflora* seems to have left its impress most distinctly on the greenhouse forms.



315. Calceolaria arachnoideo-crenatiflora.

A. *Herbaceous Calceolarias, parents of the florists' varieties of this country.*

B. *Lvs. simple.*

C. *Fls. essentially yellow.*

crenatiflòra, Cav. (*C. pèndula*, Sweet). One–2 ft., the stem soft-hairy, terete: radical lvs. ovate and long petioled (the petioles winged at top), undulate and dentate, sometimes obscurely lobed, rugose and pubescent, paler beneath, often purplish towards the tip; stem-lvs. shorter-petioled and becoming sessile above: fls. in a forking corymb, the slipper large, oblong or oblong-obovate, furrowed or crenate, hanging, yellow, with orange-brown dots. Chile. B.M. 3255.—From this species we seem to have derived the spots of Calceolaria fls.

corymbòsa, Ruiz & Pav. One–2 ft., the stem 4-angled: radical lvs. ovate and sometimes cordate, obtuse or nearly so, doubly crenate, rugose and hairy, whitish beneath; stem-lvs. smaller and narrower, somewhat clasping, opposite: fls. small (about half as large as in *C. crenatiflora*), in a broad, somewhat loose corymb, the slipper somewhat short-oblong, clear yellow outside and marked with red lines inside. Chile. B.M. 2418.

amplexicaùlis, HBK. A ft. or two high: lvs. cordate-ovate to ovate-lanceolate, long-acuminate, pubescent, woolly beneath and deep-rugose above, clasping: fls. small, in an upright corymb, pale yellow and spotless, the slipper hoof-shaped. Equador, etc. B.M. 4300.

cc. Fls. purple.

purpùrea, Grah. Stems erect, pubescent, 1–2 ft.: radical lvs. spatulate and acutish, with a strong midrib, sparsely hairy, rugose, dentate; stem-lvs. broad-cordate and clasping, less toothed: fls. in loose corymbs, small, purplish or reddish violet, the slipper somewhat furrowed. Peru. B.M. 2775.—Supposed to have entered largely into purple-fld. varieties.

arachnoidea, Grah. Stem a foot or two high, terete, branchy, woolly, with appressed hairs: lvs. oblong or lingulate, narrowing into long winged petioles, clasping, obscurely toothed, rugose, woolly on both sides: peduncles in pairs, forking: fls. small, dull purple, the slipper nearly globular and furrowed. Chile. B.M. 2874.

B. *Lvs. compound, or essentially so.*

scabiosæfòlia, Sims. Often 2 ft., the stem terete, hairy and leafy: lvs. opposite, with clasping petioles, cut nearly or completely to the midrib: lfts. varying from lanceolate to broad-oval, acuminate, ciliate, dentate: fls. very small, in small hairy corymbs, pale yellow, the slipper nearly orbicular in outline. Peru. B.M. 2405.—In essentially pure form, this is sold by seedsmen as an annual and bedding plant.

pinnàta, Linn. Often reaches 3 ft. or more: lvs. pinnatifid or completely compound, the divisions short and nearly entire, obtuse or nearly so: fls. small, sulfur-yellow. Peru. B.M. 41.—The first known garden species, still sold as an annual.

AA. *Shrubby Calceolarias.*

integrifòlia, Murr. (*C. rugòsa*, Ruiz and Pav. *C. salicifòlia*, Pers.). Two ft. or less high, branchy and bushy: lvs. glabrous, oval-lanceolate, crisped and dentate, the short petioles winged: fls. in terminal clusters, small, yellow. Chile. B.M. 2523.—Variable. Probably the chief source of shrubby Calceolarias.

thyrsifòlia, Grah. More shrubby: lvs. linear and clustered, toothed, sessile, not hairy: fls. small, yellow, in a close, terminal cluster. Chile. B.M. 2915.

C. alba, Ruiz & Pav. Shrubby: lvs. linear, toothed above: fls. small, white. Chile. B.M. 4157. G.C. III. 22: 141. Gn. 51: 1102.—*C. Andina*, Benth. Shrubby, glandular-pubescent: lvs. orbicular-ovate, thick, rugose, hairy: fls. small, yellow, the slipper crenate. Chile. B.M. 7528.—*C. bicolor*, Ruiz & Pav. Shrubby: lvs. ovate, dentate: fls. small, the slipper sulfur-yellow above and white below. Peru. B.M. 3036.—*C. Bürbidgei*, Hort. Handsome yellow-fld. hybrid of *C. Pavonii* × *C. fuchsiæfolia*. Gn. 47: 1012.—*C. flexuòsa*, Ruiz and Pav. Shrubby at base: lvs. large-ovate, coarsely crenate-dentate: fls. rather large, clear yellow, with very large green calices. Peru. B.M. 5154. F.S. 22: 2231.—*C. fuchsiæfòlia*, Hemsl. Shrubby: lvs. lanceolate: fls. yellow, panicled, upper lip very large. Peru. Gn. 15: 173. G.C. II. 15: 269.—*C. Henrici*, Hook. f. Shrubby, evergreen: lvs. willow-like, small-toothed: fls. panicled, clear yellow, the upper lip large. Equador. B.M. 5772.—*C. hyssopifòlia*, HBK. Shrubby: lvs. crowded, small, lanceolate and toothed, or at top of stem linear and entire, margins revolute: fls. rather large, in many-fld. corymbs, pale sulfur-yellow, the slipper obovate-orbicular and crenate. Equador. B.M. 5548.—*C. lobàta*, Cav. Herbaceous: lvs. triangular-ovate, palmately 5–7-lobed, dentate: fls. in terminal clusters, clear, pale yellow,

and spotted on the up-curved slipper. Peru, Bolivia. B.M. 6330.—*C. Pavónii*, Benth. Herbaceous: lvs. large and wrinkled, ovate, truncate or cordate at base, the radical ones winged, all jagged and toothed: fls. large, clear yellow, the lip up-curved. Peru. B.M. 4525.—*C. Pisacomensis*, Meyer. Shrubby: lvs. ovate-cordate, nearly or quite obtuse, nearly sessile, irregularly crenate, margins reflexed: fls. large, orange varying to red, the slipper up-curved. Peru. B.M. 5677.—*C. plantaginea*, Smith. Herbaceous, stemless: lvs. ovate-spatulate, toothed at top: scapes many, few-fld., the fls. large, yellow, the under side of the slipper dotted with red. Chile. B.M. 2805.—*C. Sinclairii*, Hook. Herbaceous, half-hardy: lvs. oblong-ovate, stalked, crenate-dentate, hairy: fls. small, lilac or flesh colored, spotted within, the two lips nearly equal, not saccate. New Zeal. B.M. 6587.—*C. tenella*, Poepp. & Endl. Herbaceous, half-hardy, 6 in. high: lvs. ovate or orbicular, small (⅜in. long), nearly or quite sessile: fls. yellow, spotted within. Chile. B.M. 6231.—*C. violacea*, Cav. Shrubby: lvs. small, ovate-cordate, deep-toothed, stalked: fls. yellow-salmon, spotted within and without, the two lips not saccate. Chile. B.M. 4029.

L. H. B.

CALÉNDULA (Latin, *calendæ* or *calends*: flowering throughout the months). *Compósitæ*. Herbs of temperate regions, of 20 or more species. Annuals or perennials, with alternate simple lvs., mostly large heads with yellow or orange rays, glabrous incurved akenes, plane naked receptacle, pappus none, and involucre broad, with scales in one or two series.

officinàlis, Linn. POT MARIGOLD. Fig. 316. Annual: 1–2 ft. high, more or less hairy: lvs. oblong and more or less clasping, entire, thickish: heads solitary, on stout stalks, large with flat, spreading rays, showy, closing at night. S. Eu. B.M. 3204.—One of the most universal garden fls., running into many vars., distinguished by size, color, and degree of doubling. The color varies from white-yellow to deep orange. This is the Marygold of Shakespeare's time. The fl.-heads are sometimes used in cookery, to flavor soups and stews. The Calendula is of the easiest culture in any warm, loose soil. The seeds are usually sown where the plants are to stand, but they may be sown indoors or in a frame and the plants transplanted. The akenes are large and germinate quickly. The plant blooms the whole season, particularly if the fls. are picked. It is a hardy annual, and in the southern states will bloom most of the year.

suffruticòsa, Vahl. More diffuse, annual: lvs. sessile, lanceolate, somewhat dentate: heads bright yellow, not doubled, very numerous, on long peduncles. W. Mediterranean region.—Seeds are sold by American dealers.

C. Póngei, Hort., and *C. pluviàlis*, Linn., will be found under Dimorphotheca.

L. H. B.

CALICO BUSH is a *Kalmia*.

CALIFORNIA, HORTICULTURE IN. California occupies the mountain slopes and plain-like valleys of a vast area, much of which is peculiarly well-fitted to horticultural uses. New York, Ohio, Maine, New Jersey, Vermont, Massachusetts, New Hampshire, Connecticut, Delaware, and Rhode Island, united, have a less area than California. The range of products grown successfully in California is nearly or quite as great as that of all the rest of the United States; the humid sea-level islands of Florida are adapted to some plants, such as Cassava, which do but poorly in California, but on the sheltered uplands of California many species which entirely fail in Florida are perfectly at home. Here, as every tourist can see in a single summer, one finds, and often on an enormous scale, the vines, walnuts and prunes of France; the olives, oranges, lemons, chestnuts, figs and pomegranates of Italy and Spain; the Acacias, Eucalypts, Casuarinas, and salt-bushes of Australia; the melons of Turkestan; the cotton and tobacco of the south; the hemp, flax, rye, Russian mulberries, and other products of the more extreme north, the cereals of the great west, the bulbs of Holland, the costly seed-crops of European gardens, and, in brief, examples of the greater part of the useful horticultural productions of the temperate zones.

While the American pioneers of Kentucky were fighting Indians, and struggling to obtain the right to navigate the Mississippi, the Spanish pioneers of California were planting pear, orange and olive trees, date palms, and European grapes, about the early Missions. After the American conquest, and the gold discovery of 1848, horticulture gained a foothold in the mountain lands below the Sierra peaks. Every village and town had its gardens and its beginnings of orchards. Soon the thoughts of men turned to the broad, fertile, untilled valleys, and in a few years the wheat farmer became the typical Californian. Lastly, the state entered upon a magnificent and still continuing period of horticultural development, which well deserves to be written down in history as one of the most important facts of modern material progress.

Not so long ago almost 160,000 square miles of California were considered "nearly all waste." Now,

316. Calendula officinalis, double-flowered ($\times \frac{2}{3}$).

one finds that forests, pastures, farms, gardens, so suggestively occupy the land that, although there is room for many more, it is difficult to call anything worthless except the great heights that shelter and water the valleys below. Even the deserts have underlying streams, and blossom with tree and vine as men sink artesian wells there. The miracles of Italy, ancient Palestine, modern India, are being repeated over large districts of California.

The great valleys and nearly level lands of California, the true cereal belts, subject to frosts, comprise about 40,000,000 acres of land; the foothill fruit-belts,

of Coast Range and Sierra, hardly as yet one-tenth occupied, comprise fully 25,000,000 acres; in timber and fine grazing lands, capable of perpetual renewals, are 12,000,000 acres; high mountains cover some 13,000,000 acres; arid lands, often yielding enormously under irrigation, or slowly conquered by neutralizing their superabundant alkali, occupy about 10,000,000 acres. Over these great areas every wind current, every mountain spur, every alteration in slope or altitude, helps to make a local climate. The complicated geological development of California has produced soils almost as varied as its local climates. Still, the state can be conveniently divided into five characteristic climate-zones: in the high Sierras the mean annual temperature is from 30° to 44°; in the lower Sierras it is from 44° to 52°; near the Pacific ocean it is from 52° to 67°; in the central valleys of Sacramento and San Joaquin it is from 60° to 68°, and in the southern counties from 68° to 72°. But every part of California shows very sharp horticultural contrasts upon farms not a mile apart. Local climate is the key-note of California life. Placer county, for instance, extends from the center of the Sacramento valley east to the summit of the Sierras. It has upland Canadian valleys, pines and snow-blockades at one end; groves of oranges and lemons in the Sierra foothills, and rich alfalfa fields along the "bottoms" of the Sacramento valley rivers. See Fig. 317.

Statistics are apt to be dull reading, but the horticulture of California can be shown only by some of its results in recent years. Let us glance at a few of the records. Take the well-known industry of raisin-making. In 1873, 120,000 pounds were produced in California. By 1894 this crop had grown to 103,000,000 pounds. The interstate shipments of fresh fruits, beginning late in the seventies, rose by 1894 to nearly 180,000,000 pounds. The interstate shipments of dried fruits rose between 1884 and 1897, from about 2,000,000 pounds to 150,000,000 pounds. During the same period of only 13 years, the product of beet-sugar increased from about 2,000,000 to over 70,000,000 pounds. Oranges, for many years a noted California product, rose between 1884 and 1898, from 850,000 boxes to 4,640,000 boxes. Turning to some other separate industries, in 1897 the dried apricot crop was over 30,000,000 pounds, the prune crop was over 97,000,000 pounds, the dried peach crop was over

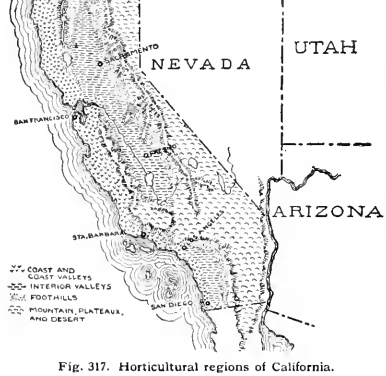


Fig. 317. Horticultural regions of California.

27,000,000 pounds. The wine-production of the state in 1897 was 34,500,000 gallons. The pack of canned fruit in 1898 was 2,000,000 cases. In 1893, in a very careful tabulation of the area planted to fruit-trees and vines, made by me for the Popular Science Monthly, I estimated as follows:

Kind	*Acreage*
Citrus and semi-tropic	95,000
Deciduous fruits	200,000
Nut-bearing trees	25,000
Grapes	191,933
Small fruits	5,081
Total	517,014

At the usual distances of planting, this would give 48,000,000 fruit trees and about 240,000,000 grape-vines. Since 1893 nearly six years have passed, and yet the acreage has not greatly gained. Some vineyards and worn-out orchards have been destroyed. The area in small fruits has nearly doubled. The citrus and semi-tropic fruits have somewhat increased in area. There have been seasons of heavy frosts and of light rainfall. The industry has been less generally profitable during recent years. A multitude of lesser horticultural occupations have attracted attention.

Among these new horticultural industries of the last decade or so are the extensive growth of tree, flower and vegetable seeds, of cut-flowers, of vegetables and of decorative plants. California has always had important nurseries and large market-gardens, but there is now a tendency to specialize more than ever before, and to supply, in many departments, the markets of America and Europe. Portugese, Italian, Chinese and Japanese peasants have settled in large numbers in the richer districts of California, introducing their special horticultural industries. Large farms and orchards are still profitable, but every year the small, well-tilled plots increase in number and relative importance.

CHARLES H. SHINN.

CALIFORNIA POPPY is *Eschscholtzia*.

CALIFORNIA YELLOW BELLS is *Emmenanthe pendulıflora*.

CALÍMERIS (Greek, *beautiful arrangement*). *Compósitæ*. A few Asian herbs, often united with Aster, but horticulturally distinct, and differing from that genus in the hemispherical involucre of few, nearly equal, scarious-margined bracts, and broad, convex receptacle. Akene flat and hairy. Hardy perennials of low growth, suited to the border in front of stronger plants. *C. Tatarica* is described in the genus Heteropappus.

inctsa, DC. (*Aster incisus*, Fisch.). One to 2 ft., erect, corymbose at the summit: lvs. lanceolate, remotely incise-dentate: scales of involucre red-margined: fls. large, purple-rayed or almost white, and yellow-centered. —Of easy culture in any good soil, making a display throughout July and Aug. The commonest species.

Altàica, Nees (*Aster Altàicus*, Willd.). Lower, pubescent or hispid: lvs. linear-lanceolate and entire; scales of involucre pubescent and white-margined: rays narrow, blue.

L. H. B.

CALIPHRURIA. See *Calliphruria*.

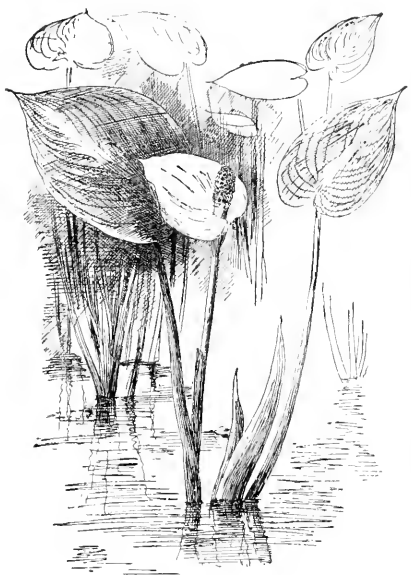
CÁLLA (ancient name, of obscure meaning). *Aròideæ*. A monotypic genus, containing a native bog-plant with a white spathe. Herbs, with creeping rhizomes and 2-ranked lvs. Differs from Orontium in the parallel secondary and tertiary veins of the leaf-blade. See *Richardia* for *C. Æthiopica*, *albomaculata*, *Elliottiana*, and *nana*. The Calla of florists, or Calla Lily, is Richardia.

palustris, Linn. Fig. 318. Rhizome bearing many distichous lvs. one year, the next only 2 lvs. and the peduncle: petioles cylindrical, long-sheathed: blade cordate: spathe elliptical, or ovate-lanceolate, white. Eu., N. Asia, and E. N. Amer. B. M. 1831.—An interesting little perennial plant, useful for outdoor ponds.

JARED G. SMITH.

CALLIÁNDRA (Greek, *beautiful stamens*). *Leguminòsæ*. Tropical American shrubs, distinguished from Acacia by the presence of a thickened margin on the pod. Lvs. bipinnate; lfts. numerous; fls. usually borne in globose heads; corolla small, obscured by the numerous, long, silky, purple or white stamens. Cult. in S. Calif., and prop. by cuttings.

Lambertiàna, Benth. (*Acàcia Lambertiàna,* D. Don). Unarmed; branches terete: lvs. puberulous-villous: pinnæ 2–3-yoked: lfts. 9–12-yoked, oval-oblong, obtuse at both ends: petiole not glandular: peduncles 3–5, racemose: heads roundish; stamens 20–25, exserted. Mexico. B.R. 721



318. Calla palustris.

tetrágona, Benth. (*Acàcia tetrágona,* Willd.). Unarmed, glabrous: branches tetragonal: pinnæ 5–6-yoked: lfts. 16–29-yoked, linear, acute, the outer larger: heads pedunculate, axillary; fls. white: pod linear-obtuse, thickened at the margin.

Portoricensis, Benth. (*Acàcia Portoricénsis,* Willd.). Unarmed shrub, 10 ft. high: pinnæ 5-yoked: lfts. 15–25-yoked, linear, obtuse; petioles not glandular: branchlets pubescent: heads globose, pedunculate, axillary: calyx ciliate on the margin: filaments long, white: stamens 20–25: pod straight, linear, tapering at the base. West Indies.

CALLICÁRPA (Greek, *beauty* and *fruit*). *Verbenàceæ.* Shrubs or trees, mostly with rough, stellate hairs: lvs. opposite, usually dentate and deciduous: fls. small, perfect, in axillary cymes; corolla with short tube, 4-lobed; stamens 4: fr. a small, berry-like drupe, red, lilac or violet, with 2–4 seeds. About 30 species in trop. and subtrop. regions of Asia, Australia, N. and C. Amer. Some species are cult. chiefly for their decorative fr., profusely produced in fall; the hardiest are *C. purpùrea* and *C. Japónica,* and they may be grown even north in sheltered positions, if somewhat protected during the winter. If killed to the ground, young shoots spring up vigorously, and will produce fls. and fr. in the same season. If grown in the greenhouse, they require a sandy compost of loam and peat, and plenty of light and air. Prop. readily by greenwood cuttings in spring or summer under glass, also by hardwood cuttings, layers and seeds.

A. *Lvs. lanceolate beneath.*

Américàna, Linn. Shrub, 3–6 ft., with scurfy, downy tomentum: lvs. cuneate, elliptic-ovate, acuminate, obtusely serrate, 3–6 in. long: cymes short-stalked; corolla bluish, glabrous: fr. violet. July–Aug. Virg. to Texas and W. India.—One of the handsomest in fr., but more tender than the Japanese species. There is a var. with white fr.

AA. *Lvs. glabrous beneath, but glandular: corolla glandular outside.*

Japónica, Thunb. Shrub, 2–5 ft.: lvs. cuneate, elliptic or ovate-lanceolate, acuminate, crenately serrate, $2^1/_2$–5 in. long: cymes pedunculed, many-fld.: fls. pink or whitish: fr. violet. August. Japan. P.F.G. 2: p. 165.

purpùrea, Juss. (*C. gracilis,* Sieb. & Zucc.). Shrub, 1–4 ft.: lvs. cuneate, elliptic or obovate, coarsely serrate above the middle, entire toward the base, $1^1/_2$–3 in. long: cymes pedunculed, few or many-fld.: fls. pink: fr. lilac-violet. August. Japan, China. Gn. 23: 392.—Closely allied to the former, but smaller in every part.

C. cána, Linn. Shrub: lvs. broadly elliptic, shining above and whitish-tomentose beneath: fr. deep purple. E. India, China, Philippine Isl.—*C. dichotoma,* C. Koch = *C. purpurea.*—*C. lanata,* Schau., not Linn. = *C. pedunculata.*—*C. Mmmrazaki,* Sieb. = *C. Japonica.*—*C. mollis,* Sieb. & Zucc. Shrub, to 4 ft.: lvs. oblong-lanceolate, rounded at the base, tomentose beneath: fls. and fr. pink. Japan.—*C. pedunculata,* R. Br. Shrub: lvs. oblong-ovate, nearly sessile, and rounded at the base, green and slightly tomentose beneath: cymes slender-pedunculed. E. Ind., Austr. Sieb. Flor. d. Jard. 4: 97.—*C. rubella,* Lindl. Shrub or small tree, to 20 ft.: lvs. cordate-oblong, tomentose beneath: fr. purple. Himal., China. B.R. 11: 883. F.S. 13: 1359 (as *C. purpurea*).

ALFRED REHDER.

CALLIÓPSIS. Consult *Coreopsis.*

CALLIPHRÙRIA (Greek, *beautiful prison;* referring to the spathe inclosing the flowers). Written also Caliphuria. *Amaryllidàceæ.* Tender bulbs from New Granada, distinguished from Eucharis by the stamens, the filaments being petalid, with three large linear teeth on top, the middle one bearing the anther. The fls. appear with the lvs. Prop. by offsets. J. G. Baker. Amaryllideæ, p. 112.

Hartwegiàna, Herb. Bulb ovid, 1 in. thick, stoloniferous, with brown membranous tunics: lvs. bright green, firmer and more closely veined than in Eucharis, with an oblong-acute blade 4–5 in. long, 2 in. broad, narrowed into a petiole, which is flat above, and round beneath: scape slender, 1 ft. long: fls. 6–8, in an umbel, white; perianth 1 in. long and wide. Andes of Bogota. B.M. 6259. Int. in 1889 by Reasoner, who has never flowered it.

C. subedentàta, Baker = Eucharis subedentata.

CALLIPRÒRA is included in *Bradàea.*

CALLÍPTERIS (Greek, *beautiful fern*). *Polypodiàceæ.* A genus of ferns allied to Asplenium, with elongate sori formed on both sides of the veins, and the veins uniting to form meshes or areolæ. Some fifteen species are known from the warmer parts of both hemispheres. The following is the only one in cultivation. Culture of tropical Aspleniums.

prolífera, Bory (*Asplènium decussàtum,* Swz.). Lvs. 2–4 ft. long besides the stalks, which are 1–2 ft. long, with numerous pinnæ 6–12 in. long, 1–2 in. wide, with deeply crenate margins and frequently with bulblets in the axils; veins pinnate, with the branches of contiguous veins uniting. Polynesia and Malaya. L. M. UNDERWOOD.

CALLÍRHOË (Greek mythological name). *Malvàceæ.* POPPY-MALLOW. Seven native species of hardy, showy herbs of the easiest culture and deserving a much greater popularity. The two kinds mentioned are chiefly prop. by seeds, but the perennial species may also be prop. by cuttings. The name is also written *Callirrhoë.*

A. *Annual: involucre absent.*

pedàta, Gray. Fig. 319. Height 1–3 ft.: stem erect, leafy: radical, and lower lvs. round-cordate, palmately or pedately 5–7-lobed or -parted, the lobes coarsely toothed or incised, upper 3–5-cleft or -parted, usually into narrow divisions: fls. red-purple, cherry red, varying to lilac. Common in Texas. R.H. 1857, p. 430.

AA. *Perennial: involucre present.*

involucràta, Gray. Height 9–12 in., plant hirsute or even hispid: root large, napiform: stems procumbent: lvs. of rounded outline, palmately or pedately 5–7-parted

319. Callirhoe pedata.

or -cleft, the divisions mostly wedge-shaped, incised, the lobes oblong to lanceolate: fls. crimson-purple, cherry red or paler. All summer. Minn. to Tex. G.W.F. 26. R.H. 1862:171, as *C. verticillata*.

Var. **linearilòba,** Gray. Less hirsute than the type: stems ascending: lvs. smaller, 1–2 in. across, the upper or all dissected into linear lobes.—An excellent trailer, especially for rockeries. Thrives even in very dry soils, the root penetrating to a great depth. A sunny position is preferable.

J. B. Keller and W. M.

CALLISTÉMMA, CALLISTÉPHUS. See *Aster, China*.

CALLISTÉMON (Greek, *kallos*, beauty; *stemon*, a stamen; in most of the species the stamens are a beautiful scarlet color). *Myrtàceæ*. Bottle-brush. Australian shrubs: lvs. evergreen, short: fls. in dense, cylindrical spikes, at first terminal, but the axis growing out into leafy shoots; anthers versatile, with parallel cells opening longitudinally: fr. persisting several years. Prop. by ripened cuttings in sand under a handglass, which flower when small; or by seeds, but the seedlings are slow in reaching the flowering state. Rapid growers; very ornamental; greenhouse in the north; hardy in California, thriving in any soil and without irrigation.

A. *Lvs. flat, penninerved.*

speciòsus, DC. Lvs. thick, narrow-lanceolate, pubescent when young; spikes dense, large: fls. scarlet, the calyx and corolla pubescent; stamens obscurely or very shortly 5-adelphous. March–April. West Australia. B.M. 1761, as *Metrosideros speciosa*. Height 10 ft.

lanceolàtus, Sweet. Fig. 320. Height 6–10 ft.: lvs. crowded, thick, lanceolate, punctate, reddish when young; spike rather loose, of reddish fls. N.S.Wales. 6 ft.

rigidus, R. Br. Lvs. linear or narrowly linear-lanceolate, rigid, almost pungent-pointed: spikes dense: fls. red; anthers dark. New South Wales. 4 ft.

AA. *Lvs. channeled above, linear, nerveless or 1-nerved.*

linèaris, DC. Height 4 to 6 ft.: fls. dark or pale scarlet: fr. more globular and more contracted at the mouth than in *C. rigidus*. June. N. S. Wales.

J. Burtt Davy.

CALLÌTRIS (from the Greek for *beautiful*). *Coniferæ*, tribe *Cupressineæ*. About 15 trees or shrubs, growing in Africa and the Australian region, allied to Thuja. The small cones have 4–6 separating woody scales: lvs. small and scale-like, persistent. Of very attractive habit. The only species in the Amer. trade is

robusta, R. Br. Cypress Pine. Somewhat resembles our native red cedar, but is conical in form and very dense. It is a fine tree for tall hedges and windbreaks. Young trees planted out in S. Fla. make fine specimens, branching from the ground. In five years the plants reach 10–12 ft. high. Little known in this country. Queensland.

L. H. B.

CALLÙNA (Greek, *to sweep*; the branches are sometimes used for making brooms). *Ericàceæ*. Heather. Low evergreen shrubs with imbricated, scale-like lvs. in four rows, the branchlets therefore quadrangular: fls. in terminal racemes; corolla campanulate, 4-lobed, shorter than the 4-parted colored calyx; stamens 8: fr. capsular. One species in W. and N. Eu., also in Asia Minor; in E. N. Amer. in some localities naturalized. For culture, see *Erica*.

vulgàris, Salisb. (*Erica vulgàris*, Linn.). From ½–3 ft.: lvs. oblong-linear, obtuse, sagittate at the base, glabrous or pubescent: fls. small, in long, erect, rather dense racemes, rosy pink, sometimes white. Aug.–Sept.—Cultivated in many varieties: Var. **álba** (and var. *alba Hammondi*), with white fls.; var. **Alpórti,** of more vigorous growth, with rosy carmine fls.; var. **cárnea,** with flesh-colored fls.; var. **flóre-plèno,** with double

320. Callistemon lanceolatus.

rose-colored fls.; var. **pýgmæa,** forming low, moss-like tufts; var. **tomentósa,** the branchlets and lvs. with grayish tomentum. The Heather is a very handsome

small shrub, well adapted for borders of evergreen shrubberies, or for dry slopes and sandy banks and preferring sunny positions; it is also found growing well in swamps and in partly shaded situations. Cut branches keep their life-like appearance for many months. ALFRED REHDER.

CALOCHÓRTUS (Greek for *beautiful* and *grass*). *Liliàceæ*, tribe *Túlipeæ*. West American cormous plants, the occidental representatives of Tulipa. St. usually branched, and from a coated corm, more or less leafy; perianth of unequal segments, the outer ones the smaller and more or less sepal-like, the 3 inner ones large and showy and bearing glands and hairs; stigmas 3, sessile and recurved; stamens 6; fls. showy, shallow-cupped on the inner segments, arching. Nearly all the species are in cult. Monogr. by J. G. Baker, Journ. Linn. Soc. 14: 302–310 (1875); and by S. Watson, Proc. Amer. Acad. Arts and Sci. 14: 262–268 (1879). See also Colochorti in the Sierra Nevada, by George Hansen, Erythea, 7: 13–15; A. Davidson, Erythea, 2: 1–2, 27–30. L. H. B.

Calochortuses are natives of western North America. One or two extend into British America, and a few, belonging to a peculiar group, are found in Mexico; the remainder are natives of the United States, from Nebraska to the Pacific ocean. While the generic characteristics are unmistakable, the species and even varieties have the most variable tastes as to soil, exposure and climate. The Colorado desert and the summits of the Sierra Nevada, the heavy clay lands of Californian valleys, the volcanic soils of the foothills and the meadows of the Northwest, each has its own representatives of this beautiful tribe. The character of the genus can be treated better under the various groups. Nearly every known species is in cultivation to some extent. Some are readily grown, others present considerable cultural difficulties; but while there are some which will probably always be difficult to cultivate, there are many species—and the number includes the very best—which can be successfully grown by any one who is willing to give a little special care to their culture; and there are a few which possess such vigor and hardiness as to be adapted to extensive cultivation. All Calochortuses are hardy in the sense of withstanding extreme cold, but they will not withstand alternate thawing and freezing nearly so well; and thus we have the paradox of their going safely through severe eastern or European winters and suffering the loss of foliage in mild ones. They should be planted in the fall, and it is better to plant late, so that leaf growth is delayed until spring. Diverse as are their natural habitats, one soil will answer the needs of all. In my own experience, a light loam, made lighter with sand or sawdust, powdered charcoal, or spent tan-bark, is best. My very best results have been with a mixture of equal parts of a good light loam and spent tan-bark, with a little broken charcoal. Wallace, one of the most successful English growers, recommends making a bed sloping to the south, composed of leaf-mold and road grit in equal parts, with a smaller proportion of sharp sand. The idea is a light, porous, not too stimulating soil, with perfect drainage. Wallace recommends covering the beds with reeds to throw off the heavy rains. I accomplish the same end by such thorough drainage that the rains pass through quickly. It is better to lift the bulbs as soon as they ripen, and replant in the fall. Water sparingly at all times. They take well to pot culture with similar soils and treatment. While not to be forced rapidly, they considerably anticipate their out-of-door season. The same treatment can be used in cold-frame culture, but do not coddle them too much. Under suitable conditions they are really very hardy and tenacious of life, but excessive moisture, either in air or ground, is not to their liking after the flowering season arrives. Theoretically, all Calochortuses of Section A (Star Tulips) should have shade, and all Mariposas (AA) sunshine; but I find that the light shade of the lath-house suits all alike, giving much finer bloom in the Mariposas. The flowering season extends over three months, according to species. CARL PURDY.

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A. STAR TULIPS.—*Blossoms or fruit more or less nodding: inner perianth segments strongly arched.*

B. *Fls. subglobose, nodding: st. usually tall and branching.* GLOBE TULIPS.—These have a single long and narrow shining leaf from the base, and slender, flexuous, leafy stems, the perfection of grace in outline. The flowers are exquisite in delicacy of tints. Woodland plants.

1. **álbus,** Dougl. Fig. 321. Strong, 1 ft. high: fls. globular, pendent, 1 in. across, of a satiny texture, delicately fringed with hairs. Calif. B.R. 1661. F.S. 11: 1171.—Chaste and delicate.

321. Calochortus albus (×¼).

Var. **paniculàtus,** Baker. Lower: lvs. narrower, fls. smaller.

Var. **amœ̀nus,** Hort. Like *C. albus*, but rosy colored. Cent. Calif.

2. **pulchéllus,** Dougl. Similar, but fls. flatter, of pure yellow, the edges of petals with a line of stiff hairs: very handsome. Northwest Calif. B.R. 1662.

BB. *Fls. bell-shaped, erect when open, mostly lined with hairs, the pedicels becoming recurved: stem mostly low, and fls. often more or less umbellate.* STAR TULIPS PROPER.—Like the Globe Tulip, but smaller as a rule, and the fls. dainty open cups. All of the species resemble each other, and were first included under *C. elegans*.

3. **Maweànus,** Leichtl. Plant low (4–10 in.), usually branched: fls. white, purplish at the base, filled with silky hairs, the gland covered by a broad semicircular scale: capsule long-elliptic. Calif. N. B.M. 5976 as *C. elegans*.—Variable. Var. **màjor,** Hort. Fig. 322. Twice as large in all its parts. Var. **róseus,** Hort. Fls. tinged rose.

4. **Bénthami,** Baker. Resembles *C. pulchellus*: sts. low: lvs. narrow: fls. nearly erect, yellow, the segments ½ in. long and brown at the base. Sierra Nevadas, in Calif. J.H. III. 30: 549.

5. **cæruleus**, Wats. Similar to *C. Maweanus*, but lined and dotted with blue: low, 2–5-fld., the pedicels very slender: perianth ciliate inside: capsule nearly or quite orbicular. Calif., in the Sierras.

6. **élegans**, Pursh. Similar to the last: petals greenish white and purplish at base, bearded, little or not at all ciliate: gland covered by a deeply fringed scale. Oregon, Idaho.

Var. **amœnus**, Hort. Fls. lilac, large and showy. G.C. III. 15: 808.

Var. **Lobbii**, Baker (*C. Lóbbii*, Hort.). Dwarfer, alpine: fls. straw-colored, with dark eye; anthers less pointed. Ore.

Var. **nanus**, Wood (*C. Lyallii*, Baker). Subalpine, dwarf: petals narrow and usually more acute, more hairy and ciliate. Mts. Calif., N.

BBB. *Fls. bell-shaped; like* BB, *but tall (1 ft. or more), and stoutly erect, with several fine, erect caps, similar to C. Maweanus.* GIANT STAR TULIPS.—In this splendid group we have the very dainty, silky fls. and handsome, glossy lvs. of the Star Tulip, with a stout st. a foot or two high, and large fls. Unlike the others, they naturally grow in open places, and have a vigor and health which are a high recommendation.

7. **Tolmiei**, Hook. & Arn. Stout, a ft. high, generally branched: petals often more than an inch long, tinged lilac, with purple and white hairs: gland without a scale: capsule broad-elliptic, acutish. Mt. Shasta, N.—Remains a long time in bloom.

8. **apiculàtus**, Baker. Taller and stouter, with umbellate straw-colored fls. N. Idaho.

9. **Purdyi**, Eastw. Fls. silvery white, filled with blue hairs. S. Ore. G.C. III. 23: 395.—Very handsome.

BBBB. *Fls. bell-shaped, the petals naked or hairy only at the base: low: leaf solitary.* MEADOW TULIPS.—These Calochortuses are natives of wet meadows. *C. lilacinus* and *C. Vesta* grow well in all soils as long as well drained, and as garden plants thrive everywhere. In habit they are low, flexuous and leafy. The cups are open, erect and numerous, an inch or so in diameter.

10. **lilacinus**, Kellogg (*C. umbellàtus*, Wood). A handsome species, with large, clear lilac fls., hairy only at base: fls. 4–10, on long, slender scapes: capsule elliptic, obtuse. Grows naturally in wet meadows, and makes offsets freely. N. Calif. and Ore. B.M. 5804 as *C. uniflòrus*. Perhaps the same as the next.

11. **uniflorus**, Hook. & Arn. St. very short, bearing bulbs at base, 1–2-fld.: petals lilac, with purple claw and hairy on the lower half. Coast ranges, Calif.

12. **nudus**, Wats. Low, delicate: leaf solitary: fls. 1–6, umbellate, small, white or pale lilac, not hairy, denticulate. Calif., in the Sierras.

AA. MARIPOSA TULIPS.—*Blossoms on stout, erect pedicels, the stems stout and strict: fls. open-bell-shaped.* Excepting in B, the Mariposa or Butterfly Tulips have slender, grassy, radical lvs., stiff, erect stems bearing cup-shaped fls., and sparingly leafy and with an erect capsule. Bulbs small.

B. *Capsule acute-angled or winged: fls. lilac or white.* These are hardy species, growing in the meadows from Oregon to Montana, where they endure much cold. They form a connecting link between the Giant Star Tulips and the true Mariposas. Their lvs. are like those of the Star Tulips—long, broad and glossy. Like the Star Tulips, too, the seed-pod is handsome, 3-cornered and winged. The stems are stiffly erect: the fls. cup-shaped, not so brilliant as the true Mariposas, but very delicate: the plants are hardy, healthy and vigorous, and are to be highly recommended for cold climates.

13. **nitidus**, Dougl. Scape erect, but not stiff: leaf solitary, glossy, narrow: fls. 1–3, large and showy, lilac, yellowish, or white, with a deep indigo blotch in the center, lined with yellow hairs. Meadows, E. Ore. to Mont.—Very beautiful and showy.

14. **Greenei**, Wats. St. stout and branching, 1 ft., 2–5-fld.: sepals with a yellowish hairy spot; petals lilac barred with yellow below, and somewhat purplish, loose-hairy, not ciliate: capsule beaked. Calif. and Ore.

15. **longebarbàtus**, Wats. Slender, about 1 ft. high, bulb-bearing near the base, with 1 or 2 narrow radical lvs., 2-branched and usually 2-fld.: fls. erect or nearly so, lilac with yellow at base, scarcely hairy except the long-bearded gland. Washington.

16. **Howellii**, Wats. St. erect, 1 ft. or more, 1–2-fld.: lvs. very narrow: sepals ovate, short-acuminate; petals yellowish white, 1 in. long, denticulate, slightly ciliate near the base, brown-hairy inside, the gland yellow-hairy. Ore.

BB. *Capsule obtuse-angled.*

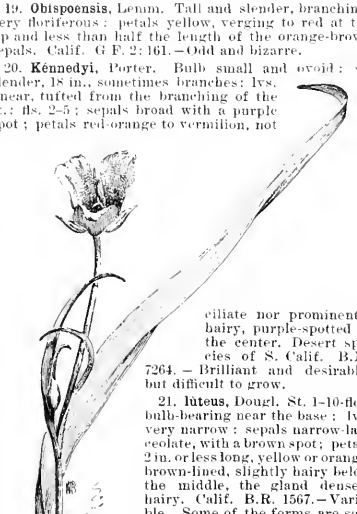
C. *Color yellow or orange or orange-red, more or less marked with brown and purple (except in forms of C. luteus): in cult. forms running into other colors.*

17. **Weedii**, Wood. Radical leaf single, glossy, broad: st. tall, leafy, bearing large orange-colored fls. dotted with purple: petals triangular, square-topped: gland small, hairy: bulb heavily coated with fiber. Calif. B.M. 6200, as *C. citrinus*. G.C. III. 16: 183.—Varies to white.

18. **Plummeræ**, Greene. Similar, but purple and very showy. Calif. G.C. III. 16: 133. J.H. III. 29: 289. Gn. 47: 999.—A fine species, with fl. of large size and full outline, lined with long, silky yellow hairs. It is the *C. Weedii*, var. *purpurascens*, of Watson.

19. **Obispoensis**, Lemm. Tall and slender, branching, very floriferous: petals yellow, verging to red at the tip and less than half the length of the orange-brown sepals. Calif. G.F. 2: 161.—Odd and bizarre.

20. **Kennedyi**, Porter. Bulb small and ovoid: st. slender, 18 in., sometimes branches: lvs. linear, tufted from the branching of the st.: fls. 2–5: sepals broad with a purple spot; petals red-orange to vermilion, not ciliate nor prominently hairy, purple-spotted at the center. Desert species of S. Calif. B.M. 7264.—Brilliant and desirable, but difficult to grow.



322
Calochortus Maweanus, var. major (×¼).

21. **luteus**, Dougl. St. 1–10-fld., bulb-bearing near the base: lvs. very narrow: sepals narrow-lanceolate, with a brown spot; petals 2 in. or less long, yellow or orange, brown-lined, slightly hairy below the middle, the gland densely hairy. Calif. B.R. 1567.—Variable. Some of the forms are sold as *C. venustus*.

Var. **citrinus**, Wats. (*C. venùstus*, var. *citrìnus*, Baker). Petals lemon-yellow, with a central brown spot.

Var. **oculàtus**, Wats. (*C. venùstus*, var. *oculàtus*, Hort.). Petals pale or white, lilac or yellowish, with a dark spot.

Var. **concolor**, Baker (*C. cóncolor*, Hort.). Petals deep yellow, marked with red bands, hairy below. Gn. 48: 1043.

22. **aùreus,** Wats. Very low: petals yellow, not hairy, the hairy gland purple-bordered. S. Utah.

23. **clavàtus,** Wats. Petals yellow lined with brown, the lower part bearing club-shaped (or clavate) hairs, the gland deep and circular; anthers purple. Calif.—In this excellent sort we have the largest-flowered and stoutest-stemmed of all Mariposas. The bulb is very large, the single bare leaf 1 or 2 ft. long; the st. is heavy, stout and zigzag. The fls are shaped like a broad-based bowl, sometimes 5 or 6 in. across. The color is a deep, rich yellow, and the lower half is covered thickly with stiff yellow hairs, each tipped with a round translucent knob, and in the light like tiny icicles. There are various strains: El Dorado, the largest, not so deep yellow; Ventura, very stout, deep yellow; Obispo, like the last, but the upper half of the back of each petal is olive brown, which shows through the deep yellow of the inside, giving changeable shades.

cc. *Color white or lilac: sometimes running into yellows.*

24. **venùstus,** Benth. BUTTERFLY TULIP. Stout, 6–36 in.: petals white or pale lilac, with a reddish spot at top, a brown-yellow center, and brown base: gland large and oblong, usually densely hairy: capsule 1–2½in. long. Calif. B.R. 1669. F.S. 2: 104. Gn. 46, p. 395.—Very variable. The yellow forms (as var. *sulphùreus,* Hort.) are often treated as forms of *C. lùteus.* To this group of Calochortuses is properly applied the Spanish name Mariposa (butterfly), for their brilliantly colored fls., with eye-like spots on each petal and sepal, and other delicate markings with dots, lines and hairs, which are strongly suggestive of the wings of a brilliantly colored butterfly. Botanists have variously divided this great group of allied forms between *C. lùteus* and *C. venùstus.* Botanically all can be considered as either strains of one variable species or as a number of closely allied species.

Var. **pictus,** Wallace (G.C. III. 18, p. 14). Creamy white, brilliantly marked, often with a gold blotch. Gn. 48, p. 277.

Var. **purpuràscens,** Wats. Petals deep lilac or purplish, darker at center, the fl. fully 3 in. across. Strong grower. Gn. 46: 986.

Var. **ròseus,** Hort. (*C. ròseus,* Hort.). Creamy white or lilac, with an eye midway and a rose-colored blotch at apex. Gn. 46: 986.

Var. **sanguíneus,** Hort. Fls. deep red, with very dark eye, and without the rose blotch at the apex. Perhaps a form of *C. lùteus.*

Var **Vèsta,** Hort. (*C. Vèsta,* Wallace). Tall, long-stemmed, vigorous, bearing large white fls. tinged with lilac and beautifully marked. Produces large offsets, which flower in 2 years. Gn. 46: 986.

25. **splèndens,** Dougl. Strong and tall, 1–2 ft.: fls. 2–3 in. across; petals large, pale, clear lilac, paler below, with a darker claw and scattered long, white hairs below the middle. S. Calif. B.R. 1676.

Var. **atroviolàceus,** Hort. Tall and slender: fls. 1–1½in. across, of a deep purple color, with a dark spot on the claw, and short hairs on the lower third.

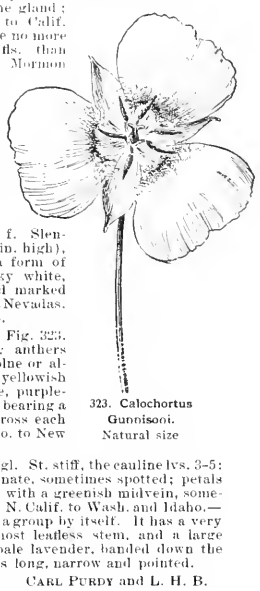
Var. **rùber,** Hort. As large as the type but deep, reddish purple, with a dark purple spot at base of claw.

26. **flexuòsus,** Wats. Related to *C. splèndens,* but with sts. so weak as to almost be said to creep. The fls. are large and very brilliant, a dazzling purple, with a darker purple eye, and yellow hairs below. S. Utah.—Int. by Purdy in 1897.

27. **Pàlmeri,** Wats. St. 1–2 ft., very slender and flexuous, 1–7-fld., bulb-bearing near the base: sepals with long, narrow, recurved tips, spotted; petals 1 in. or less long, white (or yellowish below), with a brownish claw and bearing scattered hairs about the gland: capsule very narrow. S. Calif.—The *C. Palmeri* of dealers is not always this species.

28. **Catalìnæ,** Wats. Habit of *C. venustus:* st. 2 ft., branching: fls. white to lilac, or deep lilac, very large and handsome, a large round black spot at base of each petal.—A lovely species between *C. splèndens* and *C. venùstus.* Remarkable for blooming with the Star Tulip section, fully a month before other Mariposas. Native to Santa Catalina Isl., off S. Calif.; also to Calif. coast.

29. **Nuttallii,** Torr. & Gray. SEGO LILY. St. slender, bulb-bearing at base, usually with only 1 cauline leaf, 1–5-fld.: sepals ovate-lanceolate, often dark-spotted; petals 1–2 in. long, white tinged with greenish yellow or lilac, with a purplish spot or band above the yellow base and hairy about the gland; anthers obtuse. Dak. to Calif. and N. Mex.—There are no more exquisitely beautiful fls. than these Sego Lilies (the Mormon name) of the Great Basin. Most of them are plants of the sagebrush deserts. The lvs. are an ashy green, the foliage scant, but the great fls. are wonderful in tintings. There are shades in blue, pink, lilac, and yellowish; also white.



323. Calochortus Gunnisoni. Natural size

30. **Leichtlinii,** Hook. f. Slender alpine species (5–6 in. high), by some regarded as a form of *C. Nuttallii:* fls. smoky white, banded with green and marked with dark brown. Sierra Nevadas. B.M. 5862. F.S. 20: 2116.

31. **Gùnnisoni,** Wats. Fig. 323. Much like *C. Nuttallii;* anthers acuminate: fls. light blue or almost white, delicate yellowish green below the middle, purple-banded at the base, and bearing a band of green hairs across each petal. Rocky Mts., Wyo. to New Mexico.

32. **macrocárpus,** Dougl. St. stiff, the cauline lvs. 3–5: fls. 1 or 2; sepals acuminate, sometimes spotted; petals 2 in. or less, acute, lilac with a greenish midvein, somewhat hairy. B.R. 1152. N. Calif. to Wash. and Idaho.—This fine species forms a group by itself. It has a very large bulb, a stout almost leafless stem, and a large flower of an exquisite pale lavender, banded down the back with green. Petals long, narrow and pointed.

CARL PURDY and L. H. B.

CALODÉNDRUM (Greek, *beautiful tree*). *Rutàceæ.* One of the handsomest deciduous trees at the Cape of Good Hope. Cult. in northern greenhouses, and outdoors in S. Calif. and S. Fla. Its great panicles of white or flesh-colored fls. are sometimes 7 in. across and 6 in. deep. A monotypic genus. It is a symmetrical tree, with attractive, evergreen foliage, and many interesting features. Called "Wild Chestnut" in Africa. Prop. by cuttings of half-ripened wood under glass in heat.

Capensis, Thunb. CAPE CHESTNUT. Height in Africa, 70 ft.: branches opposite, or in 3's: lvs. simple, decussate, ovate, obtuse, retuse or acute, parallel-nerved, 4–5 in. long, studded with oil cysts, which look like translucent spots when held to the light: panicles terminal; peduncles usually trichotomous: calyx deciduous: petals 5, linear-oblong, 1½ in. long, 2 lines wide, sprinkled with purple glands: stamens 10, 5 alternate, sterile, and petaloid: seeds 2 in each cell, larger than a hazelnut, black and shining. G.C. II, 19: 217.

CALOPHÁCA (Greek, *kalos,* beautiful, and *phaka,* lentil). *Leguminòsæ.* Deciduous shrubs or herbs, with alternate, odd-pinnate, pubescent, and often glandular lvs.: fls. papilionaceous, solitary or in racemes: pod pubescent and glandular, cylindrical. About 10 species from S. Russia to E. India. The two cultivated species are low, prostrate shrubs, with grayish green foliage, and rather large yellow fls. in erect racemes, followed by decorative, reddish pods. They prefer a well-drained soil and sunny position, and are well adapted for borders of shrubberies and sandy or rocky slopes. Prop. by seeds, sown in spring; the young seedlings should have plenty of light and air, as they are very liable to

damp-off if kept too moist and shady. Sometimes grafted high on Caragana or Laburnum, forming a very attractive, small standard tree.

Wolgárica, Fisch. Two–3 ft.: pubescent and glandular: lfts. 11–17, roundish ovate or oval, $\frac{1}{5}$–$\frac{1}{2}$ in. long: racemes long-peduncled, with 4–7 fls.; corolla over $\frac{3}{4}$ in. long. June–July. S. Russia, Turkestan.—*C. grandiflora*, Regel, is similar, but lfts. 17–25; racemes 10–16-fld.; corolla 1 in. long. S. Russia. Gt. 35: 1231.

ALFRED REHDER.

CALOPHÝLLUM (Greek, *beautiful-leaved*). *Guttiferàcea*. Tropical trees, with shining, leathery, evergreen penninerved lvs. and panicled fls. The following is cult. outdoors in S. Fla. and S. Calif., and possibly in northern warmhouses. Prop. by cuttings.

Inophyllum, Linn. Branches terete; lvs. obovate, usually marginate; fls. white, fragrant, in loose, axillary racemes; peduncles 1-fld., usually opposite; sepals 4; fr. reddish, as large as a walnut. E. Tropics.—Int. by Reasoner, 1893. Also in S. Calif. A tall tree, with beautiful glossy lvs. and white fls. Oil is extracted from the seeds. Has medicinal properties.

CALOPÒGON (Greek, *beautiful beard*). *Orchidàcea*. One of our daintiest native orchids, with pink fls. an in. across, grass-like lvs., and a small bulb. The lip is on the upper side of the flower, spreading, distant from the column, with a narrowed base. One of the choicest hardy bog plants. A moist and shaded position and very porous soil are most suitable for this pretty plant, though I have seen it do admirably well on a rockery only slightly shaded at midday, but here the plants were watered very freely every day during hot or dry weather. Prop. by offsets, separated from the old tubers, but the old established plants should not be disturbed very often. Collected clumps of all our native orchids are offered at very reasonable figures, and these give immediate satisfactory results, while the small offsets would not be strong enough to flower for several years, and require much attention during the first year, or perhaps longer.

pulchéllus, R. Br. Height 12–18 in.: scape 2–6-fld.; fls. pink, magenta, or purple: lip bearded with white, yellow, and purple club-shaped hairs. Bogs, Newf. to Fla., west to Minn. and Mo. G.W.F. 14. G.F. 10: 505. J.H.III. 35: 45. B.M. 116, as *Limodorum tuberosum*.—Eleven fls. on a scape is the average number in Pennsylvania bogs.

J. B. KELLER and W. M.

CALOTHÁMNUS (Greek, *beautiful bush*). *Myrtàcea*. Australian shrubs somewhat similar to Callistemon but more graceful in habit: lvs. long, alternate: fls. showy, usually red, in lateral clusters: stamens united in bundles opposite the petals; anthers erect, attached by the base, oblong or linear; cells parallel, turned inwards, opening by longitudinal slits. Ornamental greenhouse shrubs. Hardy out of doors in California. For cult., see *Callistemon*.

quadrifidus, R.Br. Height 2–4 ft.: lvs. narrow, terete or slightly flattened, heath-like, glandular-dotted; fls. rich crimson, 4-merous; calyx 2-lobed in fruit; staminal bundles nearly equal, of 15 to 20 or more filaments. W. Austral. B.M. 1506.

J. BURTT DAVY.

CALPÚRNIA (after Calpurnius, an imitator of Virgil, because these plants are allied to Virgilia). *Leguminòsæ*. Trees and shrubs from tropical and southern Afr. cult. out of doors in S. Calif. Lvs. odd-pinnate; racemes long, axillary and terminal: fls. yellow.

sylvática, E. Mey. Shrub, 6–10 ft. high: lvs. 2–6 in. long: lfts. in 3–10 pairs, membranous, obovate-elliptical, retuse or obtuse: fls. $\frac{1}{2}$ in. long: ovary glabrous. Caffraria.—Also rarely cult. north as a greenhouse shrub.

lasiógyne, E. Mey. (*C. aùrea*, Benth.). A taller shrub, with larger lvs. and fls., more coriaceous, more pubescent, and exactly elliptical or oblong leaflets. The silky ovary at once distinguishes it. Natal.

CÁLTHA (Latin name of the Marigold). *Ranunculàcea*. A genus of beautiful marsh plants, about 10 species, of temperate and frigid regions. Succulent, perennial herbs, glabrous, with a fascicle of strong, fibrous roots: lvs. simple, rather rounded-cordate at base: fls. yellow, white or pink; sepals large, deciduous, petal-like; petals none; stamens numerous, carpels sessile, becoming follicles, with two rows of seeds. They flourish best in wet places near running water. Though naturally bog plants, they succeed admirably well in an ordinary border in rather rich soil. They should be introduced more liberally into the flower garden, where they flower very freely year after year, and generally mature a second quite abundant crop of bloom in the fall. The flowers last a long time in water, and sell readily in the cut-flower market. Monogr. by G. Beck, in Kaiserlich-Königliche Zoöl.-Bot. Gesellschaft (Vienna, 1886), 36: 347–363; E. Huth, Monogr. in Helios 9: 69–74.

biflora, DC. No true stem; scape slender, usually 2-fld.: lvs. as in *C. palustris*: sepals 6–9, nearly white or sometimes bluish: follicles at maturity distinctly stalked. Spring. Calif. to Alaska. Int. 1881.

leptosépala, DC. Stout scape, 8–12 in.: lvs. all basal or barely one on stem; nerves at base nearly parallel, otherwise like those of *C. biflora*: sepals 7–10, oblong, becoming narrower, white; fls. solitary: follicles scarcely stalked. May–June. Alaska to Wash. and Colo. Gn. 30: 565.

palústris, Linn. MARSH MARIGOLD. Stem hollow, 1–2 ft., branching, several-fld.: lvs. cordate or reuiform, dentate, crenate or entire: fls. bright yellow, 1–2 in. broad; sepals 5 or 6, rarely 7: follicles compressed, $\frac{1}{2}$ in. long. Apr.–June. Wet ground. Carolina to Canada and westward. Gt. 47, p. 630. D. 115, pl. 35.—Used before flowering in the spring as "Cowslip greens." Var. **mon-**

324. Calycanthus floridus.

strósa-plèno, Hort. (var. *flore-pleno*, Hort.). An improvement on the above: fls. larger, of greater substance, and often much doubled. Very beautiful.

K. C. DAVIS and J. B. KELLER.

CALTROPS. *Trapa.*

CALYCÁNTHUS (*Kalyx* and *anthos*, flower; the calyx is large and conspicuous). *Calycanthàceæ*. CAROLINA ALLSPICE. SWEET-SCENTED SHRUB. Deciduous shrubs of aromatic fragrance: lvs. opposite, petioled, entire, usually rough above; fls. terminal or axillary, solitary, rather large, with numerous sepals and no distinct petals; stamens 5–23; fr. capsule-like, but not dehiscent, like the rose-hip, formed by the calyx tube and containing numerous akenes. Six species in N. America and E. Asia. Ornamental shrubs, with rather large, handsome foliage and mostly sweet-scented fls.; they are almost hardy north, except *C. occidentalis* and *C. præcox*. They grow in almost any well drained and somewhat rich soil, and succeed as well in shady as in sunny positions. Prop. by seeds sown in spring; also, increased by layers put down in summer, and by suckers or division of older plants.

A. *Winter-buds without scales, very small; fls. brown, in summer.*

B. *Lvs. densely pubescent beneath.*

flóridus, Linn. Fig. 324. Three–6 ft.; lvs. oval or broad-ovate, acuminate, dark green above, pale or grayish green beneath, $1\frac{1}{2}$–3 in. long; fls. dark reddish brown, fragrant, about 2 in. broad. Va. to Fla. B.M. 503.—This species is the most cultivated for its very fragrant fls.

BB. *Lvs. glabrous beneath or nearly so; fls. slightly or not fragrant.*

férvidus, Walt. (*C. férox*, Michx. *C. laevigàtus*, Willd.). Three–6 ft.; lvs. usually elliptic or oblong, acute or acuminate, green beneath, 2–$5\frac{1}{2}$ in. long; fls. reddish brown, $1\frac{1}{2}$ in. broad. Alleghanies. B.R. 6: 481.

glaúcus, Willd. Fig. 325. Four–6 ft.; lvs. usually ovate or oblong-ovate, acuminate, glaucous beneath, 2–$4\frac{1}{2}$ in. long; fls. reddish or yellowish brown, $1\frac{1}{2}$ in. broad. Va. to Ga. B.R. 5: 404.—Var. **oblongifólius**, Nutt., with oblong-lanceolate lvs.

occidentàlis, Hook. & Arn. (*C. macrophýllus*, Hort.). To 12 ft.; lvs. usually rounded at the base, ovate or oblong-ovate, green beneath and sometimes slightly pubescent, 4–6 in. long; fls. light brown, 3 in. broad. Calif. B.M. 4808. F.S. 11: 1113. R.H. 1854: 341.

325. Calycanthus glaucus (× $\frac{1}{3}$)

AA. *Winter-buds with scales; fls. before the lvs., axillary, with 5 fertile stamens. (Chimonanthus.)*

præcox, Linn. (*Chimonánthus frágrans*, Lindl.). Lvs. elliptic-ovate or oblong-lanceolate, acuminate, green and glabrous beneath, 3–5 in. long; fls. very fragrant, 1–$1\frac{1}{2}$ in. broad, outer sepals yellow, inner ones striped purplish brown. China, Japan. B.M. 466. B.R. 6: 451. L.B.C. 7: 617. G.C. III. 11: 213.—Desirable for temperate regions for its very early, sweet-scented fls.

The newly introduced *C. nitens*, Oliv., from China, allied to *C. præcox*, has the lvs. coriaceous, long-acuminate, shining and smooth above. ALFRED REHDER.

326. Calypso borealis.

CALYCÓTOME (*Kalyx*, and *tome*, a section or cut; calyx looks as if cut off). *Leguminòsæ*. Low, spiny, divaricate shrubs; lvs. 3-foliolate, deciduous; fls. papilionaceous, yellow, fascicled or in short racemes; calyx truncate, obscurely denticulate. Four species in the Mediterranean region, of which two are sometimes cultivated; not hardy north. They prefer a sunny position and well drained soil. For prop., see *Cytisus*.

villòsa, Link. Two–4 ft.; branchlets grayish tomentose; leaflets obovate, densely silky beneath, under $\frac{1}{2}$ in. long; fls. $\frac{1}{2}$ in. long, 3 or more, fascicled; pod villous. May, June.—It is excellent for dense, low hedges.

spinòsa, Link. Closely allied, but somewhat larger in every part, and with glabrous branchlets and pods; fls. solitary or few. B.R. 32: 55. ALFRED REHDER.

CALÝPSO (from the Greek goddess, whose name signifies concealment; referring to its rarity and beauty). *Orchidàceæ*. One of our rarest and most prized native orchids, a delicate bog plant, 3–4 in. high, with a small bulb, one roundish or ovate, striated leaf, and one pink flower with a spotted sac. A monotypic genus. For culture, see *Calopogon*; but more difficult to grow than that plant.

boreàlis, Salisb. Fig. 326. Leaf an inch wide and long; scape 3–4 in. high, with about 3 sheaths; sepals and petals similar, ascending, lanceolate, acuminate, pink; lip larger than the rest of the fl., with brown spots in lines and purple and yellow markings, woolly-hairy within; column petal-like, ovate, bearing the lid-like anther just below the apex. Maine to Minn. and N.; also Eu. Abundant in parts of Oregon and Washington. B.M. 2763.

CALYPTRÓGYNE (Greek-made name). *Palmàceæ*, tribe *Arèceæ*. Spineless stoloniferous palms, with short or long caudices, ringed below; lvs. terminal, unequally pinnatisect; segments a few joined together, narrow or broad, falcate, very long-acuminate, plicate; margin

recurved at the base; nerves numerous; petiole very short; sheath short, open; spadices simple or branched at the base, long-pedunculate; spathes 2, narrow, the lower much shorter than the peduncle, split at the apex, the upper deciduous, elongated, split its entire length; bracts connate, bordering the lower lip of the flower-bearing cavity; bractlets minute; fr. small, oblong or obovoid. Species 8. Trop. Amer.

Ghiesbrechtiana, H. Wendl. (*Geonoma Ghiesbreghtiana*, Lindl. & H. Wendl.). Stem short or almost none; petiole 5 ft. long; lvs. elongate-oval; segments in 6 pairs, unequal, almost opposite, rather remote, lanceolate, very long-acuminate, falcate, the two uppermost on each side very wide. Chiapas, Mex.

C. spicigera, H. Wendl. Stem evident; lvs. irregularly pinnate, 3 ft. or less long, the stalks flat on upper side. Guatemala.—*C. Swartzii*, Hort., is a Geonoma.

Calyptrogynes are handsome palms, seldom seen outside of large collections. Special care must be given to the soil so that it will be sweet and porous, especially after the plants leave the seed-pan. Well-drained pots and a little charcoal mixed with the soil, and the plants kept in a uniformly moist state, are conditions essential to the healthy growth of the plants.

In this genus, *C. Ghiesbrechtiana* is the most widely known species, another garden name for which is *Geonoma Verschaffeltii*. These are shade-loving palms, having leaves of comparatively thin texture, and consequently are subject to attacks of red spider unless properly cared for in regard to moisture. Calyptrogynes are most useful in a small state, old plants in general being rather leggy and poorly furnished.

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

CALYSTĒGIA. See *Convolvulus*.

CALYX. The outer floral envelope. See *Flower*.

327. Camassia esculeota.

CAMÁSSIA (*Quamash* or *Camass* is the Indian name). *Liliàceæ*. Fls. blue, purple, or whitish, with 6 spreading, 3–7-nerved sepals, and 6 filiform stamens, filiform style, and 3-angled, 3-valved, several-seeded capsule. The Camassias are bulbous plants, found only in the temperate regions of N. Amer., and closely allied to Scilla. Bulb, as in Scilla; the many lance-shaped lvs. sheathing at base: st. erect, many-fld., bracted below each flower, and flowering in long succession from the bottom. The genus has not been carefully studied, and many forms are confused under the same names. Monogr. by J. G. Baker, Jour. Linn. Soc. 13: 256; S. Watson, Proc. Amer. Acad. Arts and Sci. 14: 240. On questions of nomenclature, consult Coville, Proc. Biol. Soc. Wash. 11: 61.

Camassias are natives of rich meadows, very wet in winter and spring but dry in summer. They do well in any good loam, avoiding too rank manures. They are perfectly hardy. Bulbs should be set in early fall, at a depth of 4–6 inches, and left undisturbed. As cut-flowers, they open in long succession. The bulbs produce offsets very sparingly. Seeds grow readily, and seedlings bloom in three to four years.

A. *Plant 2 ft. or more high, robust: fls. very many (30 or more).*

Cusickii, Wats. Bulb very large (weighing 4–8 oz.): lvs. numerous, broad, glaucous, somewhat undulate (15 in. long, often 1½ in. wide): st. often 3 ft. high: fls. 30–100, very pale, delicate blue; segments spreading, crinkled at the base, faintly 3–5-nerved. Ore. G.F. 1: 174. —One of the best of the genus. Differs from *C. esculenta* in its larger bulb, more numerous lvs. and stouter and more clustered habit. Grows on drier land. Hardy in New Eng., and grows well in good garden soil.

AA. *Plant usually less than 2 ft. high, with shorter spikes: fls. fewer.*

esculénta, Lindl. CAMASS. Fig. 327. Not very stout, 1–2 ft.: lvs. ⅜in. or less broad: fls. 10–40, dark blue or purple, the perianth irregular (5 segments on one side and 1 on the other, and deflexed); segments 3–5-nerved and a little longer than the stamens, narrow and channeled at the base: pedicel not exceeding the fls.: capsule ovate to oblong, obtuse, transversely veined. Calif. to Utah and N. B.R. 18: 1486. F.S. 3: 275. Gn. 46, p. 339, 983.—Bulb cooked and eaten by the Indians. The fls. vary to white.

Leichtlinii, Wats. Stout, often 3 ft. high: fls. cream-colored, ranging to white, nearly regular, the stamens and style ascending; segments broad and flattened at the base, usually 5–7-nerved: capsule oblong-ovate, emarginate, obliquely veined. Mts., Calif., N. B.M. 6287, as *C. esculenta*, var. *Leichtlinii*, Baker.—Purple-fld. Camassias are sometimes referred to this species, but it is doubtful if they belong with it.

Hówellii, Wats. Bulb rather small: lvs. few, 1 ft. long and less than ½in. wide: st. often 2 ft. high, many-fld., with spreading pedicels twice or more longer than the linear bracts: fls. pale purple, opening in the afternoon, the segments ½in. long, 3–5-nerved: capsule small, broadly triangular-ovate and very obtuse. Ore. —Int. 1892 by Pilkington & Co.

Fràseri, Torr. Scape 12–18 in. high: lvs. keeled: fls. light blue, smaller than in *C. esculenta*: segments 3-nerved: pedicels mostly longer than the fls. Penn., W. and S. B.M. 1574, as *Scilla esculenta*.

Var. **angùsta**, Torr. (*C. angústa*, Hort.). Very slender, and lvs. narrower (¼in. wide): fls. smaller, ⅓ or ¼in. long. La. and Ark. to Tex.

L. H. B. and CARL PURDY.

CAMBIUM is a nascent layer of tissue between the wood and bark of trees and shrubs. From it is developed secondary wood and bast. The thickening of stems and roots is mainly due to activity of the cambium. It is most evident in June and July, when tissues are rapidly forming. Woodsmen take advantage of this to peel bark. Boys also take advantage of the readiness with which bark and wood separate at the cambium to make whistles of basswood or willow. Trees are more easily bruised at this time in the year than at any other. The cambium plays an important part in the healing of wounds upon stems. It is the union of the cambium layers of cion and stock that makes grafting possible. W. W. ROWLEE.