MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XI

WITH 35 PLATES

1923

ST. LOUIS, MISSOURI

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BY THE BOARD OF TRUSTEES

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Missouri Botanical Garden Bulletin

Vol. XI St. Louis, Mo., January, 1923 No. 1

THIRTY-FOURTH ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the thirty-fourth annual report of the Director.

The year 1922, while showing general progress in the various departments of the Garden, has no single feature to emphasize, such as the erection of a new main entrance or the construction of special greenhouses or exhibits. Perhaps the one thing to be noted in which the greatest progress over previous years has been made is the very considerable increase in the reputation and recognition of the Garden, particularly in this country. It may safely be said that never before was the service rendered by the Garden to plant lovers throughout the world so great as at the present time. Quite apart from the local demands made upon an institution of this sort for information about plants and general gardening practices, the inquiries from this country and abroad indicate that the Missouri Botanical Garden is coming to be almost universally regarded as one of the chief centers for accurate botanical and gardening information. Business firms are likewise beginning to realize that, because of our laboratory, library, and herbarium facilities, we are in a position to give much-needed advice concerning the tremendous number of plant products entering into commercial life.

One reason for this development is the unusual publicity which the Garden is now receiving through newspapers and magazines published outside of St. Louis. Hardly a month passes without one or more articles from the BULLETIN being reprinted elsewhere, and probably more special write-ups of the Garden have appeared, or will appear shortly, than ever before in its history. Talks about the Garden over the radio

have brought requests for further information from most of the surrounding states, and the practice of the leading film companies of putting the various flower shows into their movie circuits, both in this country and abroad, has undoubtedly brought the Garden to the attention of people who never heard of it before.

In so far as has been possible the Garden has prepared special exhibits calculated to be of interest to visitors attending the more important conventions in the city. For example, there was provided, on the occasion of the meeting of the American Medical Association last May, an exhibit of old herbals, accompanied by a talk on the subject to representatives of the medical libraries; a special demonstration of the diseases of plants calculated to be of interest to medical men; and a miniature reproduction of the old Chelsea Physic Garden. The latter was of special interest, since it was laid out and planted entirely by the disabled soldiers working in the School for Gardening. This garden, which contains practically all of the medicinal plants that can be grown successfully out of doors in St. Louis, will be retained as a permanent feature. Classes from the St. Louis School of Pharmacy now make regular visits to this garden, where they find many valuable and interesting object lessons to pharmacists. The large number of exotic plants of both medicinal and economic importance growing in the greenhouses also attract much attention from these students.

Still another means of calling the attention of the public to the Garden has been through the two special flower shows held in St. Louis during the past year. One of these, put on by the St. Louis Garden Club and held in the floral display house, attracted some 28,000 visitors in two days, and there can be no question that the continuation of such an annual show will do much towards increasing in St. Louis the development of a love for gardens and the consequent beautifying of the city and its surroundings. The fall flower show, held at the Coliseum under the auspices of the professional florists, gardeners, and horticulturists of St. Louis, as well as the St. Louis Garden Club, was the most successful show of the kind ever held in St. Louis. The Missouri Botanical Garden exhibited chrysanthemums, as well as their special collection of plant curiosities, and the new white water-lily, *Nymphaea* "Mrs. George H. Pring," was awarded a special medal by

the Society of American Florists and Ornamental Horticulturists.

The backward spring, followed by a summer of unprecedented drouth, entailed much additional work in order that outdoor display features be maintained in an attractive and presentable condition. Few people realize the difficulties involved in growing successfully the large number of plants and trees maintained at the Garden in spite of a combination of adverse atmospheric and climatic conditions which is not to be found in any other city where a similar garden is established. Years of experience have enabled us to grow plants, both in the greenhouses and out of doors, in spite of the unfavorable environment, but conditions are constantly growing worse, and there can be no question but that the difficulties of making a satisfactory display are considerably greater than they were ten years ago.

The Federal Quarantine Act, which makes it so much more difficult and more expensive to obtain, from at home or abroad, plants for replacement, has forced the Garden to maintain very much larger reserve supplies. In consequence, the nursery has been considerably extended during the past year and the number of trees and hardy perennials, particularly roses, has been more than doubled. In fact, the ease and cheapness with which these plants could formerly be obtained made it unnecessary for the Garden to maintain a nursery of any extent, while at the present time it is becoming one of its most important departments. Seeds, which can still be obtained without much difficulty from foreign gardens and correspondents throughout the world, are now received in large quantities, and the number of seedlings grown from such sources exceeds by many times those formerly maintained.

The usual displays of blooming plants have been arranged in the floral display house throughout the year, and the effect obtained has been as satisfactory as could be expected. The plan of establishing iris, daffodils, and other bulbous plants in the arboretum and similar tracts has been continued, and the spring display from these plants as they have become established is increasing in attractiveness every year. The wet spring and absence of early frosts made the autumn appearance of the Garden a matter of special comment. The brilliant colored fruits of many trees and shrubs attained a perfection not seen in the city for a great many years.

Construction and repair work has been of a more or less routine character. A new concrete bridge leading from the wild flower garden into the arboretum was completed, and a sprinkling system installed in the rose garden and perennial garden. Two of the boilers established at the time the central heating plant was built were retubed, and certain other minor changes in the heating system were attended to. The rock work in the succulent house was rebuilt, and this permitted the inclusion of many new specimens as well as the rearrangement of the older plants. Particular attention was paid to painting, including over a mile of wire and iron fence surrounding the Garden, as well as inside work on the floral display and palm houses.

ATTENDANCE FOR THE YEAR 1922

	Week-days	Sundays
January	4,533	6,923
February	4,260	4,737
March	5,583	6,374
April	10,972	16,533
May	18,212	30,777
June	19,919	8,052
July	16,696	6,633
August	14,300	11,650
September	9,236	9,413
October	13,665	11,440
November	39,440	49,087
December	5,088	4,509
	161,904	166,128
		161,904
Total		328,032
Total attendance for the year 1921		291,816
Increase for 1922		36,216

ANNUAL BEQUESTS

The annual flower sermon, provided for in the will of Mr. Shaw, was preached at Christ Church Cathedral on Sunday, May 14, by the Rt. Rev. C. S. Quin, Bishop Coadjutor of Texas.

The $500 bequest, provided by Mr. Shaw "For premiums or prizes at a flower show or exhibit" was bestowed in prizes at the spring flower show of the Garden Club of St Louis, held at the Missouri Botanical Garden, and at the fall flower show under the auspices of the St. Louis Flower Show Association, held at the Coliseum.

RESEARCH AND INSTRUCTION

During the entire year the third-floor laboratory has been more than crowded with the research work in progress. At the beginning of the academic year 1922-23 it was found necessary to expand in some way, and laboratory space was also arranged in the south basement. Owing to the uses to which this basement is already put, and likewise owing to the conditions of light and ventilation, further expansion in this way is impossible without costly alterations.

Three courses involving lectures—besides the usual research courses—have been offered during the first term of the academic year, and a similar number are arranged for the second term. The need of space for laboratory course work has been temporarily supplied by utilizing a portion of the lecture hall. Such arrangements emphasize the pressing need of a laboratory wing or building. The library is of necessity encroaching upon all available space, and provision for the laboratories would permit of the necessary library expansion. The demand for a laboratory building has, moreover, on other grounds been warranted for some time, since it is impossible to provide all required types of modern equipment, power, and supplies in the present quarters without reconstruction and without seriously marring the building in respect to its probable ultimate use.

The School for Gardening, which, as announced in the last annual report, was to be reorganized and reopened in the fall, is now an established fact. Dr. Edgar Anderson, of the Michigan Agricultural College and Bussey Institution of Harvard University, took charge at the opening of the school year, and there are now some eighteen students enrolled. A full account of the courses offered and a general plan of the School appeared in the BULLETIN for June, 1922.

Graduates, Fellows, and Investigators.—The following is a list of those to whom have been extended the regular privileges of the laboratories, whether as graduate students, candidates for degrees in Washington University, or as special investigators doing co-operative or independent research; likewise special lists of the several fellowship groups:

Graduate students.—H. R. Rosen and F. S. Wolpert, formerly Rufus J. Lackland research fellows; C. G. Deuber, formerly teaching fellow in Washington University; Cora A. Mautz, instructor in botany in the Principia School; Harry

M. Jennison, formerly assistant professor of botany in the University of Montana; A. F. Camp, C. C. Epling, L. J. Klotz, S. G. Lehman, S. R. Warner—all Rufus J. Lackland research fellows; Grace E. Howard and Mildred L. Johnson—Jessie R. Barr graduate fellows in Washington University; L. E. Tisdale, instructor in botany in Washington University; Marion A. Griffiths, assistant pathologist, Cereal Disease Investigations, U. S. Department of Agriculture; and H. C. Young, special research fellow of the National Research Council (Crop Protection Institute).

Besides affording space for the above and for members of the regular scientific staff of the Garden, the research laboratories are also utilized by Dr. Joanne K. Armstrong (research assistant), Dr. George M. Armstrong (assistant professor of botany in Washington University), and Dr. Nellie Carter (teaching fellow in Washington University).

Rufus J. Lackland Fellows.—Mr. Arthur F. Camp, A. B. University of California, assistant in plant pathology, University of California, reappointed second year; Mr. Carl C. Epling, A. B. University of California, instructor in botany, Oregon Agricultural College; Mr. Leo Joseph Klotz, B. S. and M. S. Michigan Agricultural College, reappointed second year; Mr. Samuel George Lehman, B. S. Ohio University, M. S. North Carolina State College, assistant in botany, North Carolina State College, assistant pathologist, North Carolina Agricultural Experiment Station; Mr. Selden Richard Warner, B. S. William and Mary College, M. S. Cornell University, head of biology department, Sam Houston College, Huntsville, Texas.

Jessie R. Barr Fellows.—Miss Mildred Lewis Johnson, B. S. Oregon Agricultural College, M. S. Washington University, assistant in botany, University of Oregon; Miss Grace Elizabeth Howard, A. B. and M. S. University of Washington, graduate assistant, University of Washington.

Teaching Fellows.—Mr. Lionel E. Tisdale, B. S. Alabama Polytechnic Institute, M. S. Michigan Agricultural College, assistant state pathologist, South Carolina Agricultural Experiment Station, Clemson College; Dr. Nellie Carter, B. S., M. S., and D. Sc. University of Birmingham, Birmingham, England.

Teaching Fellow and Research Assistant.—Dr. Joanne Kar-

rer Armstrong, B. S. and M. S. University of Washington, Ph. D. Washington University, reappointed third year.

Fellowship of the Crop Protection Institute.—Mr. Harry C. Young, B. S. Ohio University, M. S. North Carolina State College, research assistant in plant physiology and instructor in botany, Michigan Agricultural College, was appointed by the committee in charge to the plant investigation fellowship maintained by the Crop Protection Institute, this fellowship being one of two remunerative and responsible ones established "in order to promote original research relative to the fungicidal and insecticidal properties of sulphur" and the effects of conditions on its action. This fellowship was located at the graduate laboratory of the Garden for 1922-23.

At the annual commencement of Washington University on June 8, the degree of Doctor of Philosophy was conferred upon the following members of the graduate laboratory: Harry M. Jennison, with a thesis entitled "Potato Blackleg, with Special Reference to the Etiological Agent," and Harry R. Rosen, the title of whose thesis was "A Bacterial Disease of Foxtail *(Chaetochloa lutescens)*." The degree of Master of Science was conferred on Carl G. Deuber, Mildred L. Johnson, and Cora A. Mautz.

Following their graduation in June, Dr. H. R. Rosen was promoted to an associate professorship in plant pathology, at the University of Arkansas; and Dr. H. M. Jennison, after returning to his former position in Montana, was appointed professor of botany in the University of Tennessee.

Publications and Papers.—The delays of the previous year in the publication of the ANNALS have not been completely overcome, but Volume VIII has been completed and three numbers of Volume IX have appeared. Material is already at hand for more than three succeeding numbers. The articles actually published are listed below:

Armstrong, G. M. "Studies in the Physiology of the Fungi. XIV. Sulphur Nutrition: The Use of Thiosulphate as Influenced by Hydrogen-Ion Concentration."

Webb, R. W. "Studies in the Physiology of the Fungi. XV. Germination of the Spores of Certain Fungi in Relation to Hydrogen-Ion Concentration."

Burt, E. A. "Some North American Tremellaceae, Dacryomycetaceae, and Auriculariaceae."

Rosen, H. R. "Tilletia texana in Missouri."

Duggar, B. M., and Joanne L. Karrer. "The Sizes of the Infective Particles in the Mosaic Disease of Tobacco."

Burt, E. A. "The North American Species of Clavaria, with Illustrations of the Type Specimens."

Pfeiffer, Norma E. "Monograph of the Isoetaceae."

Payson, E. B. "A Monographic Study of the Genus Thelypodium and Its Immediate Allies."

Pring, G. H. "A New Hybrid Nymphaea."

In addition to the preceding, those listed below, by members of the Garden staff, have appeared in gardencraft and other periodicals. Besides these, attention should be drawn to many shorter and popular articles in the BULLETIN, and more especially to the lists of native and exotic plants suitable for the gardens of Missouri and adjoining states.

Jensen, L. P. "A College Course for Nurserymen"; "Oldest Living Trees"; and "Publications of Interest to Park Executives." Parks and Recreation, 1922.

Pring, G. H. "Factors to Be Considered in Breeding Water-Lilies." Gardeners' Chronicle of America, 1922.

Pring, G. H. "The Orchid Exhibit at the Missouri Botanical Garden." Gardeners' Chronicle of America, 1922.

Scientific and Popular Lectures.—During the year a number of lectures have been delivered, or papers read, on scientific and popular topics by members of the scientific and Garden staffs to special audiences as follows:

L. P. Jensen, January 9, before the St. Louis Florists' Club, "Our Vanishing Wild Flowers."

G. H. Pring, January 13, before the St. Louis Florists' Club, "A Trip Through the American and African Tropics."

G. H. Pring, January 31, before the Men's Club of the Church of the Redeemer, "The Relation Between Insects and Flowers."

B. M. Duggar, February 3, before the biologists of Washington University, "Filterable Diseases of Plants and Some Recent Studies on the Mosaic Disease of Tobacco."

George T. Moore, February 22, a discussion under the auspices of the St. Louis Natural History Museum Association, "Co-operation of Civic and Scientific Institutions in Establishing a Natural History Museum in St. Louis."

George T. Moore, March 1, before the Centenary Methodist Church, "What to See at the Missouri Botanical Garden."

B. M. Duggar, March 3, before the Webster Groves Nature

Study Society, "The Life Relations of Some of Our Wild Mushrooms."

L. P. Jensen, March 7, before the Study Club of Collinsville, Illinois, "Aboriculture."

George T. Moore, March 10, before the vocational class of Cleveland High School, "Professions Depending Upon Botany and Gardening."

Hermann von Schrenk, March 22, before the Engineering Societies, New York, "Destruction of Marine Piling."

L. P. Jensen, March 28, before the Junior High School Parents-Teachers' Association, Belleville, Illinois, "The Preservation of Wild Flowers."

L. P. Jensen, April 1, before the Danish Silver Cross Society, "American Parks and Gardens."

L. P. Jensen, April 7, before the graduating class of the Blair School, at the planting of their class tree in St. Louis Park, "The Value of Trees."

L. P. Jensen, April 7, before the North St. Louis Business Men's Association, at the memorial tree planting in Waterworks Park at Chain of Rocks, "The Value of Trees."

G. H. Pring, April 20, before the Women's Club of Carlinville, Illinois, "The Landscape Features of the Missouri Botanical Garden."

Hermann von Schrenk, April 20, before the conservation section of the Missouri Federation of Women's Clubs, "Forestry in Missouri."

G. H. Pring, April 20, at the Clifton Heights Presbyterian Church, "European Gardens."

L. P. Jensen, May 1, before the Parkview Association, at the Grace Methodist Episcopal Church, "The Planting and Care of Trees in St. Louis."

B. M. Duggar, May 1, before the St. Louis section of the American Chemical Society, at the Annex Hotel, "The Use of Micro-organisms in Industrial Chemistry."

G. H. Pring, June 2, before the senior students of the Cleveland High School, "Advantages Pertaining to the Profession of Gardening."

John H. Kellogg and L. P. Jensen, June 21, before the Natural History Museum Association, "Our Native Plants and How to Know Them."

G. H. Pring, June 22, before the Women's Christian Temperance Union, "God's Beautiful Flowers and How They are Used."

George T. Moore, August 3, before the Teachers' College, Columbia University, "A Modern Botanic Garden in Relation to Community Needs."

Hermann von Schrenk, September 15, before the convention of the American Association of Port Authorities, at Toronto, "Marine Borers."

L. P. Jensen, October 2, before the St. Louis Scout Masters' Association, at the Francis Home, "Some Interesting Facts About Trees."

B. M. Duggar, October 10, before the plant pathologists, at the University of Wisconsin, "Some Aspects of Current Research in Mosaic Diseases."

B. M. Duggar, October 10, before the biologists of the University of Wisconsin, "Micro-organisms and Environment."

G. H. Pring, October 10, before the St. Louis Aquarium Society, "Aquatic Plants."

L. P. Jensen, October 20, before the Boy Scouts of Webster Groves, at the Bristol School, "The Use of Trees and Shrubs."

George T. Moore, November 22, before the meeting of the St. Louis Library Association, at the Garden, "The Garden Library and Some of Its More Unusual and Rare Books."

HERBARIUM

The herbarium has continued a normal growth during the past year. The representation of the flora of North America, particularly the southwestern United States, has been greatly augmented. Substantial additions of plants also have been made from Mexico, Central America, the West Indies, South America, Europe, Africa and Australia. On account of the congestion in certain parts of the herbarium it has been necessary to shift a large part of the collection in order to gain sufficient space to insert the specimens mounted during the year. This change was effected during the summer months without great inconvenience to the department. Additional case-capacity, however, is necessary in order to care for adequately the rapidly growing collections. A large part of the curator's time has been devoted to a more thorough organization of several families of vascular plants in order that the

wealth of material may be more serviceable for comparison and study.

New Accessions.—The larger additions to the herbarium during the past year have been through field work and through the purchase of important sets of plants. Among the more noteworthy collections acquired are the following: E. Bartholomew, "North American Uredinales" 200; Dr. P. A. Van der Bijl, 26 fungi from South Africa; T. S. Brandegee, 143 plants of Mexico, collected by C. A. Purpus; B. F. Bush, 380 plants of Missouri and Oklahoma; Hon. Joseph R. Churchill and Walter Deane, 164 plants of New England; Ira W. Clokey, 208 plants of Colorado; Rev. John Davis, 2216 plants, mostly from Missouri and South Carolina; Dr. C. W. Dodge, 26 specimens of fungi from Massachusetts and British Columbia; J. A. Drushel, 162 plants of North America; D. Lewis Dutton, 226 plants of Vermont; Farlow Herbarium of Harvard University, 600 non-vascular plants; Mrs. Roxana Stinchfield Ferris, 918 plants of Texas; H. A. Gleason, 147 plants of Colombia, South America; Gray Herbarium of Harvard University, 134 plants of Nova Scotia and New England; J. M. and M. T. Greenman, 3000 plants of Central America; Mrs. Adele Lewis Grant, 67 specimens of *Mimulus;* Herbert C. Hanson, 312 plants of Colorado; Miss Caroline C. Haynes, 50 specimens of North American hepatics; J. M. Holzinger, 50 specimens of North American mosses; Max Koch, 155 plants of Australia; W. R. Lowater, 72 fungi of Ohio; New York Botanical Garden, 366 non-vascular plants of North America; M. Nijhoff, 850 cryptogams of Germany, Austria, and Switzerland, and 450 fungi of Germany; Prof. Adolf Carl Noe, 52 plants of Albania and Montenegro; Prof. Morton E. Peck, 538 plants of Oregon; Dr. P. O. Schallert, 96 mosses, hepatics and lichens of North Carolina; Dr. H. von Schrenk, 126 plants of Santo Domingo, and 167 plants from various parts of North America; United States Department of Agriculture, 186 grasses of the Hawaiian Islands and British Guiana, collected by Professor A. S. Hitchcock; University of Wisconsin, 30 specimens of fungi of Wisconsin; Theo. Oswald Weigel, 405 plants of the Nyassa Mountains in Africa, and 40 specimens of European *Centaurea;* Dr. J. R. Weir, 34 fungi of New Zealand; Dr. A. Yasuda, 25 fungi of Japan; Dr. S. M. Zeller, 30 specimens of fungi from Oregon. Numerous smaller collections have been received from correspondents and friends of

the Garden, which have been recorded in current numbers of the BULLETIN.

Mounting and Distribution.—Nearly 13,000 specimens have been mounted and distributed in the herbarium during the fiscal year. This number represents mainly the plants received during the year, thus rendering available for immediate use the newly acquired material.

Field Work.—The Curator of the Herbarium made a botanical expedition to Central America during January, February, and March. The countries visited were the Canal Zone, the Republics of Panama, Costa Rica, Nicaragua and Guatemala. The object of the expedition was two-fold; first, to study certain groups of plants in the field and to secure adequate material of them for monographic study; second, to make a general collection of Central American plants. Approximately 3000 specimens were obtained on the expedition. This collection greatly augments the Garden's representation of the flora of Central America. A complete report of the expedition cannot be made at the present time but the collections thus far studied contain a considerable number of rare plants and some new to science. In addition to the expedition to Central America, a limited amount of local field work has been carried on, and several local botanists and friends of the Garden have generously contributed to the herbarium plants of especial interest.

Exchanges.—Several important collections have been acquired by exchange with scientific institutions with which the Garden maintains exchange relations and from individual correspondents. A limited number of duplicate herbarium specimens have been distributed during the past year.

Use of the Herbarium by Outside Botanists.—A relatively large number of visiting botanists have consulted the herbarium at various times during the year. Several loans of herbarium specimens have been made to institutions for study by specialists in different parts of the country. Dr. Norma E. Pfeiffer, Assistant Professor of Botany at the University of North Dakota, who for several years has been occupied in the preparation of a monograph of the Isoetaceae, based primarily on the collections represented in the herbarium, has completed the work, and the monograph was published recently in the ANNALS OF THE MISSOURI BOTANICAL GARDEN.

Statistical Summary (For the year ending December 31, 1922).—

Number of specimens received on new accessions:

By purchase.....	7,493		
By gift.....	1,101		
By exchange.....	1,739		
By field work.....	3,000		
Total .....13,333 valued at $1333.30			
Number of specimens mounted and incorporated .....12,332 valued at $2466.40			
Number of specimens discarded from the herbarium..... 276 without value.			
Number of specimens in organized herbarium	898,364	valued at	$139,559.90
Number of specimens in unorganized herbarium	68,168	valued at	5,473.46
Wood specimens, etc., supplementing the herbarium.....		valued at	280.00
Microscope slides, etc.....		valued at	410.00
Total valuation.....			$145,723.36

LIBRARY

The daily library work of checking up and entering the current numbers of the hundreds of serial botanical publications which the library receives annually, collating the volumes for binding after their parts have made the round of the scientific staff, and finally distributing the bound volumes and other accessions of the year in their respective sections of the library, has been kept well in hand throughout the year. There have been few opportunities to pick up from sales of botanical libraries volumes lacking in our serial sets or other desiderata long since out of print, for the German dealers in such works now issue few and scanty lists instead of the voluminous catalogues of former times. Leipzig has been the principal mart for scientific books.

Use of Library by Botanists Not Connected with the Garden.—Many botanists have visited the Garden during the year to work up or to consult the literature in their special fields. There have been loans on the interlibrary plan of 129 books to 29 institutions for use by their botanists.

Cases for Linnaean and Prelinnaean Sections.—Steel cases having doors with locks, and containing about 215 feet of shelving, so spaced as to accommodate the rare illustrated herbals of the Prelinnaean period, which are the beginnings

of botanical science, and to hold also the important taxonomic books of the Linnaean period were installed during the summer. These irreplaceable books are now under lock and also protected from the dust and smoke of the city.

The portion of the library on floras arranged geographically, formerly on shelves on all the side walls of the office of the Secretary to the Director, was removed from that room during the summer and placed on the same floor in the space formerly occupied by the works on the ferns, mosses, algae, lichens, and plant morphology—all the latter having been moved to the basement. These extensive changes were necessary to keep books of the same section together.

Publications.—Parts 3 and 4 of Vol. VIII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN were issued in the first part of the year, completing the volume of 410 pages and 3 plates. Parts 1 and 2 of Vol. IX, containing 219 pages and 19 plates, have been published, and part 3 is in page proof. The ANNALS is our principal exchange for publications of scientific societies and institutions. The Garden publishes also, but chiefly for local circulation, the Garden BULLETIN, of which 10 volumes have been issued. While the BULLETIN was originally intended to serve primarily as a means of informing the public what is of particular interest at the Garden, special attention has been given to native and exotic plants suitable for the gardens of Missouri and adjoining states. It now apparently fills a distinct need among those amateurs interested in the establishment of gardens in this region, for its copies are in request throughout the state. Some 31 of the articles have been republished in various horticultural journals, and the BULLETIN is in increasing demand all over the United States. Visitors from the East and from the far West frequently ask to see some special plant or collection of which they have read in the BULLETIN or in some publication copying our articles.

Both the ANNALS and the BULLETIN are supplied to regular subscribers; separates of the various articles in the ANNALS are also for sale by the library. The cash receipts for the year from such sales and from Books of Views of the Garden were $1545.81.

Statistical.—There have been donated to the library, or received from our correspondents during the present year, 470 volumes, valued at $956.20, and 889 pamphlets, valued at $170.94; and 228 volumes were bought at a cost of $1058.09,

and 21 pamphlets, costing $9.75. The library now contains 39,181 books, and 52,297 pamphlets, a total of 91,478, valued at $133,644.69. There are also 330 manuscripts, valued at $1,609.80 and 964,958 index cards, valued at $10,025.88. A total of 7,002 index cards have been added during the year, of which 556 were typewritten by library employees, and 6,446 purchased at a cost of $135.31. Three hundred and thirty books were bound.

Respectfully submitted,

GEORGE T. MOORE,
Director.

STATISTICAL INFORMATION FOR DECEMBER, 1922

GARDEN ATTENDANCE:

Total number of visitors	9,597

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	16
Total number of books and pamphlets donated	194

HERBARIUM ACCESSIONS:

By Gift—

Bechtel, Professor A. R.—Fungi of Indiana	17
Boyce, J. S.—*Exobasidium Vaccinii* (Fuck.) War. on three new hosts, from Oregon	3
Bush, B. F.—Plants of Pennsylvania and Florida	3
Charlton, O. C.—Specimens of oak, from Dallas, Texas	8
Drushel, J. A.—Plants of Vermont, Alabama, Ohio, Missouri, and Colorado	24
Grant, Mrs. Adele Lewis—Specimens of *Mimulus*, mostly from California	67
Ledman, O. S.—*Erythraea venusta* A. Gray? from Chili	1
Suppan, Professor Leo—Specimens of "Chichicate" from Cuba	1
Weir, Dr. J. R.—*Poria semitincta* Pk	1
Yasuda, Dr. A.—Fungi of Japan	25

By Purchase—

Ferris, Mrs. Roxana Stinchfield—Plants of Texas	918
Gleason, Dr. H. A.—Plants of Colombia, South America	147
Peck, Professor Morton E.—Plants of Oregon	538
Total	1,753

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XI **FEBRUARY, 1923** **No. 2**

CONTENTS

ST. LOUIS, MO.

1923

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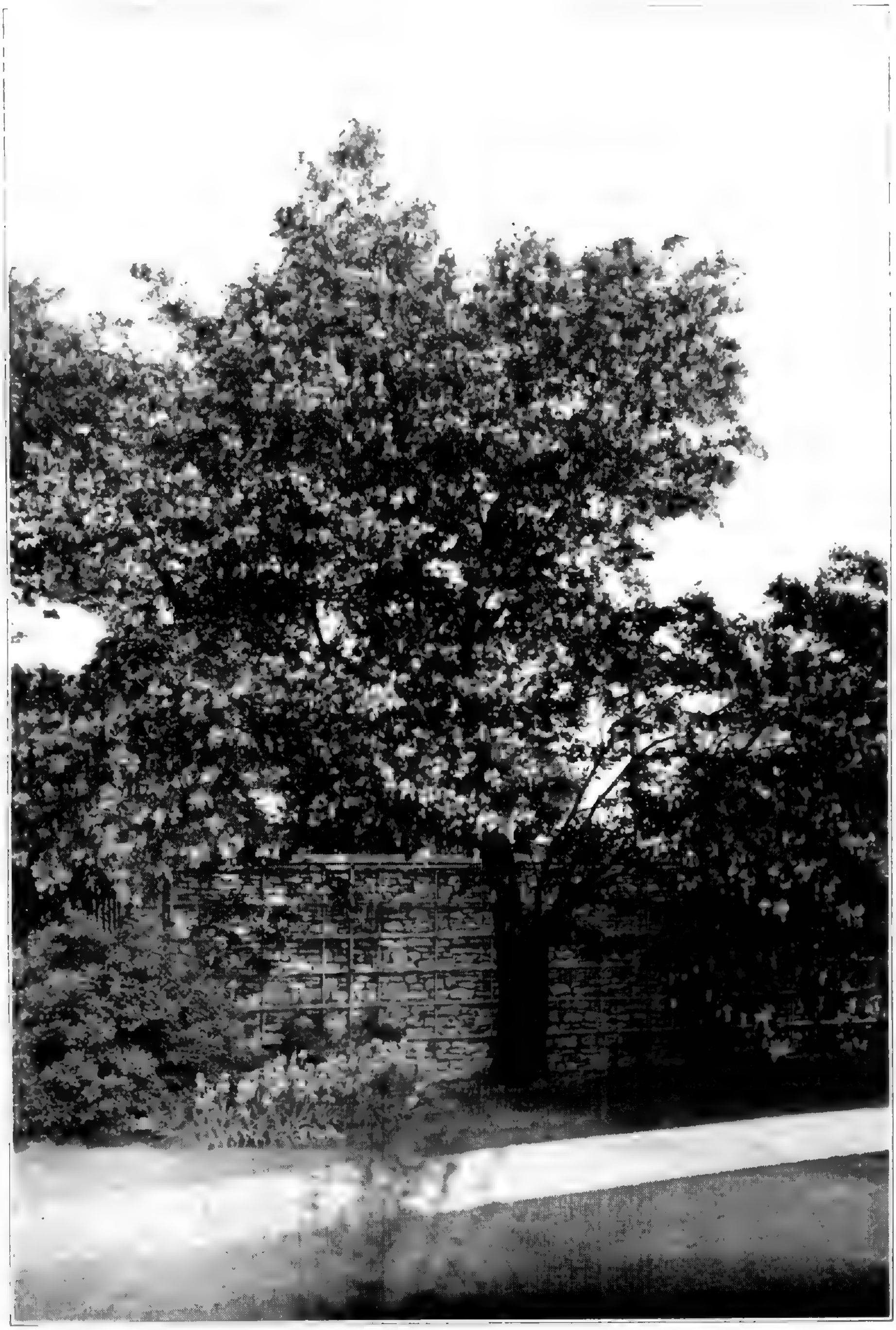


YELLOW-WOOD (CLADRASTIS LUTEA)

Missouri Botanical Garden Bulletin

Vol. XI FEBRUARY, 1923 No. 2

YELLOW-WOOD

The genus Cladrastis has frequently been called the "Queen of Beauty" of the pod-bearing trees. It is represented by four species found in North America and eastern Asia, but the yellow-wood, *Cladrastis lutea,* is the most common in this country. This species is native to the hilltops of Tennessee, Kentucky, and North Carolina, where it is found growing on the banks of mountain streams and at the edges of woodlands. It is one of the most beautiful of the native flowering trees, possessing a wide graceful head upon a moderately short trunk. It is often cultivated as a specimen tree for open lawns and is particularly attractive during the flowering period when flanked with evergreens.

An old specimen of yellow-wood may be found at the Garden growing south of the main entrance near the stone wall. That this tree must have been prized by Henry Shaw is shown by the care taken for its preservation during the erection of the stone wall. The tree has attained its maximum development, reaching forty feet in height and the spread of branches about equalling the height. It is supported by a trunk two and one-half feet in diameter which is biforked three feet from the ground, the two branches measuring one and one-half feet in diameter. Unfortunately, despite surgical treatment, the tree is showing signs of rapid deterioration, and the removal of one of its main branches has been necessary. However, with its thousands of wistaria-like festoons of white flowers, it still presents a picturesque appearance in the spring.

Description.—Small tree, rarely reaching 50 feet in height; wood yellow, covered with smooth bark similar to that of the beech; branches graceful, slim and pendulous; leaflets ovate or oval, glabrous, shiny green, 3–4 inches long; panicles loose, drooping, 10–20 inches long; flowers white, fleecy and extremely fragrant, blooming in June; pods persistent, delicate, thin, containing very few seeds. The wood yields a clear yellow dye.

MUSKMELONS

During the past few years numerous inquiries have been received at the Garden concerning the origin and names of the many varieties of muskmelons, and accordingly this article has been prepared with the idea of clearing up the confusion which seems to exist regarding the fruit.

The terms muskmelon and cantaloup are used in different parts of the country to designate entirely different kinds of melons. In the South the term cantaloup generally refers to all the varieties of muskmelons, whereas in the North it is more narrowly restricted to the larger, smooth, yellow-fleshed melon. In any case the use of "cantaloup" instead of "muskmelon" as a general term is incorrect, since all authorities agree that the cantaloup is only one of the subdivisions of the muskmelon. It is the general belief that many of the newer melons on the market, such as the Casaba and Honey Dew, are hybrids produced by a crossing of distinct species. This is not the case, however, since all true muskmelons have originated from a single botanical species, *Cucumis Melo*, and there is probably no other plant which has produced such a variety of forms. In this respect it resembles the chrysanthemum, in which great variation has been obtained by cultivating and selecting and hybridizing with but a single, or at most two, species, and is unlike the rose whose numerous varieties have been produced from a great number of distinct botanical species.

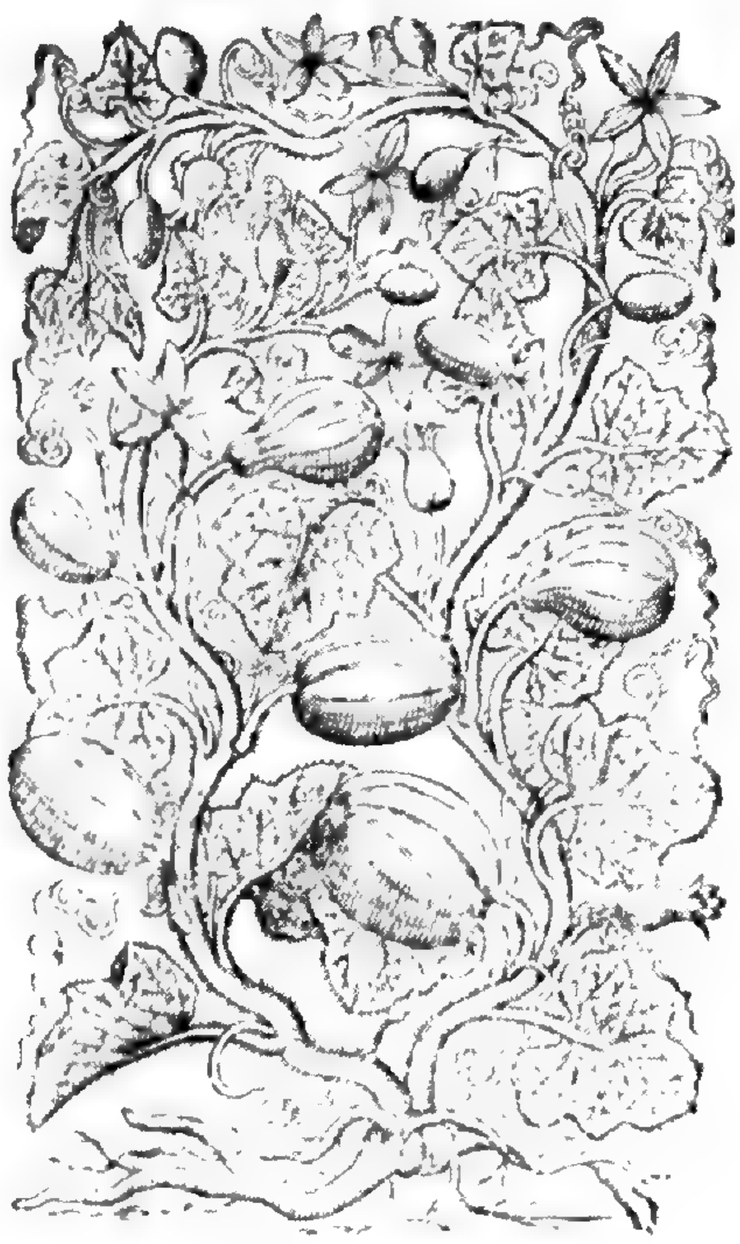
One of the most widespread beliefs is that the muskmelon and the cucumber readily cross and that if the two are grown in close proximity the pollen from the cucumber flower will have a deleterious effect upon the melon. Strangely enough, there has never been any report of the effect of the muskmelon pollen on the cucumber fruit, although one would expect the effect of crossing these two plants to be manifested in both directions. As a matter of fact, while the muskmelon and the cucumber are very closely related, both belonging to the genus Cucumis, attempts to cross these two plants have never been successful. It is not unlikely that various types of melons taste like cucumbers, but this is because they belong to the cucumber family and not because they have been hybridized with the cucumber.

Numerous attempts have been made to classify the muskmelon, but the one generally accepted is that prepared by Naudin. Naudin obtained material from all over the world

FESTOONS OF YELLOW-WOOD FLOWERS.

HISTORIE OF PLANTS. 771

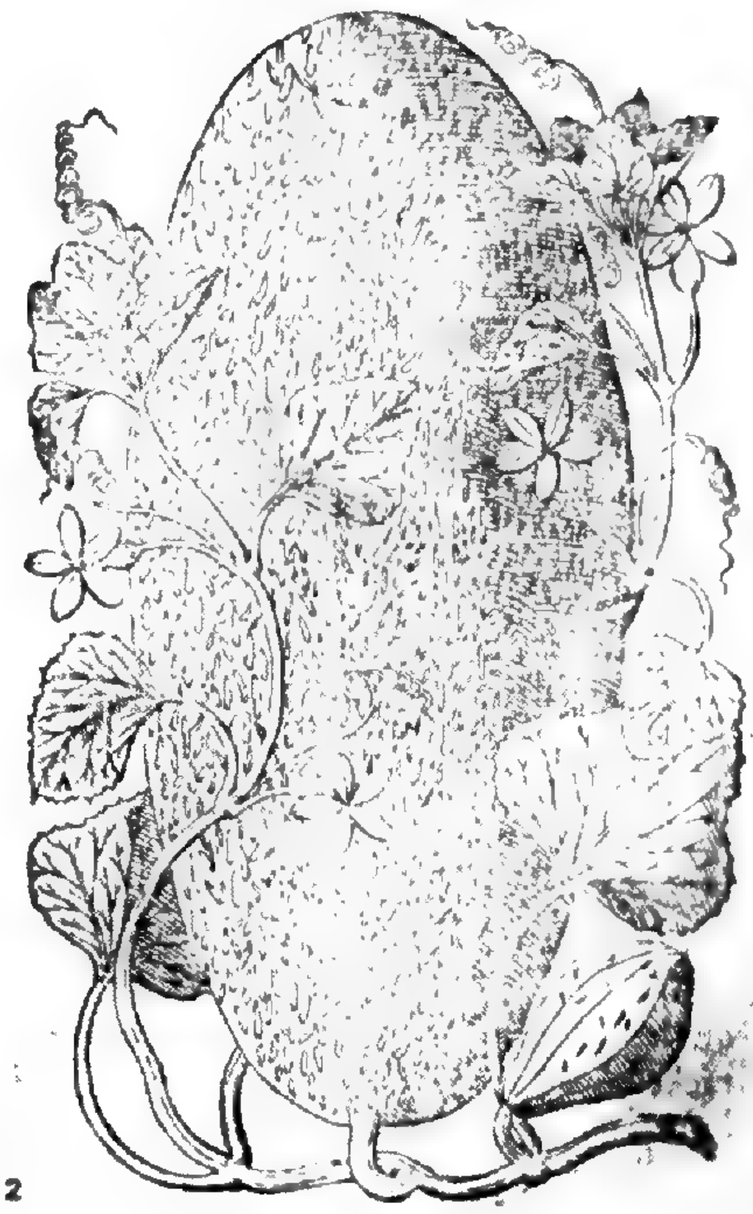
1 *Melo.*
The Muske Melon.



2 *Melo Saccharinus.*
Sugar Melon.

3 *Pyromelo.*
Peare fathion Melons.

4 *Melo Hiſpanicus.*
Spaniſh Melons.



Ccc 2 *The

REPRODUCTION OF PAGE FROM "THE HERBALL OR GENERAL HISTORIE OF PLANTS" BY JOHN GERARDE, 1597, SHOWING FOUR TYPES OF MELONS.

and grew thousands of plants, and as a result of his investigation came to the conclusion that *Cucumis Melo* could be divided into ten groups as follows:

(1) Cantaloups (Melon Cantaloups).—These are characterized by hard and scaly or rough skins and are usually deeply furrowed. The name is derived from Cantaluppi, a former country seat of the Pope near Rome, where these melons were introduced from Armenia. A considerable difference of opinion seems to prevail as to the spelling of this word, which appears as cantaloupe, cantaloup, cantaleup, canteloup, canteloupe, cantalope, cantelope, in various articles on the subject both in this country and abroad. Naudin spelled it cantaloup, and the weight of authority seems to be with this spelling.

(2) Netted Melons (Melons Brodés).—This group includes the nutmegs and related forms which are grown so extensively in the northern states. The so-called "Rocky Ford" which belongs to the netted group is not a distinct variety, as is generally supposed. The "Netted Gem" melon was the original variety used to develop the Rocky Ford cantaloup. Years of selecting and crossing have greatly improved this type, and the Rocky Ford strains of cantaloups now possess both the green and salmon-tinted flesh. The so-called "Osage" type which appears on the market under the name Osage Melon originated near Ordway, Colorado, adjacent to the Rocky Ford district, and is sometimes confused with the true Rocky Ford melon. The former, however, is characterized by an orange-colored flesh and is entirely distinct from the Rocky Ford type. Another important type belonging in this group is the Montreal Masket, or Montreal, which was developed in Canada. This melon, because of its fine flavor and keeping qualities, is in great demand.

(3) Sugar Melon (Melons Sucrins).—This group is apparently an offshoot of the nutmegs, and is not often grown in this country, although several standard English types are to be found. It includes the so-called Pineapple Melons and some of the other oblong varieties, but is not sharply distinguished from the previous group.

(4) Winter Melons (Les Melons d'Hiver ou Melons sans Odeur).—It is to this group that the Casaba and Honey Dew melons belong. Until comparatively recently the so-called winter or scentless melons were seldom, if ever, grown in this country. They were regarded as being of inferior quality,

and practically their only advantage was their keeping quality. For this reason they have been a favorite variety in Spain and southern France, where they are grown for the Scandinavian, Russian, and other northern markets. The Casaba melon, also spelled Kassaba, Cassaba, Cassabad, and Casba, was named for the town of Kassaba, some twenty miles from Smyrna. About 1878 seed were sent to California by travelers who had tasted the melons in the hotels of Smyrna. From this beginning hundreds of acres of this variety are now grown each year, principally in the San Fernando Valley of southern California. They come into the market after the ordinary cantaloup has disappeared and are frequently shipped as late as December or January. The Honey Dew melon is an old south-of-France variety and it is listed by the French seedsmen under the name of White Antibes Winter Melon. At the present time it is most extensively grown in California. The winter melons are characterized by their lack of odor and greenish or pale pink, rather than reddish orange, flesh.

(5) Serpent Melons (Melons-Serpents).—This is the variety which is frequently sold under the name of Snake Cucumber and is used exclusively in the making of preserves. The older botanists regarded it as a distinct species, but it was later shown that it is merely one of the numerous varieties of *Cucumis Melo.* This variety should not be confused with a fruit sometimes sold under the name of Snake Cucumber, which is a true gourd and possesses a smooth hard shell.

(6) Cucumber-formed Melon (Le Melon Cucumeriforme de l'Inde).—This group contains fruits variously mottled or colored, resembling the cucumber in general shape. The flavor is acid, and this type of melon is seldom cultivated.

(7) Chito Melon (Le Melon Chito).—The first record of this fruit appeared in 1851 in Belgium and Germany. It is then recorded as having come from Cuba and South America, but Naudin questions whether it is not identical with melons from Asia which had been described by earlier botanists. It might very easily have reached America by means of the Spanish and Portugese navigators. It is grown in this country more as a curiosity than anything else, and appears in seed catalogues under a variety of names, such as Mangal melon, vegetable orange, garden lemon, etc. The fruit is about the size, shape, and color of an orange, the flesh being pale yellow or

white and slightly acid. It is never eaten raw but has been used in pickles and preserves.

(8) Dudaim Melons (Les Melons Dudaims).—Melons belonging to this group have likewise been regarded as a distinct species, but most authorities include them under the original species, *Cucumis Melo.* It is popularly known as garden pomegranate or Queen Anne's pocket melon and is chiefly characterized by its powerful muskmelon odor. The fruit is about the size and shape of an orange, marked with alternate longitudinal bands of orange and mottled streaks of brown. It is not edible on account of the disagreeable after-taste.

(9) Red Persia Melon (Le Melon Rouge de Perse).—This type of melon is not grown in this country except as a curiosity. It was obtained by Naudin indirectly from Lindley, who designated it the small apple melon from Persia. The fruit is round, about the size of a small orange, dark green when young but becoming dull as it matures. It has practically no odor and is apparently not eaten even in Persia. Its chief claim to distinction is the red color of the flesh, and according to Naudin it is "an object simply of curiosity."

(10) Wild Melons (Les Melons Sauvages).—This group includes those melons which have never been cultivated and are of no economic importance. They occur in various parts of India and Africa, but should not be regarded as the parents of any melon at present on the market. According to some authorities, the original species was indigenous to southern Asia from the foot of the Himalayas to Cape Comorin. Others, however, believe that the original *C. Melo* was once wild from the west coast of Africa as far east as India. It has been cultivated from a very remote period, having been grown by the Egyptians, while the Greeks and Romans were familiar with several varieties. Gerarde, in his "Herball," 1597, described and figured several kinds of melons (see plate 4). That he was aware of the great number of varieties of this species is indicated by the following statement: "There be found diverse kinds which differ in bigness or form; it shall be therefore sufficient to describe some one or two of them and refer the rest unto the view of their figures, which most likely do express their differences, especially because this volume waxeth great, the description of no moment, and I hasten to an end." Some of the most prized commercial varieties had their immediate origin in Persia and the near-by Caucasian regions. From here they were introduced into Italy, France, and

Spain. It has been claimed that Columbus brought the first muskmelon seed to America.

While the classification of Naudin is still the standard for students of the species *Cucumis Melo*, for purpose of convenience it has become customary to divide the commercial muskmelons into two groups—namely, the netted and the scaly-skinned varieties. The netted group, known as nutmeg or netted melons, comprises those usually grown in the North for the home garden and early market. The scaly or furrowed group contains the longer-season varieties, and the term cantaloup is correctly applied here.

Cogniaux who, like Naudin, attempted to monograph all the melons and closely related plants, simply made two groups —var. *agrestis* including the supposed wild forms, and var. *culta* for the great number of cultivated types, whether edible or not.

NOTES

Dr. B. M. Duggar, Physiologist to the Garden, has been elected president of the Botanical Society of America.

Dr. B. M. Duggar, physiologist to the Garden, spoke before the St. Louis Garden Club, January 16, on "Shrubs for Fall Effects, in Fruit and Foliage."

The Hon. Arthur M. Hyde, Governor of Missouri, Henry W. Kiel, Mayor of St. Louis, and S. H. Cromwell, Mayor of Kansas City, visited the Garden, February 9.

Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated talk before the St. Louis Garden Club, February 20, on "Water-lilies and Other Aquatic Plants."

Dr. George T. Moore, Director of the Garden, spoke before the educational section of the Wednesday Club, February 21, on "Have the School Virtues of Old Grown Obsolete?"

Dr. Huron H. Smith, Curator of Botany, Public Museum, Milwaukee, visited the Garden, January 3-7, consulting the herbarium and library, and gave a lecture, January 5, on "The Aboriginal Uses of Plants by the Menominee Indians."

For the ensuing year the Board of Control of Botanical Abstracts has re-elected Dr. B. M. Duggar, Physiologist to the Garden, editor of the section, physiology of the higher plants, and Dr. J. M. Greenman, Curator of the Herbarium, editor of the section, taxonomy of the higher plants.

Recent visitors to the Garden include Dr. H. S. Jennings, head of the department of zoology, Johns Hopkins University; Dr. R. W. Webb, scientific assistant, department of plant pathology, U. S. Department of Agriculture, Madison, Wisconsin; Dr. Norma E. Pfeiffer, associate professor of botany, University of North Dakota.

Mr. L. P. Jensen, Arboriculturist to the Garden, gave an illustrated lecture before the St. Louis Natural History Museum Association, at Soldan High School, January 17, on "The Call of Humanity—Preserve Our Forests!"; before the St. Louis Park Department Association at the Swedish Hall, February 14, on "The Preservation of Our Forests"; and on February 16, before the Women's Club of Pana, Ill., at the Elks Club House, on "Planting and Care of Home Grounds."

Mr. John H. Kellogg, in charge of herbaceous grounds and nursery at the Garden, spoke before the scoutmasters of Webster Groves, Mo., January 8, on "Our Native Trees"; before the Liberty Prairie Women's Club, Liberty Prairie, Ill., January 18, on "Ornamental Planting on the Farm"; and gave an illustrated lecture before the Boy Scouts Troop No. 90, at Temple Shaare Emeth, February 14, on "Winter Botany."

Dr. George T. Moore, Director of the Garden; Dr. J. M. Greenman, Curator of the Herbarium; Dr. Edgar Anderson, Geneticist; Dr. Nellie Carter, Instructor in Botany, Henry Shaw School of Botany, and Mr. H. C. Young, Crop Protection Institute Fellow, attended the meetings of the American Association for the Advancement of Science, at Boston, December 26-30. Mr. Young presented a paper on "Toxic Properties of Colloidal Sulphur."

The following addresses were given in Cincinnati recently by Dr. George T. Moore, Director of the Garden: "Botany and Business," before the Blue Hydra Society of the University of Cincinnati, February 12; "The Relation of the Botanical Garden to Business and Industrial Life," at noon, February 13, before the Chamber of Commerce of Cincinnati; "The Relation of a Botanical Garden to Civic Life as Illustrated by the Missouri Botanical Garden," in the evening, February 13, before the Cincinnati Chapter of the Wild Flower Preservation Society.

STATISTICAL INFORMATION FOR JANUARY, 1923

GARDEN ATTENDANCE:

Total number of visitors	18,568

PLANT ACCESSIONS:

Total number of plants received as gifts	31
Total number of plants received in exchange	15
Total number of seed packets received in exchange	53

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	17
Total number of books and pamphlets donated	174

HERBARIUM ACCESSIONS:

By Gift—

Boyce, Dr. J. S.—Parasitic fungi of Oregon	12
Bureau of Plant Industry, U. S. Department of Agriculture—Photograph of *Senecio Malmstenii* Blake	1
Drushel, J. A.—Plants of Vermont, New York, Mississippi, Texas, and Colorado	22
Grant, Mrs. Adele Lewis—Specimens of *Mimulus* from California	55
Hibbard, Miss—Species of *Clavaria* from Vermont	7
Kellogg, John H.—Plants, cultivated in Missouri Botanical Garden	10
Miles, L. E.—Specimens of *Septobasidium*	2
Pfeiffer, Dr. Norma E.—*Isoetes* of North America	6
Pring, Geo. H.—Orchids, cultivated in Missouri Botanical Garden	81
Pring, Geo. H.—*Tetradenia* sp., cultivated in Missouri Botanical Garden	1
Munz, Prof. P. A.—*Mimulus* sp. from California	1
Roper, Miss Ida M.—*Helianthus petiolaris* Nutt. from England	1
Weir, Doctor James R.—*Poria semitincta* Pk	1

By Purchase—

Bartholomew, Elam—"North American Uredinales," Cent. XXVIII, Nos. 2701-2800 incl.; XXIX, Nos. 2801-2900 incl.	200

By Exchange—

Schallert, Doctor P. O.—Lichens and fungi of North Carolina	54
U. S. National Museum—Miscellaneous herbarium specimens	1,098
Total	1,552

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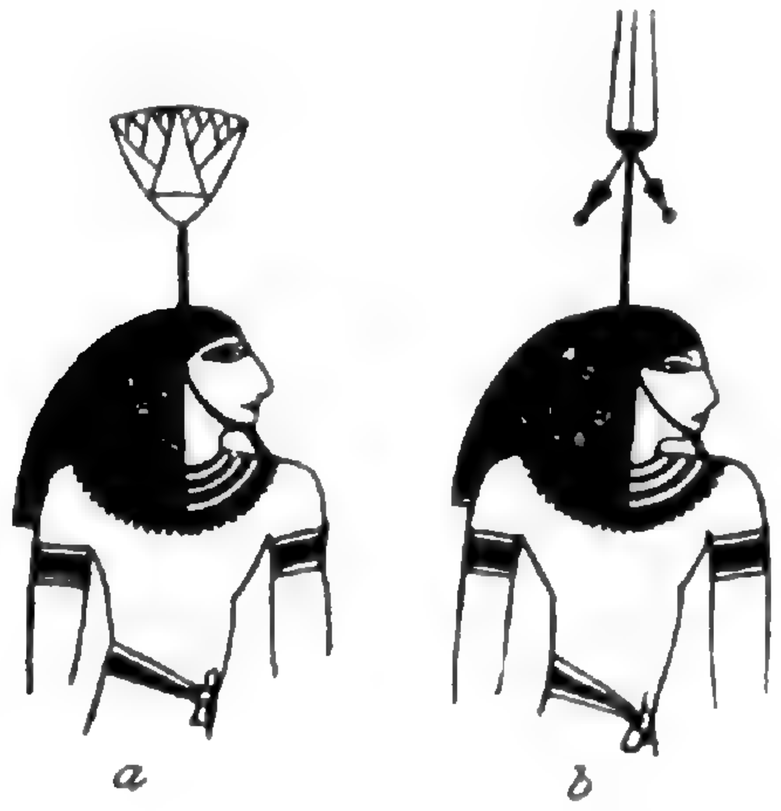

Fig. 1.—Nefer Tûm (after Wilkinson).

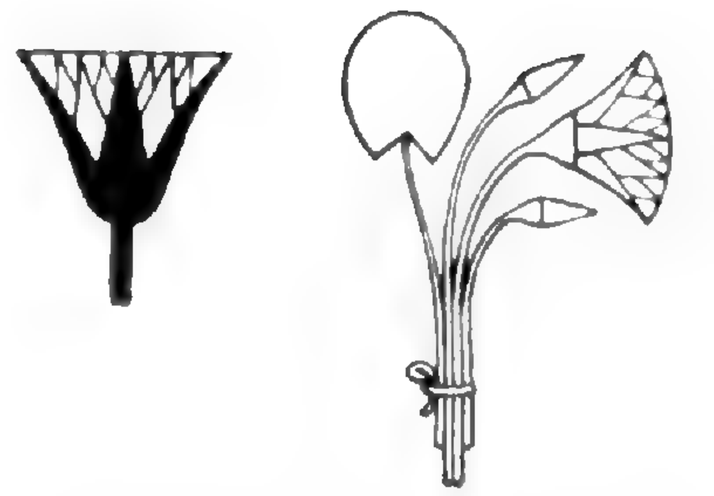

Fig. 2.—Egyptian lotus (desigus after Wilkinson).

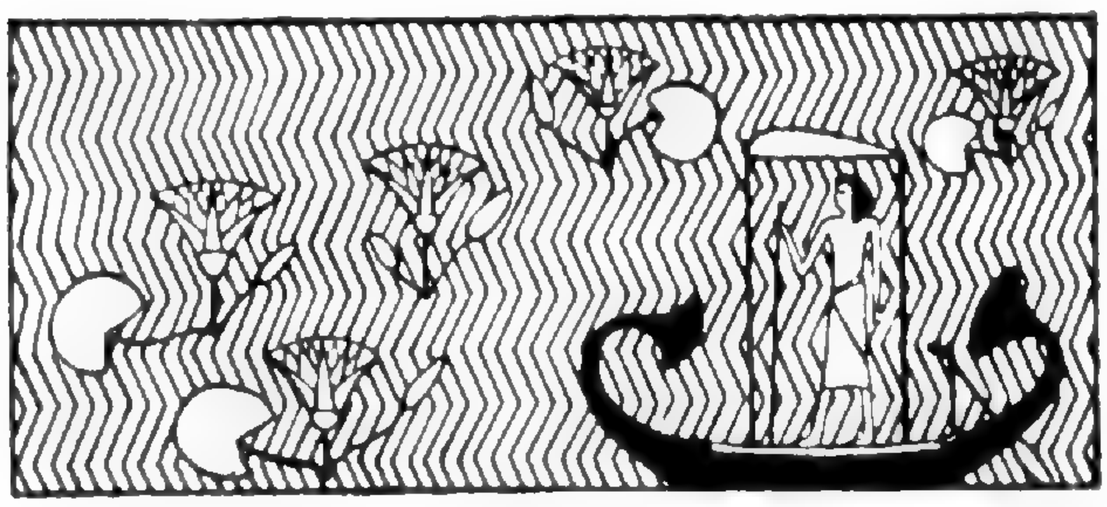

Fig. 3.—Pleasure boat in a pond of lotuses (after Wilkinson).

Fig. 4

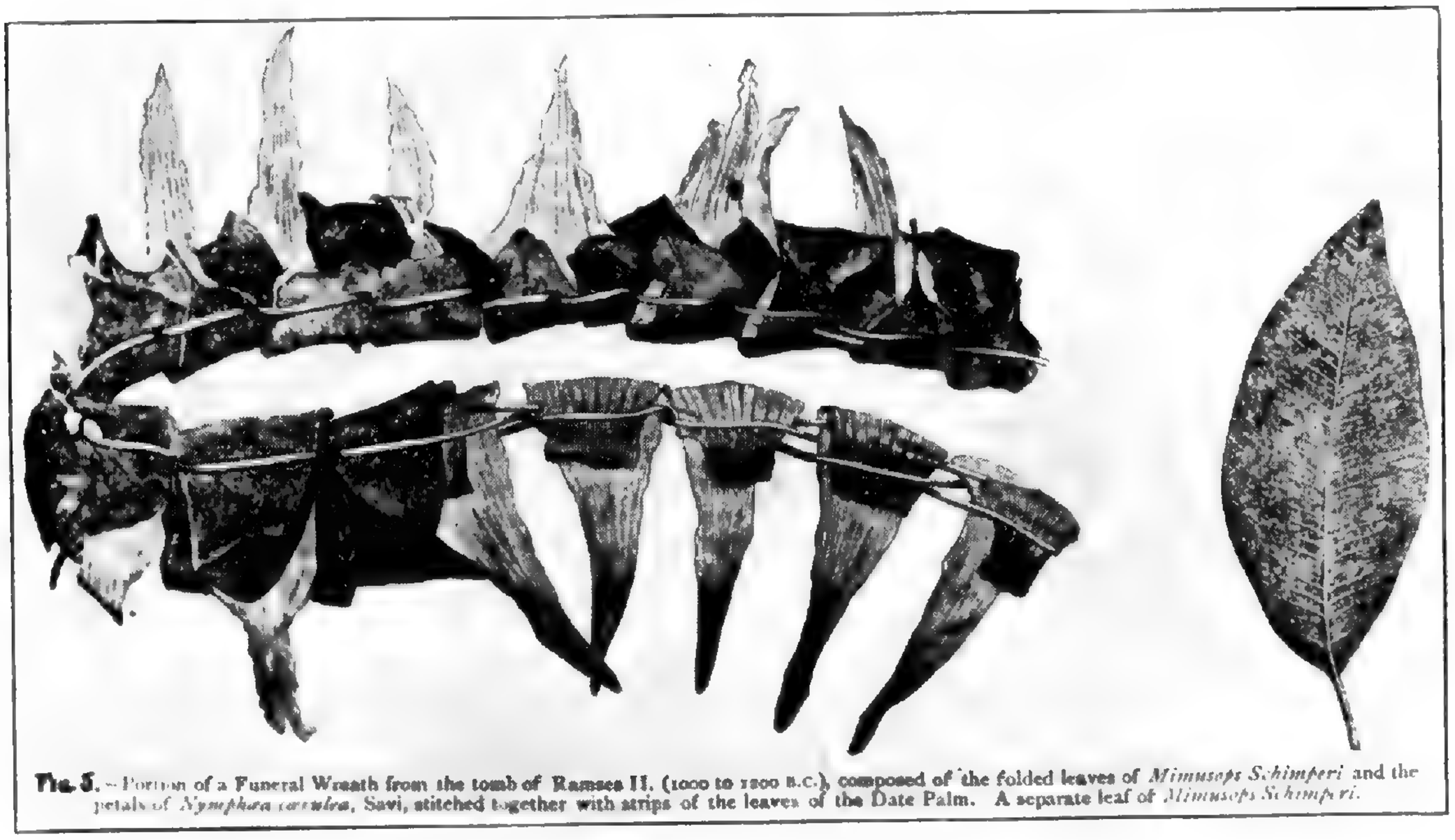

Fig. 5.—Portion of a Funeral Wreath from the tomb of Ramses II. (1000 to 1300 B.C.), composed of the folded leaves of *Mimusops Schimperi* and the petals of *Nymphæa coerulea*, Savi, stitched together with strips of the leaves of the Date Palm. A separate leaf of *Mimusops Schimperi*.

Missouri Botanical Garden Bulletin

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THE TRUE SACRED EGYPTIAN LOTUS OF THE NILE

Among the various articles reported as having been found in the tomb of Tutankhamen reference has repeatedly been made to floral wreaths and bunches of flowers. Although nearly every sort of scientist seems to have been present at the opening of the tomb, the botanist was apparently not considered necessary, and consequently no definite knowledge is available as to the actual identity of the flowers associated in the burial of the king. The finding of these floral offerings has revived the interest in the so-called sacred Egyptian lotus, and the Garden is receiving many inquiries as to where the plant may be obtained and what it is; for in spite of the unanimity of opinion among archeologists and botanists as to the true sacred Egyptian lotus considerable confusion exists in the popular mind respecting this flower.

Many believe that the Hindoo sacred lotus, *Nelumbo nucifera,* which is found growing in association with Buddhist temples, is the sacred lotus of the ancient Egyptians. This plant is not a true water-lily despite the fact that it grows in water. Its subterranean roots produce tall leaf stems three feet or more above the water and are terminated by a concave circular leaf. The pink flowers are extended above the leaves upon long cylindrical stems, later producing a peculiar pitted fruit not unlike the end of an ordinary watering-can. The seeds, suggesting an olive seed in shape, are embedded in each opening. Recently these peculiar seed-pods have become familiar objects in florists' shops, where after being dried and treated with bronze, gold, or colored paints, they are sold for decorative purposes. The native water-lily *Nelumbo lutea,* or as it is commonly called, the American lotus or chinkapin, is the chief source of this supply. The Hindoo lotus *(Nelumbo nucifera)* has become naturalized in Japan, presumably having been introduced from India by the ancients. The Japanese grow this plant for its edible tubers

which are used in much the same manner as the sweet potatoes. The seeds are also used in confectionery. About 1876 the Hindoo lotus was introduced commercially into this country where it has now become naturalized.

According to the botanists, Pickering, Pleyte, Joret, and Schweinfurth, and the archeologist, Wilkinson, the Hindoo sacred lotus (Nelumbo) is never found in the ancient Egyptian monuments. Furthermore, it does not seem to have been known in Egypt before the advent of the Persians who undoubtedly introduced it into the Nile region. All of the evidence goes to prove that the "sacred lotus" of the Egyptians was a true water-lily native to the Nile Valley and Delta. Two species of water-lily are figured on the monuments and tombs of ancient Egypt, one, a white night-blooming species *(Nymphaea Lotus)*, and the other, a blue day-blooming lily *(Nymphaea caerulea)*. Of these, the night-blooming type occurs much more frequently. Pleyte found the white "lotus" only on a single tomb belonging to the twelfth dynasty. Schweinfurth, during his researches in 1883-1884, found petals of the white lily mingled with those of the blue in the funeral wreaths of Ramses II and Amenhotep I, but he never observed any carving or picture of the plant.

The use of flowers in funeral decorations seems to have been very prominent in the nineteenth and twenty-first dynasties. The custom was to lay wreaths and semicircles of flowers on the breast of the enwrapped corpse until the sarcophagus was almost entirely packed with the floral tributes. Schweinfurth found flowers of *Nymphaea caerulea* upon stems 18–20 inches long fastened between the bands encircling the mummies of Ramses II and the priest Nisboni. A breast wreath from the coffin of Ramses II was illustrated in "Nature," 1885, and consists of foliage leaves of *Mimusops Schimperi* folded two or four times and fastened to petals of *Nymphaea caerulea* with fibers of the date-palm in such a manner that the petals were held and clamped without being pierced; these were again strung upon strips of date-palm leaves (pl. 5, fig. 5). The flowers and leaves in this wreath were as perfect as if newly dried, and consequently, by soaking them in water, Schweinfurth was able to identify them beyond doubt. The two varieties of water-lilies observed on carvings may be distinguished from each other by the leaf characters. Since the leaves of the blue species are entire and its petals acute, while the white species has sharply dentate or toothed leaf margins

and broad petals rounded at the apex, the difference is usually evident, even in very crude representations (pl. 5, fig. 2).

The blue lotus frequently appears in figures of social life. It was presented to the guests at convivial meetings, as well as at feasts for the dead. In carvings figured by Wilkinson the guests were distinguished from the hosts and servants by the wearing of lotus flowers (pl. 5, fig. 4). In most of the reproductions the flowers are considerably conventionalized, but Schweinfurth saw them in the temple of Ramses II at Abydos and on coffins of the Ptolemaic period, painted blue. An interesting Theban picture shows a pleasure boat, the water being represented by the characteristic wavy lines and further emphasized by the presence of the lotus leaves and flowers upon its surface (pl. 5, fig. 3).

The "lotus" was also a favorite flower in religious observances, being figured among offerings to the gods in the fourth dynasty and standing in front of Osiris at the judgment of the dead. According to the historian Diodorus, "When the Egyptians approached the divine place of worship they held the flower of the 'Agrostis' in their hand, indicating that man had proceeded from a well-watered or marshy land, and that he required a moist, rather than a dry aliment." The Agrostis, according to Wilkinson, is another name for the lotus. Wiedemann says that the god Niefer Tum was figured as a man crowned with an uprising lotus flower (pl. 5, fig. 1), a symbol of the resurrection and of his power to grant continuous life in the world to come.

The earliest botanical knowledge of water-lilies dates from the Greek and Roman literature, but earlier writers became acquainted with the African species of water-lilies through traveling in Egypt. For instance, Herodotus states: "When the river [Nile] is full and has made the plains like a sea, great numbers of lilies, which the Egyptians call lotus, spring up in the water; these they gather and dry in the sun, then having pounded the middle of the lotus, which resembles a poppy, they make bread of it and bake it. The root also of the lotus is fit for food, and is tolerably sweet, and is round, and of the size of an apple." In a further description he states: "Lilies, like roses that grow in the river, the fruit of which is contained in a separate pod that springs up from the root, in form very much like a wasp's nest; in this there are many berries fit to be eaten, of the size of an olive stone, and

they are eaten both fresh and dried.'' This is unquestionably the Nelumbo and not the true Egyptian lotus.

Pliny, in his ''Natural History,'' mentions the name ''lotos'' for four distinct plants, the herb lotos, the Egyptian lotos, a shrub lotos (probably the pomegranate), and tree lotos. He refers to the Egyptian lotus as ''Lotometra'' and records that the Egyptian bakers knead the flour of its seeds with milk and water to make bread, and further states that ''there is not any bread in the world more wholesome and lighter than this, so long as it is hot, but once cold, it is harder of indigestion and becometh weightie and ponderous.'' He mentions that the seed pods were gathered and piled in heaps until they partially decomposed, in which state they were easily washed and cleaned free from the outer shell. They were then dried and ground into flour. He also draws attention to the closing of the flowers at sunset *(Nymphaea caerulea)*.

The confusion caused by both Nelumbo and Nymphaea being called ''lotus'' dates back at least as far as a Greek record of a remarkable banquet imagined by Athenaeus. The conversation turning upon flowers, one of the feasters tells about the ''lotus'' growing in the marshlands adjacent to the city during summer, and says: ''It bears flowers of two colors, one like a rose [Nelumbo], its garlands woven with the flowers of this color, called garlands of Antinous; but the other kind is called lotus garland, being of a bluish color [Nymphaea].'' The lotus of the ancient Egyptians was therefore not the pink-flowered Nelumbo, despite the fact of its having grown in the Nile Delta for a considerable number of years, but either *Nymphaea Lotus,* of nocturnal habit, or *Nymphaea caerulea,* of diurnal habit. The flower of these water-lilies was employed by the ancients in many ways, especially as a flower of beauty and ornament. It was the emblem of the Nile god, for it was a product of the river. It was offered to Osiris as a treasured object. It was associated with the bodies of the dead. There is, however, no direct evidence that it was a sacred flower or an object of worship. According to Wilkinson, it was the ''favorite flower in the hands of the Egyptians'' as the rose or orchid would be in the hands of any modern people. It was also the symbol of Nefer Tum and the resurrection in much the same way that the Easter lily is used as a decoration and gift flower during the Easter season.

EXPANSION OF THE GARDEN

The experience of botanical gardens established within cities has invariably been that ultimately they were compelled to move to other localities because of the difficulty of growing plants in a city atmosphere. In some cases, an additional reason for moving has been that necessary room for expansion could only be obtained in this way.

For a great many years it has been recognized that it is no longer possible to grow to perfection, either outdoors or indoors, many trees and plants at the present location of the Garden, and those in charge have felt that there was no other alternative than to look forward to a time when the present location of the Garden must be abandoned. On the other hand, all interested in the Garden would deplore the necessity for giving up its present accessible location. By far the greater number of visitors come on street-cars or by foot, and to move the Garden outside the city to a distance sufficient to insure its favorable location for the next fifty or hundred years would greatly reduce its influence as a recreational and educational institution. Many who now come to the Garden frequently would be excluded from this pleasure, and visits of schools in a body and other large delegations would probably be eliminated.

Abandoning the present location would likewise involve moving the library, the herbarium, and the laboratories. Accessibility is a distinct factor in the usefulness of these important adjuncts of a botanical garden, since both commercial and educational institutions of the city depend greatly upon them for assistance and advice.

The Board of Trustees was thus confronted with two horns of a dilemma, apparently irreconcilable, and it is only recently that the proper solution of the problem seems to have been arrived at. By retaining in its present location that part of the Garden which is now improved, including all of the buildings and greenhouses, there can be no objection to acquiring additional land some distance from St. Louis where floral display material as well as plants and trees for outside use can be grown. In other words, the plan involves making the present location of the Garden a permanent one for an indefinite period, where it will serve as the city showroom in which to display the material grown to best advantage

away from the deleterious effects of the smoke-laden atmosphere.

Information concerning the effect of smoke on plant life is abundantly available. As early as 1866, at the international horticultural and botanical conference held in London, results of experiments on the effect of coal smoke on plants were presented. At this time, while soot was regarded as distinctly unfavorable to plants, it was not believed in itself to be toxic. The chief injurious agent generally was sulphurous acid, the presence of which in the atmosphere in an amount of one part to five hundred thousand parts of air was sufficient to produce spots and discolorations on the foliage and eventually to cause the leaves to fall. Still later English botanists, investigating the same effects, came to the conclusion that sulphuric acid, which, of course, is readily obtained from sulphurous acid in the presence of moisture, is, because of its cumulative action, the principal cause of injury to trees and shrubs. It was demonstrated at that time that, as the result of burning coal containing pyrites and sulphur in other forms, sulphuric acid from the air was deposited on the plants and acted as a persistent and gradual caustic, eating into the tissues not only of the leaves but of more tender twigs and branches. Sulphurous acid was thought to act in an entirely different way, entering into the inter-cellular passages and acting directly upon the protoplasm. Its injurious effect seemed to be more manifest in herbaceous and the so-called soft-wooded plants. However, sulphurous acid is by no means the only toxic substance present in smoke. There are various other products of the destructive distillation of coal which are injurious to vegetation, but the effect is more obscure.

Added to these toxic substances, the deposit of a coating of finely divided carbon mixed with other materials upon the surface of the plant may be either directly injurious or so reduce its general vitality as to make it more susceptible to the attack of insect or fungous pests. While the plant may not be immediately killed by being subjected to the deleterious agents present in smoke, the effect upon its rate of growth and its ability to produce flowers is often most marked. Many trees and shrubs growing in St. Louis are, of course, able to exist after a fashion under present conditions, but when a comparison is made between these plants

and those growing in the country removed from the ill effects of smoke, a striking contrast is noted.

The few evergreens still living in the Missouri Botanical Garden apparently make little or no progress from year to year, and eventually all will probably succumb. The large collection of evergreens set out by Mr. Shaw, such as pines, junipers, arbor-vitae, hemlocks, larches, yews, and firs, which previously constituted such an attractive element in the landscape, have all disappeared. Broad-leaved evergreens, such as rhododendrons, azaleas, hollies, etc., are likewise affected. While the American holly is apparently more resistant to the injurious action of smoke than any similar tree, its growth is nothing like what it should be.

The effect upon trees which annually shed their leaves is not so marked, since, of course, they do not expose throughout the year such a large surface to be affected by smoke. The fact remains, however, that such trees as the birches, beeches, hackberries, alders, sour-gums, hard maples, crab-apples, lindens, and black locusts have been almost entirely eliminated from places in the city subjected to serious smoke trouble. Even the redbud shows the effect, and it is almost impossible to bring to bloom satisfactorily at the Garden, dogwoods, crab-apples, lilacs, etc. Indeed, nothing is more marked than the scarcity, if not entire absence, of flowers on some of our most beautiful shrubs when subjected to the action of smoke. The golden-bell and bridal-wreath frequently fail to blossom at all, and weigelias, hydrangeas, flowering currants, roses, and a long list of similar shrubs at the Garden are increasingly showing the effect of having to live in an atmosphere more or less saturated with toxic substances.

Occasionally, we have a real catastrophe at the Garden which, because of a peculiar combination of atmospheric conditions, produces damage in a few hours which ordinarily would be spread over a long period of time. In November, 1917, hundreds of plants in the greenhouses were destroyed or seriously injured by the action of one smoke cloud. Chrysanthemums, cinerarias, orchids, ferns, azaleas, and numerous other plants either dropped their flowers and most of their leaves or had the foliage so discolored by the action of the smoke that only a small percentage of them survived (see November, 1917, BULLETIN). Those plants which were not annuals, and consequently not thrown away, were so

seriously affected that it required several years of the most careful attention to bring them back to anything like a normal condition. The appearance of many of the plants was as though they had been sprayed with a rather strong solution of sulphuric acid.

Owing to the fact that the land surrounding the Garden has, within the past ten years, been almost completely occupied by small dwellings and apartments, with the consequent increase in smoke in the immediate vicinity, it has been more and more difficult to grow plants in the Garden, and the necessity for some such move as is indicated above has been felt to be imperative. While the primary object of securing an additional tract of land at a considerable distance from the city would be for the purpose of growing plants to be either temporarily shown in the greenhouses or to be established outside for as long as they could survive the smoke, it is also hoped that a part of the new land can be devoted to the establishment of a real arboretum. Any attempt to have a representative collection of trees of the Mississippi Valley in the Garden has failed in the past because of the impossibility of growing successfully many varieties in the city atmosphere. A complete collection of such trees and shrubs in the vicinity of St. Louis, together with trees from similar climates throughout the world, would be of the greatest benefit to students and of much interest and practical value to lovers of trees. Incidentally, if the right location can be secured it would make possible the preservation of many acres of natural forest which might otherwise disappear within a comparatively short time.

Of the 125 acres originally set aside by Mr. Shaw for Garden purposes, not more than half has ever been improved and opened to the public, the balance having always been used as farm or pasture land. With the present income of the Garden it would be impossible to make available for public use the unimproved portion of the Garden, and experience has shown that even were it possible the use of this additional area by the public would hardly justify the expense. At the present time the North American tract and the old arboretum are visited by but few. Seldom more than an hour or two is spent by visitors at the Garden, and most of them confine themselves to the region near the main entrance and conservatories. The new plan, therefore, does not sacrifice in any way any part of the Garden ever known or used by the

public. While it appears to restrict the area of the Garden, it is in reality a very distinct expansion—an expansion, however, which makes it possible to beautify and improve the section in the city now open to visitors.

By disposing of the area adjoining the improved portion of the Garden which is bounded on the north by Shenandoah Avenue, on the west by Kingshighway, on the southwest by Vandeventer Avenue, on the north by Shaw Avenue, and on the east by a line from where Alfred Avenue comes into Shaw Avenue to the intersection of Alfred and Shenandoah, enough money can be secured to make possible the development of the out-of-town annex.

In order to make the disposal of this land legal and to have the permission of the court for the sale, application was made in the Circuit Court of the City of St. Louis, and after two hearings at which the Attorney General of the state was represented, the court entered a decree permitting the sale of the tract and authorizing the Board of Trustees in their discretion to purchase land sufficiently far from the adverse atmospheric conditions of the city to carry out successfully the trust established by Mr. Shaw.

EXPEDITION TO THE TROPICS FOR ORCHIDS

About the first of April the horticulturist to the Garden, Mr. G. H. Pring, will start for Panama and Colombia for the purpose of organizing an expedition into the mountain regions of parts of South America to collect orchids as well as certain interesting economic plants. Before making such a trip it was necessary to obtain a special permit from the Federal Horticultural Board of the Department of Agriculture, in order that the cattleyas and other orchids best known to the public might be admitted. These plants, with many others, were formerly imported by the thousands, but since the enforcement of "Quarantine Number 37" very few have entered the country. The fact that the Missouri Botanical Garden is prepared to combat any injurious insect or fungous pest which may happen to inhabit the collected specimens was undoubtedly a factor in obtaining the necessary permit.

During the recent annual orchid displays the visitors have repeatedly manifested a desire to see an exhibition of orchid

flowers arranged in masses, similar to the chrysanthemum show. The habits and manner of growth of orchids do not permit their propagation in the same way as chrysanthemums, and it is necessary to secure the plants from their native home. Since the famous Brownhurst orchid collection was given to the Garden by the late D. S. Brown, it has been possible to remove the exhibit of orchids from the alcoves to the floral display house where hundreds of blooming plants from all parts of the tropical world are shown. The general public have become acquainted with the large mauve variety of orchid through its commercial use and are not so much interested in the smaller less showy varieties. In fact, they do not consider some of the rarest plants as orchids at all or if so regard them with disappointment. Therefore, in order to bring the orchid show to the same high degree of excellence as the "mum show" and similar exhibits it becomes necessary to obtain the popular favorites in quantity. With this in view the expedition to the tropics is being planned. The genus Cattleya includes many species which flower at different months of the year. These make their home in the mountain ranges at an elevation of 8000–10000 feet, ofttimes in almost inaccessible places. Once secured they are brought down the mountain slopes by pack-mule to the nearest town, where the plants are carefully sorted and packed and transported by water to the sea-coast. Here they are shipped by steamer to the port of entry in the United States.

The favorite haunts of the various species of Cattleya are the mountain ranges of Colombia, Venezuela, Guatemala, Ecuador, British Guiana, and Brazil, each variety being practically indigenous to a special locality. The species most desired at the Garden are those flowering in January and February, and these are *Cattleya Trianae* and *Cattleya Schroederae*. The former is found in the upper Magdalena near Natagaima on the Saldana River of Colombia and the latter in the Llanos de Cassanare on the Venezuelan border of the same country, two widely separated regions particularly when the difficulties of transportation are borne in mind. Despite this fact it is hoped that sufficient plants may be collected and brought back to St. Louis, so that the most notable exhibition of orchids ever held at the Garden may be made during the early part of 1924.

NOTES

Dr. George T. Moore, Director of the Garden, spoke before the Garden Club of Kirkwood, March 19, on "Conserving Natural Resources."

Among recent visitors to the Garden were Prince Gelanio Caetani, Italian Ambassador to the United States, accompanied by his secretary, Signor Celesia, on March 10; and Dr. T. J. Barrett, Resident Director of the Citrus Experiment Station and Graduate Laboratory of Subtropical Agriculture of the University of California, Riverside, California, March 14.

Dr. George T. Moore, Director of the Garden, addressed the Women's Chamber of Commerce, March 6, at the Hotel Claridge, on "The Black Smoke Tax." He also spoke before the Greater St. Louis Conference, on the evening of March 20, at the Statler Hotel, on "The Smoke Nuisance."

STATISTICAL INFORMATION FOR FEBRUARY, 1923

GARDEN ATTENDANCE:

Total number of visitors	5,169

PLANT ACCESSIONS:

Total number of plants received as gifts	81
Total number of seed packets received in exchange	46

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	29
Total number of books and pamphlets donated	95

HERBARIUM ACCESSIONS:

By Gift—	
Drushel, J. A.—Plants of Vermont, Colorado, and Utah	6
Grant, Mrs. Adele Lewis—*Mimulus* spp. from California	2
Johnson, Harry P.—*Sterculia?* from Florida	1
By Exchange—	
U. S. National Herbarium, by W. W. Eggleston—Drug and other plants	47
Total	56

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Physiologist in charge of Graduate Laboratory

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Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
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J. ULRICH
Inside Floral Display

H. VALLENTINE,
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

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DAHLIAS FROM SEED.
(Started March 27, picked September 20.)

Missouri Botanical Garden Bulletin

Vol. XI APRIL, 1923 No. 4

THE FALL DAHLIA SHOW

Each year the dahlia is attracting greater attention in the East and to a considerable extent in the West. Numerous dahlia shows have been held, and reports indicate that a great number of persons view them and that competition among the exhibitors is very keen. To stimulate interest in the dahlia, a flower that has been somewhat neglected in the Middle West, the Missouri Botanical Garden is planning to attempt a dahlia show next fall. It is proposed to stage this show in the floral display house the first part of October, but this time is only tentative as the exact date cannot be set until the season draws to a close. Due notice will be given later of the date. This show is the first of its kind in this region, and the staging of future dahlia shows will depend upon its success and the response of the public to it. The object of such a show is to stimulate a greater interest in the culture of this most beautiful flower, as well as the proper staging of the blooms and their artistic arrangement.

To aid the show as much as possible the Missouri Botanical Garden will grow a collection of dahlias from seeds and from tubers of the newer and finer varieties, many of these being contributed by their originators. The Garden, however, will not be a competitor. For a first show the sections in the premium schedule will be few and the classes limited. Special classes for named varieties are not warranted this year. While the show will be open to both commercial growers and amateurs, ribbon awards only will be made to amateurs.

The following is the preliminary schedule:

Section I—Specimen blooms (one to a vase).

Class A—Cactus.
Class B—Collarette.
Class C—Decorative.
Class D—Peony-flowered.

Class E—Pompon.
Class F—Seedling.
Class G—Single.
Class H—Show.

Section II—Collection of ten varieties (one bloom to a vase).
Section III—Collection of five varieties (one bloom to a vase).
Section IV—Vase of ten blooms (one variety).
Section V—Vase of five blooms (one variety).
Section VI—Most artistic vase; receptacle and arrangement considered (one or more varieties and any number permitted).
Section VII—Most artistic basket arrangement; receptacle and arrangement considered (accessories permitted).

That classes in Section I may be understood, the following classification of the dahlia as adopted by the American Dahlia Society is given below:

CACTUS DAHLIAS—(*a*) A true, fluted type: Flowers fully double; floral rays (petals) long, narrow, incurved or twisted, with sharp, divided, or fluted points and with revolute (rolled back) margins, forming, in the outer florets, a more or less perfect tube for more than half the length of the ray.

(*b*) Hybrid cactus or semi-cactus type: Flowers fully double; floral rays short as compared with previous type, broad, flat, recurved or twisted, not sharply pointed except when tips are divided (staghorn), margins only slightly revolute, and tubes of outer florets, if any, less than half the length of the ray.

DECORATIVE DAHLIAS—Double flowers, full to center in early season, flat rather than ball-shaped, with broad, flat, somewhat loosely arranged floral rays with broad points or rounded tips which are straight or decurved (turned down or back), not incurved, and with margins revolute if rolled at all.

BALL-SHAPED, DOUBLE DAHLIAS—(*a*) Show type: Double flowers, globular or ball-shaped rather than broad or flat, full to center, showing regular spiral arrangement of florets; floral rays more or less quilled or with markedly involute margins and rounded tips.

(The class called fancy dahlias is not recognized separately in this classification, but is included in the sub-section *a*.)

(*b*) Hybrid show, giant show, or colossal type: Flowers fully double, broadly hemispherical to flatly globular in form,

loosely built so spiral arrangements of florets is not immediately evident; floral rays broad, heavy, cupped or quilled, with rounded tips and involute margins.

(*c*) Pompon type: Shape and color may be same as *a* or *b;* but must be under two inches in diameter.

PEONY-FLOWERED, OR "ART" DAHLIAS—Semi-double flowers with open center, the inner floral rays being usually curled or twisted, the other or outer petals being either flat or more or less irregular.

DUPLEX DAHLIAS—Semi-double flowers, with center almost exposed on opening of bud, with petals in more than one row, more than 12, long and flat, or broad and rounded, not noticeably twisted or curled. Many so-called peony-flowered dahlias belong here.

SINGLE DAHLIAS—Open-centered dahlias, small to very large, with 8 or 12 floral rays, more or less in one circle, margins often decurved (turned down or back). There are no distinctions as to colors. The type embraces the large Twentieth Century, as well as small English varieties.

COLLARETTE DAHLIAS—Single type: Open-centered blossoms with not more than nine floral rays, with one or more smaller rays, usually of a different color, from heart of each ray floret, making a collar about the disc.

Final premium schedules with instructions as to staging may be obtained in August by addressing the Director, Missouri Botanical Garden, St. Louis, Mo.

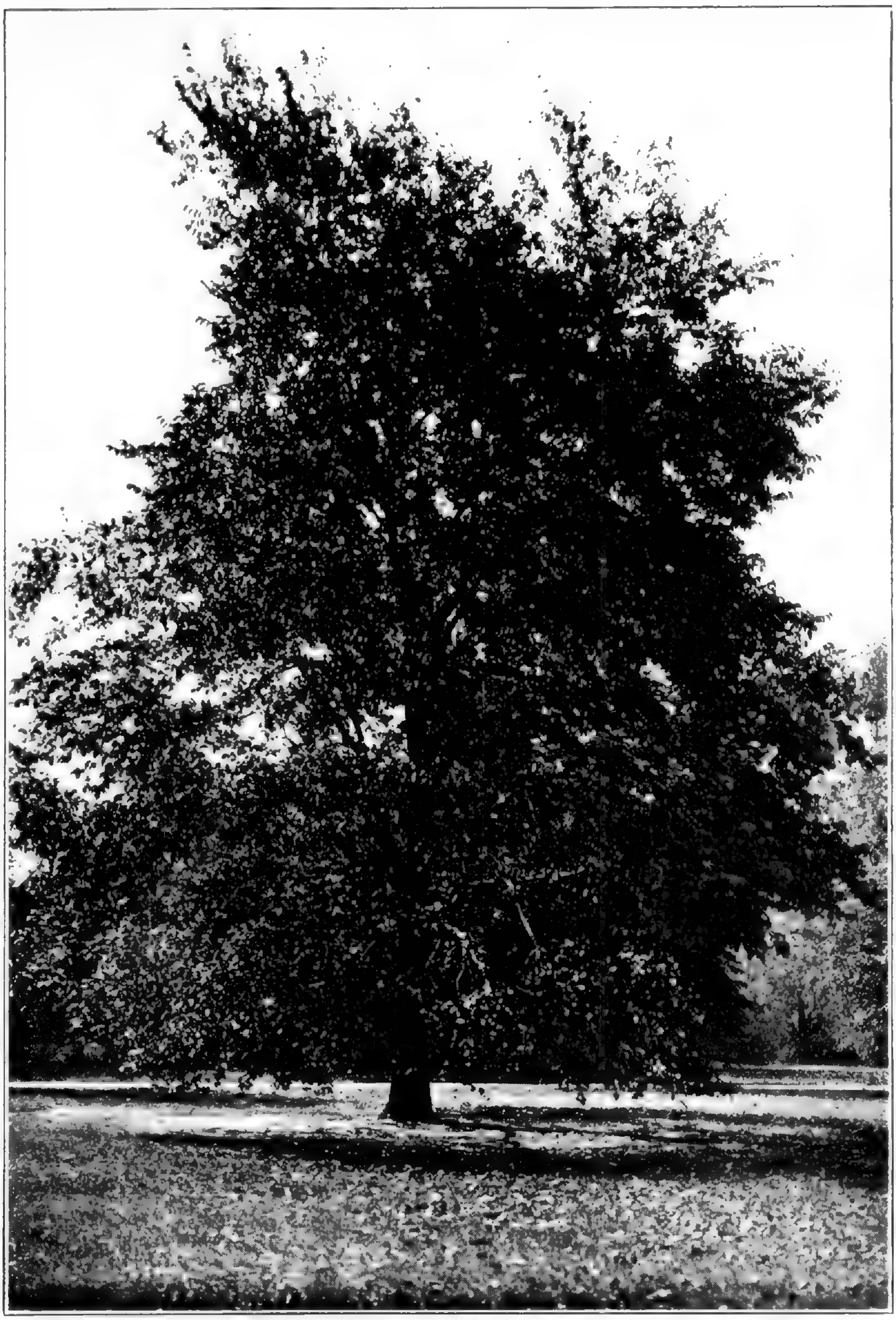
DAHLIAS FROM SEED

Not every one is aware of the fact that dahlias may be raised in one season from seeds as readily as from tubers, and moreover the seeds have the advantage of being less expensive. Definite named varieties cannot be expected from seeds as the plants are variable, but when flowers of various forms and sizes are permitted in the garden the results are very satisfactory. It might be well to mention, however, that the best plants can be expected from selected seeds of double varieties which most seed firms feature. The cost of such a packet is slightly greater than that of a mixed lot of seeds, but dahlias raised from seeds from double-flowered plants will produce a greater percentage of double flowers. Of course, some single

varieties will appear, but frequently they are pretty enough to be worth saving. Dahlias raised from seed usually produce good tubers the first season, and when a particularly fine variety is secured it can be perpetuated by dividing the tubers in subsequent years. Some gardeners raising dahlias from seed and securing a great variety of good flowers are tempted to name them and place the tubers on sale. The varieties of dahlias, as well as of many other flowers, are already so very great and many of them so similar that any attempt to introduce new kinds without first registering them with the particular flower society should be discouraged.

To obtain best results the dahlias should be started indoors in some sunny window about the first part of April. The seed should be planted in boxes containing finely sifted soil and covered about a quarter of an inch. The soil must always be kept moist, and it is better if the box is covered with a pane of glass or piece of paper until the seeds break through the surface. The boxes should be kept in a cool room, as rapid growth in a warm room is detrimental to the plants. When the seedlings are about two inches high they should be transplanted into other boxes, being spaced two inches apart, or, better still, they should be potted in small pots. Care must be exercised not to let the plants become pot-bound at any time, and they should be shifted into larger pots when the roots become too crowded at the base of the ball of soil in the pot. If a hot-bed or cold-frame is available good stocky plants can be had for planting outdoors some time in May. After planting out, two systems of training may be practised: (1) All side shoots may be pinched off, only the central shoot being allowed to grow. This method will produce few but very fine flowers. (2) When quantity of bloom is the object in the garden the plants may be pinched to about four main branches. No matter how they are trained, however, dahlias should always be staked, as sometimes a summer storm accompanied by a heavy rain lays them flat.

Failure with dahlias one year should not discourage the amateur from trying a second time. The behavior of the plants varies from year to year and unless conditions are ideal they will grow but give very few blooms. Except in a few favored localities in this country dahlia seasons are variable. There is little doubt, however, but what seed sown in the open in this locality, on account of the long growing season, will produce blooming plants before frost.



THE SCOTCH OR WYCH ELM.

THE SCOTCH OR WYCH ELM

Among foreign deciduous trees for ornamental planting in the vicinity of St. Louis the Scotch or wych elm (*Ulmus glabra*) is one of the most desirable. It is better adapted to our changeable climatic conditions and more able to endure the smoky atmosphere of the city than most trees. It is a splendid tree for lawn and park planting, the head being well massed yet so well broken as to make its general aspect very beautiful. The photograph of a specimen in the Missouri Botanical Garden shows its typical form (plate 7). This specimen has a spread of branches of 30 feet and a height of about 40 feet. *Ulmus glabra* generally retains its leaves several weeks longer in the fall than either the English or American elms and consequently is more desirable as a shade tree. It can usually be distinguished from the other elms common in this vicinity by the large very rough leaves with a stalk so short that it is frequently hidden by the base of the blade. The drooping of the branches at their extremities is also characteristic. The word "wych" originally meant "drooping," and the popular name of the tree has nothing to do with witches as is generally supposed.

The Scotch elm is a native of Europe and northern Asia to the Amur region. In some of the more favorable regions of its native habitat it attains a height of 100 to 120 feet, but it is generally much smaller, and a height of 40 to 50 feet may be considered an average. The branches are generally wide-spreading, the lower ones drooping at the extremities, the middle ones horizontal, and the upper ascending, forming an oblong or round-topped head. The bark of the branches remains smooth for many years, hence the specific name "glabra," meaning smooth. The leaves are broad, rough above, hairy beneath, pointed at the apex, obovate to oblong-obovate, sharply and doubly toothed, the teeth pointed forward. The leaf-stalks are very short. The fruit is oval or roundish-obovate, little notched at the apex, with the seed, ¾-1 inch long, in the middle. The flowers are arranged in clusters, each flower having 5–6 stamens.

AN AFRICAN REPRESENTATIVE OF THE IRIS FAMILY

An interesting member of the iris family that blooms occasionally at the Garden throughout the year is *Moraea iridioides*. This plant which has been established in the tropical fruit house since 1913 would be found within the iris garden except for the fact that it is not hardy. The genus Moraea differs from the true iris in that the perianth tube is absent, the six segments of the perianth being attached to the top of the ovary and falling separately like the petals of a rose (plate 9). There are also other minor differences. The plant grows from two to three feet high, and has narrow, strap-shaped leaves forming a large clump. The perianth segments are white, with the beard and portion immediately above it an orange-yellow, and the style branches a delicate lavender shade. Were it not for the poor keeping quality of the flower (individual blossoms lasting only a few hours, or a day at the most) the plant would probably be more widely grown.

According to Curtis' "Botanical Magazine," *Moraea iridioides* was discovered by Thunberg in the interior of the Cape country, growing in the woods not far from the Sea Cow River. It was first cultivated in 1758, the seeds having been sent from the Cape under the title of "white water lily." In 1804 the plant was pictured and described in Volume 19 of Curtis' "Botanical Magazine."

NOTES

Mr. L. P. Jensen, arboriculturist to the Garden, gave an illustrated lecture before the Women's Club of Litchfield, Illinois, March 26, on "The Beautification of Home Grounds."

Dr. Edgar Anderson, in charge of School for Gardening, conducted the members of the "Be Square" class of the Pilgrim Congregational Church on a field trip to Jefferson County, April 22.

On April 21 the Garden was visited by the senior class in city planning and landscape architecture of the University of Illinois, and were shown around the buildings and grounds by Mr. John Noyes, landscape designer to the Garden.

MORAEA IRIDIOIDES.

FLOWER OF MORAEA IRIDIOIDES.

Recent visitors to the Garden include Mr. C. A. Reed, of the U. S. Department of Agriculture, April 6; Prof. Shigenori Kawagoe, professor of botany, Imperial College of Agriculture and Forestry, Kagoshina, Japan, April 24; and Miss Hawkes and Miss Lacy, of the U. S. Department of Agriculture library, April 29.

The members of the Carpe Diem Literary Society visited the Garden, April 24, and after a tour of the greenhouses and grounds assembled in the lecture room, where Dr. Anderson, in charge of the School for Gardening, gave an illustrated talk on "The Activities of the Missouri Botanical Garden."

Dr. Edgar Anderson lectured before the Woodcraft Council at the Union Avenue Christian Church on "Out-of-Door Experiences," April 17; and on April 24 a lecture by Dr. Anderson on "Flowers for City Gardens" was broadcasted by the St. Louis Post-Dispatch radio station in connection with the Garden's co-operation in National Garden week.

Dr. George T. Moore, Director of the Garden, and Dr. B. M. Duggar, Physiologist, attended the meetings of the American Philosophical Society, at Philadelphia, April 20-21. Dr. Duggar presented a paper before the society, April 21, on "Indications Respecting the Nature of the Infective Particles in the Mosaic Disease of Tobacco."

STATISTICAL INFORMATION FOR MARCH, 1923

GARDEN ATTENDANCE:

Total number of visitors	17,430

PLANT ACCESSIONS:

Total number of plants received as gifts	8
Total number of seed packets received in exchange	361

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	36
Total number of books and pamphlets donated	79

HERBARIUM ACCESSIONS:

By Gift—	
Bisby, Prof. G. R.—Fungi of Manitoba	16
Drushel, J. A.—Plants of Vermont, Alabama, Missouri, Colorado, and California	11
Epling, C.—*Peniophora decorticans*, from Oregon	1
Hill, Clara B.—*Senecio salignus* DC, from Arizona	1
Latham, Roy—Fungi of Long Island	2
Linder, D. H.—Fungi of Massachusetts	4
Overholts, Prof. L. O.—*Merulius* sp. from California	1
Pring, G. H.—Acorns of *Quercus macrocarpa*, Mich	1
Rost, E. C.—Photograph of *Echinocactus Parryii*	1
Rusby, Dr. H. H.—Fragments of type of *Gynoxis discolor* Rusby, from Bolivia	1
Standley, Paul C.—*Hymenochaete rubiginosa*, from Salvador	1
By Purchase—	
Bush, B. F.—Plants of Missouri	244
Gleason, Dr. H. A.—Plants of British Guiana	815
Hanson, Herbert C.—Plants of Arizona	261
By Exchange—	
Kirkwood, Dr. J. E.—Plants of Montana	300
Payson, Dr. E. B.—Plants of Wyoming	15
Royal Gardens, Kew, England, by Lieutenant-Col. A. W. Hill.—Fragments of type and photograph of *Monardella odoratissima* Benth	1
U. S. National Museum—Type material of *Isoetes Martii* A. Br. from Brazil	1
U. S. National Museum, by Paul C. Standley—Plants of Central America	638
University of Minnesota, by Dr. C. O. Rosendahl—Part of type of *Isoetes mexicana* Underwood, from Mexico	
	2,316

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

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MISSOURI BOTANICAL GARDEN BULLETIN

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FRUIT OF HAWTHORN
(CRATAEGUS PRUNIFOLIA).

SPRAY OF HAWTHORN FLOWERS
(CRATAEGUS MOLLIS).

Missouri Botanical Garden Bulletin

Vol. XI MAY, 1923 No. 5

THE HAWTHORN
THE OFFICIAL STATE FLOWER

The hawthorn (*Crataegus*), or red haw as it is sometimes called, has become of special interest to Missourians since the passage of a bill by the Missouri Legislature making it the state flower.

The genus *Crataegus*, common in this country, is widely distributed in the temperate region of the northern hemisphere. More than eight hundred species have been described for North America, while only about sixty are native of the Old World. The considerable range in habit and size of the hawthorn, together with its attractive foliage and abundance of showy flowers followed by bright-colored fruits, makes it unusually valuable for planting in parks and private grounds. While the Missouri species have only white flowers, other species are pink and crimson, and the fruit, while generally red, may also be yellow or orange, and in one species blue. The hawthorns are easily transplanted and are benefited by a liberal pruning at this time. They may likewise be propagated by seed. These, however, germinate slowly, requiring from two to three years before the seedling appears.

Botanically, the numerous species are difficult to distinguish, their identification depending upon a number of minute characters, including the number and color of stamens. In order to facilitate their systematic arrangement, they have been divided into a number of groups, eleven of which are represented in Missouri. Following is a list of the more important species of hawthorn to be found within the state, the principal member of each group being described at length.

CRUS-GALLI GROUP

Crataegus efferta.—A tree 15–18 feet high, with a tall trunk covered with a light red-brown scaly bark. Branches large, spreading, forming a broad flat-topped head; branchlets stout, nearly straight, light orange-green at first, becoming light olive-green at the end of the first season and dull gray-brown the following year, armed with stout, straight or slightly curved, chestnut-brown spines. Leaves oblong-obovate, acute or rounded at the apex, gradually narrowed to the slender concave-cuneate base, serrate above the middle, nearly full grown when the flowers open in early May, dark yellowish green on the upper surface, pale bluish green beneath. Flowers white, in 10–12-flowered corymbs; stamens 10; anthers pale yellow. Fruit lustrous dark crimson, ripening and falling at the end of September. Habitat: on dry limestone hills near Pacific, Missouri.

Crataegus strongylophylla.—A tree 6–12 feet high. On dry rocky hills, Jasper County, Missouri.

Crataegus discolor.—A tree 15–20 feet high. On dry hills, Carter County, Missouri.

Crataegus infesta.—A tree 10–15 feet high. Along roadsides, Christian County, Missouri.

Crataegus hamata.—A tree 10–12 feet high. On dry hills, Franklin County, Missouri.

Crataegus tardiflora.—A tree 12–15 feet high. Along roadsides, Christian County, Missouri.

Crataegus tenuis.—A tree 10–15 feet high. On dry hills, Franklin County, Missouri.

Crataegus tantula.—A tree 15–25 feet high. In moist soil in thickets and borders of woods, Jasper County, Missouri.

Crataegus barrettiana.—A tree 15–20 feet high. In rich bottom lands, St. Louis County, Missouri.

Crataegus ferox.—A shrub 10–15 feet high. On hillsides, Jasper County, Missouri.

Crataegus pachyphylla.—A tree 15–20 feet high. In low moist soil, Cole County, Missouri.

Crataegus albanthera.—A tree 15–20 feet high. On rocky hills and glades, Taney County, Missouri.

Crataegus candens.—A tree 10–15 feet high. On gravelly banks of streams, Shannon County, Missouri.

Mo. Bot. Gard., Bull., Vol. 11, 1923

HAWTHORN TREE (CRATAEGUS MOLLIS).

Crataegus monosperma.—A tree 10–15 feet high. In creek bottoms, Taney County, Missouri.

Crataegus truncata.—A tree 15–20 feet high. On rocky hills and glades, Taney County, Missouri.

Crataegus tenuispina.—A tree 15–20 feet high. On gravelly banks of streams, Carter County, Missouri.

Crataegus rotunda.—A tree 15–20 feet high. On prairies, Jasper County, Missouri.

Crataegus parciflora.—A tree 12–15 feet high. On dry rocky hillsides, Jasper County, Missouri.

Crataegus Engelmanni.—A tree 10–15 feet high. On limestone slopes and ridges, Franklin and St. Louis Counties, Missouri.

Crataegus barbata.—A shrub 8–12 feet high. On rocky hills and glades, Taney County, Missouri.

Crataegus pilifera.—A tree 15–20 feet high. On rocky hills and barrens, Taney and Christian Counties, Missouri.

Crataegus villiflora.—A tree 10–15 feet high. On gravelly banks of streams, Franklin County, Missouri.

Crataegus permera.—A tree 15–20 feet high. On rocky banks and hillsides, Shannon and Butler Counties, Missouri.

Crataegus rubrifolia.—A tree 15–20 feet high. Along streams, in rich soil, Shannon County, Missouri.

Crataegus consueta.—A tree 10–15 feet high. On rocky hills and glades, Taney County, Missouri.

Crataegus tenuisepala.—A tree 15–20 feet high. On gravelly ridges between swamps, Butler County, Missouri.

Crataegus leptophylla.—A tree 15–20 feet high. In low rich soil, Cole County, Missouri.

Crataegus acutifolia.—A tree 20–25 feet high. In open woods, St. Louis County in Missouri, and Illinois.

Crataegus rubrisepala.—A shrub 8–12 feet high. In thickets on dry hills, Jasper County, Missouri.

Crataegus rudis.—A tree 10–20 feet high. In woods and on gravelly banks of streams, Carter County, Missouri.

Crataegus munita.—A shrub or small tree 10–15 feet high. On dry rocky hillsides, Jasper County, Missouri.

Crataegus vallicola.—A tree 15–25 feet high. In rich soil on wooded slopes, St. Louis County, Missouri.

Crataegus calophylla.—A tree 20–25 feet high. On moist prairies, Greene County, Missouri.

Crataegus paradoxa.—A shrub 5–8 feet high. On dry limestone barrens, Jasper County, Missouri.

Crataegus Parkae.—A tree 20–25 feet high. On moist prairies, Greene County, Missouri.

Crataegus effulgens.—A shrub 10–15 feet high. On moist prairies, Greene County, Missouri.

Crataegus polyclada.—A tree 15–20 feet high. On moist prairies, Greene County, Missouri.

Crataegus setosa.—A tree 15–25 feet high. On gravelly borders of streams, Carter County, Missouri.

PUNCTATAE GROUP

Crataegus succincta.—A tree 14–18 feet high, with a tall trunk covered with a dark red-brown bark broken into small, closely appressed scales. Branches large, spreading below and ascending above, forming a broad, rather open head; branchlets slender, nearly straight, orange-green at first, becoming dull chestnut-red and reddish brown the second year, armed with slender, slightly curved, purple, shining spines. Leaves acute and short-pointed at the apex, gradually narrowed to the base, finely serrate above the middle, about half grown when the flowers open in the middle of May, thin, firm, yellow-green, smooth and lustrous on the upper surface, paler beneath. Flowers white, in 4–7-flowered corymbs; anthers pale yellow; stamens 20. Fruit lustrous orange-red, ripening early in October. Habitat: tops of limestone hills, St. Louis and Franklin Counties, Missouri.

Crataegus verruculosa.—A tree 20–25 feet high. On gravelly banks of streams, Greene County, Missouri.

Crataegus sordida.—A tree 20–25 feet high. In low woods and gravelly banks of streams, Shannon, Carter, and Ripley Counties, Missouri.

Crataegus angustata.—A shrub 5–12 feet high. On gravelly banks of streams, Taney County, Missouri.

Crataegus vicina.—A tree 20–25 feet high. On hillsides, Jasper County, Missouri.

Crataegus sucida.—A tree 20–25 feet high. On gravelly banks of streams, Shannon County, Missouri.

Crataegus macropoda.—A tree 10–15 feet high. In low moist ground, Jasper County, Missouri.

Crataegus incaedua.—A tree 15–20 feet high. On borders of streams, Shannon County, Missouri.

Crataegus hertiflora.—A tree 15–20 feet high. On gravelly banks of creeks, Taney County, Missouri.

Crataegus Lettermani.—A tree 18–20 feet high. In low rich ground, St. Louis County, Missouri.

Crataegus secta.—A tree 12–15 feet high. In low moist soil, Jasper County, Missouri.

VIRIDES GROUP

Crataegus viridis—A tree 20–35 feet high, with a straight trunk covered with a smooth gray or pale orange-colored bark. Branches small, forming a round, compact head; branchlets slender, ashy gray to light red-brown the first season, armed with very few or no spines. Leaves ovate to oblong-ovate or oval, pointed or rarely rounded at the apex, gradually narrowing to the square base, finely serrate above and sometimes slightly lobed at the apex, nearly fully grown when the flowers open in late April, at maturity dark green and shiny on the upper surface, pale beneath, turning brilliant scarlet in autumn. Flowers white, in many-flowered corymbs; stamens 20; anthers pale yellow. Fruit bright scarlet or orange, ripening in autumn and mostly persistent throughout the winter. Habitat: in rich moist ground, eastern Missouri, Illinois, south to Arkansas, Texas, and Florida.

Crataegus lanceolata.—A tree 25–30 feet high. In river bottoms, St. Louis County, Missouri.

Crataegus ovata.—A tree 25–30 feet high. On low moist river banks, St. Louis County, Missouri.

Crataegus furcata.—A shrub 15–20 feet high. On rocky hillsides and along small streams, Jasper County, Missouri.

Crataegus ludoviciensis—A tree 15–25 feet high. On river bottoms, St. Louis County, Missouri.

Crataegus lutensis.—A tree 10–12 feet high. On wet bottom land, Newton County, Missouri.

Crataegus nitens.—A tree 20–25 feet high. In rich soil on rocky hillsides, Marion County, Missouri.

Crataegus Davisii.—A tree 20–25 feet high. In rich soil on rocky hillsides, Marion County, Missouri.

Crataegus Pechiana.—A shrub 10–15 feet high. On dry rocky hills, in sterile soil, Marion County, Missouri.

PRUINOSAE GROUP

Crataegus calliantha.—A shrub 5–10 feet high, with small erect stems covered with dark rough bark. Branchlets slender, nearly straight, dark orange-green at first, becoming light orange-brown and lustrous the first season and dark chestnut-brown the following year, and armed with numerous, nearly straight, stout, dark brown spines. Leaves ovate, acuminate, rounded at the broad base, sharply serrate and slightly divided above the middle, about half grown when the flowers open late in April, at maturity thick, yellow-green, lustrous and smooth above, paler beneath. Flowers white, in compact 5–7-flowered corymbs; stamens 20; anthers pale pink. Fruit pink. Habitat: on limestone hills, St. Louis and Franklin Counties, Missouri.

Crataegus bracteata.—A shrub 6–9 feet high. On bottom lands, Jasper County, Missouri.

Crataegus rubicundula.—A shrub 5–10 feet high. In river bottoms, St. Louis County, Missouri.

Crataegus decorata.—A shrub 8–12 feet high. On rocky hillsides, Taney County, Missouri.

Crataegus platycarpa.—A tree 15–20 feet high. On dry ridges between swamps, Butler County in Missouri, and Arkansas.

Crataegus aspera.—A shrub 10–12 feet high. On gravelly banks of streams, Jasper County, Missouri.

Crataegus magnifolia.—A shrub 10–12 feet high. On gravelly banks of streams, Jasper County, Missouri.

Crataegus patrum.—A tree 15–20 feet high. On river bottoms, St. Louis County, Missouri.

Crataegus aperta.—A shrub 10–15 feet high. On rocky hills, St. Louis County, Missouri.

Crataegus callicarpa.—A tree 15–20 feet high. On hillsides, St. Louis County, Missouri.

Crataegus locuples.—A tree 15–20 feet high. On wooded hillsides, St. Louis County, Missouri.

Crataegus Mackenzii—A shrub 6–15 feet high. On rocky barrens, Jackson County, Missouri.

Crataegus rigida.—A shrub 9–12 feet high. In oak woods on limestone hills, Franklin County, Missouri.

Crataegus brachypoda.—A tree 12–20 feet high. On gravelly banks of streams, Carter and Ripley Counties, Missouri.

Crataegus sicca.—A shrub 3–6 feet high. On dry limestone hills, Franklin County, Missouri.

MOLLES GROUP

Crataegus mollis (*red haw*).—A tree 30–40 feet high. Branches smooth, ashy gray, heavy, wide-spreading, forming a broad, round-topped head; branchlets stout, covered at first with a thick coat of white hairs, becoming smooth in the second year, armed with occasional straight, thick, chestnut-brown, lustrous spines. Leaves broad-ovate, acute, usually cordate or rounded at the wide base, serrate and more or less deeply divided into 4 or 5 pairs of lobes, about half grown when the flowers open in early May, firm in texture at maturity, dark yellow-green on the upper surface, paler beneath. Flowers white, in broad, many-flowered corymbs; stamens 20; anthers light yellow. Fruit large, red, ripening in August and dropping as soon as ripe. Habitat: in low rich soil, northern and eastern Missouri, Ontario to South Dakota, Nebraska, Kansas, and Tennessee.

Crataegus dasyphylla.—A tree 15–20 feet high. In rich moist soil, Jasper County, Missouri.

Crataegus declivitatis.—A shrub 9–15 feet high. On steep bluffs along the Mississippi River, South St. Louis, Missouri.

Crataegus macrophylla.—A tree 20–25 feet high. On river bottoms, St. Louis County, Missouri.

Crataegus lasiantha.—A tree 20–25 feet high. In low moist soil, Jasper County, Missouri.

Crataegus umbrosa.—A tree 25–30 feet high. On river bottoms, St. Louis County, Missouri.

Crataegus Treleasei.—A tree 20–25 feet high. In moist soil on banks of streams, St. Francois County, Missouri.

Crataegus dumetosa.—A shrub 6–9 feet high. In thickets on fertile uplands, Jasper County, Missouri.

Crataegus Kelloggii.—A tree 20–25 feet high. On river banks, St. Louis County, Missouri.

Crataegus lanuginosa.—A tree 20–25 feet high. In low rich soil, Jasper County, Missouri.

Crataegus dispessa.—A tree 15–20 feet high. Along streams, Shannon County, Missouri.

DILATATAE GROUP

Crataegus coccinioides.—A tree 15–20 feet high covered with dark brown scaly bark. Branches stout, spreading, light gray, forming a broad head; branchlets stout, nearly straight, smooth, bright chestnut-brown, shiny, armed with stout, reddish purple, shining spines. Leaves broad-ovate, acute, full and rounded or square at the base, sharply serrate and divided above the middle into short lobes, about half grown when the flowers open in early May, at maturity thin, firm, rather rigid, dull dark green on the upper surface, pale beneath, turning orange and scarlet in autumn. Flowers white, in very compact 5–7-flowered corymbs; stamens 20; anthers deep rose color. Fruit ripening in October, dark crimson. Habitat: on rich hillsides, near St. Louis, Missouri, and eastern Kansas.

Crataegus speciosa.—A tree 15–20 feet high. On rocky hills, Jasper County, Missouri.

COCCINEAE GROUP

Crataegus Margaretta.—A tree 20–25 feet high, with a straight trunk covered with thin, dark gray-brown bark. Branches small, rather erect, forming a narrow open head; branchlets slender, orange-green at first, becoming bright chestnut brown and shiny at the end of the season, and ashy gray tinged with red during the second year, armed with thin, straight or nearly straight, chestnut-brown spines. Leaves broad, oblong-obovate, acute or rounded at the apex, gradually narrowed to the base, coarsely doubly serrate above the middle, and divided into short rounded lobes, at maturity firm and leathery, smooth and dark green above, paler beneath. Flowers white, in 3–12-flowered corymbs; stamens usually 20; anthers light yellow. Habitat: in rich soil, St. Louis and Greene Counties in Missouri, Ontario, Michigan to Illinois, Iowa and Tennessee.

INTRICATAE GROUP

Crataegus villicarpa.—A shrub 3–6 feet high, with small, pale gray stems. Branchlets slender, slightly zigzag, light red-brown, covered with long white hairs at first, becoming dull chestnut-brown and pubescent in their first year, and gray tinged with red the following year, armed with numerous slender, curved or straight, bright red-brown, shining

spines. Leaves ovate, acuminate, gradually narrowed towards the base, doubly serrate above, more than half grown when the flowers open in the middle of May, at maturity thin but firm, blue-green on the upper surface, paler beneath. Flowers in compact 3–5-flowered hairy corymbs; stamens 5–10; anthers pale yellow. Fruit orange-yellow, more or less tinged with red. Habitat: on rocky hills and barrens, Franklin and Taney Counties, Missouri.

Crataegus neo-Bushii.—A shrub 5–10 feet high. On dry gravelly soil, Shannon County, Missouri.

Crataegus padifolia.—A tree 10–15 feet high. On hillsides, Taney County, Missouri.

Crataegus leioclada.—A shrub 6–8 feet high. On rocky hills and barrens, Taney County, Missouri.

UNIFLORAE GROUP

Crataegus trianthophora.—A shrub 2–5 feet high. Leaves oblong-obovate, cuneate at the base. Flowers in 2–3-flowered corymbs; stamens 20; anthers yellow. Fruit light orange-red, lustrous, ripening in October. Habitat: in dry open woods, Carter County in Missouri, and Arkansas.

MICROCARPAE GROUP

Crataegus Phaenopyrum (cordata), Washington thorn.—A tree 20–30 feet high, with a straight trunk dividing into slender, usually upright branches, forming an oblong head. Branchlets slender, zigzag, bright chestnut-brown, smooth and shiny, becoming dark brown or reddish brown, armed with slender sharp spines. Leaves broad-ovate to triangular, acute or acuminate, square, rounded, or heart-shaped at the base, coarsely serrate above, more or less lobed, fully grown when the flowers open in late May, at maturity thin and firm, dark green and lustrous above, pale beneath. Flowers in many-flowered corymbs; stamens 20; anthers rose color. Fruit ripening in September and October, persistent on the branches nearly all winter. Habitat: along banks of streams in rich soil, Franklin, St. Francois, Wayne, Shannon and Ripley Counties in Missouri, southern Illinois, Kentucky, Tennessee, Virginia, and Alabama.

Crataegus apiifolia (parsley haw).—A tree 15–20 feet high. Along borders of streams and swamps, southeastern Missouri, Virginia to Florida.

MACRACANTHAE GROUP

Crataegus tomentosa.—A tree 15–20 feet high, with a trunk covered with smooth, pale gray or dark brown bark. Branches slender, spreading, smooth, gray, forming a wide flat head; branchlets slender, covered, when they first appear, with a thick hoary tomentum, becoming dark orange color in their first winter and ashy gray the second season, unarmed or armed with few slender, straight, ashy gray spines. Leaves ovate, rhombic or elliptic, acute at the apex, gradually narrowed to the square base, sharply serrate above and often divided above the middle into several short lobes, nearly fully grown when the flowers open in late May or early June, at maturity firm, thin, gray-green above, pale pubescent beneath, turning brilliant orange and scarlet in autumn. Flowers white, in many-flowered corymbs; stamens 20; anthers pale rose color. Fruit ripening in October, dull orange-red, persistent throughout the winter. Habitat: in rich soil, northwestern Missouri to the valley of the Meramec River, Ontario, New York, Ohio, Michigan, Kansas south to Alabama.

Crataegus simulata.—A small tree 3–7 feet high. In moist rich soil, Joplin and Jasper Counties, Missouri.

Crataegus hispidula.—A shrub 6–9 feet high. On limestone cliffs, Jasper County, Missouri.

Crataegus missouricnsis.—A shrub 3–6 feet high. On bluffs and rocky banks, Shannon and Ripley Counties, Missouri.

Crataegus globosa.—A shrub 15–20 feet high. On dry gravelly banks of streams, Shannon, Taney, and Christian Counties, Missouri.

Crataegus obscura.—A shrub 3–8 feet high. On limestone cliffs, Jasper County, Missouri.

Crataegus spinulosa—A shrub 6–8 feet high. In low moist soil along streams, Jasper County, Missouri.

Crataegus Chapmani.—A tree 15–20 feet high. On banks of streams, Taney County in Missouri, Virginia to northern Georgia and Tennessee.

Crataegus rupicola.—A shrub 6–10 feet high. On dry rocky hills, Taney County, Missouri.

Crataegus pudens.—A shrub 8–15 feet high. On gravelly banks of streams, Shannon County, Missouri.

Crataegus mollicula.—A shrub 6–12 feet high. Rocky banks of streams, Shannon County, Missouri.

Crataegus insperata.—A shrub 3–6 feet high. On rocky banks of streams, Jasper County, Missouri.

Crataegus ensifera.—A tree 15–20 feet high. Along roadsides, Christian County, Missouri.

Crataegus pertomentosa.—A shrub 6–15 feet high. On rocky barrens, St. Louis and Jackson Counties, Missouri.

PLANT LABELS IN USE AT THE MISSOURI BOTANICAL GARDEN

In a botanical garden labels of various materials and designs are essential for displaying the names and keeping a record of the plants. The plants in that portion of the garden and conservatories always open to the public require labels that are permanent and easily read, yet not so conspicuous as to spoil the appearance of the plants or plantings.

A type of label that is used to a considerable extent outdoors in summer is the Simplex Weatherproof (pl. 12, No. 1), consisting of a standard 18 inches long and a card-holder 1¾ x 2¾ inches. The name of the plant is printed with India ink on a celluloid card, which, together with a piece of transparent covering, usually mica, is slipped into the groove of the holder. Two holes at the base of the holder carry off any moisture that collects in the label. This type of label is neat and easily read, but cannot be considered permanent because during the winter months soot and moisture accumulate between the celluloid and mica, clouding the lettering.

Number 2, a zinc label with an oval face 1¼ x 2¾ inches and a standard 6 inches long, is the best general label for indoor and outdoor plantings of herbaceous materials. It is strong, durable, and permits fairly large lettering that lasts the life of the label. Zinc labels that have been exposed to the weather for many years gradually darken, but if their surface is moistened the lettering can be distinguished. Lead pencil, India ink, prepared solutions sold by seed firms, and chemical inks of various compositions are used for lettering. A satisfactory preparation is that used at the Garden, and consists of 1 dram copper acetate, 1 dram ammonium chloride, ½ dram lampblack, and 10 drams water. The surface of the zinc should be polished with fine sandpaper or emery cloth and the lettering done with a glass stylus, steel pens corroding too rapidly. The oval label is the most difficult on which

to write because of the slanting face, and to overcome this the labelers have devised two methods. One consists in passing the standard of the label through a slanting V-shaped hole cut through the surface of a table, this bringing the oval portion flat on the table. A second and better way consists in cutting the same kind of a hole in a board ½ inch thick and near this hole fastening an oval block over which the label fits securely, making a rigid surface on which to write. The board is fastened to the table by a clamp. It frequently happens that labels of this type are badly bent by persons stepping on them, cultivators striking them, or even by the heaving action of frost, but they are readily straightened by placing them in a press moulded to their shape. The oval label, and in fact all zinc labels, may be used a number of times if the lettering is removed with a weak solution of muriatic acid and the surface polished with sandpaper.

Number 3 is a celluloid hanging label 2 x 3 inches with an eyelet and a copper wire for attaching to plants. The writing is done with India ink. This is an ideal label for vines and tall plants where the writing can be brought up to the level of the eye, but is only suitable for conservatory use.

Number 4 is very similar to No. 3 except that it is of zinc. This is a very good type of permanent label for trees, shrubs, and vines, but is not as easily read from a distance as No. 3. Sometimes, instead of being fastened with a wire, a brass nail is passed through the eyelet and the label nailed to the trunk of a tree. When tacked to stakes 2 x 2½ inches and 2 feet high, this label is ideal for marking nursery rows.

Another type of hanging label for trees and shrubs is No. 5. This consists of a strip of sheet zinc 8½ inches long, 1¼ inches wide at the top and tapering to a point at the bottom. In fastening this label the tapered portion is carried around the branch once and the end lapped over. The disadvantage of this label, and in fact all labels that are fastened to the stems and branches with wires, is that if it is not loosened occasionally the growth of the trees and shrubs will be restricted and sometimes malformed, or often the label will be broken off.

Number 6 is a zinc hanging label of a different pattern, with an eyelet and a copper wire. Its dimensions are 1 x 1¼ inches. A type of label that is used considerably for orchids

grown in baskets is No. 7. It consists of a sheet of celluloid ¾ x 4 inches, to which a piece of mica of the same size is secured at one end by a brass button. At the opposite end of the button is a small hole in the celluloid and mica. The label is written on the celluloid with India ink, the mica fastened over, and a copper wire passed through the holes. This label is used only for orchids, but is very satisfactory on account of the mica protecting the surface.

The stick label (No. 8), consisting of a sheet of zinc 1 inch wide and 6 inches long, serves admirably for pot plants and for use in coldframes and in the open where a somewhat permanent label is required. It is also used for small plants in nursery rows where only hand cultivation is practiced, but when a horse or tractor is employed there is danger of the labels being torn up and lost.

Another type of stick label is No. 9, which consists of a piece of celluloid ¾ x 5 inches. When printed with India ink it makes a very good label for pot plants, particularly the orchids.

When only temporary labels are needed nothing surpasses the wooden stick label for cheapness and ease in lettering with pencil. Number 10, a stick label 8 inches long, is very good for labelling plants that are set in nursery rows. For seeds, pot plants, hot-beds, cold-frames, and wherever a small temporary label is required nothing surpasses the 6-inch wooden stick label (No. 11). This label may be obtained with one side painted white, and while the cost is slightly higher than that of the unpainted label, the additional price is compensated for by the better appearance and more lasting quality of the writing.

Number 12 is a good wooden hanging label with painted surface and copper wire attached, and is well suited for a temporary label, such as on plants for shipment. When used outdoors it lasts longer than a year.

Number 13 is a large durable lead label 3 x 6 inches, with the lettering stamped and filled in with white paint. This type of label is well suited for marking large plant groups and is practically indestructible, as the lettering is always legible even if the paint wears out. This label would be too expensive for general use on account of the cost of stamping and the necessity of an iron holder for each label.

Number 14 is a more expensive, but very permanent, label well suited for specimen trees. It consists of an oval piece of zinc 4½ x 8 inches, the letters being raised and the whole moulded at one time. The surface is slightly concave to fit the trunk of the tree, and two holes are provided for nailing it to the bark. This label must be inspected once in a while, as sometimes the expansion of the tree trunk cracks the label in a vertical line between the nail holes.

The labels described above are the ones used at the Missouri Botanical Garden. There are other types of labels, among which may be mentioned painted wooden labels of various sizes; glazed porcelain labels with the letters burnt in; and flat hollow glass labels into which a written card is inserted and the bottom closed with a cork.

WORK OF VOCATIONAL STUDENTS

From time to time mention has been made in the BULLETIN of the training of vocational students assigned to the Missouri Botanical Garden by the United States Veterans' Bureau. The two following articles have been prepared by two of the regular students and are printed as submitted, since it is believed that this discussion of two aspects of the work in the words of the men actually engaged in it gives a better idea of its value than any general article.

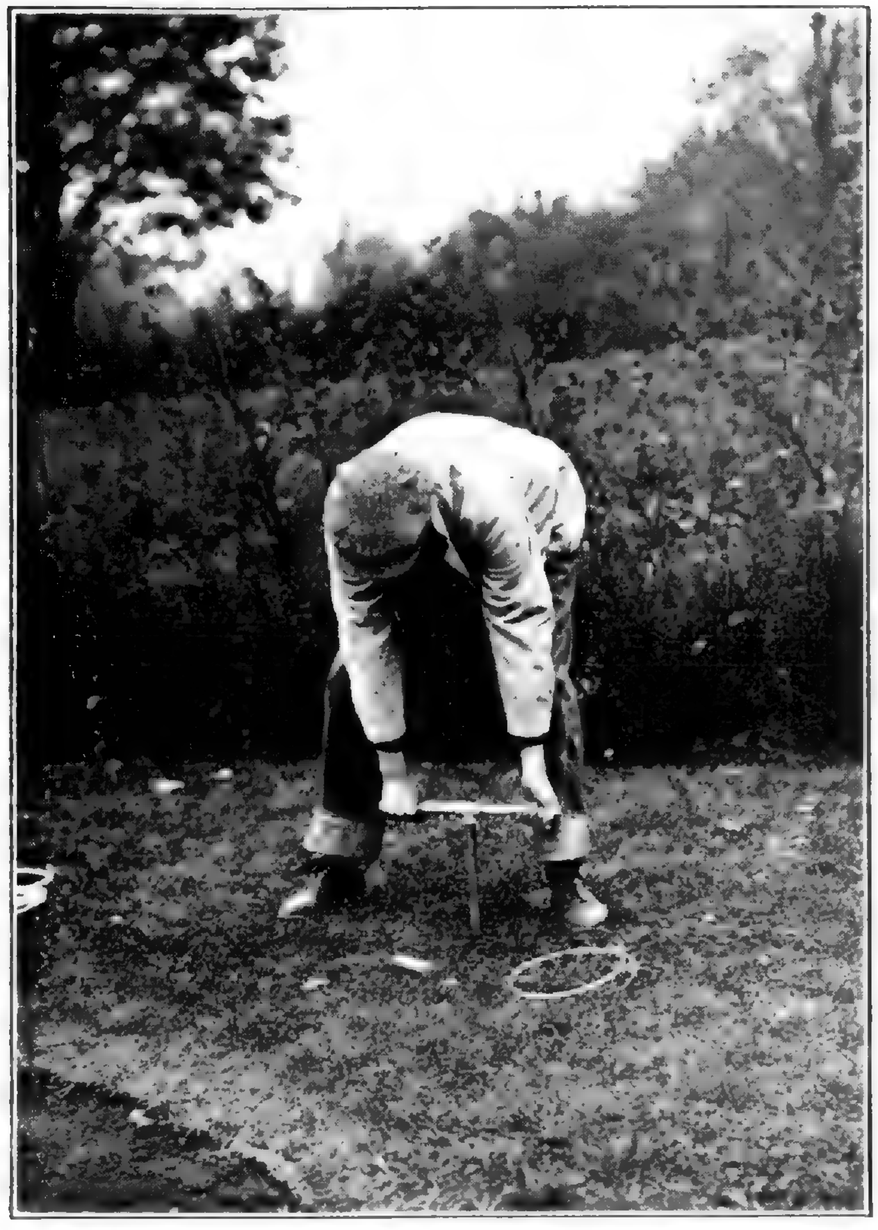
THE USE OF EXPLOSIVES

From an agricultural standpoint, explosives, especially the dynamites, are indispensable to the farmer, to the owner of an estate, or to the park superintendent.

Many persons have not cared to use dynamite, because they thought it too hazardous, but with due care dynamite can be used to loosen tight subsoil, to blast holes for tree-planting, to loosen and break rock, to dig ditches, to blast stumps, and to terrace farm land.

Last fall, in the Missouri Botanical Garden, the subsoil in the flower beds just south of the water-lily ponds was loosened with 20 per cent dynamite. The subsoil was found to be a tight impervious fire clay that became soggy in wet weather and extremely hard in our hot, dry summers. An inch and one-half auger was used, boring holes 3–3½ feet deep. The

TYPES OF PLANT LABELS IN USE AT THE GARDEN.



WORK OF VOCATIONAL STUDENTS.
Boring holes for dynamite and placing charge.

holes were spaced 10–12 feet apart and were about 3 feet south of the flower beds. The charge of one-half stick of dynamite, a No. 6 cap with 3 feet of fuse, was lowered to bottom of hole; charge was tamped gently at first, then harder and tighter till hole was filled, and then the fuse was lighted. If the sod were blown out of place, the charge should have been a few inches deeper. The results can be seen this coming summer when the ground is dry.

In Forest Park, the trees newly planted were formerly set in spade-dug holes, with a loss each year of at least 40 per cent. Now the holes are blasted and trees planted, with a loss of not over 5 per cent. Dynamite has paid the Park Board of St. Louis. In blasting holes for trees, the hole should be 30 inches deep; the charge one-half stick of dynamite; 30-inch fuse and No. 6 blasting cap. The shot is the same as a subsoil shot, except the hole must be dug afterward. But the newly planted tree will have a good start, whereas with a spade-dug hole it was problematical.

Remember, all blasting must be done when the soil is dry.

SOME INTERESTING FACTORS, RELATIVE TO VOCATIONAL TRAINING

In the Missouri Botanical Garden are fourteen vocational students, rehabilitating themselves in landscape gardening. The mode of training is different from that in some institutions in that the mornings are devoted to practical work in the different departments, and the afternoons to lectures. Our schedule is as follows:

	Monday	Wednesday	Thursday	Friday
Oct.-Jan.	Taxonomic Botany (Kellogg)	Landscape Design (Noyes)	Weekly Review Special Features (Pring)	Plant Materials Tropical Plants (Pring)
Feb.-June	Entomology (Anderson)	Landscape Design (Noyes)	Weekly Review Special Features (Pring)	Plant Materials Dormant Woody Plants (Jensen & Kellogg)
Oct.-Jan.	Floriculture (Pring)	Landscape Design (Noyes)	Weekly Review Special Features (Pring)	Insects, Diseases and Control (Kohl)
Feb.-June	Tree Surgery Forcing Fruits and Vegetables under Glass (Pring & Jensen)	Landscape Design (Noyes)	Weekly Review Special Features (Pring)	Soils and Fertilizers (Anderson)

The faculty consists of the following: Dr. George T. Moore, Director; Mr. G. H. Pring, Horticulturist and Superintendent of the Garden, also Co-ordinator of the Vocational Students; Dr. Edgar Anderson, Geneticist; Mr. L. P. Jensen, Arboriculturist; Mr. P. A. Kohl, Floriculturist; Mr. John Noyes, Landscape Designer; and Mr. John Kellogg, Herbarist and in charge of Nursery.

Mr. G. H. Pring, our co-ordinator, has instituted an afternoon lecture, a little out of the ordinary in that our lecturers are two of the vocates. The subjects covered to date are: bedding plants, floral display, carnations, cycads, ferns, palms, roses, orchids, mums, pruning, grafting, budding, etc.

The lecturers read their lecture at first, but now they speak extemporaneously and use notes. The lecture uses an hour or more, after which we have a discussion. Each student must study the subject thoroughly, else Mr. Pring may ask him to explain his question. And each student tries to have a question that will cause the lecturers to do some deep thinking to answer it.

To give an idea as to the subject matter, we will take the lecture on ferns, as given by Harry Schramm and M. J. Benda. Schramm had the propagation and culture, and Benda the history and evolution. The propagation was by far the harder to give, due to the fact that so few persons know the structure and reproductive processes a fern goes through. Schramm told us when to gather the spores, when to sow; moisture conditions; when to transplant; pests and diseases and control.

Benda gave us the history; where the fern stands in relation to other plants. He gave us the botany of the fern in so simple language that our less-educated comrades could understand.

Jansen started the discussion by asking Schramm how to figure the cubic feet of a greenhouse. Wahl asked if the fern was a monocotyledon or a dicotyledon. Zeiner asked if the mealy bug could be killed with nicotine. Aubuchon asked if ants were harmful to ferns. Holton wondered if either lecturer could tell him why some Boston ferns were plumose. Lance asked Benda if the reproduction were sexual or asexual. Ward asked Benda what conditions were necessary for the antheridia to get to the archegonia on the prothallus.

Goodwin (who is deaf) asked for the formula of hydrocyanic acid gas. Wilhelm asked if shade were necessary in growing ferns. Stenzinger asked how to sterilize soil.

Every Thursday is review day and one class the boys look forward to. The lecture is of two-fold value: The students have to face an audience of practical critics. Every one has to study the lecture of the week, and be able to answer his own question as well as the question of others. Then, too, our lecture afternoon is so full of interest to every one that no one falls asleep, as they might if one man lectured.

NOTES

Dr. B. M. Duggar, Physiologist to the Garden, has been elected a member at large of the biological division of the National Research Council.

Dr. Edgar Anderson, Geneticist to the Garden and in charge of School for Gardening, spoke before the pupils of the Kennard School, May 16, on "Flower Families."

The annual flower sermon, provided for in Mr. Shaw's will, was preached at Christ Church Cathedral, May 27, by the Rev. W. Russell Bowie, of Grace Church, New York City.

The visitors attending the convention of the American Federation of Arts were guests of the Garden, May 24, and were shown around the buildings and grounds by special guides.

Mr. L. P. Jensen, Arboriculturist to the Garden, is the author of an article in the St. Louis Globe-Democrat, April 26, on "The Destruction of Wild Flowers Due to Injudicious Picking."

Recent visitors to the Garden include Dr. R. C. Knight, of the laboratory of plant physiology, University of London, on May 16, and Prof. W. A. Setchell, professor of botany, University of California, May 22.

The fourth number of Volume IX of the Annals of the Missouri Botanical Garden, has recently been issued, with contents as follows:

"A Bacterial Disease of Foxtail (*Chaetochloa lutescens*)," H. R. Rosen.

"The Toxic Property of Sulphur," H. C. Young.

Mr. L. P. Jensen, Arboriculturist to the Garden, has given the following illustrated lectures recently: "Conservation of Forests," before the "Be Square" class of the Kingshighway Presbyterian Church, April 26; "Beautification of Home Grounds," before the Women's Club of Belleville, Ill., the afternoon of April 30; "The City Beautiful," before the Belleville Chamber of Commerce, the evening of April 30; "Conservation of Forests," before the St. Louis Association of Gardeners, at the Forest Park greenhouses, May 21.

The fourth annual flower show under the auspices of the Garden Club of St. Louis was held in the floral display house at the Garden, May 26 and 27, the date having been set back a week on account of the unusually late blooming season.

Dr. J. M. Greenman, Curator of the Herbarium, attended the annual meeting of the Illinois Academy of Science, at Galesburg, Ill., April 4, and presented a paper on "Opportunities for Botanical Research in Central America."

STATISTICAL INFORMATION FOR APRIL, 1923

GARDEN ATTENDANCE:
Total number of visitors.....21,645

PLANT ACCESSIONS:
Total number of plants received in exchange..... 73
Total number of seed packets received as gifts..... 616

PLANT DISTRIBUTION;
Total number of plants distributed as gifts..... 50

LIBRARY ACCESSIONS:
Total number of books and pamphlets bought..... 25
Total number of books and pamphlets donated..... 57

HERBARIUM ACCESSIONS:
By Gift—
Drushel, J. A.—Plants of Alabama, Michigan, Missouri and Texas..... 12
Gastellum, Miss Gregoria—*Legascea decipiens* Hemsl. from Arizona..... 1
Johnson, Harry P.—Seed of *Mucuna* sp. from Florida.. 1
Latham, R.—*Hypocrea rufa*..... 1
Ledman, O. S.—*Draba caroliniana* Walt. from Missouri. 1
Lewis, Miss Mary D.—A cultivated specimen of *Phaius grandifolius* Lour. from Florida..... 1

Overholts, Doctor L. O.—*Merulius rugulosus* B. & C. and *Stereum papyrinum* Mont. from Florida..... 2
Welch, D. S.—*Peniophora incarnata*..... 1
Wolf, Dr. F. A.—*Marssonia Potentillae*..... 2

By Purchase—
Weigel, Theo. Oswald—Plants of Bolivia, collected by K. Fiebrig..... 66

By Exchange—
New York Botanical Garden—Fragments of South American Senecios..... 18

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The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XI JUNE, 1923 No. 6

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VIEW OF FEATURE GARDEN FROM LINNEAN HOUSE GARDEN

Missouri Botanical Garden Bulletin

Vol. XI JUNE, 1923 No. 6

THE FOURTH ANNUAL FLOWER SHOW OF THE GARDEN CLUB OF ST. LOUIS

In 1920 the first show of the Garden Club of St. Louis was held in the floral display house of the Missouri Botanical Garden. That year marked the beginning of amateur flower shows in St. Louis, and each succeeding year has witnessed an improvement. The gain in experience in the method of staging the shows and of handling the flowers for exhibition made the fourth annual flower show, held May 26 and 27 of this year, a great success. The response of the general public to exhibit in a flower show is very slow at first, but once interest is aroused wonderful results may be expected.

The object of the Garden Club of St. Louis in undertaking these flower shows is to create a wider local interest in the growing of flowers, shrubs and trees, fruits and vegetables, and to demonstrate what a variety of beautiful and useful plants may be grown successfully in this climate.

The show is held in a garden that is internationally famous, and as the exhibition days are in the latter part of May, visitors are drawn to the Garden at one of the best seasons of the year for outdoor floral displays of perennials, iris, peonies, wild plants, shrubs and trees. The floral display house at the Garden, in which the show is staged, is without equal in this country. Plate 15, taken from the balcony surrounding the banana pit, gives an idea of the general view the visitor to the show receives upon entering the house. The permanent planting of shrubs and the abundant natural light were of great advantage in staging the exhibits.

The time to set for a show of this kind is wholly dependent upon outdoor materials and must necessarily be made to suit

the variable spring conditions. On account of the unusually late spring this year the show was postponed a week.

The premium list for these shows is very complete, and while not all the plants listed can be had at their best on the exhibition days, there are always an abundance of plants which may be entered. The iris and most of the peonies were at their prime this year. The entries in the classes for the most artistic arrangement of cut flowers were numerous, and the table holding those exhibits attracted a great deal of attention. Much can be learned from these displays as to the best materials to use and the containers best suited for the particular flowers. A flower is often considered cheap because it is common and yet it may have many more artistic features than its expensive neighbor. Many a person would doubt that a bowl of yellow iris with spikes of common grass would take first prize in artistic arrangement, but had he seen such a display he would have been convinced of its merits.

People come to flower shows to learn not only how to stage and arrange flowers, but to see what is new, and in the latter case there is much room for improvement. The exhibitors are of course familiar with the material displayed, but they seldom realize that many of the visitors are seeking information and are curious concerning the names of the plants. If it were possible, some uniform type of label should be adopted at all flower shows, and these should be so placed that they can be found without having to touch the exhibits and yet not so conspicuous as to mar their beauty.

The exhibits that attracted a great deal of attention were the miniature gardens in adults' and children's classes. This feature was new at the show and, judging from the comments and interest aroused, much can be expected next year. So much can be learned of the proper treatment of home grounds so forcibly illustrated from models that more classes in miniature gardens should be included in the premium schedule next year. Both amateurs and professionals should be encouraged, and city lots, suburban grounds, and country homes could be the subjects. The study and execution of practical problems should be the object rather than the production of replicas of existing gardens which are meritorious only on account of their wonderful detail in miniature. Competitors should be

JUDGING THE FOURTH ANNUAL ST. LOUIS GARDEN CLUB FLOWER SHOW.

given certain specifications to follow. The dimensions of the grounds and the nature of the subjects treated, whether to be a garden only or to contain the house and other buildings, should be stated. The selection of the materials to use should be left to the exhibitor.

All flower shows contemplating exhibits of miniature gardens should issue their premium schedules sufficiently early to give the exhibitors an opportunity to study the class in which they wish to enter. To be worthy of the name miniature gardens need much thoughtful consideration both as to design and materials to use. To secure the proper materials and build the gardens require a great deal of time, at least three months being needed. If final premium schedules cannot be issued this far in advance some provision should be made to issue preliminary schedules covering the miniature gardens. It would be interesting to have a class permitting the exhibitor to use natural materials or a combination of natural and artificial materials. In this case a garden on a larger scale should be allowed, as many growing plants are too large for a garden on a scale of one-quarter inch to the foot.

Some uniform scale of points on which the miniature gardens are judged should be adopted. It would be interesting to know on what points the models were judged at the various shows this year. The following is a suggestion of a scale of points:

MINIATURE GARDEN SCORE CARD

Design:

(Originality, proportion, color harmony)..... 25 per cent

Plantings:

(Proper arrangement and selection of trees, shrubbery beds, and flower beds)..... 25 per cent

Materials:

(Materials used that best represent what they portray) ..... 25 per cent

Workmanship:

(Perfection of execution in every detail)..... 25 per cent

100 per cent

GATHERING FLOWERS FOR THE SHOW

Despite the fact that the continuous rain the night preceding the opening day may have kept out some of the entries, the 1923 flower show was a remarkably good one. It is not only in the management of the show that experience is gained every year, but the exhibitors also gain in knowledge as to the proper way to treat the flowers and plants they hope to display.

Commercial growers who exhibit at flower shows have most of the growing conditions under control, but the amateurs are entirely dependent upon natural conditions. Prospective exhibitors are apt to have their choice blooms destroyed by wind, rain, heat, insects, and diseases. All of these conditions must be guarded against as the time of the show draws near, as a poorly developed or disfigured bloom will always disqualify an exhibit in the eyes of the judges. Rain injures all flowers, but those of delicate texture, such as the iris, suffer to a greater extent. To guard against injury of flowers by rain the blooms should be cut one or two days previous to the time of exhibition. Some flowers may be cut sooner than this. For instance, the peony may be picked at the time the first petals begin to unfold, and it gains in size and beauty by being kept in a dark cool place to take up as much water as possible. The iris open very rapidly, and on this account should not be cut until the evening before the show. In examining the buds one can see readily which will open the following day.

When gathering flowers for exhibition purposes it is well to carry along a pail half filled with water and to place the flowers in the pail immediately upon cutting them. It is better not to crowd too many flowers in the pail, but rather to make several trips to the house and carefully place them in deep containers full of cool water. The gathered flowers should be kept in a cool dark place free from draughts in order to reduce transpiration and to enable the stems to take up as much water as possible.

Light-colored flowers lose much of their beauty if allowed to open in the strong sunlight. If the flowers are of such a nature that they cannot be cut until just before the show, it is well to construct some temporary shading of cheese-cloth.

It sometimes happens that the choicest blooms have developed too rapidly and are in danger of being past their prime at show time. In that case the development can be slightly checked by constructing some heavier shading over the plants, this being removed towards evening and replaced in the morning. For protecting individual flowers small cones of waxed cloth or paper may be purchased, or they can be made at home from stout waterproof paper. The cones should be at least six inches in diameter and fastened to a stake just above the bloom. The flower should also be well staked to prevent being whipped about by the wind. In fact, as the spring season is usually unsettled, much damage can be prevented if all tall plants that are apt to be broken by the wind are staked and securely tied. Most perennials can be cut a day in advance of the show if placed in a cool dark place. On the day of the show all dead or decaying leaves should be removed, a fresh cut made at the bottom of the stems, and the water changed in the pails or vases. Cut flowers for the home should be treated in this manner every day, as water tainted with decaying vegetable matter is very detrimental to the flowers.

The oriental poppy wilts rapidly after cutting, and requires a treatment that differs radically from the usual method of handling cut flowers. After cutting the flowers immerse about two inches of the stem in boiling water for a few moments, or hold the ends in a flame, or cauterize with a hot soldering iron or similar object. This will seal the end and prevent the usually milky, sap from escaping. If a fresh cut is made at a later time the stems must again be cauterized. This treatment also applies to the poinsettia and other flowers that wilt down if just placed in water.

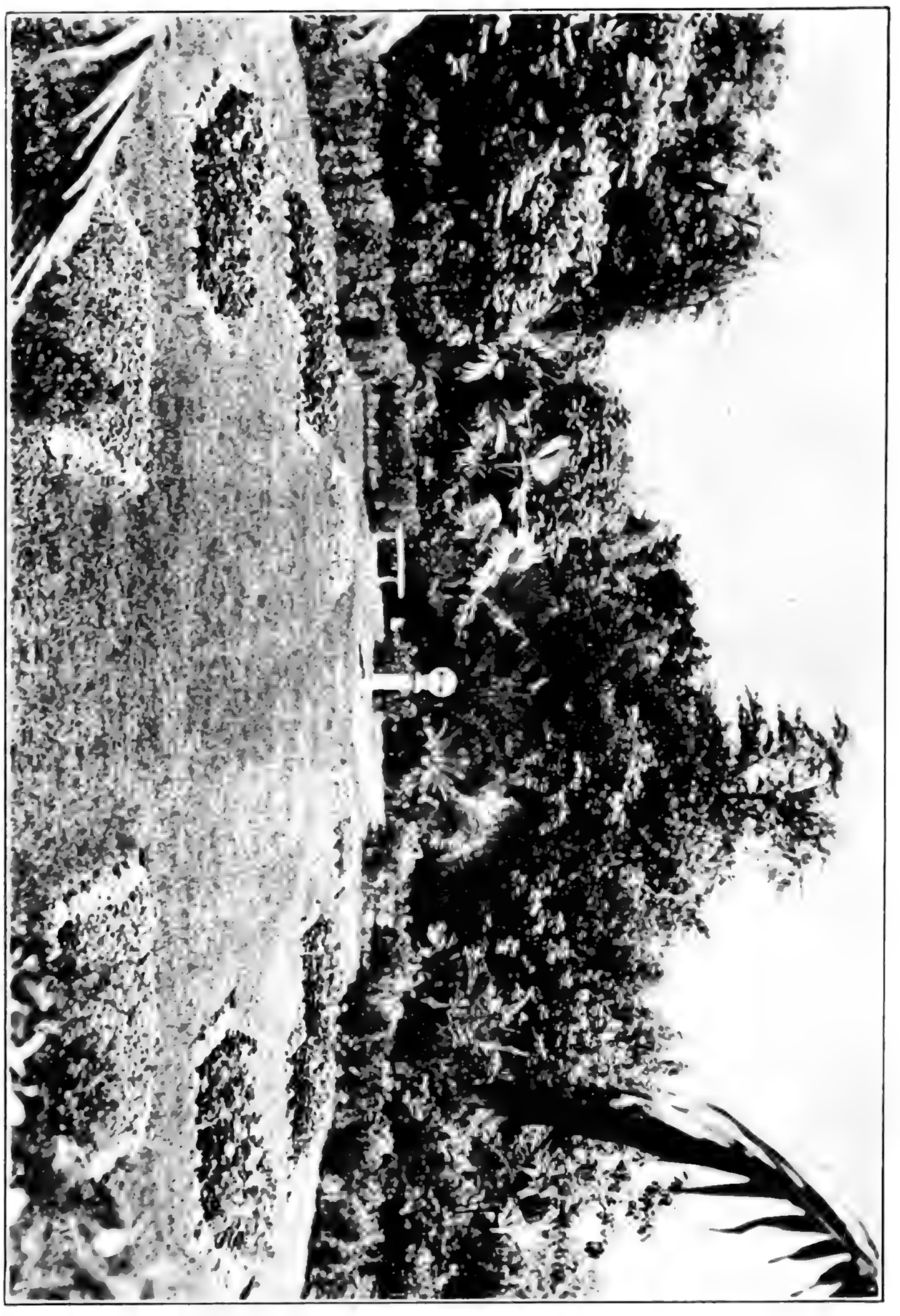
Transporting flowers to the show is a problem that confronts every exhibitor. Iris in bud or open flower are perhaps the most difficult to handle on account of their delicate structure and habit of branching. Wrapping them is almost out of the question, and the only way to manage is to leave them in a bucket or wide-mouthed vase and transport in some conveyance in which the flowers are protected from wind and contact with any solid objects. Smaller flowers, such as delphiniums, daisies, pansies, violets., etc., can be carried in bundles, or better still, boxes. Moist paper or moss should be

put over the stems, but water should not come in contact with the blooms. When arranging the flowers at the show the tips of the stems should again be cut in order that they may continue taking up water. When packing round flowers, such as peonies, tulips, roses, etc., a light covering of tissue paper around each flower before placing in the box will prevent bruising of the petals. Tissue paper is a great aid in packing flowers and should be used unstintingly in separating the various layers in the boxes.

Sprays of shrubs are treated in the same way as the perennials both as to gathering and packing. Pendulous branches of shrubs sometimes hang in an awkward position and when in bloom do not give the desired effect. This can be remedied by staking the branches that are to be cut in such a way that when the flowers open they are facing in the right direction. After the blooms open their position cannot be altered.

THE FEATURE GARDEN

In conjunction with the spring flower show a special garden was developed to give the public an idea of what could be accomplished in a very short time. A piece of ground, 60 x 80 feet, was selected near the floral display house, and by sodding, laying out beds, planting a hedge and bedding plants, and placing a few pieces of garden furniture attractively, a most pleasing garden was created. The plants in the beds consisted of pink geraniums and blue ageratum bordered with sweet alyssum. A hedge of red cedar formed the inner boundary of the garden and beyond this was a mass planting of shrubs, with a few palms to screen it from the natural treatment surrounding. Through the opening in the wall that encloses the Linnean Garden, one was attracted to this small garden by the view of a gazing globe. At the opposite end was a bird bath, while two white seats terminated the other walks. The garden was illuminated on the two evenings of the show and attracted a great many persons. It will be retained until spring, when it will be planted with pansies, bulbs, and iris.



THE FEATURE GARDEN.

MINIATURE GARDEN MADE AT SCHOOL FOR GARDENING.

MATERIALS FOR MINIATURE GARDENS

Much interest was manifested in the miniature gardens displayed at the fourth annual show of the Garden Club of St. Louis, and the purpose of this article is to aid those who contemplate making gardens for the next show by bringing together a list of materials that may be used.

Houses may be made of cardboard, wax, wood, and cardboard and plastacene. The Garden Club of America has been furnishing a very desirable model house, garage, and stand, for ten dollars. The house and garage were designed by Mr. William A. Delano, and are cast in plaster of Paris to the scale of one-eighth inch to the foot. The tray permits the treatment of a level piece of ground, or, if desired, the soil level may be raised to represent conditions met with on an average lot. A mixture of one-half sawdust and one-half plaster of Paris (bulk measure), mixed with water to form a paste, makes a suitable ground base. This is spread in the tray and moulded to the desired elevation. Another base may be made from ground cork (the material in which Malaga grapes are packed) and orange shellac. This mixture is light in weight, a point to consider when models have to be transported considerable distances. The finishing surface may be of plaster of Paris or a combination of white sand, beeswax, and paraffin. For accuracy in executing a model a blue-print of the grounds is drawn to scale, placed on the board, and wire brads driven at intervals along the contour lines to the proper elevation. The base mixture is then applied and moulded to the desired elevations, the nails being covered eventually with the finishing material.

Every model usually requires some turf and for this purpose various materials are available. The Garden Club of America sells an article to represent grass, called plastaline (similar to Turkish toweling), for thirty-five cents a pound. Sand, colored green with dry powdered paint, is another material to use. Fish glue or shellac is applied to the portion to represent the lawn and the colored sand dusted on from a can having a perforated lid. After drying, all loose sand is blown off, preferably by means of a rubber bulb or bellows, as the fine particles are detrimental to the throat and lungs.

Sawdust, dyed with green-house paint and sifted when dry, forms another good substance to represent grass and is applied in the same manner as the sand. After the first coat has dried, glue or shellac may again be painted over the surface and another dusting given. This operation is repeated until the proper thickness is secured, but sufficient time must be allowed between applications for the glue or shellac to dry. Finely ground felt may be dyed and applied in the same way. Green velvet and blotting paper may also be used to represent grass, although the effect is usually too perfect.

Trees may be made from various materials. Natural sponges, dyed green with dyestuffs, are frequently used. It would be well to caution against handling these dyes with the bare hands. The pieces of sponge may be cut to various shapes and fastened to twigs of trees or shrubs with silk-covered magnet wire. This is best accomplished by threading a needle with the copper wire and fastening the sponges to the twigs by winding and passing the needle through the pieces of sponge. Sponges may also be glued on, but the glue becomes sticky in damp weather. Cedar trees may be represented by the luffa sponge (dish-rag gourd) dyed green. Natural materials may also be used, such as evergreens (red cedar), etc. The trunks and branches of trees may be made of wire, but properly branched twigs give a more natural effect. Flowering trees may be represented by dipping twigs in glue and then rolling them in some loose material, such as confetti, bran, chopped moss, etc.

Shrubs may be made of the natural rubber and luffa sponges, or of small twigs dipped in glue and then rolled in some dyed material, such as bran. Blooming shrubs may be represented by painting the sponges with oil paints or pasting small artificial flower stamens and paper flowers to portions of the shrubs. Painted cloth and bits of painted sawdust may also represent flowers. Shrubs may be fastened to the model with glue, but this sometimes is a tedious process. The spring-clip clothes-pins and carpenter's clamps are useful to hold the sponges in place until the glue has dried. When a composition base is used and it is known where the shrubbery beds are to be, wire anchorages can be set before the mixture is poured, these being so placed that they just pro-

trude far enough above the surface to pass wire or thread through them. The principal shrubs can then be sewn in place and the smaller ones attached to these. Holes can be bored in the composition to hold the trunks of trees, or, if the location of the trees can be anticipated, small metal cylinders (pencil holders, etc.) can be set before the base mixture is poured. The tree trunks are later fastened in place by gluing, pegging, or cementing with plaster of Paris. Another method would be to drive a nail through a small wood base, and to sink this base in the mixture with the nail protruding sufficiently to hold the trunk of the tree. Burning a hole in the trunk with a red-hot nail of the same size as the one in the base and then gluing the trunk to the nail in the base has been recommended, but there is danger that the trunk might split. All of the methods in working out these details have their advantages and disadvantages, and the way best suited to the individual needs must be selected.

Hedges may be made of rubber sponges, the finer ones for small hedges and the coarser for the larger. These are also dyed with green paint or dry powdered paint. They may be held in place in the same way as the shrubs. This material may be cut before placing in the final location or first set and then clipped with sharp scissors. Natural effects may be secured with clipped evergreens, such as the yew and spruce. The cones of the alder, which remain hanging on the trees for several years, are well suited for representing dwarf, formal evergreens.

Flowers may be represented by various materials glued in place. As previously stated, the effect of flowers may be obtained by painting spots on the shrubs with bright oil colors. Flowers can be purchased at ten-cent stores, the stamens of which are the proper size to fit the scale of the whole model and make admirable flowers for beds. They may be pasted in the proper place, or wired and stuck in holes bored in the base.

Cardboard is very useful in work of this kind. The various thicknesses may be purchased at art stores or even that taken from boxes may be used. Houses, fences, walls, garden furniture, coldframes, etc., may be cut from it and painted to suit. A good stout knife is essential, and this must be kept sharp. A steel straight edge must be used, for the knife may slip and

if a wood or celluloid ruler is used an uneven line will result that will spoil the whole effect. The knife is used only to make the first cut, then by drawing a discarded razor blade several times through this a smooth edge finally results. Suitable holders for these blades can be purchased from photographic supply houses for fifty cents. When cardboard must be painted, it is better to use oil paints, as water colors are apt to warp the material.

Stepping-stones may be represented by bits of cardboard, chips of stones, or pebbles glued in place. Bird-baths, statuary, pottery, benches, steps, sun-dials, fountains, etc., may be carved out of hard ivory soap or shaped from plastacene.

It is sometimes desired to represent water, and of course the most natural effect can only be secured with water. When a base is built that will permit of some underground structure, a pool may be made in the following manner. A shallow tin box (for instance, Nabisco tin) is secured, tested for leaks, and any holes that may exist, soldered. Stones, sand, and pebbles are then cemented in place to give a natural effect. If the edges of the plaster of Paris composition forming the base are brought to the surface of the water, much of the water is apt to disappear by capillarity. To prevent this the banks of the pool should be given a coat of hot paraffin. Mirrors may be used to represent water and also a celluloid preparation obtainable from the Celluloid Company, 30 Washington Place, New York City.

Garden trellisses, arbors, rose arches, clothes supports, etc., may be made with toothpicks and matches glued together and painted. Wire screening of $\frac{1}{8}$ and $\frac{1}{4}$-inch mesh is useful for fences, rose arches, etc. Small candles may represent pillars. Vegetables may be made of pieces of paper, colored sawdust, bits of pine cone, etc. Garden furniture can be constructed from wooden plant labels which may be purchased from seed stores and florists' establishments.

Quite a variety of tools are required in making a miniature garden, but they are such as are found in most every home. A hammer is indispensable. Next in importance are a pair of scissors, preferably manicure scissors with curved blades, pliers, saw, dividers, knives, screw-driver, file, plane, vise, drill,

gimlet, ruler, straight edge, spring-clip clothes-pins, carpenter's clamps, spirit level, square, nails, pins, wire, thread, tape, glue, shellac, dyestuffs, house paint, powdered paint, oil paints, water-colors, sandpaper, etc. Tweezers or forceps are useful in gluing on small pieces of paper and flowers, some of which are too small to handle, and when being glued often adhere to the fingers in a very vexatious manner.

As the individual is confronted with his particular problems he will contrive new materials and new ways of using them. Miniature gardens are so fascinating to make that the classes in the premium schedules should bring forth a greater number of entries next year.

NOTES

The delegates and their wives attending the convention of the Rotarians International, held at St. Louis, visited the Garden June 20 and 21 and were shown around the buildings and grounds by special guides.

Recent visitors to the Garden include Dr. H. H. McKinney, of the office of Cereal Investigations, U. S. Department of Agriculture, Madison, Wisconsin, on June 7; and Dr. F. W. Pennell, Curator of the Herbarium, Philadelphia Academy of Natural Sciences, June 11-16.

Mr. L. P. Jensen, Arboriculturist to the Garden, spoke before the St. Louis District Greens Section at the Algonquin Golf Club, May 25, on "Obnoxious Insects and Their Control"; and on June 11 he gave an illustrated lecture before the Waterloo Commercial Club, at Waterloo, Illinois, on "The Beautification of Cities."

Upon the arrival of President and Mrs. Harding in St. Louis, Mrs. Harding was presented with a bouquet consisting of the following 19 varieties of orchids grown at the Missouri Botanical Garden:

Cattleya Harrisonii, Brazil
Cattleya Trianae, Colombia
Cattleya intermedia, southern Brazil
Cattleya intermedia alba, southern Brazil

Cattleya Mendelii, Colombia
Cattleya Mossiae, Brazil
Cypripedium Pollettianum, Garden hybrid
Dendrobium nobile, Ceylon
Dendrobium Roxburghii, India
Epidendrum Parkinsonianum, Mexico
Epidendrum patens, Guatemala
Laelia purpurata, Brazil
Laelia tenebrosa, Brazil
Lycaste, Mexico
Maxillaria tenuifolia, Mexico.
Oncidium ampliatum, Nicaragua
Oncidium Kramerianum, Central America
Phalaenopsis Regnieriana, China
Vanda suavis, India.

In addition to these there were various garden hybrids of Brasso-Cattleya and Laelia-Cattleya.

At the commencement of Washington University, June 11, degrees were conferred upon members of the graduate laboratory at the Garden, as follows: Doctor of Philosophy, Arthur Forrest Camp, Adele Lewis Grant, Grace Elizabeth Howard, Leo Joseph Klotz, Samuel George Lehman, Ferdinand Sebastian Wolpert, and Harry Curtis Young; Master of Science, Marion Alice Griffiths.

STATISTICAL INFORMATION FOR MAY, 1923

GARDEN ATTENDANCE:

Total number of visitors	36,338

PLANT ACCESSIONS:

Total number of plants received in exchange	300
Total number of seed packets received in exchange	122
Total number of bulbs donated	178

PLANT DISTRIBUTION:

Total number of plants distributed as gifts	24

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	16
Total number of books and pamphlets donated	96

HERBARIUM ACCESSIONS:

By Gift—

Chavalier, Dr. August—*Isoetes Schweinfurthii* A. Br. & Baker from Africa	1
Drushel, J. A.—Plants of Vermont, Ohio, Wisconsin, Illinois, Missouri, and Texas	13
Hartmann, Harold—*Clivia miniata* Regel, cultivated plant	1
Stephens, C. R.—Plants of Florida	3
Total	18

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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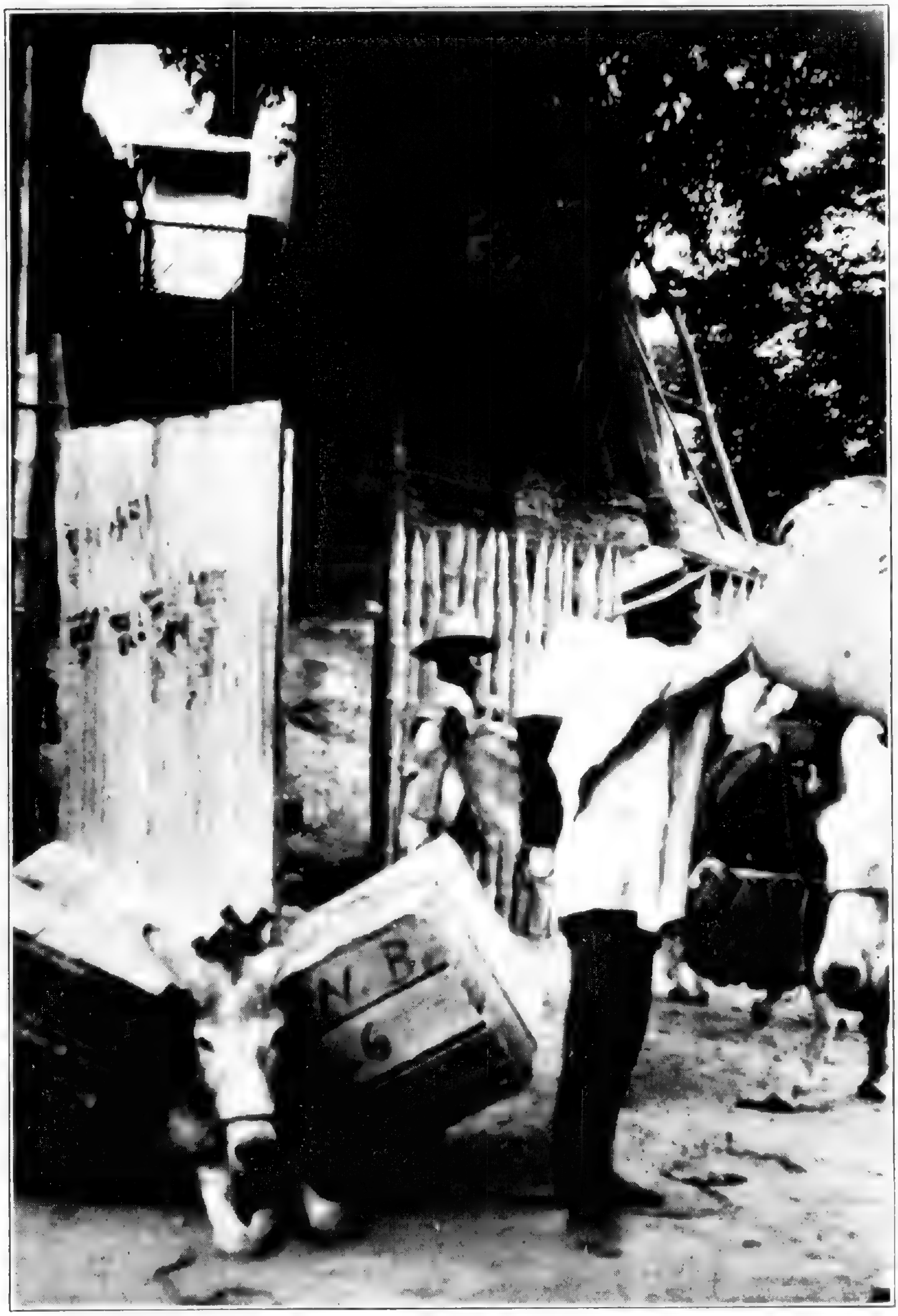


UNLOADING ORCHIDS AT NORMAN BLACK COFFEE WAREHOUSE, GIRARDOT.

Missouri Botanical Garden Bulletin

Vol. XI SEPTEMBER, 1923 No. 7

AN EXPEDITION FOR ORCHIDS TO CENTRAL AND SOUTH AMERICA

The orchid collection of the Missouri Botanical Garden has always been a notable one, and after the acquisition of the Brownhurst collection, through the generosity of the late Mr. D. S. Brown, it took first rank in this country for the number of varieties as well as quantity of plants. The annual orchid show held during January and February has attracted wide attention, and its inclusion in several moving picture circuits, both national and international, has been a most effective means of advertising St. Louis and the Garden.

The general public is apt to judge such an exhibition from the standpoint of color and quantity of bloom rather than the rarity of the plants, and for this reason it seemed desirable if possible to augment considerably the number of more showy orchids, especially cattleyas. During the war, however, practically all the collectors of orchids, particularly in South America, went out of business, and it is no longer possible to buy these native plants through local agents. Consequently, the only way in which they can be obtained is to send a representative direct to the country where these particular orchids are grown, in the hope that by a fortunate combination of circumstances, he may secure enough of these plants to make the trip worth while.

Another factor which has greatly restricted the importation of native orchids into the country has been the restrictions imposed by the Plant Quarantine Act, and indeed it was not possible to consider securing cattleyas from South America until this difficulty was overcome. However, be-

cause of the standing of the Missouri Botanical Garden, the Federal Horticultural Board granted a special permit, allowing orchids collected in South America and Panama to enter at New Orleans and come direct to St. Louis, where they could be inspected, instead of following the usual regulations. If such an arrangement had not been made it would have been useless to undertake the planned expedition, but with the way clear for the delivery of the plants to the Garden, Mr. George H. Pring, Horticulturist to the Garden, began at once to make preparations for the trip.

Early collectors of orchids in Colombia, such as Schlim, Blunt, Linden, the Klablock brothers, Chesterton, Lehmann, and Kalbrayer, had no difficulty because of the abundance of accessible plants. During these easy-collecting days the commercial cattleya was found growing upon houses and in forests close at hand. In Yacopi, in the Departamento Cundinamarca, the villagers even presented a collector with forty cases of plants. A present-day collector, however, must rely upon the natives exclusively, making his headquarters at the nearest village and waiting with all the patience at his command for the return of the natives with the coveted orchids. During this time he has abundant opportunity to become familiar with the native food which consists of bananas, prepared in various fashions, the yuca (Manihot roots), sun-dried fish, and last but not least, the native meat, taking the usual chances with ptomaine poisoning and dysentery.

Boxes must also be prepared for the possible shipments. This usually involves cutting trees, from which boards are made by crude native methods. These packing crates are of standard size, 46 x 46 x 75 cm., and for ventilation spaces are left between the boards and occasionally bamboo strips are used on the ends. When the plants arrive they are cleaned, cutting away any surplus back pseudo-bulbs or waste material, then dried thoroughly before packing. The plants are put into the cases as tightly as possible, no packing material being used, each box holding ten *arrobas*, or 250 pounds. This weight diminishes during transportation to this country to about six *arrobas* or 150 pounds.

The best time for collecting *Cattleya Trianae*, according to Cyril Allen of Bogota, is during the dry season (November to March). The flowering season, "*Varanillo*" ("little dry season"), which is from the end of July to September, is

then over, and if collecting is done during this period it is possible to select the best types. Cattleyas do not grow in the hot country, but in the foothills of the Cordilleras, from 2000 to 6000 feet altitude, where the mean temperature is 65–67° F. Most cattleyas are entirely local in their distribution, certain species being confined to a small given region and disappearing completely when this area is passed. They inhabit the topmost branches of the Aquapa (Bombax), 150–200 feet in height, where there is plenty of sunlight. Even in the dry season they are subjected to heavy dews at night which more or less prevent shrivelling. *Cattleya Mendelii* has been found growing upon rocks too hot for the naked hand, suggesting that most cattleyas need abundant sunshine.

Cattleya Percivalliana grows much better upon rocks and cliffs overhanging streams than upon trees. Other cattleyas, such as *C. Trianae,* prefer the topmost branches of trees. They may be found in either the crotches or branches, upon the sides of the main trunk, or in many cases surrounding the limbs of the smaller branches where their roots tenaciously hold them fast against the strongest wind, often making it necessary for the natives to pry the plants loose, with attached bark, by means of their machetes. If there are many plants upon a tree, there is no hesitation about cutting the tree down. Plants are not so plentiful at the present time, however, and it is truly an orchid hunt. Nothing but the trained eye of the native Indian can find the cattleyas in their concealed locations. According to authorities, there are now more commercial cattleyas in the United States and Europe than growing in their native environment in Colombia.

The appearance of the orchids as collected is rather disappointing to the orchid enthusiast who has been used to orchids in the greenhouse. Masses of dried-up back pseudobulbs, old flowering spikes, and dead leaves present anything but a pleasing appearance. The dark green color to which we have become accustomed in orchid houses is replaced by a foliage of yellowish green.

The following extracts from Mr. Pring's diary give a graphic picture of what it means to obtain orchids under present-day conditions:

"I left St. Louis, April 1, bearing letters of introduction from the Colombian ambassador at Washington to Govern-

ment officials in Colombia and from Secretary Wallace to the Minister of Agriculture; also a letter from the Colombian Consul at St. Louis. Sailing from New Orleans on the Steamship Heredia, I arrived at Havana on April 6. During the day among places visited was the botanical garden where seeds of a rare palm were collected. Among the grotesque sights in this city is the human boneyard in Colon Cemetery where human remains are taken from unpaid graves and diverted to the central human dump. From a botanical standpoint a fine avenue of *Ficus*, in which the trees are supported by their aerial roots, was interesting. Some of the famous street trees are the mango, sapota, and royal palm. I arrived in Cristobal, C. Z., April 11. Having a letter of introduction to Mr. C. W. Powell, an orchid grower of Balboa, and being assured by telephone that he was at home, I took the train to Balboa. Upon locating his residence and attached orchid garden in which is the finest collection of Panamanian orchids, I was informed that Mr. Powell was on a collecting trip. After visiting Panama City, I caught the train back to Cristobal and sailed the next morning. Before leaving, Mr. Powell telephoned me informing me of his return and urging me to return to Balboa, but in view of the necessity of meeting Mr. Cyril Allen in Bogota, who was soon leaving for England, I arranged to again stop at Balboa on my return trip. I sailed from Cristobal at 11 A. M. aboard the steamship Sixaola.

"Aboard ship I was particularly fortunate in meeting Mr. Norman Black, who was making his way back from the States to Bogota. During the conversation I informed him of my mission and likewise mentioned my letter of introduction to Mr. Cyril Allen, who proved to be a personal friend of Mr. Black. The entire trip from then on was under the guidance of Mr. Black. We arrived at Cartagena, the first Colombian port, the following day. My first impression of Colombia was not very favorable, since there seemed to be very little for the botanist here. Of historical interest is the Spanish wall upwards of three hundred years old, which was built for the protection of the town against pirates in the early days. Despite the extreme tropical weather, shrubs, perennials, and annuals were seen growing on the old stone wall. A trip through the market place was chiefly notable because of its unsanitary condition—fish, bananas, sugar, meat, vege-

tables, all exposed to the many flies. Passing through the *parque* in the center of the town I was interested in seeing a row of empty barrels on each side of the walk and upon investigation found that these were placed here for the purpose of protecting the young, freshly planted almond trees. This seems to be the favorite tree for street planting in the small villages and towns throughout Colombia.

"Leaving Cartagena we arrived at the port of debarkation the following day, Puerto Colombia. We left here at 5:30 and reached Magdalena town, Barranquilla, at 11:30 P. M. During this time one goes through the ordeal of finding bag and baggage and securing reliable natives to transfer same to the small train that takes one on to Barranquilla. There is no checking system but in view of my ambassadorial letter I was shown every courtesy by the custom officials, who examine bags only at the port. The following morning we went to the *aduana,* or customs, at Barranquilla for trunk inspection. Here again system was lacking and people had to find their own trunks. We left the customs house at eleven o'clock with instructions to return '*mañana.*' Again my letter secured us preference at inspection the following morning. At the river steamer office we were informed that all river rates had been raised. However, we booked on the 'Ayacucho' to sail that evening. On leaving the hotel Black said: 'Pring, I forgot my bed equipment.' On asking for an explanation I found that bed equipment for the trip had to be purchased, consisting of a pair of sheets, mosquito bar, pillow and pillow case, and native straw mat, or '*petate,*' supposed to take the place of the comfortable mattresses of home. This equipment cost $14.50.

"The Magdalena river boat was rather interesting to a St. Louisan in that it was an exact replica of those used on the Mississippi River. In fact we later found that these boats are built in towns along the Mississippi and shipped to Colombia to be assembled. We were shown to our 'cabin de luxe' which was on the uppermost deck. The stateroom equipment consisted of an American iron cot, guiltless of mattress and covers, upon which were placed the recently acquired bedding; a wash stand, electric lights, and fan. The two doors were screened but the windows were bare. We left at nine o'clock. We found it impossible to walk upon the upper deck inasmuch as the air was filled with thou-

sands of sparks. I was informed that the boat was of the wood-burning type and in passing backwards and forwards to our cabin we took the chance of our clothes being set afire by falling sparks.

"I had been advised by Americans to buy American canned food and an American ham before leaving Barranquilla, but on suggesting this to Black he told me that I might as well get used to native food, as I would have to eat it for several months; that I would soon become accustomed to, and learn to like, many of the native dishes. When once accustomed to meals as served on the boat I concluded that he was right, as I very soon began to like the various ways in which the banana was served, either as fritters, pies, or as a dessert cooked with sweet juices. Among the vegetables the most common was the yuca (Manihot). This is cultivated as a companion crop with corn. Roots from the fully developed plant are eaten, in shape resembling the turnip and much more farinaceous than the ordinary potato. The meat served would not suit the American palate, inasmuch as the cattle are killed at five o'clock in the morning and served the same day. It is very dark in color and always hard and stringy. Eggs are served three times a day and the first question asked by the waiter is *'Como se huevos, senor?'* Coffee is served in the form of *'Cafe con leche'*, about a tablespoonful of concentrated coffee being poured in the cup, after which boiling milk is added. For dessert various tropical fruits are always offered, such as mangoes, avocado, pineapples, and papaya. During the forenoon and afternoon various refreshing drinks are served, prepared from the native brown sugar; others are also made from oats.

"Our first port the following morning was Calamar, which is the river port for Cartagena. The next port was La Florida, where we stopped to take on wood for fuel. This performance took place about every five or six hours, day and night, on the trip. The wood is cut from the forest along the river and piled to regulation height. The peons carry all the wood on their backs, the corners of a sack being inverted over the head and held by the right hand extended at arm's length. Another man piles the wood, extending from the right hand to the top of the head of the carrier. When packed to the limit, a piece of rope about six feet long, held in the left hand, is thrown over the pile and held taut by

CATTLEYA TRIANAE GROWING UPON TREES IN THE CENTRAL ANDES.

TERRESTRIAL ORCHIDS GROWING IN ANDES OF BOGOTA.

CATTLEYA TRIANAE AS GROWN IN THE STATE GOVERNMENT HOUSE AT IBAGUE, DEPARTMENTO DE TOLIMA.

MR. CYRIL ALLEN AND MR. G. H. PRING, HORTICULTURIST TO THE GARDEN, COLLECTING ODONTOGLOSSUM FLAVESCENS IN THE ANDES OF BOGOTA.

the right hand. By this crude method the pile is held secure while the peon runs down the gang plank to the boat. With one heave the pile is thrown on the floor, where it is stacked by another man. On an average two hours is taken up in this manner when the boat stops for fuel.

"Just prior to reaching the town of Magangue the boat again pulled in shore to receive 200 head of cattle. These were placed on the four freight barges, attached to both sides of the steamer. These cattle were on the boat for four days, during which time they were only given water.

"The vegetation on each side of the river for the first two or three days was very disappointing and uninteresting, because of the lack of rain in this part of the country. What vegetation was present presented a yellow appearance.

"The next port of interest was La Gloria. Here one was gratified in having sufficient time to view the native houses. These resemble stucco but Black informed me that the skeleton is made of bamboo and the stucco made from river sand mixed with cow manure. From here on the vegetation began to be of interest, the mahogany delta appearing. About the only amusement one finds throughout the day is watching the alligators, which vary from three to fifteen feet long, basking in the sun, and which form targets for those possessing revolvers or guns. After leaving the town of Gamarra we began to view some very picturesque scenery, with the western Cordilleras appearing. The next important town was Bodega Central, the river port for exporting cargo from the prosperous town of Bucaramanga, the latter shipping 250,000 bags of coffee to the United States annually. From Bucaramanga to the river port is a four-day mule-back trip.

"The next town was Puerto Wilches, a river port for the exporting and importing of both cargo and passengers to and from Bucaramanga. It possesses a railroad of seventeen miles which was intended when begun to connect with Bucaramanga, but the remaining 120 miles is by mule-back. During the rainy season the Bodega Central route is used, combined with freighting over the river Lebrija.

"The vegetation here becomes very interesting, presenting a darker green appearance than lower down the river. Lots of trees, including the native cedar, bombax, lignum-vitae, and, closer to the river, the giant bamboo. Here we passed the river Lebrija where we unloaded some American machin-

ery. I was particularly interested in some large heaps of the palm seed which I readily identified as the ivory nut palm. It is from this region that the ivory palm is exported to the states for the purpose of making buttons.

"After leaving this river port I had my first experience of seeing orchids upon trees, together with various other epiphytes, including bromeliads, Nephrolepis, Polypodiums, mosses, etc., the young growth being impenetrable. Particularly noticeable was the rattlesnake plant, leaves of which are used for wrapping the native brown sugar in cake form. Various species of Heliconia, presenting their bright orange colored bracts, were very picturesque. The scenery, with the mountains in the background, was almost beyond description.

"The next port of interest, especially to Americans, was Barranca Bermeja which is the center of the tropical oil industry, so far only used for local consumption because of lack of transportation to the ocean port. This company owns, so I am informed, four oil-burning river boats for transporting oil. This town is the only one upon the entire river with up-to-date houses with screens and sanitation, due of course to the tropical oil industry. The town includes American shops and refineries, the oil fields being about seventeen miles inland at Las Infantas. There are upwards of 400 Americans employed in this region. The oil is pumped to Barranca Bermeja by a pipe line.

"The next port was Puerto Berrio. From here there is railroad connection with Medellin, the second largest town in the country, famous as a coffee center. It has a population of 90,000. At Puerto Berrio we stayed for one day to unload American freight, the principal part of which was wheat. One is very much relieved to find probably the most up-to-date hotel in the country here, built of concrete. The surrounding houses vary from the native houses composed of four uprights with thatched roof to the adobe hut. There were likewise small stores in which might be purchased various imports.

"Transit for these last two or three days was extremely slow in view of the various sandbars, so much so that traveling at night had to be abandoned. It is interesting to note that there is not a single government light along the entire river to indicate a navigable channel. The pilots evidently pick the channel out by observation or by instinct. The

rapidity of the stream is estimated at six miles per hour. In places the river is extremely wide, covering hundreds of miles of territory. One is disappointed in not seeing the number of wild birds expected. After the heat of the day is past, which is after three o'clock, there are numbers of parrots which always fly in pairs. Along the edges of the stream the bird most frequently seen is the egret. During transit one becomes indifferent to the familiar sound of the bottom of the boat dragging on sandbars. However, on reaching a bend in a narrow part of the river, we ran aground and were held fast. In the course of two or three hours the boat was pushed off by means of long mahogany poles, and block and tackle attached to a winch. After taking soundings with ordinary bamboo rods, we were found to be in only two and one-half feet of water, so the boat backed out and tied to the bank to await patiently the rise of the river.

"It was here that I started my first collections for the herbarium. I had not gone very far through the impenetrable vegetation when my friend Black advised me to not be quite so much interested in plants, but more so in my own safety, in view of the rattlesnakes, etc.

"During the two days and three nights spent here several monkeys were shot and the only excitement was watching other boats going through the same experience with the sandbar. Within two days there were eight boats tied up at this point, aggregating twenty per cent of the navigation of the river. Much interest was shown in the black measuring stick on the side of the river which gradually indicated the rising stream. A most unusual incident for a passenger ship was the shutting down of the boilers, under orders from the captain, which resulted in no electric lights, no fans, no water in the shower baths, and last but not least, no water for sanitation. Upon remonstrating with the captain we were informed that he was saving fuel, despite the fact that the banks on each side were heavily wooded. The morning of the third day at six o'clock the gage indicated that there was three feet of water, so we finally got by the sandbar.

"From now on the river was quite narrow, the scenery very picturesque, with mountains all around. We finally reached the uppermost port of the Lower Magdalena River, La Dorada. From here we caught a wood-burning train to Beltran, a distance of sixty-five miles. The object of this

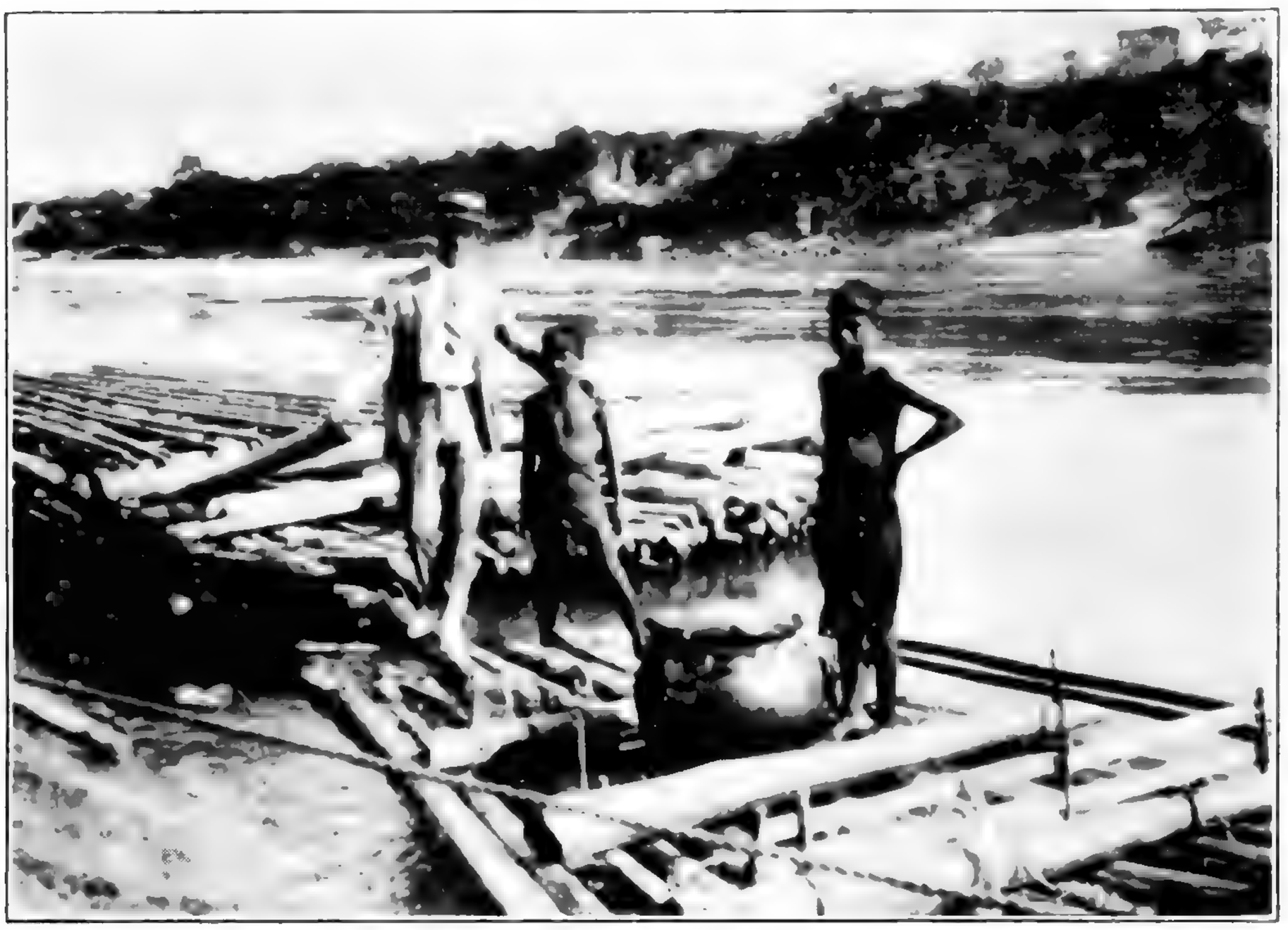
railroad is to avoid the rapids at Honda which cause the river to be unnavigable at that point. Honda is likewise in a big coffee-shipping district. Arriving at Beltran at twelve o'clock we again went through the unpleasant pandemonium of transferring baggage to the boat on the Upper Magdalena River. We arrived here after a very picturesque trip. One of the interesting towns is Ambalema, situated in a big tobacco-growing district noted for its native-made cigars; also for its pottery. On this trip we noticed various native rafts floating down stream, carrying principally coffee and bananas. The coffee rafts are the most permanent, being built of bamboo with double decks. The bananas are floated down on rafts made from the banana trunks. When arrived at their destination the bamboo rafts are sold for the purpose of house building, whereas the banana rafts, after being unloaded, are cut loose to continue their trip of disintegration down the river.

"We arrived at Girardot the following morning. This is the uppermost navigable port of the Upper Magdalena River. It has a population of 12,000 and is the center of the coffee district. The coffee is not grown here, but it is the main shipping center for all the Magdalena and Bogota region.

"The distance traveled from Barranquilla to Girardot was 700 miles. After going through the customs, we enjoyed a very pleasant rest at the Pension Inglesa. I here had the pleasure of visiting the various coffee warehouses, one of special interest being a recently constructed building belonging to Norman Black & Co., which includes the only coffee-cleaning machinery in that district. Most of the coffee as brought into Girardot is hand-picked from the plant, in which state it is received at the warehouse. It then is spread out in the sand to dry, after which it is hand cleaned, the two halves being separated from the outer husk. It is then finally cleaned again by hand, sorted, and graded for size. With the installation of machinery most of this handwork is eliminated.

"The next step of our journey was started the following morning, to Bogota. Leaving at 7 A. M. by train, we started our upward climb from the tropics, 600 feet above sea level, to the temperate climate of Bogota, 8,500 feet. We got as far as Facatativa, where we were obliged to change to another train because of a difference in rail gage. We finally arrived

LEAVING UPPER MAGDALENA RIVER ON RAFT EN ROUTE TO THE NAVIGABLE PORT OF GIRARDOT.



ARRIVAL AT GIRARDOT, SHOWING DOUBLE BAMBOO RAFT IN BACKGROUND.

ORCHIDS EN ROUTE ON PACK MULE FROM NATAGAIMA TO UPPER MAGDALENA RIVER.

ARRIVAL OF ORCHIDS AT NORMAN BLACK COFFEE WAREHOUSE AT GIRARDOT.

at Bogota at five o'clock, on May 1, exactly one month from the time we left St. Louis. After traveling in the tropics, at Bogota one feels the effect of the altitude in the form of headaches and increased heart action. The *'Sabana'* of Bogota is extremely picturesque, surrounded by the eastern Andes. The population is approximately 140,000. During my first week in Bogota I suffered from a slight attack of ptomaine poisoning, after which I had many consultations with Norman Black, who kindly consented to act as my agent, and with Mr. Cyril Allen, who very kindly put me in touch with his native collectors who could obtain the varieties of orchids wanted in quantity for the Garden. I was advised by both Black and Allen not to go with the native collectors to gather orchids, inasmuch as I would be exposed to malaria, typhoid, etc., combined with the danger of being absolutely at the mercy of the natives of that region, especially as my knowledge of Spanish was extremely limited. Again, the word would undoubtedly be passed in advance that an 'Americano' was coming and prices would be raised in proportion.

"In view of the fact that Cyril Allen had collected and exported orchids for the past fourteen years, and that Norman Black, through his experience with the natives in dealing in coffee, knew of their financial trustworthiness, I decided that their advice was final. As Mr. Allen was leaving shortly for Europe, quick action was necessary. Within two weeks I was in touch with a native collector of *Cattleya Trianae* and another to collect *Cattleya Schroederae*, in two widely separated regions. To collect these two varieties in the quantity desired Mr. Allen stated that he would have demanded six months' time. On the other hand, I was contemplating a six weeks' stay in Bogota. The transactions with the natives were accomplished by Allen and Black, it all being carried on in the native tongue. I was present at the conference, but only as a guest of Black, and not supposed to be interested in the orchid transaction. In other words, Black was the agent who wanted the shipment for export. This meant that the Garden got the benefit of strictly native prices, which it would have been impossible for me to obtain.

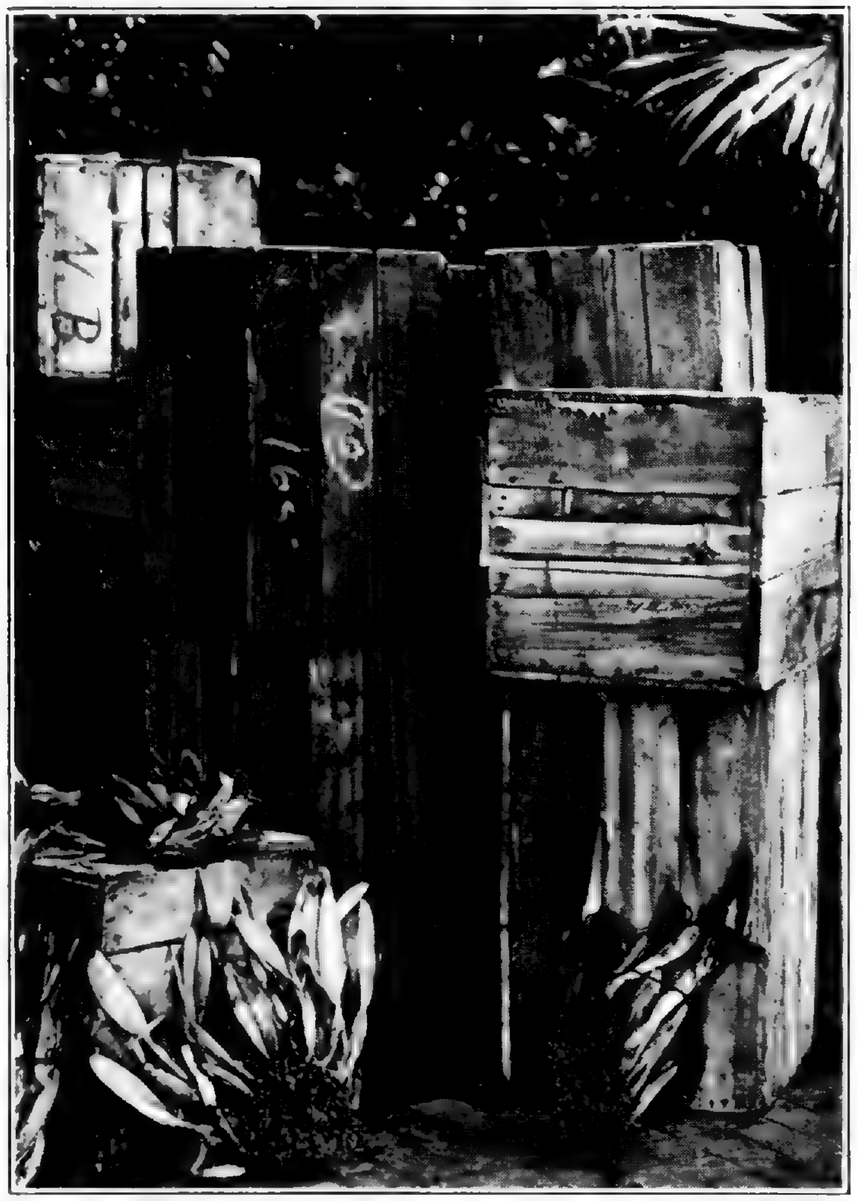
"The next difficulty for me to settle was the question of financing the natives, who had to take sufficient money to buy the plants from the collectors in the fields. Norman

Black strongly advised me not to advance any money. Allen, on the other hand, stated: 'If you don't advance the money to buy the orchids, it is impossible to expect the natives to bring them to your base of operations.' So I finally decided to advance sufficient money to purchase the plants in their native habitat. After arrangements were made by telegram and later with the native agent at the small village of Natagaima, he presented himself at Girardot to receive the first payment. On seeing him Black recognized him as one of his best coffee shippers, which was much of a relief to me, as he had always found him absolutely reliable.

(To be continued.)

ALBINO REDWOOD SHOOTS

During the past few months there has been exhibited in the floral display house at the Garden a bowl with a curious plant, concerning which a great many questions have been asked. The bowl contained a dark-looking, irregular mass from which numerous white shoots had developed, each shoot a miniature branching tree with thick short leaves. Few familiar with the stately coast redwood (*Sequoia sempervirens*) of California would have recognized any kinship thereto in this lonely fragment; and yet the curious plant was a piece of redwood grown by Miss Kate Tehau of St. Louis. The dark mass within the bowl was a piece of redwood burl, part of a swelling or excresence frequently found on the redwood. Miss Tehau put this piece, which consisted largely of bark, into the bowl where it rested on some pebbles, added enough water so that the lower surface was constantly wet, and kept it in a warm room near the window. After a few weeks small shoots started from the bark at various points, and all of them were snow-white. As the shoots grew in length small pointed leaves appeared, the first ones thick and fleshy, the later ones awl-shaped and thinner. The shoots grew vigorously for several months and branched frequently. Several grew to twelve inches in length. The tips then gradually wilted, and little by little the stems drooped and finally died. The flat woody lower surface of the base piece was frequently examined for root formation, but none developed.



PACKING-BOXES UPON THEIR ARRIVAL AT THE GARDEN.

UNPACKING PLANTS UPON THEIR ARRIVAL AT THE GARDEN.

ALBINO REDWOOD SHOOTS.

Until within a few weeks of reaching their fullest growth both the shoots and leaves were perfectly white, recalling the well-known Indian-pipe both as to color and texture. Near the end, however, both shoots and leaves started to turn green, at first very faintly but increasing rapidly until just before the final wilting all of the shoots had turned a pale green. The tips showed a more pronounced color than the lower or older portions. Plate 24 gives a good idea of the general appearance of the shoots and the burl at the time that the shoots had practically completed their growth.

White or albino redwood growths were first described by Peirce (Proc. Cal. Acad. Sci. 3rd Series, Vol. 2, page 83, 1901) in an article entitled "Studies of the Coast Redwood." Peirce found some white shoots in a grove of redwood near Gilray, California, and later at other points in the state. He described them in detail, including microscopical descriptions of leaf and stem sections. He makes no mention of shoots from pieces of wood or bark as described above, all his cases apparently having been shoots from roots of stumps of trees recently felled.

Several years ago white shoots growing from chips of redwood wood and bark in a canon near Carmel, California, were brought to the writer. These were kept alive for several months, but no roots formed. Recently several cases of redwood shoots have been noted. A writer in the Florists' Exchange (May 5, 1923) refers to redwood shoots growing from knots in the greenhouses of F. R. Pierson, at Tarrytown, New Jersey. An eastern dealer advertises what is obviously the same thing, calling it "Unique Sugi-Kahn." During the past winter pieces of freshly cut redwood bark with a small piece of the wood still attached were placed in shallow dishes with water but in no case did any of the shoots develop. That shoot formation does take place from ordinary bark as well as from the bark of burls was demonstrated by the Carmel specimens. The shoots grew from dormant buds and derived their food supply from the burl during the growth period of the tree. Peirce likens these shoots to parasites because they develop no food supply of their own.

Naturally the greatest interest attaches to the white color, that is, the absence of green chlorophyll in the stems and leaves. Peirce, after an extended study, believes that the reason the white shoots are devoid of chlorophyll "is that the

leaves form and attain nearly or quite their full size at a season when there is insufficient warmth for the formation of chromatophores and chlorophyll pigment, though enough for growth.'' While this may possibly be the cause in the natural habitat, it cannot be entirely so in the present case, for the burl was kept at room temperature (70°F.) from the start. It seems therefore probable that other factors are involved. It is of interest to note that Peirce transplanted one of his shoots to Palo Alto, of which he says: ''at least one leaf became pale green over half its surface on either side of the midrib.'' Whether the conditions under which our specimen grew, which caused it to turn green throughout, were sufficiently different to show this variance with Peirce's specimen, further experimental work will have to determine.

NOTES

Mr. L. P. Jensen, Arboriculturist to the Garden, gave an illustrated lecture on ''Wild Flowers'' before the Chautauqua Association, Piasa, Ill., August 2.

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Maryland Terrace Association, September 24, on ''The Care of Lawns and Shrubbery.''

Mr. Pring's lecture, ''Collecting Orchids in Colombia,'' was broadcasted from the Grand Leader Radio Station, August 20, and from the Post-Dispatch Station, September 11.

Recent visitors to the Garden include Professor John T. Buchholz, professor of botany, University of Arizona, Professor John H. Schaffner, professor of botany, Ohio State University, and Mr. Fuyuwo Kagawa, government research scholar of Japan.

Mr. L. P. Jensen, Arboriculturist to the Garden, attended the convention of the American Institute of Park Executives held in Kansas City, September 10-16, and on September 11 presented a paper before the convention on ''Arboretums in Connection with the Park System.''

The Dahlia Show, which will be the first of its kind in St. Louis, will be held under the auspices of the Garden in the floral display house, October 10 and 11. The premium lists which include both amateur and commercial entries will be mailed upon application to the Director.

The first show of the St. Louis Aquarium Society was held at the Garden, September 14-16. Over one hundred aquaria were exhibited, representing fifty distinct species and varieties of fish, including some hybrids new to St. Louis. The awards were in the form of eight silver cups and many ribbon prizes. The Garden exhibit, consisting of sixteen aquaria containing sixteen kinds of fish and thirty aquatic plants, although not in competition for a prize, was nevertheless awarded a silver cup for its educational value.

STATISTICAL INFORMATION FOR JUNE-AUGUST, 1923

GARDEN ATTENDANCE:

Total number of visitors in June	29,209
Total number of visitors in July	18,621
Total number of visitors in August	24,952

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts in June	62
Total number of plants and seed packets received in exchange in June	26
Total number of plants and seed packets received as gifts in July	12
Total number of plants received in exchange in July	67
Total number of plants and seed packets received in August from South America, Central America, and West Indies, through expedition of Mr. G. H. Pring, Horticulturist	3,122

PLANT DISTRIBUTION:

Total number of plants distributed as gifts in June	1,253
Total number of plants distributed in July	12
Total number of plants distributed in August	250

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June	42
Total number of books and pamphlets donated in June	144
Total number of books and pamphlets bought in July	99
Total number of books and pamphlets donated in July	383
Total number of books bought in August	38
Total number of books and pamphlets donated in August	76

HERBARIUM ACCESSIONS:

JUNE

By Gift—

Buchholz, Dr. John T.—*Trillium* sp. from Arkansas... 1
Churchill, Hon. Joseph R.—Plants from the Province of Quebec, Canada 210
Epling, Carl—*Juniperus virginiana* from Arcadia, Missouri 1
Lahman, Mrs. Charles E.—*Ipomoea* sp. from Oklahoma 1
Lehman, S. G.—*Diaporthe Sojae* Lehman, type, and other specimens 4
von Schrenk, Dr. H.—Wood-destroying fungi of Honduras 12
Stephens, C. R.—*Daedalacanthus* sp. *and Ruellia* sp. from Florida 2

By Purchase—

Gleason, Dr. H. A.—Plants of British Guiana..... 416

By Exchange—

College de Longueuil, by Fr. Marie Victoria—Plants of the Province of Quebec, Canada..... 190
New York Botanical Garden, by Dr. N. L. Britton—*Senecio Leoni* Britton & Wilson, of Cuba, fragments of the type 1

938

JULY

By Gift—

Buchholz, Dr. John T.—*Pellaea atropurpurea* var. *Bushii* from Arkansas 1
Griffiths, Miss Marion A., and Miss Fanny Fern Smith—*Reboulea hemispherica* from Southern Illinois..... 1
Houck, Miss A. W.—*Epipactis gigantea* Dougl. from California 1
Kurtzweil, George L.—*Agrostis hymealis* (Walt.) BSP. from Iowa 1
McAdow, Miss Marian—*Hakea oleifolia* P.Br. from Florida 1
Taylor, F. C.—*Cornus canadensis* L. from Wisconsin... 1
Royal College Science for Ireland, by Arnold Arboretum—Cultivated specimens of *Platanus* from England.... 12

By Field Work—

Greenman, Dr. J. M.—Plants of Missouri and Illinois.. 140
Kellogg, John H.—Chiefly, plants cultivated in Missouri Botanical Garden 639

797

AUGUST

By Gift—

Petersen, Prof. N. F.—*Doassonsia deformans* on *Sagittaria latifolia* and *Typha angustifolia* from Nebraska. 2
Vallentine, Henry—*Magnolia grandiflora* L. from Tennessee 5
von Schrenk, Dr. H.—*Juniperus* sp. and *Eustoma Russellianum* Griseb. from Texas..... 2

By Field Work—

Kellog, John H.—Chiefly, plants cultivated in Missouri Botanical Garden 66
Pring, George H.—Plants of Colombia and Panama.... 323

398

Total 2,133

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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VIEW IN THE CENTRAL ANDES NEAR ARMENIA.

Missouri Botanical Garden Bulletin

Vol. XI OCTOBER, 1923 No. 8

AN EXPEDITION FOR ORCHIDS TO CENTRAL AND SOUTH AMERICA.

(Continued from September Bulletin.)

"Inasmuch as arrangements were now completed with reliable native collectors, I turned my attention to the business of collecting in the Andes around Bogota. In this region at an altitude of 9,000 feet, only terrestrial orchids are found. Some interesting genera, such as Pleurothallus, Stellis, and Odontoglossum, were very prevalent. The latter genus is notable for its yellow-flowered species, *flavescens*, which is often mistaken for Oncidium when first seen. This species evidently will soon become extinct, since the natives collect the plants, strip off the leaves, and carry the pseudo-bulbs down to the market place where they are sold for food. We first discovered this species through the remains of the leaves which had been torn off and left on the trail. Another interesting orchid which is familiar in our collection is Epidendrum. The majority of the species are of epiphytic habit, but those in this region are terrestrial. They may be found growing either along the hedge-row in company with various other tall-growing plants, or in dense shade. The most common species noted is the pink-flowered *Epidendrum elongatum*.

"Apart from the orchids, the flora is very limited in the Andes of Bogota, and the majority of plants seen are dwarf in size. The native authorities are reforesting the mountains in the vicinity of Bogota with the Australian eucalyptus which they use for building purposes. There are no other large trees at this altitude excepting those in cultivation in private gardens, such as the Australian species of Acacia and various

species of Ficus which have been introduced from lower altitudes.

"In addition to collecting orchids my attention was now turned to the collection of herbarium specimens. My first experience was rather interesting. I visited a suburb of Bogota called Chapinero, and having collected some two or three dozen specimens which I was carrying in my arms, I attracted the attention of small boys who likewise immediately got busy collecting and very shortly I was beset by them, holding up weeds and wanting to sell them to me. One of the most common plants here is the dandelion which is of course imported with European or American grass seed. Drying specimens for the herbarium is not a very easy proposition in Bogota because of the moist atmosphere. After these daily trips all specimens had to be placed between drying pads and finally put in press to prevent spoiling. On an average it took ten days to two weeks to prepare specimens, all the drying papers being changed daily.

"A trip was taken to Zipaquira, a small village notable for its salt mines which antedate the settling of Bogota by the Spaniards. The mines were visited under the direction of a superintendent who gave us to understand that it was only within the past five years that more modern methods have been applied in bringing out the salt from the mountains. Dynamite and a narrow-gauge railroad now replace digging by hand and carrying out on the backs of the natives. In former days when the salt was dug by the Indians, the method was to dig down into the mountain, but at the present it is to go in from the side. At the present time the salt mine includes two levels, the upper about 75 to 100 feet above the lower and reached by steps cut in the salt. The longest salt chamber into the mountain measures about 700 metres. The salt is loaded on trucks and taken to the mouth of the mine where a series of washing tanks removes the carboniferous deposit. Despite the fact that these salt mines are more than large enough to supply the entire country, they cannot compete with the American and European salt which is imported from the border states of the Atlantic or Pacific. For instance, the town of Cali, which is one day's trip by railroad from the Pacific port of Buenaventura, gets all its salt from the United States. Cali may be reached from Zipaquira within

six or eight days by railroad and muleback but the cost of this transportation is much greater than by ocean freight from the States. The mines are controlled by the government, the approximate daily yield being 7,000 *arrobas* or 175,000 pounds. Various herbarium specimens were collected from this region.

"A place of interest, both because of natural scenery and as a collecting area is Tequendama Falls. From Bogota you can go by train to within three miles of the Falls and the remaining distance by ox-cart. The falls are not very large from the standpoint of volume of water, comparing them with Niagara, but they have a drop of over 300 metres. I think the natural scenery surrounding this area is the most picturesque I have ever seen. For the Andes of Bogota, the hills are extremely rich in the orchids mentioned, and in general the flora is much richer. I was very highly interested in a white-flowered Epidendrum which I finally succeeded in reaching and bringing back for the Garden collection. One of the exciting incidents for an American is leaving the Falls by ox-cart during rainy weather and trying to catch the train to Bogota. The springless cart in which I rode held seven other people, and we all felt as though we might be dumped over the precipice at any time. One of the many other places visited in this region is Chia. Here, before entering the town, one passes over a very picturesque stone bridge which was built by the Spaniards in 1792.

"On June 10 I was highly delighted to receive a telegram from the *Cattleya Trianae* collector at Natagaima, stating that the orchids would shortly be leaving that region and that the natives had brought in 50 *arrobas* more than he was supposed to purchase and did I need them. My reply was that I would take all that had been collected.

"My next trip was to Girardot, the uppermost port of the Upper Magdalena River. Here I found fifty cases of the coveted *Cattleya Trianae* in the Norman Black warehouse awaiting my inspection. A half-dozen cases were unpacked, and I found that my instructions regarding packing had been carried out to the letter. The shipment was now ready for its homeward trip. The plants in this shipment were collected near the small village of Natagaima, where my native collector had his base of operations. From here he spread

the news that he was in the market for 'Tulipans' and the natives immediately got together their pack-mules and started in all directions on the orchid hunt. During this time my agent was making packing cases of a standard size and constructed so as to permit plenty of ventilation. Bamboo strips were used at the ends of most of the cases, permitting free circulation of air into the center. Of course it had been necessary for him to buy American nails and likewise saw and hammer, before leaving Bogota for this small native village. After a period of three to four weeks the natives, with their pack-mules loaded with 'Tulipans' roughly tied in bundles, began to arrive. These were bought by the collector for so much the *arroba*. They were then cleaned and put under cover to dry, then packed in the cases without any packing material whatever. The most important feature was to see that the plants were absolutely dry when packed, otherwise they will rapidly begin to rot.

"The next lap of the journey was by mule back to the Upper Magdalena River, twenty-five mules with two cases each being required. Here a large double-decked coffee raft was waiting. On this raft the cases were floated down the stream to my base of operations in Girardot. From there they were again freighted on mule back to the Norman Black warehouse, near by. The next part of the journey after their final inspection and O. K. was in the hands of Mr. Norman Black. From the warehouse to the boat by pack-mule again, by steamer to Beltran, by train from Beltran to La Dorada where they were again unpacked and taken to a steamer on the Lower Magdalena River to continue their five or six hundred-mile trip to the coastal town of Barranquilla. From there they were sent by train to Puerto Colombia; from there by ocean steamer to Panama, where they waited to be transferred to a New Orleans steamer. At New Orleans they were taken in charge by our agents and shipped to East St. Louis by fast freight. To hasten delivery at the Garden, automobile trucks brought them to the Garden without awaiting transfer across the river by the Terminal Railroad. This itinerary of the orchids from their native environment to their new home emphasizes the fact that the biggest factor of expense is transportation and not the original cost of the orchids.

"Inasmuch as the collector of *Cattleya Schroederae* needed

CROSSING THE RIO VIEJA.

ON THE TRAIL TOWARD LA MARIA.

ON THE TRAIL TO THE QUINDEO PASS.

WESTERN COASTAL PORT OF BUENAVENTURA, SHOWING NATIVE HUTS IN THE BAY.

two or three months to get to his region along the Venezuelan border, I decided to leave the details of forwarding the balance of the shipment in the hands of Mr. Black. Twelve cases of this shipment have recently arrived at the Garden in good condition.

"After successfully getting the plants which I had been sent for, my thoughts now turned towards home. Unfortunately, most of the Magdalena ports were under quarantine for yellow fever which was prevalent in the Bucaramanga region, so I was advised to go by mule back over the mountains to the Pacific port of Buenaventura. I was particularly interested in making this hazardous trip inasmuch as it took me through the 'Tulipan' region. I was not the only person anxious to leave for home, as during the last week in Bogota my friends, including a Virginian, a Spaniard, and an Ecuadorean, the latter gentleman having been with me during my entire stay in Colombia, were all glad to get away.

"Before leaving Girardot we bought medical supplies, etc. We went from here to Flanders and here caught a train to Ibague, the capital of the Departmento de Tolima. It was here we decided to elect the Ecuadorean treasurer and general manager of the expedition. After locating the agent who furnishes mules for such trips we were informed that it would take nine mules and four horses to carry ourselves and freight, which included our trunks, two cases of orchids, an herbarium press, etc. We could hardly see how it would take nine mules to carry our freight, but we were informed that it was best to have extra mules in case of accident. That afternoon the men were busy equalizing the loads of the mules which necessitated unpacking one extra-large trunk and placing the contents in separate boxes. To make the packs waterproof, everything had to be wrapped in American tar-paper and roped on the outside. We left Ibague at daybreak. My Spanish friend and myself were not expert horsemen. However, the Ecuadorean, who was brought up in the mountains of Ecuador, was qualified for the trip, and the Virginian had previously belonged to the United States cavalry, so he was likewise an experienced horseman. We had three expert guides, each carrying his famous machete about two feet long. Their traveling equipment consisted of an old pair of pants, a shirt, and a 'roana,' the native cape; also

the 'alpargata' or native shoes, made of hennequin fibre. It is interesting to see the many uses of the 'roana,' one of which is to place it over the head of the mules before loading. Without this it is impossible to load them. This performance is carried out periodically throughout the journey, inasmuch as the various trunks, etc., are always slipping from the mules' backs and coming in contact with abutting rocks along the trail.

"Our first objective after leaving Ibague was Caja-Marca, where we arrived at dusk and managed to secure a shelter for the night. The tired guides had to unpack the mules in darkness. Our valises containing necessaries for the night had to be divested of their tar-paper coverings. This performance was the regular thing every evening. I was interested to find various plants of the 'Tulipan' at the house where we stayed. Upon asking the woman where she collected them she replied *'Arribe'* (up there).

"The next morning we were up again before daylight, our guides informing us that today's trip was the most dangerous of the four days, inasmuch as we would have to climb to an altitude of 10,000 or 11,000 feet by the Quindeo Pass. We were advised to ride mules for the day as they are very much surer-footed, this being essential in view of the narrowness of most of the trails. We rode mules for the first three hours and then changed to our horses, deciding that we would sooner take the chance than go further on mule back. Our meals during the day consisted of the characteristic native soup, home-made bread made from corn, and of course the native meat.

"The second day we were to make the town of Armenia, which was a hard day's ride, before dark. We eventually climbed to and were safely crossing the Quindeo Pass. The scenery throughout the day was indescribably beautiful. Crossing the Pass I noticed a large red fruit that looked like a strawberry. Stopping my mule, after a short climb, I found it to be a raspberry larger than the largest strawberry I had ever seen. My friends, who had not been so much interested in my orchid material, became alert at sight of this edible fruit. I found three ripe fruits and exclaimed 'This is the best find I have had yet; I will take the fruit home and try to introduce this large-fruited variety.' My friends replied:

'That sounds very nice, but we have allowed you to stop frequently for your blamed orchids and now that you have found something decent to eat you even want to take that away.' Three against one was too much for me, so the large-fruited raspberries were lost to science. I afterwards found that the natives called these 'moras.'

"After finishing our costly (to me) dessert we started to descend to Armenia which we could see in the distance but alas a few hours' hard ride away. The progress seemed to be somewhat slow so we spurred our horses ahead; otherwise we would have had to stay in the mountains for the night. Just before dusk, with the town in the distance, our leader said we would have to speed on to make the town. My horse evidently had usually led the pack-trains because he made speed only when in the lead, so we were placed at the head. We started down grade on a half-way decent road at full speed. The Virginian, who was bringing up the rear, and who carried a revolver, decided to pull off a little Wild West show by the aid of his gun. The horses, evidently not used to such demonstrations, became somewhat frightened and increased their speed. This would have been to our liking had not my horse suddenly collapsed after one of these spurts. The only things I remember were flying hoofs and having the presence of mind to turn out of the way of the mule which was following. Before my friends could dismount I was up and helping the horse. The Ecuadorean came up as white as a sheet and started feeling my legs and arms to see if any bones were broken. My friends said that my horse turned two somersaults and I turned three. It was evidently a lucky escape for me. If any bones had been broken it would have meant waiting for expert treatment until we reached the far-off town of Panama. However, I received nothing worse than abrasions on knee, hip, and elbow. The horse could not be ridden the second day.

"We eventually arrived at Armenia without any further mishaps. After a hard day's ride over trails averaging four to six feet in width, with a drop of 7,000 feet on the side, we were ready for a good night's sleep. We put up at a very comfortable hotel, which fortunately possessed a shower bath, and retired early for a much-needed rest. However, immediately across the street, a recently imported player piano and billiard

table formed a great attraction for the populace. At two o'clock in the morning the four of us yelled across and threatened to shoot the place up if they didn't stop the noise. This had its effect and the player piano ceased, but the clicking of the billiard balls could still be plainly heard at daybreak. We had very little rest that night.

"We again set forth in the morning. Inasmuch as my horse was lame, I mounted a mule for the day. Our objective for that night was La Maria. The scenery throughout the day was extremely interesting and I saw many orchids, both epiphytic and terrestrial. At noon we were approaching the River Vieja when our guides informed us that we would have to ferry across. The ferry turned out to be two hand-made canoes, about seventy-five feet long by three feet wide, tied abreast. These were attached by a ring to a cable stretched across the stream. As the canoes were poled along the ring slipped along the cable, thus keeping the ferry in a straight course. The river was about 150 feet wide and some thirty feet deep. It took about an hour and a half for the entire pack-train to cross, since all freight had to be unloaded from the mules and taken across separately, with the exception of the mule carrying mail, whose pack was left on his back. Most of the time was taken up in trying to force the mules to enter the canoes.

"After all were across and the mules repacked, we immediately started an ascent of several hundred feet, almost at a perpendicular. We passed some very interesting vegetation, especially *Lantana camara,* a variety of which is used extensively in our summer bedding. I also saw various species of begonias and araceous plants, such as anthuriums, etc. Of particular interest was an entire hillside of tree ferns which were very tempting. However, the cost of transportation was prohibitive. We finally arrived at La Maria at dusk. La Maria consisted of one house with no comfortable rooms such as we had had the previous night at Armenia. However, it was quiet and we spent the night sleeping on the bare ground, well supplied with mosquitoes and ants. The Spaniard and myself shared the same straw mat and during the night were both awakened by the approach of an animal which we concluded was a puma or wild cat. As I held the flashlight the Spaniard prepared to shoot, when we suddenly discovered

it was the landlord's dog returning from the hunt. Again I was awakened by my partner yelling 'My neck, my neck'. With the aid of my flashlight I found a big stag beetle tightly fastened to his neck. After removing this we rested uninterruptedly until daybreak.

"We started on the fourth day's journey with Zarzal as our objective. During this day I was able to collect several epiphytic orchids which were brought back to the Garden. We reached Zarzal at noon and from here secured automobiles which brought us to Tulua at four o'clock. We put up here for the night and tried to locate bath or shower but without success, the result being that we all went to the river for a swim. The next morning we left on the '*Ferrocarri del Pacifico*', or Pacific railroad, for Cali. Here we found a very good hotel, in fact, the only hotel during my three months in Colombia that had running water in the bedrooms. We were advised not to leave Cali for the seaport of Buenaventura until our reservations for sailing were assured, because of the lack of good hotels in Buenaventura. So the Virginian and I, after two days in Cali, said good-bye to our friends and left by train over the mountains to Buenaventura. The scenery across the Western Andes is very picturesque. In spite of the fact that the journey is an all-day trip and very tiresome, it is extremely interesting for the botanist, observing the vegetation, varying according to the altitude. On nearing the Pacific coast one is particularly struck with the wonderful varieties of Anthuriums, Philodendrons, and ferns. We reached Buenaventura at five o'clock in the evening where hundreds of natives literally fought for our grips. After putting up at the one and only hotel, I was convinced that we had been wise to stay in Cali as long as we had. The majority of the population in this coastal town is black. The houses are mostly of the native type with thatched roofs, and most unsightly. Along the seacoast one sees rows of these huts, built above the water upon stilts. However, of recent date, a large concrete American-built dock has been completed, with railroad connections. This has greatly increased the handling of freight to towns of the interior. Before the building of these docks the steamers would anchor in the bay and all freight and passengers were transferred on barges. One can still see the barges tied up in the bay. We sailed

the next day, Monday, on the Panama-Pacific freighter, 'General O. H. Ernst', for Panama, and arrived at Balboa early Wednesday morning.

"My first act was to locate Mr. C. W. Powell, whom I had previously cabled of my arrival. After leaving my baggage and plants in his care, I again boarded the steamer and took the trip through the Panama Canal. On arrival at Cristobal I immediately interviewed the manager of the United Fruit Company's freight office and, after presenting my government permit and explaining the object of my expedition, secured his promise that the incoming Colombian orchid shipment would have his personal supervision and be transferred to the first boat for New Orleans. The next morning I took the train back to Balboa and was the guest of Mr. Powell for a week, during which time I went through his collection of orchids thoroughly. On leaving, upwards of 200 plants were given me for the Garden, many of which are new to science and brought to this country for the first time. In exchange I presented Mr. Powell with one case of my Colombian orchids which I had brought with me. (The orchids obtained from Mr. Powell will be discussed in a later issue of the BULLETIN).

"My next objective was the West Indies, and I arrived at Kingston, Jamaica, after a two days' trip. A week was spent in Kingston, the principal place of interest being the Hope Botanic Gardens. Through the courtesy of the Director I secured a shipment of large tree ferns, so necessary for our tropical fern house. These were obtained in the region of the Castleton Gardens, about fifteen miles from the Botanic Gardens. Various orchids and economic plants were also given me in exchange for a case of Colombian orchids which I had brought with me. I finally sailed for New York, bringing with me two crates of plants aggregating 900 pounds. Before leaving I cabled Dr. Moore to arrange with Washington to permit entry of these through the port of New York, since my permit called for entry at New Orleans alone. On arriving at New York I was met by a special government representative. After various preliminaries I finally placed the shipment in the hands of the American Express Company, thus terminating my responsibility for the expedition.

"My first communication from the Director notified me

that the first Colombian shipment had arrived in New Orleans. I immediately started for St. Louis by automobile and upon arrival found the imported orchids in every nook and corner of the houses, demanding immediate attention. Within the first month we had arranged in permanent baskets over 3000 plants. Prompt action was necessary as the plants had come through in excellent condition and had started new growths which when developed produce the large mauve flowers. The sooner the plants could be permanently established in their baskets the more rapidly would the growths develop, with more chance of producing flowers at the scheduled time. The plants will undoubtedly produce their best display next year.

"The latter part of September twelve cases of *Cattleya Schroederae* were received at the Garden. These were contracted for before I left Bogota and were forwarded by Mr. Norman Black. This is but half of the plants ordered of this variety and it remains to be seen whether any more will be shipped. Considering the length of time on the way the plants arrived in excellent condition."

THE FALL DAHLIA SHOW

Last spring it was announced in the April number of the BULLETIN that a dahlia show would be staged at the Garden some time in October. It was hoped that a show of this kind in the Middle West would arouse a greater interest in this beautiful autumn flower. As the Florists' Telegraph Delivery Association was to hold its eighth annual convention in St. Louis and the members were to visit the Garden in a body on Thursday, October 11, it seemed desirable to stage the show at that time. The date was accordingly set for October 10-11, providing the dahlias were in condition.

On the opening morning many exhibitors brought in their choicest blooms. The rules were lenient for the first show in order to encourage entries, and every possible assistance was rendered the exhibitors by the students at the Garden. As a show of this kind was new in this city much extra work was entailed in not only properly classifying the entries, but also in aiding the exhibitors in staging their blooms. After a

number of shows, exhibitors should be more familiar with the rules and regulations and know just what is expected of an exhibit to be worthy of the judges' consideration. The dahlias were in excellent condition and after Thursday were still worthy of being displayed. Accordingly the show was continued until the following Monday, and a large number of people visited the Garden during the six days of the exhibit.

The individual blooms were wonderful in size, color, and quality. Most of the entries in the amateur section were in the classes calling for specimen blooms, but the class for the best vase with any number of blooms also brought a number of exhibits. The commercial section was likewise well represented in all classes. The show, as staged in the floral display house, was a colorful collection of dahlias and was remarkably good considering that it was the first. The tables were covered with a deep green cloth, and the palms and other plants in the permanent planting gave the proper background of green against which all colors were seen to the best advantage.

The following were the winners in the amateur section in the various classes:

SPECIMEN BLOOMS—ONE TO A VASE

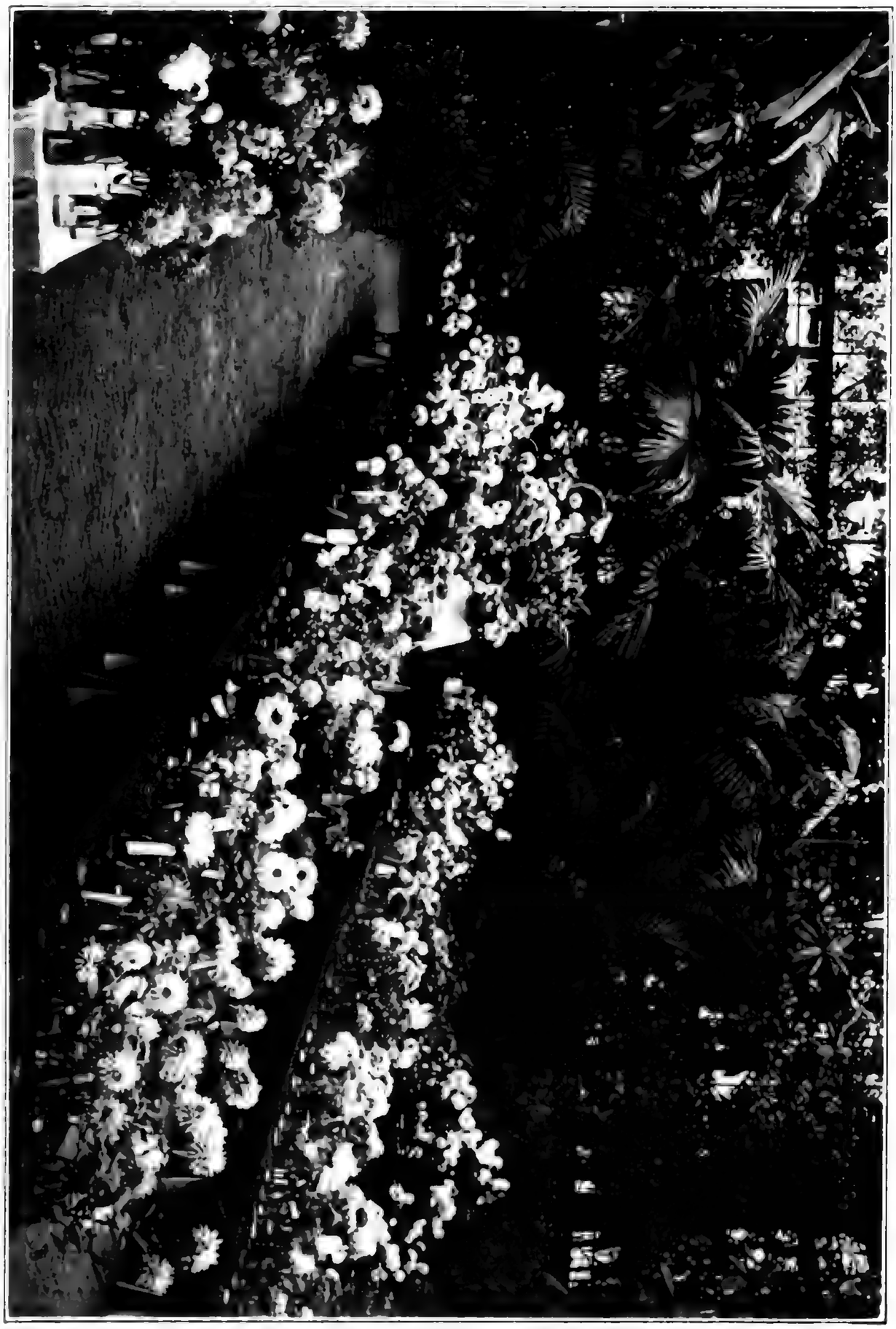
Class No.

1. Cactus
   1st—Mr. P. L. Walsh, Chaucer & Thorpe, R. R. 28, Overland, Mo.
   2nd—Miss Eva Robinson, Mounds, Ill.

1a. Hybrid Cactus
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.

2. Collarette
   No entries.

3. Decorative
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.



THE FALL DAHLIA SHOW.

4. Peony-flowered
   1st—Mrs. Frank Taylor, Bowling Green, Mo.
   2nd—Mr. Harold Hartman, 3232a Pulaski St., St. Louis, Mo.

5. Pompon.
   1st—Miss Eva Robinson, Mounds, Ill.
   2nd—No entry.

6. Seedling
   1st—Mrs. Frank Taylor, Bowling Green, Mo.
   2nd—No entry.

7. Single
   1st—Mr. P. L. Walsh, Chaucer & Thorpe, R. R. 28, Overland, Mo.
   2nd—Mr. P. L. Walsh, Chaucer & Thorpe, R. R. 28, Overland, Mo.

8. Show
   1st—Mrs. Frank Taylor, Bowling Green, Mo.
   2nd—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.

9. Collection of ten varieties (one bloom to a vase)
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mrs. Katie Axt, Route 2, Clayton, Mo.

10. Collection of five varieties (one bloom to a vase)
   1st—Mr. Carol S. Cole, 7957 Dale Ave., St. Louis, Mo.
   2nd—Mrs. A. E. Kelly, Iuka, Ill.

11. Vase of ten blooms (one variety)
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mrs. Katie Axt, Route 2, Clayton, Mo.

12. Vase of five blooms (one variety)
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.

13. Most artistic vase, receptacle and arrangement considered (one or more varieties and any number permitted)
   1st—Mr. E. H. Johanning, 3828 Utah Pl., St. Louis, Mo.
   2nd—Mrs. C. R. D. Meier, Kent Road, Clayton, Mo.

The bronze medal of the American Dahlia Society was awarded to Mr. E. H. Johanning, 3828 Utah Place, St. Louis, for the most meritorious exhibition in the amateur section.

The following were the winners in the commercial section:

SPECIMEN BLOOMS—ONE TO A VASE

Class No.

1. Cactus
   1st—Missouri Dahlia Farm, St. Charles and Walton Rds., St. Louis County.
   2nd—Missouri Dahlia Farm, St. Charles and Walton Rds., St. Louis County.

1a. Hybrid Cactus
   1st—W. A. Rowe Floral Co., Kirkwood, Mo.
   2nd—Missouri Dahlia Farm, St. Louis County.

2. Collarette
   1st—W. A. Rowe Floral Co., Kirkwood, Mo.
   2nd—Missouri Dahlia Farm, St. Louis County.

3. Decorative
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—Missouri Dahlia Farm, St. Louis County.

4. Peony-flowered
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—W. A. Rowe Floral Co., Kirkwood, Mo.

5. Pompon
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—Missouri Dahlia Farm, St. Louis County.

6. Seedling
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—Missouri Dahlia Farm, St. Louis County.

7. Single
   1st—W. A. Rowe Floral Co., Kirkwood, Mo.
   2nd—Missouri Dahlia Farm, St. Louis County.

8. Show
   1st—W. A. Rowe Floral Co., Kirkwood, Mo.
   2nd—Missouri Dahlia Farm, St. Louis County.

9. Collection of ten varieties (6 blooms to a vase)
   1st—W. A. Rowe Floral Co., Kirkwood, Mo.
   2nd—Missouri Dahlia Farm, St. Louis County.

10. Collection of five varieties (6 blooms to a vase)
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—No entry.

11. Best general display of dahlias (not to exceed 30 square feet)
   1st—Missouri Dahlia Farm, St. Louis County.
   2nd—W. A. Rowe Floral Co., Kirkwood, Mo.

12. Most artistic basket arrangement, receptacle and arrangement considered (accessories permitted)
   1st—Julius Schaeffer, Inc., St. Louis, Mo.
   2nd—Jensen, Inc., St. Louis, Mo.

The Silver Medal of the American Dahlia Society was awarded to the Missouri Dahlia Farm, St. Charles and Walton Roads, St. Louis County, for the most meritorious exhibit in the commercial section.

That dahlias can be grown successfully in this part of the country was clearly demonstrated in this show, and some of the finest blooms were produced in the city. Of course, an adverse season may come, but the average year should always produce a good crop of flowers.

The following dahlia firms generously sent tubers to the Garden to help stimulate interest in the dahlia. These were planted in the nursery last summer and all which developed satisfactory blooms were exhibited:

J. K. Alexander,
East Bridgewater, Mass.
Huntington Beach Nurseries,
Huntington Beach, Cal.
New York Botanical Garden,
New York City.
Quannapowitt Dahlia Garden,
Wakefield, Mass.
Jacob Schulz Co., Inc.
Louisville, Ky.
Geo. L. Stillman,
Westerly, R. I.
M. G. Tyler,
Portland, Ore.
R. Vincent, Jr. & Sons Co.,
White Marsh, Md.
Geo. H. Walker,
North Dighton, Mass.

The thanks of the Garden are due the judges, Messrs. W. A. Manda, South Orange, N. J., and C. Tonseth, Portland, Oregon, as well as the amateur and commercial exhibitors for their splendid cooperation in making this the first dahlia show, such a success.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Junior Chamber of Commerce, October 12, on "What is an Orchid"?

Mr. E. E. Watson, of the Michigan Agricultural College, East Lansing, Michigan, recently visited the herbarium in connection with his studies of the genus Helianthus.

Mr. L. P. Jensen, Arboriculturist to the Garden, spoke before the Webster Groves Nature Study Society, October 5, on "The Beautification of Home Grounds," and on October 24 he gave an illustrated lecture before the Women's Club of Greenfield, Illinois, on "The Use of Native Materials in Ornamental Planting."

Dr. Edgar Anderson, head of the School for Gardening, conducted a group of boys from the Bellefontaine Farms on a field trip on the afternoon of October 10, and in the evening he spoke before another group at the same institution on "Flower Forms."

Mr. G. H. Pring, Horticulturist to the Garden, has recently given the lecture "Collecting Orchids in South America" before the following audiences: St. Louis Landscape Association, at the American Hotel, October 8; Society of Sigma Xi, in the lecture room at the Garden, October 15; Clifton Heights Presbyterian Church, October 18; Missouri State Florists' Association at Sedalia, October 25.

The Mail Advertising Service Association of North America visited the Garden by moonlight on the evening of October 22. Temporary lights were placed in the palm house and in the floral display house. Owing to the fact that business sessions occupied the entire day, this was the only chance that the out-of-town delegates had to visit the Garden, and about two hundred delegates took advantage of this unusual opportunity.

The Trustees' banquet, given in honor of the visiting delegates of the Florists' Telegraph Delivery Association, was held at the Chase Hotel on the evening of Wednesday, October 10, about seven hundred being in attendance. President

Whitaker presided, and Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated talk on "Hunting Orchids in the Tropics." The next day, October 11, the members of the Florists' Telegraph Delivery Association visited the Garden. As an expression of appreciation of the relationship between the florists and the Garden, and in memory of the founder of this institution, a wreath of magnolia leaves and dahlias was placed by the association at the tomb of Mr. Shaw.

Students completing their work for the Doctorate of Philosophy in the Graduate Laboratory in June, 1923, have been appointed to positions as follows: Dr. H. C. Young, Chief in Botany at the Ohio Experiment Station, Wooster, Ohio; Dr. A. F. Camp, Plant Pathologist to the Florida State Board of Agriculture and assigned to the Agricultural Experiment Station at Gainesville, Fla.; Dr. L. J. Klotz, Assistant Professor in Botany with special reference to physiology at the New Hampshire State College, Durham, N. H.; and Dr. Grace E. Howard, Curator of the Botanical Museum and Instructor in Botany, Wellesley College, Wellesley, Mass. Dr. S. G. Lehman has returned to his position as Assistant Plant Pathologist at the North Carolina Agricultural Experiment Station, Raleigh, N. C.; Dr. F. S. Wolpert continues his work as Instructor in Science, Principia Academy, St. Louis; and Dr. Adele Lewis Grant has resumed her work as Instructor in Botany at Cornell University. Dr. Young formerly held the National Research Council (Crop Protection Institute) Fellowship for the investigation of the toxicity of sulphur; Drs. Camp, Klotz, and Lehman were Rufus J. Lackland Research Fellows, and Miss Howard held a Jesse R. Barr Fellowship in Washington University.

Upon the resignation of Dr. H. C. Young, Mr. L. E. Tisdale was appointed to the unexpired term of the National Research Council Fellowship, under the auspices of the Crop Protection Institute, to pursue further investigations on the use of sulphur as a fungicide.

Mr. Selden R. Warner, formerly Rufus J. Lackland Research Fellow in the Graduate Laboratory, is continuing his studies during the first semester, 1923-24, at the University of Chicago. Miss Mildred L. Johnson (Mrs. L. J. Klotz), former holder of a Jesse R. Barr Fellowship, is now resident at Durham, N. H.

STATISTICAL INFORMATION FOR SEPTEMBER, 1923

GARDEN ATTENDANCE:

Total number of visitors.....22,774

PLANT ACCESSIONS:

Total number of plants received in exchange..... 677
Total number of seed packets received in exchange.... 6

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 15
Total number of books and pamphlets donated..... 46

HERBARIUM ACCESSIONS:

By Gift—

Anderson, Dr. E.—Plants of New Hampshire and New York 14
Bisby, Prof. G. R.—Fungi from northern Manitoba..... 30
Churchill, Hon. Joseph R.—Plants of Quebec, Massachusetts, Connecticut, South Carolina, and Colorado..... 410
Clark, H. Walton—*Ricciocarpus natans* from California. 1
Drushel, Prof. J. A.—Plants of Wisconsin, Illinois, Missouri, and Colorado..... 9
Fairman, Dr. C. E.—Fungi of New York..... 5
Ledman, O. S.—Plants of Franklin County, Missouri.... 2
Lowater, D. R.—*Sphaerobolus stellatus* from Toledo, Ohio 1
McAdow, Miss Marian A.—*Cassia Fistula* L. from Florida 1
Miles, L. E.—Fungi of Alabama..... 4
Stevens, Prof. F. L.—Fungi of Panama and Costa Rica 5
van der Bijl, Dr. P. A.—Fungi of South Africa..... 8
von Schrenk, Dr. Hermann—*Juniperus Sabina* L. from Montana 3
Wolf, Dr. F. A.—*Poria Cocos* (Schw.) Wolf on tuckahoe 1

By Exchange—

Botanic Garden of University of Cluj, by Prof. Al. Borza—Plants of Roumania..... 200
Pammel, Prof. L. H.—*Lilium michiganense* Farw. from Iowa 2

By Purchase—

Davis, Rev. John—Plants of New Hampshire, Nebraska, Texas, and California..... 476

By Field Work—

Greenman, Dr. J. M.—Plants of St. Louis County, Missouri 12

Total 1,184

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

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MR. C. W. POWELL AT THE ENTRANCE TO HIS ORCHID GARDEN.

Missouri Botanical Garden Bulletin

Vol. XI NOVEMBER, 1923 No. 9

THE PRIVATE ORCHID COLLECTION OF MR. C. W. POWELL

On his return journey from the recent orchid collecting trip to South America, Mr. George H. Pring stopped at the famous garden of Mr. Powell in Balboa and, because of the importance of Mr. Powell's collection, and the fact that we have a large number of Panamanian species at the Garden, the following account of his experiences while there is given in full:

"The native orchids concentrated in this notable Canal Zone garden embrace the major portion of the Panamanian species known to science. The collection has been brought together within the last ten years by Mr. Powell chiefly from the Chiriqui region. Mr. Powell's enthusiasm for these plants has caused him to be locally termed 'the Orchid Man', and his garden is one of the show places in Balboa to both the botanist and tourist.

"The collection aggregates upwards of five thousand specimens which are concentrated in his garden on the east side of the residence. The garden is surrounded by an eight-foot chicken-wire fence covered with various species of climbers to shade the plants from the sun. This same vine-covered wire meets overhead, giving shade and likewise supporting the suspended orchids. The density of the shade is governed, according to the requirements of the season, by pruning. At the western end of the garden most of the shade is provided by a large mango tree, upon trunk and extended branches of which various shade-loving epiphytic plants are tenaciously rooted. Toward the eastern portion of the garden full sun-

shine is permitted for the benefit of sun-loving terrestrial orchids. Of interest here was a large bed of the dove orchid, *Peristeria elata*, producing upwards of fifty flower spikes, averaging four feet high and well filled with maturing buds. The soil consisted of a heavy sandy loam, and Mr. Powell informed me that the plants grow under like conditions in the wild state, except that in the wild state they grow in association with grasses. Sobralias were also planted in similar beds, two noteworthy specimens being the new species, *S. Rolfeana* and *S. Powellii*, in full bloom. Other terrestrial orchids growing in shade were various species of Habenaria, including several undetermined species. Associated with these shade-loving terrestrials were some recently collected plants of the Mandarin orchid, *Phragmopedilum caudatum* var. *Warscewiczii*.

"The greater part of the collection is represented by epiphytes, the genus Epidendrum dominating all others by its many species. The beautiful *Epidendrum atropurpureum* var. *rhodoglossum* and *E. prismatocarpum* were in full bloom, as was also the new species of the bucket orchid *Coryanthes Powellii* and *C. Hunteriana*. Mr. Powell remarked that it is almost impossible to get the natives to climb the trees to collect bucket orchids, as the large masses of roots are invariably infested with numbers of stinging ants. Removing a clump of these plants may be compared with disturbing a hornets' nest, but, according to Mr. Powell, who had experienced both adventures, the hornets are easier to combat than the thousands of small stinging ants.

"Some of the more showy orchids were *Trichopilia suavis* and *T. marginata* growing upon large blocks of wood. Of recent discovery was the albino form of both species, *T. marginata* var. *alba* being the most striking. The oncidiums in flower included the showy *O. ampliatum*, several plants of which were also observed in the central parkway in Panama City, attached to trees. There were also several long spikes of *O. panamense* which somewhat resemble *O. altissimum*. Various species of Pleurothallis, Stelis, Scaphyglottis, and Masdevallia were in bloom, the rare white-flowered *M. Livingstoneana* being particularly noticeable.

"On account of the atmospheric conditions the growing of orchids in Panama is considerably simplified. During the

MR. POWELL'S ORCHID GARDEN AT BALBOA.

week, as Mr. Powell's guest, he and I discussed the cultivation of orchids from all angles. In basketing he has adopted the same system as practiced at the Garden of using only baskets or blocks of wood for all epiphytic orchids. His baskets, however, are much shallower than these used at the Garden and narrowed to the base, whereas those at the Garden are perfectly square. The Garden method enables the grower to fasten the orchid more securely without wrapping or tying it in with wire. After demonstrating our method of packing the peat and moss in such a way as to tightly fasten the plant, Mr. Powell decided to adopt it instead of his method of potting, as with ordinary garden plants in soil. The growing medium used is the native sphagnum moss mixed with Osmunda fiber imported from the United States, the greater part being the sphagnum.

"As the rainy season was at its height during this period, artificial watering was unnecessary, but during the dry season the hose is in constant use. The atmosphere during the week of my visit was at saturation point, and even wearing apparel hanging in the house would mildew. To overcome this all clothes wardrobes are connected with electric lights, which are kept burning during the wet season. During the day there is an abundance of sunshine, sufficient to overcome the damping off of young plants. Both Mr. Powell and Mr. Cyril Allen of Colombia, the latter having had experience in Europe in growing orchids, suggested that more direct sunshine should be given orchids than ordinarily practiced in the United States and Europe. I accepted the suggestion for Europe, but in St. Louis the heat of the direct sun in the summer immediately burns the leaves and pseudobulbs. The amount of sunshine and dry atmosphere in St. Louis is evidenced by the fact that such orchids as Schomburgkia, Chysis, and *Laelia Boothiana* flower annually. My own observations in Colombia, especially with regard to cattleyas, proved that in their natural habitat these orchids withstand considerable sunshine. The plants growing in the most shady places, as upon branches of trees, produce long, narrow pseudobulbs, whereas those attached to the trunk and fully exposed to the sun produce short, thick growths with the maximum amount of flowers to the spike.

"In examining Mr. Powell's herbarium specimens I was

particularly interested in the retention of the natural color of foliage and flowers. In this moisture-laden climate it is almost impossible to dry specimens by the ordinary method without applying artificial heat, and an electric iron is generally used to force drying. The fresh specimen is placed between blotting-paper and the heated iron applied until the specimen is pressed and dried. At frequent intervals the specimen is tested by touching the leaves or flowers, the operation being considered complete when they will not adhere to the finger. Frequently an hour or so is taken for an individual specimen.''

The following article is a translation from ''Orchidaceae Powellianae Panamenses,'' by Dr. R. Schlechter:

''In 1919, one of my Costa Rican correspondents brought to my attention the fact that Mr. C. W. Powell had brought together in Panama an important collection of orchids of that vicinity and urged me to get in touch with him. I accordingly wrote Mr. Powell and received from him the answer that R. A. Rolfe, of Kew, had already taken up the study of his collection, but that he would be glad to send me duplicates of the separate numbers possible. I therefore did not anticipate that I should have the opportunity of working on the collection. R. A. Rolfe, who, in 1920, was already in ill health, died suddenly in April, 1921, before he had done any work on the Powell orchids.

''Mr. Powell then asked me to take over the work. I was the more pleased to do this because I knew that in the orchid flora of Panama there would not only be many new species, but that many of the Warszewiczian discoveries might be rediscovered and cleared up.

''When the first collection appeared I was agreeably surprised by the exquisitely prepared flower material. Unfortunately, however, in many cases, there was no vegetative material, since, as Mr. Powell informed me, Rolfe had written him that flowers alone would suffice. With great readiness Mr. Powell then proceeded to supply me with the vegetative parts of the various plants; not a particularly pleasant job, but one that was dispatched with zeal so that most of the numbers are already complete. The new numbers coming in each week are characterized not only by their splendid preparation, but also by their completeness.

"Mr. Powell has rediscovered the greater part of the previously known Panamanian orchids, and in addition a considerable number of new species; also a number which were not known from Panama, but were known from neighboring territories. As important as the new species, however, is the rediscovery of a long list of species founded by v. Warscewicz, and which have never since been rediscovered. We can see, therefore, how very important is Mr. Powell's collection, but the importance will be more completely demonstrated when we take up the collection in detail.

"The first enumeration of the orchids of Panama is given by Dr. B. Seemann in his 'Flora Panamensis' in the report of the 'Herald' expedition. He mentions 104 species for Panama. In my enumeration of the orchids of Central America, I was able to list 117 species. Mr. Powell has so far collected around 260 numbers that belong to 60 genera and actually 184 species, of which not less than 75 are new.

"Of the genera in the Powell collection the following 19 are new for Panama: Camaridium, Campylocentrum, Cattleya, Coryanthes, Dimerandra, Gongora, Govenia, Hexadesmia, Isochilus, Ionopsis, Laelia, Leochilus, Leucohyle, Liparis, Nidema, Osmoglossum, Restrepia, Sarcoglottis, Sigmatostalix.

"In contrast to the above we can state that the following 15 which are already known from Panama, are not in the collection: Acineta, Chysis, Coeliopsis, Corymbis, Fregea, Kefersteinia, Macradenia, Mesospinidium, Microstylis, Pescatorea, Rhyncholaelia, Scaphosepalum, Selenipedium Trichocentrum, Triphora.

"To be sure, Mr. Powell, as he has informed me, has found several of these, namely, Selenipedium, Chysis, Coeliopsis, Acineta, and Pescatorea, but has not yet been able to get herbarium material. Nevertheless, we can state that through the collection of Mr. Powell the number of known orchids from Panama has been approximately doubled. It is sure that no one has made such a contribution to our knowledge of these orchids as Mr. Powell through his 'exceedingly mighty collection,' which contains not only species with conspicuous flowers, but also those in which the size of the blooms scarcely exceeds that of a pin-head.

"Let us now consider the collection. The number of species which have been more or less unknown since they were first

described (mostly by v. Warscewicz) is quite large. I name here *Habenaria Warscewiczii* Schltr., *Masdevallia Livingstoneana* Roezl & Rchb. f., *Epidendrum Oerstedii* Rchb. f., *Brassavola lineata* Hook., *Cycnoches Dianae* Rchb. f., *C. Warscewiczii* Rchb. f., *Catasetum bicolor* Kl., *Lycaste brevispatha* Kl., and a long list of Oncidium species.

"As especially remarkable new species should be mentioned: *Pleurothallis Powellii* Schltr., *P. Hunteriana* Schltr., *Epidendrum Hunterianum* Schltr., *E. porphyrophyllum* Schltr., *E. Powellii* Schltr., *Odontoglossum Powellii* Schltr., *Osmoglossum acuminatum* Schltr., and *Ornithocephalus Powellii* Schltr., as also all Cycnoches species.

"Epidendrum stands far above all the others in the collection as the richest in number of species, with 34 species of which 12 appear to be new; then follows Oncidium with 15 species (4 new), and 2 not yet successfully determined. Here belong Pleurothallis with 14 species (9 new) of which, however, I expect several more, and Maxillaria with 11 species (6 new). In my 1918 summary of the Panama orchids Epidendrum was first with 18 species and then Oncidium with 12, while of Pleurothallis only 3 species were known. We see, therefore, how an entirely new picture has been unrolled before us. I could then give 54 genera as occurring there (one of which has since been retired, making 53). Now, through the investigations of Mr. Powell, we can add 19 more genera. There are, then, 72 genera.

"As I perceive from the collection, Mr. Powell's collecting on Chiriqui has not been at over 5,000 feet altitude. It can, however, be expected that many species will be found above this point that are not yet in the collection. From the testimony of Warszewicz there must be an entirely different luxurious orchid flora between 7,000 and 8,000 feet altitude. At this altitude occur the, as yet not rediscovered, *Cycnoches aureum* Ldl., *Sobralia Warscewiczii* Rchb. f., *Oncidium bracteatum* Rchb. f., *O. Warscewiczii* Rchb. f., and indeed also the *Fregea amabilis* Rchb. f.

"A district quite unopened botanically are the woods which stretch from the canal to the Colombian border. They would certainly furnish a large number of new species which must live in their primeval depths. Here would be found many humus-dwellers, above all Habenaria species and Spiran-

thinae, as also many other terrestrial orchids of which there has been as yet a relatively small number in the Panamanian flora. Let us hope that Mr. Powell may visit these regions and so increase his great contribution to orchidology.

"The field of Mr. Powell's investigation extends principally in the neighborhood of the City of Panama, which, in the republic, is always spoken of as 'Panama City'; further on the Chiriqui range to a height of around 5,000 feet. I have intentionally avoided expressing the height as given on the herbarium specimens in meters and therefore emphasize that they are given in English feet.

"With a single exception *(Oncidium Isthmi)* all the species are collected by Mr. Powell. Only the number in his collection will therefore be cited.

"For the purpose of a review I give here a summary of the genera, which have representatives in the collection. With each is given the number of species and the number of novelties. A few species, 6 in number, which cannot yet be named with certainty are omitted and will be left for a future occasion.

Genus	No. of species	No. of novelties	Genus	No. of species	No. of novelties
1. Phragmopedilum	1	..	19. Nidema	1	..
2. Habenaria	2	..	20. Dimerandra	1	1
3. Cleistes	1	..	21. Encyclia	6	2
4. Vanilla	1	..	22. Diacrium	1	..
5. Sobralia	6	3	23. Cattleya	1	..
6. Elleanthus	1	..	24. Laelia	1	..
7. Sarcoglottis	2	2	25. Schomburgkia	1	..
8. Liparis	1	..	26. Brassavola	2	..
9. Masdevallia	1	..	27. Polystachya	1	1
10. Stelis	4	4	28. Bletia	1	..
11. Lepanthes	1	1	29. Eulophia	1	..
12. Pleurothallis	14	9	30. Govenia	1	1
13. Restrepia	1	1	31. Mormodes	4	1
14. Isochilus	1	1	32. Cycnoches	6	4
15. Hexisea	1	..	33. Peristeria	1	..
16. Hexadesmia	2	2	34. Stanhopea	1	..
17. Scaphyglottis	4	2	35. Gongora	3	1
18. Epidendrum	33	12	36. Coryanthes	2	2

Genus	No. of species	No. of novelties	Genus	No. of species	No. of novelties
37. Lycaste	2	1	50. Odontoglossum .	2	1
38. Xylobium	3	1	51. Osmoglossum ...	1	1
39. Chondrorhyncha	1	..	52. Miltonia	1	..
40. Warszewiczella.	2	..	53. Brassia	2	..
41. Maxillaria	11	6	54. Leochilus	1	1
42. Camaridium	3	3	55. Oncidium	15	4
43. Trigonidium	1	..	56. Sigmatostalix ...	1	..
44. Ionopsis	1	..	57. Ornithocephalus.	2	2
45. Rodriguezia	1	..	58. Lockhartia	2	1
46. Notylia	2	1	59. Dichaea	2	1
47. Aspasia	2	..	60. Campylocentrum	1	1
48 Trichopilia	3	1		175	75
49. Leucohyle	1	..			

"This summary should not give the idea that Mr. Powell's botanical activities in Panama are completed. More are constantly coming in, and I hope, when Mr. Powell believes his collection has reached its limits, to bring out with him a comprehensive orchid flora of Panama. Before that time other interested parties will have perhaps been found who will help to prosecute the work. There is still much to do. First of all, Chiriqui should be explored above 5,000 feet, then the region between the canal and the Colombian border, and finally the terrestrial orchids in the humus of the woods and savannas should be carefully looked for.

"We cannot thank Mr. Powell enough for this self-sacrificing research that he has undertaken in spite of his age. For the orchidology of Panama he has done more than any of his predecessors. Let us hope that his efforts may be crowned with the same success for a long time to come."

LIST OF PLANTS PRESENTED TO THE GARDEN BY MR. C. W. POWELL

Aspasia epidendroides Ldl.
Aspasia Rousseauae Schltr.
Bulbophyllum vinosum Schltr.
Brassia longissima Schltr.

Brassia Gireoudiana Rchb. f.
Brassavola lineata Hook.
Camaridium affine Schltr., new species
Camaridium arachnites Schltr., new species*
Camaridium latifolium Schltr., new species
Campylocentrum peniculus Schltr., new species
Catasetum Warszewiczii Rchb. f.
Cattleya Deckeri Kl.
Chondrorhyncha Lipscombiae Rolfe
Coeliopsis hyacinthosma Rchb. f.
Coryanthes Hunteriana Schltr., new species
Coryanthes Powellii Schltr., new species
Cycnoches Dianae Rchb. f.*
Cycnoches guttulatum Schltr., new species
Cycnoches Warszewiczii Rchb. f.
Diacrium bilamellatum Hemsl.
Dichaea panamensis Ldl.
Dimerandra Isthmi Schltr., new species
Encyclia atropurpurea var. *rhodoglossa* Schltr.
Encyclia Hunteriana Schltr., new species
Encyclia Powellii Schltr.
Encyclia tessalata Schltr.
Epidendrum 304
Epidendrum amandum Ames
Epidendrum brevicaule Schltr., new species
Epidendrum chlorocorymbos Schltr., new species
Epidendrum coriifolium var. *purpurascens* Schltr., new variety
Epidendrum eburneum Rchb. f.
Epidendrum fragrans Sw.
Epidendrum imatophyllum Ldl.
Epidendrum Isthmi Schltr., new species
Epidendrum myodes Rchb. f.
Epidendrum nocturnum var. *panamense* Schltr., new variety
Epidendrum Ottonis Ames
Epidendrum pachycarpum Schltr.*
Epidendrum Powellii Schltr., new species
Epidendrum prismatocarpum Rchb. f.
Epidendrum radicans R. et Pav.
Epidendrum Rousseauae Schltr.
Epidendrum Stamfordianum Ldl.
Epidendrum teretifolium var. *chiriquense* Schltr., new variety
Epidendrum volutum Ldl.
Gongora aromatica Rchb. f.
Gongora Powellii Schltr., new species
Gongora tricolor Rchb. f.
Hexadesmia Powellii Schltr., new species*
Hexisea bidentata Ldl.
Ionopsis utricularioides Ldl.
Isochilus chiriquensis Schltr., new species*
Lockhartia Oerstedii Rchb. f.
Lockhartia pallida Rchb. f.
Lycaste brevispatha Kl.
Lycaste macrocarpa Ldl.*

Lycaste Powellii Schltr., new species
Masdevallia Livingstoneana Roezl. & Rchb.
Maxillaria aciantha Rchb. f.
Maxillaria alba Ldl.
Maxillaria chiriquensis Schltr., new species*
Maxillaria crassifolia Rchb. f.
Maxillaria gatunensis Schltr., new species
Maxillaria panamensis Schltr., new species
Maxillaria Powellii Schltr., new species
Maxillaria pubilabia Schltr., new species
Maxillaria Rousseauae Schltr.*
Maxillaria stenostele Schltr.
Mormodes atropurpureum Ldl.
Mormodes Hookeri Lem.
Notylia pentachne Rchb. f.
Odontoglossum Powellii Schltr., new species
Oncidium No. 267
Oncidium ampliatum Ldl.
Oncidium cheirophorum Rchb. f.
Oncidium fulgens Schltr., new species
Oncidium ochmatochilum Rchb. f.*
Oncidium Oerstedii var. *crispiflorum* Schltr., new variety
Oncidium panamense Schltr., new species
Oncidium Powellii Schltr., new species
Oncidium pusillum Rchb. f.
Oncidium stipitatum Ldl.
Ornithocephalus diceras Schltr., new species
Osmoglossum acuminatum Schltr., new species
Peristeria elata Hook.
Phragmopedilum caudatum var. *Warszewiczii* Schltr.*
Polystachya panamensis Schltr., new species
Rodriguezia secunda var. *panamensis* Schltr., new variety
Sarcoglottis Hunteriana Schltr., new species
Sarcoglottis Powellii Schltr., new species
Schomburgkia Lueddemanii Rchb. f.
Sobralia Rolfeana Schltr., new species
Stanhopea No. 295
Stanhopea No. 303
Stanhopea Wardii var. *amoena* (Kl.) Schltr.
Trichopilia marginata Henfr.
Trichopilia marginata var. *alba* Henfr.
Trichopilia Powellii Schltr., new species
Trichopilia suavis Ldl.
Trichopilia suavis var. *alba* Ldl.
Trigonidium Seemanni Rchb. f.
Vanda Roxburghii R. Br.
Warscewiczella discolor Rchb. f.
Xylobium elongatum Hemsl.
Xylobium Powellii Schltr., new species
Xylobium stachyobiorum Hemsl.

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*Plants dead on arrival.
New species and varieties introduced in the United States 39.

BRANCH OF ULMUS PARVIFOLIA.

AUTUMN FLOWERING ELMS

Generally, elms are about the first trees to bloom in the spring. A few warm days in early March, and our local elms are covered with clusters of flowers speedily turning into fruit which ripens in early summer. The following species, however, put out their flowers in early autumn and their seeds ripen before hard winter sets in.

Ulmus parvifolia (Chinese elm).—A small tree with spreading pubescent branches. Leaves ovate or oblong, very short-petioled, ¾–1 inch long, glabrous and glossy above, at first pubescent beneath, when mature usually glabrous. Flowers short-petioled, blooming in September; fruit oval to elliptic with the seed in the center. Native habitat: North China and Japan.

The tree at the Garden (plate 31) was received from the Arnold Arboretum, Boston, Massachusetts, November 2, 1915, and produced its first flowers the first week in September, this year. It is now about 15 feet high with a spread of branches of about 12 feet.

Ulmus serotina (red elm).—A tree reaching a height of 60–90 feet, with short spreading and pendulous branches, often furnished with irregular corky wings. Leaves oblong to obovate, glabrous and shiny above, pubescent on the veins beneath, 2–3 inches long. Flowers in long pendulous racemes, blooming in September; fruit elliptic, deeply notched and densely ciliate. Native habitat: Georgia to Tennessee.

Ulmus crassifolia (cedar elm).—A tree attaining a height of 80 feet, with spreading limbs and slender, somewhat pendulous branches, which, when older, are often furnished with two opposite corky wings. Leaves short-petioled, ovate to ovate-oblong, 1–2 inches long, somewhat rough and shiny above, pubescent beneath. Flowers in very short racemes, appearing in August; fruit oval-elliptic, pubescent. Native habitat: Mississippi to Arkansas and Texas.

NOTES

Mr. E. J. Palmer, of the Arnold Arboretum of Harvard University, visited the Garden recently.

Mr. L. P. Jensen, Arboriculturist to the Garden, lectured before the Boy Scout Class for the Merit Badge at the Cabanne Branch Library, November 2, on "Forestry."

Mr. L. P. Jensen is the author of an article in the September-October number of "Parks and Recreation" on "Arboretums in Connection with the Park System."

Dr. George T. Moore, Director of the Garden, spoke through the Post-Dispatch broadcasting station, November 13, on "The Growing Interest in Flower Shows."

Dr. George T. Moore, Director of the Garden, is the author of a chapter entitled "The Educational Value of Modern Botanical Gardens" in "Science Remaking the World," published this month by Doubleday, Page & Co.

Mr. G. H. Pring, Horticulturist to the Garden, acted as judge at the flower show at Oklahoma City, November 16-17, and on November 17 lectured at the Flower Show auditorium on "Collecting Orchids in South America."

Mr. G. H. Pring has recently given the lecture, "Collecting Orchids in South America," before the following audiences: The Richard Anderson Post, at the Armory, November 2; Current Topics Section of the Wednesday Club, at the Wednesday Club, November 6; St. Louis Association of Gardeners, November 7, and before the St. Louis Aquarium Society, at Eagles' Hall, November 13.

The St. Louis Flower Show was held at the Armory, November 14-18, Mr. Pring, Horticulturist to the Garden, acting as superintendent. The exhibit from the Missouri Botanical Garden included a collection of orchids consisting of representatives from the recent Colombian expedition as well as many rare cypripediums from the collection of the late D. S. Brown; over forty-five hardy varieties of chrysanthemums and ten large specimen plants of the exhibition type. The Henry Shaw gold medal for the introduction of the best new flowering plant not previously exhibited in competition was awarded to Mr. J. H. Hill, of Richmond, Indiana, for his new red rose "Sensation." The silver medal given by the Society of American Florists and Ornamental Horticulturists was awarded Mr. G. H. Pring for the creation of a new pink water-lily *Nymphaea* "General Pershing."

STATISTICAL INFORMATION FOR OCTOBER, 1923

GARDEN ATTENDANCE:

Total number of visitors	22,817

PLANT ACCESSIONS:

Total number of plants received as gifts	63
Total number of seed packets received as gifts	1

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	11
Total number of books and pamphlets donated	81

HERBARIUM ACCESSIONS:

By Gift—

Aiken, Walter H.—*Croton argyranthemus* Michx. from Florida	1
Anderson, Dr. E.—Plants of New England and the Arnold Arboretum	81
Burt, Professor Howard—*Eriogonum annuum* Nutt. from Texas	1
Diehl, Wm. W.—*Coniophora suffocata* from Virginia	1
Hollock, E. D.—*Tricholoma acre* Pk	1
Hume, H. Harold—*Holmskioldia sanguinea* Retz and *Solanum* sp. from Florida	1 2
Krieger, L. C. C.—*Lachnocladium semivestitum* B. & C. from Virginia	1
McFarland, Professor Frank T.—Plants of Kentucky	12
Ober, Mrs. Aurelia—*Colchicum autumnale* L., cultivated specimen	1
Schwarz, E. H.—*Asimina triloba* Dunal from Illinois	1
von Schrenk, Dr. H.—*Campanula* sp., cultivated specimen	1
Welch, D. S.—*Typhula variabilis* Russ. from New York	1
Zeller, Dr. S. M.—Fungi of Oregon	22

By Exchange—

Drushel, Professor J. A.—Plants of New York, Illinois, Missouri and Texas	31

By Purchase—

Holzinger, John M.—Musci Acrocarpi Boreali Americani Fasc. 20, Nos. 476-500, inclusive	25
Standley, Paul C.—Plants of Salvador collected by Dr. Salvador Calderon	220
Stevens, Professor F. L.—Fungi of Porto Rico, Trinidad, British Guiana, and Hawaii	323
Warner, S. R.—Plants of Texas	287

By Field Work—

Greenman, Dr. J. M.—*Reboulia hemispherica* (L.) Raddi., St. Louis County, Missouri	1
Greenman, Dr. J. M.—Plants of Arkansas	317
Total	**1,330**

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
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Director

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Physiologist in charge of Graduate Laboratory

EDGAR ANDERSON
Geneticist

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Pathologist

JOANNE K. ARMSTRONG
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Curator of Herbarium

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Assistant Engineer

J. CUTAK
Exotics

C. MCGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farm

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

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Engineer

H. VALLENTINE,
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

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VIEW IN CASTLETON GARDENS.

BANYAN TREE IN PARK AT KINGSTON.

Missouri Botanical Garden Bulletin

Vol. XI DECEMBER, 1923 No. 10

THE BOTANICAL GARDENS OF JAMAICA

The last point at which Mr. George H. Pring, Horticulturist to the Garden, stopped on his return to America from the orchid-collecting trip to South America was at Jamaica, where he succeeded in securing much valuable material for the Missouri Botanical Garden. The following article concludes the account of what has been one of the most successful trips ever undertaken by the Garden:

"After spending a pleasant week with Mr. C. W. Powell at Balboa, Panama, I proceeded by train to Cristobal, the Atlantic port, where I made final arrangements for shipping my Panamanian orchids to St. Louis. From Cristobal I sailed on the 'E. & F. Camito' on Saturday, July 7, for Kingston, Jamaica. After an extremely rough voyage over the Caribbean Sea, I disembarked at Kingston harbor on Monday morning. Inasmuch as I had a case of Colombian orchids for the Hope Botanic Gardens the quarantine and customs officials showed me every consideration. After securing reservations at the Myrtle Bank Hotel I immediately proceeded by automobile to visit Director Cousins of the botanic gardens, who was agreeably surprised to learn of my bringing him a case of *Cattleya Trianae* direct from Colombia. This shipment was a welcome addition to the gardens' collection, the large mauve flowers being entirely different from the Jamaican representatives of orchids and consequently much appreciated by the visiting public.

"My instructions from Director Moore when leaving were to bring back, without fail, some tree ferns so much needed for our fern house. As previously stated in a former article [October, 1923, BULLETIN], tree ferns were observed by the

hundreds upon mountain sides in the Central Andes, but transportation cost from there was prohibitive. It was for this purpose that my route home was directed by way of the West Indies instead of the shorter route via Guatemalan ports for New Orleans. Upon explaining my mission to Director Cousins, together with my desire to leave Kingston for New York by the end of the week, he immediately telegraphed to the Castleton Gardens to send men to collect the native tree fern *(Cyathea serra)*. Not having to superintend personally the collection of these ferns my time was used to better advantage in studying the wonderful plant collections at the Hope Gardens under the guidance of Superintendent Downes.

"The Hope Botanic Gardens is situated in the Liguane Plain, about seven miles from Kingston, at the base of the hilly country. It is reached either by automobile, coach, or trolley-car, from the center of the capital. The average annual rainfall at Hope is only 51.5 inches, but by the free use of the hose the gardens present a wealth of tropical vegetation. The gardens were started as a nursery and government experimental garden, later developing into botanic gardens. There are approximately six acres of lawns and three and a half acres of ornamental border plantations, besides a fernery and orchid garden. In addition there is a greenhouse in which the shade- and moisture-loving plants are grown, including begonias of the Lorraine type, gloxinias, achimenes, fancy-leaved caladiums, etc. Experimental grounds are also set aside for the selection and breeding of pineapples, mangoes, etc. One of the most notable mango introductions is the Bombay, a variety from India, possessing a very large stringless fruit. This variety is being propagated very extensively by inarching.

SPECIMEN TREES AND CLIMBERS

"The plant collection not only includes the native, but also the most interesting, economic and decorative plants from all parts of the tropical world. It is a revelation to see many plants represented in our greenhouses at home grown here under natural conditions and often towering 75–100 feet in height. Of particular interest were the sausage tree *(Kigelia pinnata)* bearing brownish pendant flowers and sausage- or cucumber-like fruit varying from two inches to two feet in length, depending upon the age, and the cacao *(Theobroma*

Cacao), the trunk producing both flowers and fruit, the latter being cylindrical and dark brown in color when ripe. The mango, being a favorite fruit, is planted extensively in the native gardens. The fruit, especially the selected types, has a pleasing red color when fully ripe. For shipping, it is picked before ripening, and to prevent bleeding a small portion of the stem is left attached. The bread-fruit *(Artocarpus incisa)* is represented by many specimens. The unusual-shaped leaves with deep clefts, terminated by the large rounded edible fruit covered with knotty protuberances, make this tree of exceptional interest.

"On the lawn near the director's office is a large African tree, the akee *(Blighia sapida)*. Specimens of this tree have been grown in our collection for many years without fruiting, and as with many others, the cause probably lies in the annual pruning necessary to keep the plants within the bounds of the greenhouse. The tree noted was in full fruit and was at least fifty feet high with a spread in proportion. The fruit was about the size of the mango and of a brilliant red color contrasting strongly with the green foliage. Another African tree, one of the earliest introductions, is the giant silk cotton tree *(Eriodendron anfractuosum)*. Near the stables several large specimens were photographed [plate 33, fig. 1], standing buttressed by their enormous, flat stem-props which formed a series of partitions similar to a revolving storm-door. In the fertile soil of the uplands many naturalized trees may be seen, with their huge spreading branches supporting hundreds of epiphytic plants, such as Tillandsia, Philodendron, Rhipsalis, Cereus, lichens, and fungi. These epiphytes, especially the Tillandsia, even grow upon the overhead trolley wires, necessitating a periodical clearing off to prevent the breaking of wires. In visiting the small public park in the center of the capital one is attracted by the banyan tree *(Ficus bengalensis)*, a native of India. Its age is attested by the hundreds of epiphytic roots, which have finally rooted in the ground for the purpose of bracing the large spreading branches. Notable among the garden climbers is the rare *Camoensia maxima* from Africa, a favorite with Director Cousins, who pointed to it with pride as one of his introductions of late years. The plant, upwards of fifteen feet across, occupied a large bed in the center of the lawn,

its supporting, arborescent branches assuming a conical shape. The hundreds of pure white flowers were beginning to fall, but despite this fact it still presented a wonderful sight. When looking at this specimen my thoughts turned to our plant in the aroid house which has been established for over four years without yielding a single flower. Many other climbers were in full bloom, including the Allamanda, Tabernaemontana, Bignonia, etc.

DECORATIVE AND FLOWERING PLANTS

"The highest leaf coloration is presented by the many horticultural forms of *Codiaeum variegatum*, better known as crotons, which are used in our country for summer bedding plants, window-boxes, general decorations, etc. In Jamaica the plants grow luxuriantly, the foliage coloration being beyond description. Next in point of interest are the many species of Acalypha represented chiefly by the green-leaved *A. hispida*, with its red flower spikes, and the highly colored *A. macrophylla*. While coleus is used to a great extent for bedding plants they are allowed to grow high, and the result is not as pleasing as with us, where they are clipped short.

"The main palm collection borders the main walk or drive and terminates at the administration building. Some excellent specimens noted were the fish-tail palm *(Caryota urens)* and *Chrysalidocarpus lutescens*, the latter forming massive clumps through the medium of the many basal shoots. *Cocos plumosa* and the royal palm *(Oreodoxa regia)* both towered to a height of fifty to seventy-five feet, the trunks terminated by the graceful somewhat drooping leaves. The rarest palm seen was the double cocoanut, *Lodoicea sechellarum*, planted near the water-lily tank. Not having seen this species for many years I took it for a Sabal palm, but upon closer examination the large double plicate leaves indicated its identity. The plant is about fifteen feet high and the only specimen in the collection.

"The collection of orchids does not include a comprehensive number of the West Indian types, since, according to Mr. Downes, it is hard to establish the plants from the interior. The foreign genera, especially the Burmese non-pseudobulbous type, such as Aerides, grow remarkably well, huge masses being established upon trees. A noteworthy species was *Aerides odoratum* in full bloom, bearing fifty large pink pendant spikes. In addition to those established upon trees,

ERIODENDRON ANFRACTUOSUM.

AERIDES ODORATUM

other orchids may be seen in pots, baskets, and on blocks of wood.

"Despite the hot dry climate at Hope Gardens a section is set aside for roses. At the time of my visit the plants showed the effect of the unfavorable atmospheric conditions in much the same manner as do ours during the months of July and August. I was informed that during the cooler season a representative number of flowers were obtained. The plants are concentrated in parallel beds about fifty feet long and six feet wide, with grass walks between. The hoe is used continually during the hot season as well as irrigation, the irrigation ditch being cut through the middle of each bed.

NURSERY

"The thousands of plants propagated annually are not only for maintaining the garden collection, but also for commercial use. These are sold locally and the proceeds used to help defray garden maintenance, the government grant evidently not being sufficient to cover fully the annual cost of upkeep. The plants propagated are mainly of the decorative type, such as roses, crotons, ixoras, hibiscus, vines, etc. Plant propagation in the tropics is a much simpler operation than with us. Large frames filled with sand are used for rooting the selected shoots, and the commoner types readily take root in a short time even when placed in nursery rows in ordinary soil. The rapidity of development from the cutting is remarkable to one familiar with greenhouse practice in St. Louis. The clay pot is an expensive luxury in Jamaica, and the bamboo pot is generally substituted for it. The bamboo is obtained from the interior or uplands in the neighborhood of Castleton. The natives cut the long canes into sections averaging about a foot long, the diameter varying according to the age of the plant. The bottom of the pot is the nodal partition of the bamboo cane, and to permit drainage a hole is made similar to that in the ordinary clay pot. After the rooted cuttings are planted in these native containers they are placed in beds in the nursery, being shaded by the overhanging branches of trees. They soon establish themselves provided they are watered frequently. When the young plant is large enough to warrant planting directly in the ground the pot is split open, exposing the rooted specimen.

CASTLETON GARDENS

"In 1860 the legislature appropriated money for the pur-

chase of the present site known as Castleton Gardens. The creation of the gardens was entrusted to Nathaniel Wilson, the island horticulturist of that period. The selection of the site, despite the fact of its not being near the Colonial Railroad, was very fortunate, inasmuch as it includes the advantages of natural beauty combined with abundant rainfall. It is situated in a deep valley surrounded by lofty mountains, through which the mountain stream, called 'Wag Water,' interruptedly flows. This natural garden presents vegetation beyond description, for not only is there a rich fertile soil, but its climate is far superior to that of the Hope Gardens. The mean temperature is 75° F., the rainfall averages 109 inches annually, and during the summer months the humidity is relatively high. It is from this region that the Garden tree ferns were collected.

"On Thursday, accompanied by Messrs. Goodwin and Martini, I was taken to visit the famous Castleton Gardens, where my tree ferns awaited inspection before being shipped to Hope Gardens for final crating. The trip by automobile over a good macadam road to Castleton is a delightful experience. Here one sees the banana plantations bordered with trees of *Bauhinia variegata,* and further along the naturalized trees of the bread fruit and Jack fruit, together with innumerable vines, such as *Abrus precatorius.* The black and red seeds of this vine are collected by the natives for making necklaces. At higher elevations one sees the native tree ferns and the massive clumps of bamboo *(Bambusa vulgaris),* their nodding plumes in the distance resembling giant tree ferns. We passed through the main gate of Castleton Gardens, which is guarded by the giant Cohune palms *(Attalea Cohune),* the enormous plumose leaves rising forty to fifty feet in height. Once inside the gate one goes into ecstasy at the wonderful combination of exotic and native vegetation. The palm collection, for which the gardens are noted, aggregates upwards of 180 undeveloped specimens of distinct species, some of these being *Carludovica palmata, Areca Catechu, Attalea Cohune, Elaeis guineensis, Manicaria saccifera, Mauritia flexuosa, Maximiliana martiana, Raphia Ruffia, Phytelephas macrocarpa,* and *Astrocaryum vulgare.* The economic plants have numerous representatives, notable among which are the kola nut, cacao, olive, pineapple, mango, mangosteen,

Potting Rooted Cuttings in Bamboo Pots.

Established Plants in Beds.

NURSERY AT HOPE GARDENS.

ORNAMENTS CARVED FROM TAGUA, OR VEGETABLE IVORY, SEEDS

avocado, clove, vanilla, black pepper, nutmeg, and several species of coffee.

"The ornamental garden is not neglected. Besides a rose garden surrounded by arbors supporting the climbing varieties there is also a large water-lily tank where the tropical varieties of both night and day-bloomers are grown, as well as the giant water-platter, *Victoria regia*. It was at Castleton that I had the pleasure of seeing for the first time two of the rarest cultivated plants in flower and fruit. One was a large tree of the mangosteen, *Garcinia Mangostana*, but unfortunately the fruit was not ripe enough to eat. The other was *Amherstia nobilis*, a native of Burma, the graceful pink pendant scapes being beyond description. Other interesting fruiting trees were hurriedly viewed, including the cannon-ball tree and the sapucaia nut, the latter somewhat resembling a cocoanut, but without its outer fibrous covering.

"The gardens are a favorite resort for picnic parties, so we stopped at one of the benches near the 'Wag Water' to eat our lunch. As I had not sampled the native drink, cocoanut water, one of my friends instructed the native boy working near by to 'shinny up' a palm and bring down a cocoanut. With the agility of a squirrel he very soon reached the top of one of the overhanging trees and with the aid of bare hands and feet, mostly feet, he held on to the leaves and pushed free the immature nuts which dropped to the ground. By cutting off the top we were able to obtain the cool, milky water.

"I finally sailed from Kingston on schedule time, Saturday, July 14, bringing with me a large crate containing ten tree ferns, weighing 900 pounds, and a smaller box of various economic plants, all of which arrived in St. Louis in excellent condition."

TAGUA OR VEGETABLE IVORY

The tagua palm *(Phytelephas macrocarpa)*, better known as the ivory-nut palm, is native to Colombia, Peru, Ecuador and Brazil. The plant is usually found growing in groves, preferring wet, heavy clay areas. Many groves were seen growing naturally in the interior of Colombia, particularly in the Department of Santander, and many clumps were observed in the region north of the western coastal port of Buenaventura. Compared with most palms, the tagua is of

low habit, averaging fifteen to twenty feet in height. The leaves, which are long, arched, and pinnate, crown the short trunk.

The female plant of *Phytelephas macrocarpa* is of commercial value for its nut-like seeds which are used as a substitute for ivory. These are obtained from trees as young as six years old. The nuts are enclosed in large pods, often weighing twenty pounds, sometimes called nigger-heads. They contain from six to nine nuts which generally drop to the ground after the pods naturally dehisce. The nuts are about the size of a small potato, oval in shape, fine-grained, of hard white composition closely resembling that of real ivory, especially when dried and cut. After being polished they are carved into chess men, ornaments, buttons, drawer knobs, fancy goods, etc.

The Colombian government permits free collection in the tagua groves, but a three per cent *ad valorem* export duty is charged on the nuts at the port of export, usually at Barranquilla or Buenaventura. The gathering of the nuts presents no great difficulty, but, because of their bulk and weight, transportation is quite a problem. Freighting down the Magdalena is out of the question on account of the excessive rates charged by the steamship lines, and the usual manner of transportation is by mule back to the Magdalena river ports, then by the crude native rafts of lumber and bamboo to the coastal ports where the combined cargo of nuts and rafts are sold.

During the war, and even up to the present time, the United States was the chief market for the sale of the tagua nuts. Prior to the war Germany and Great Britain were the largest consumers, but with the war prices dropped so low that the natives could not afford to gather the nuts, and great quantities were stored at various shipping points, principally in Ecuador. The nuts from Ecuador are well-dried and sorted and accordingly command the highest prices.

Up to the present time no attempt has been made to cultivate the palm, probably owing to the unlimited areas growing naturally. The high-grade nuts, when shelled and cleaned, bring as high as seventy-five to ninety dollars a ton during normal times. In 1919 5,234,369 pounds of nuts were imported into the United States. In 1917 the Button Manufacturers' Corporation, of Newark, New Jersey, established in

Panama City a factory to make buttons from tagua seeds. This plant is capable of using 100 tons of raw material per month, and it is planned to increase this capacity to 6,000 tons per month. The nuts used are shipped from Ecuador, Colombia, and Panama, and must be dried for three weeks before being cut into button slabs. Only native labor is used. The process of ivory-button manufacture is varied and complicated and requires many different kinds of machinery. According to a report compiled by the Pan-American Union (Bulletin, October, 1917), the West Indies, Central America, and South America use annually about $2,300,000 worth of buttons.

The only use of the tagua nut noticed in Colombia was in the carving of ornaments, in which the natives are expert. While visiting the town of Chiquinquira, in the Departmento de Cundinamarca, the natives were observed carving the seeds or nuts by the use of a hand-made lathe, pocket-knife, and polishing rag. A collection was purchased for a few dollars, consisting of various shaped vases, pots, bowls, lunch-box, and miniature chess-men (see plate 35). At the left of the photograph is shown a carved tea container, or strainer. The central ornament is a replica of the native lunch box with its separate containers. The normal lunch box is made of enamelled ware, possibly of European manufacture, the bottom compartment being filled with heated charcoal to keep the food in the upper compartments warm. The food usually consists of the native yuca root, rice, and soup, the soup being in the uppermost section. This type of lunch box was seen only in Bogota where the climate is cool.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, gave the lecture "Collecting Orchids in South America" before the patrons' associations of the Garfield School, December 4, and of the Fremont School, December 14.

Recent visitors to the Garden include Mr. John T. Bregger, in charge of research department, Stark Bros. Nursery, Louisiana, Mo., December 2; Mr. Henry Atherton Lee, pathologist of the Hawaiian Sugar Planters' Association, December 12; and Prof. A. T. Erwin, professor of horticulture, Iowa State College, December 13.

Dr. B. M. Duggar, Physiologist to the Garden, will present a paper before the physiological section of the Botanical Society of America, December 28, at the meetings of the American Association for the Advancement of Science, at Cincinnati, on "Cell Activity and H-Ion Concentration—Some Problems in Metabolism and Absorption."

Dr. J. M. Greenman, Curator of the Herbarium, will present a paper before the systematic section of the Botanical Society of America, December 29, on "Age and Area with Special Reference to the Flora of Tropical America."

STATISTICAL INFORMATION FOR NOVEMBER, 1923

GARDEN ATTENDANCE:

Total number of visitors	54,363

PLANT ACCESSIONS:

Total number of plants and seeds received as gifts	8

PLANT DISTRIBUTION:

Total number of plants distributed free	212

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	28
Total number of books and pamphlets donated	149

HERBARIUM ACCESSIONS:

By Gift—

Bibb, J. W.—*Tricholoma personatum*	1
Carpenter, Mary, Ann, and Jane—Fruiting specimen of *Sterculia* sp. from Hawaii	1
Heald, Dr. F. D.—*Stereum purpureum* Pers. from Washington	1
Irish, H. C.—*Pseudotsuga Douglasii* Carr., *Arctostaphylos Uva-ursi* (L.) Spreng., and *Berberis* sp. from New Madrid, New Mexico	3
Shear, Dr. C. L.—Fungi of Venezuela and Florida	6
Thaxter, Professor R.—*Hydnum mucidum* Fr. from Maine	1

By Exchange—

Drushel, Professor J. A.—Plants of Vermont, New York, Michigan, Missouri, and Texas	22
U. S. National Museum, by Wm. R. Maxon—*Senecio megaphyllus* Greenm. from Costa Rica	2

By Purchase—

Knowlton, Clarence H.—Plants of eastern Quebec	160
University of Nanking, by Albert N. Steward—Plants of China	150
Total	349

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. LANGAN
Assistant Engineer

J. CUTAK
Exotics

C. MCGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farm

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

W. F. LANGAN
Engineer

H. VALLENTINE,
Carpenter