

SUPPLEMENT.

THE FAMILIES OF FLOWERING PLANTS.*

By CHARLES LOUIS POLLARD.

INTRODUCTION.

A question frequently asked by those interested in nature and nature-study is how a knowledge of plants may be obtained without the expenditure of time and trouble involved in a complete course of systematic and structural botany. It is a problem seemingly difficult of solution, but one that nevertheless commands attention, since the highest province of all science is the exposition of the facts of nature. Critical and technical study of any branch of biology is valueless if the world at large is not to profit by the researches of the scholar.

Many attempts have been made to meet this growing demand for popular botany. There are countless volumes designed to instruct the layman and to give him a casual acquaintance with the flowers of field and wayside. Most of them administer, under the sugar-coated guise of popular language, a bitter pill of meaningless names and descriptions, while the dose is often made more unpalatable by numerous and wholly superfluous extracts from the poets. The folk-lore of plants is a distinct branch of botany, and a book which aims to describe the plants themselves should avoid all digressions. In an effort to simplify the technical language of the science, the device of classifying plants by artificial methods, such as the color of their flowers, the situations in which they grow, etc., has been attempted, but the unwary reader, in pursuing this course, is likely to be led into snares. Color and habitat are variable characteristics, and acquaintance with a given plant is to be gained only by familiarity with its appearance and an understanding of its relationships. There is often a clear conception of individual genera, even among those who have no comprehension of how genera are grouped. Thus nearly everyone can recognize an oak tree, the oaks forming a very distinct natural genus, while most persons can

*A series of articles under the above caption was begun in the first volume of *THE PLANT WORLD*, but extended only through the more important families of the Monocotyledons. The treatment at that time was necessarily very brief, and in the interests of completeness it has been deemed advisable to start the series anew, including illustrations and much additional text.



even distinguish certain species, as the white oak, the red oak, or the black jack. On the other hand, comparatively few of those unlearned in botany would know that the oak, the chestnut and the beech are members of the same family.

The aim of the present work is, therefore, to present an account of the families of flowering plants, giving a brief popular description of the characters of each, an outline of the geographical distribution, and a statement of the economic, ornamental or medicinal uses wherever these are important. As far as possible, some familiar generic type will be selected for illustration in each family.

CHAPTER I.

General Classification.

The flowering plants form a subkingdom known to botanists by various designations. The terms at present generally accepted in this country is Spermatophyta, which is derived from two Greek words signifying seed and plants, in allusion to the fact that they bear seed rather than spores. Recent histological researches have demonstrated, however, that there is a distinct homology between the reproductive organs of the lower groups in the vegetable kingdom and those of the flowering plants, so that the word seed as contrasted with spore is a term of greater convenience than scientific accuracy. Another name for the flowering plants, which will be found in most of the older manuals, is Phanerogamia, a word also of Greek construction, signifying visible reproduction, in allusion to the fact that the latter process is effected by distinct floral organs. The modern German systematists have adopted a compound term Embryophyta Siphonogama, which signifies plants developed from an embryo and accomplishing fertilization by means of a pollen tube which sprouts from the pollen grain. For detailed explanations of the reproductive process in plants the reader is referred to the various standard text books on vegetable morphology and physiology; but in order that certain distinctions in classification may be more clearly brought out, it is necessary at this point to give a few definitions of the essential organs involved.

Sexual reproduction in plants is effected by the union of male and female elements contained in distinct organs known as sporophylls. The male sporophyll bears microsporangies containing numerous mi-

crospores, which are the active agents in fertilization. The female sporophyll bears macrosporangies containing macrospores. The latter, when fertilized, develop embryos, which become ultimately new individuals. Among the flowering plants these various organs have received special designations somewhat more familiar in general usage. The male sporophyll is known as a stamen, the microsporangium as an anther-sac, one or more of which constitute an anther. The female

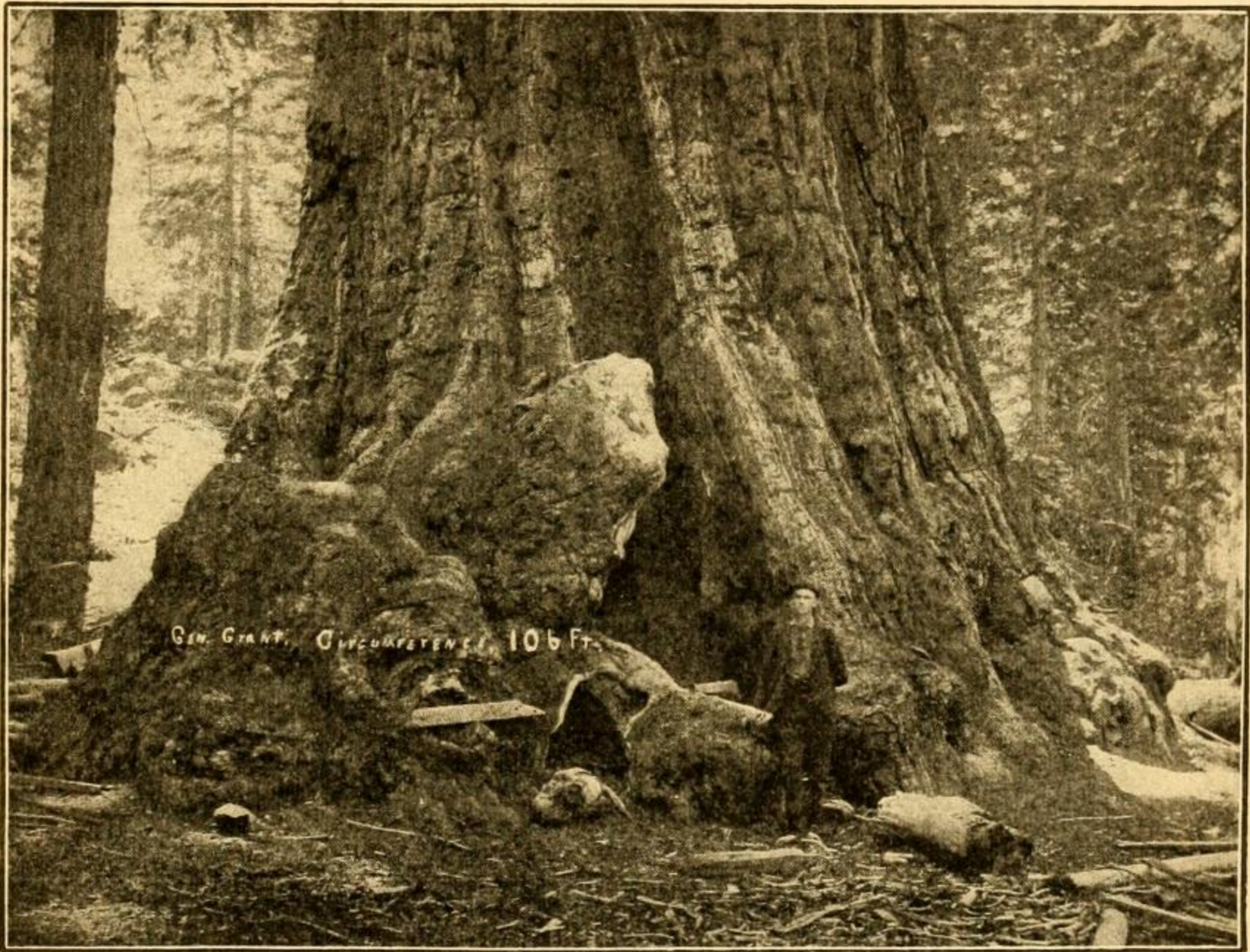


FIG. 1.—Base of a Californian Sequoia or "big tree," which represents a vanishing type of gymnospermous vegetation. (After Pinchot, Primer of Forestry, Bull. 24, Div. of Forestry, U. S. Dept. of Agric.).

sporophyll consists in the majority of flowering plants of a specially modified leaf called a carpel, which serves as a pouch to contain the macrosporangies or ovules. The carpels collectively form a structure known as an ovary, which is said to be monocarpellary or polycarpellary according to the number of divisions it contains. Each ovule includes a single macrospore or embryo-sac, and the fertilized ovule becomes a seed, the ripened ovary and its contents a fruit. A flower, on the other hand, or rather the conspicuous portion thereof (calyx and corolla) is merely a group of modified leaves serving as a protection to the enclosed stamens and ovary, which are vital organs. The showy

coloration of these leaves, which are frequently called by the general name of perianth, the presence of nectar-glands, etc., are devices to attract insects and insure proper fertilization.

The Spermatophyta are divided into the two following classes, the characters of each being appended:

CLASS I. ANGIOSPERMAE. [Greek, signifying covered seeds.]

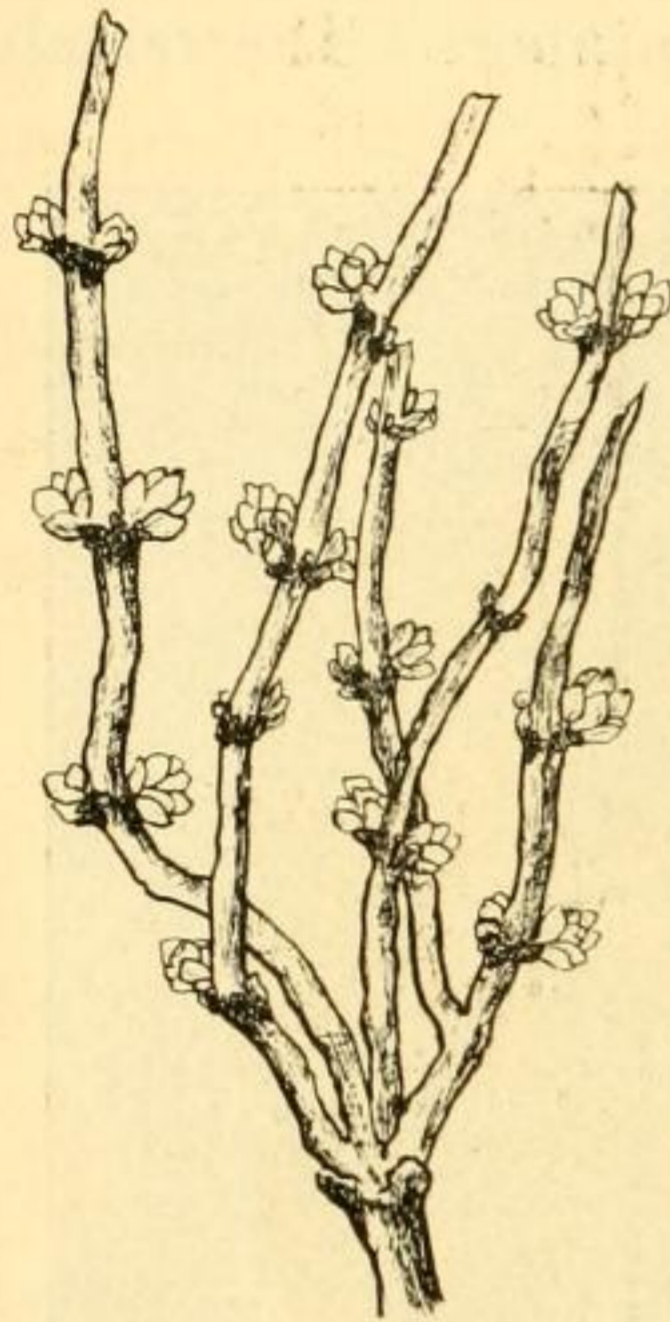


FIG. 2.—Branching stem of an *Ephedra* (family Gnetaceæ) showing the flower clusters.

Plants having their ovules enclosed in a sac or ovary formed of one or more carpels. Fertilization effected by the growth of a tube from the pollen-grain after it has lodged on the apex of the ovary (stigma); this tube penetrates a small opening in the ovule, and through it the contents of the pollen-grain are transferred to the ovule.

CLASS II. GYMNOSPERMAE. [Greek, signifying naked seeds]; Plants having their ovules borne exposed on the surface of a scale. Fertilization effected either by the growth of a pollen tube or by the direct contact with the ovule of small moving bodies known as antherozoids, analogous to the spermatozoids in animals; these are discharged from the ripe pollen grain after it has lodged on the female sporophyll.

CHAPTER II.

The Class Gymnospermae. (Fig. 1.)

The Gymnosperms, as they are commonly called, contain all of our familiar evergreen coniferous trees, and therefore constitute a prominent feature of the forests in the colder temperate regions. The class is of great interest, not only by reason of its antiquity, but because it represents a vanishing type. Not more than 450 species of gymnospermous plants are now known to exist, while in Cretaceous and Tertiary times the group was much greater. Certain genera like *Sequoia*, containing the redwoods and big trees of California, at present restricted to a small strip of territory on the Pacific coast, were formerly abundant in many different geological horizons of the country. The gymnosperms represent the lowest type of flowering plants, making a close approach in the details of their mode of fertilization and devel-

opment to some of the flowerless plants, while the absence of differentiated organs, such as well-marked flowers or floral leaves, emphasizes the same condition.

The Gymnospermae include four orders, the Gnetales, Cycadales, Ginkgoales and Coniferales or Coniferae, besides several fossil orders.

ORDER GNETALES. (FIG. 2.)

This group includes the single family Gnetaceae. The average reader is not likely to meet with the plants comprised in the family. Of the three genera, *Gnetum*, with 15 species, is native of tropical



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FIG. 3.—A cultivated Cycad (family Cycadaceae) showing the crown of leaves and palm-like stem.

South America and portions of the Old World; *Ephedra*, comprising 20 species, is found in Mexico, South America and Asia, a few species reaching the extreme southwestern United States, while *Tumboa*, a genus of a single species, is restricted to a small area on the west coast of Africa. Gnetaceous plants as a rule are shrubs, the leaves either opposite or reduced to small scales. The flowers are borne in dense spikes, and are dioecious, that is, the male and female sporophylls occur on different plants. The floral envelope or perianth is small and membranous or scaly in texture, bearing little resemblance to a flower in the ordinary sense. There is great difference in habit; many

Gnetums are woody vines or lianas; Ephedra consists of erect shrubs with green or yellowish articulated branches quite destitute of leaves, while the peculiar Tumboa has a short trunk only a foot high, but several feet in diameter, from which depend two long strap-shaped leaves of so firm a texture that they endure for many years. The Gnetales possess no economic and little ornamental value. The young herbage and the berry-like fruit of *Gnetum Gnemon* is said to be eaten as a vegetable in India.

ORDER CYCADALES. (FIG. 3.)

This order, like the last, is restricted to a single family, the Cycadaceæ or Cycad family. The group is of special interest to the botanist, in view of the peculiar method by which fertilization is effected, mention of which has been made above. Cycads were abundant in prehistoric time, as is evidenced by the large quantities of well-preserved trunks found in the cretaceous deposits in Maryland and other localities. The genera are nine in number. Of these, two are Mexican, one Cuban, two African, one Australian, and the remainder are distributed through the tropics of both hemispheres. The genus *Cycas* has a well known representative in cultivation, *Cycas revoluta* of Japan. It is palm-like in appearance, having a thick short trunk and a crown of of handsome pinnate leaves of firm texture. *Zamia* is represented by two native species in Florida, where they are known as the coontie or Florida arrowroot. They are low plants, rarely exceeding a foot in height, and cover large tracts in the dry barrens. The leaves are not unlike those of a coarse brake or fern, and the thick erect, mostly subterranean stems abound in starchy matter from which a very good grade of arrowroot is obtained.

The inflorescence of Cycads is dioecious, like that of the Gnetads. The male and female flowers are produced separately in dense cones, and consist merely of anthers and ovules without any perianth, borne on thick scales. The seeds are either hard or with spongy outer covering. Although our cultivated cycads and the native species of *Zamia* above referred to are dwarf plants, yet in tropical regions members of this group are often tall in stature, with unbranched trunks resembling those of palms, and large crowns of pinnate leaves.

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ORDER GINKGOALES. (Fig. 4.)

THIS strange group is limited to a single family, Ginkgoaceæ, the latter moreover consisting of a single genus, *Ginkgo*, with one species, *G. biloba*, the ginkgo or maidenhair tree of China and Japan. Though formerly of rare occurrence in cultivation here,



FIG. 4.—Young shoot with staminate flowers, and fully developed leaf of the maidenhair tree (*Ginkgo biloba*).

the tree is now frequently used to shade parkways and avenues, though it is not hardy in a severe climate. It is of conical outline, very symmetrical, with thick, slender-petioled irregularly fan-shaped leaves, often more or less lobed or incised at the broad outer margin, and wedge-shaped at the base. The plants are dioecious, separate individuals bearing the male and female inflorescences; a spray of leaves with the staminate flowers is shown in Fig. 4. The fruit is bright yellow in color, similar in appearance to a cherry, and fleshy in texture, with a hard central seed of stone; it is also distinguished for its nauseating odor. One of the finest plantations of these trees in this country is to be observed along the avenue leading up to the Department of Agriculture building, in Washington. During the summer, when they are clothed

with their full wealth of foliage, these ginkgos possess a unique beauty which is unrivalled by any other ornamental shrub or tree.

ORDER CONIFERAE.

We have now reached the largest and by far the most important group among the Gymnosperms, comprising as it does, some of the most valuable timber trees in the world. In referring to the pines, spruces and junipers of our northern forests the average individual is apt to use the terms "evergreen" and "coniferous" somewhat loosely and interchangeably. An evergreen plant is merely one which retains its foliage until after the new growth has begun to develop. A conifer, on the other hand, is a plant belonging to the order Coniferae, and so named on account of the characteristic fruit; thus while most conifers are evergreen and a large part of our evergreens in temperate climates are conifers, it will be seen that the two terms are not synonymous. This cone-fruit varies greatly in size, shape and structure in different genera, and there is even great diversity among the species of a single genus, as will be seen on reference to Fig. 5, which represents the cones of

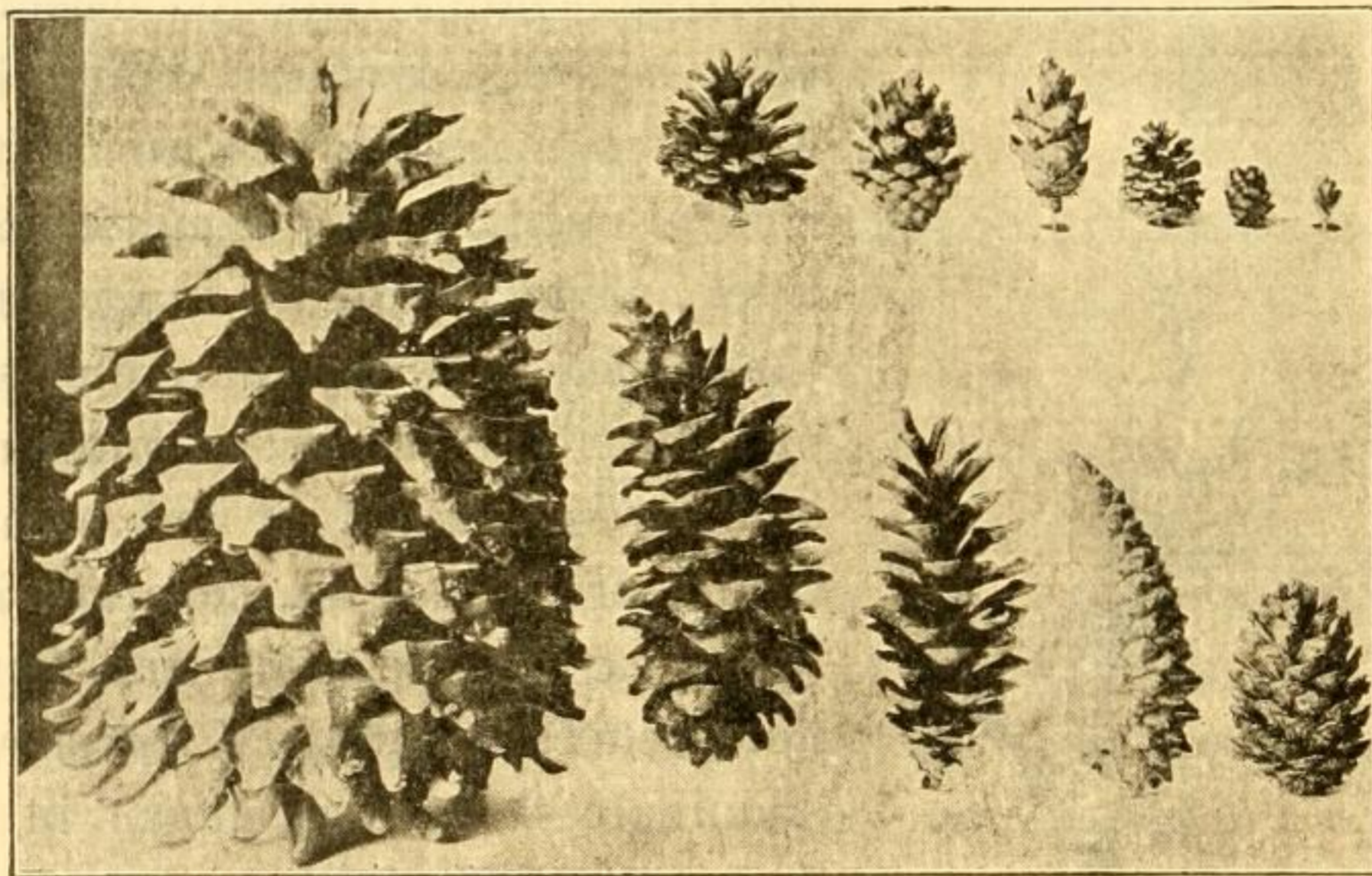


FIG. 5.—Cones. Beginning at the left, Coulter's pine, Western white pine, Eastern white pine, Knob-cone pine, Foxtail pine, Pitch pine, Lodge-pole pine, Red fir, Short-leaf pine, Eastern hemlock, and Eastern arbor-vitae. (After Pinchot. Bull. 24. Div. of Forestry, U. S. Dep't of Agric).

several pines. A cone consists of a central axis bearing adjoining or overlapping scales, which may be hard and woody or fleshy in texture, The male flowers of conifers usually resemble catkins in appearance; they consist of scalelike leaves or bracts bearing the pollen-sacs beneath. The ovules are likewise borne on or within the scales of the cone, and ripen into nutlike fruits. The wood structure in the conifers is of interest to the student of plant anatomy, the wood being uniform

in texture, without the ducts (known technically as tracheids) which traverse ordinary woods; it is freely permeated, however, by resin canals. The foliage of conifers is usually scale-like or needle-shaped, though sometimes exhibiting broad and expanded blades. The geographical distribution of the trees belonging to this order is quite extensive, although marked peculiarity is shown in individual groups. The largest genera range through the temperate regions of both hemispheres, while many of the smaller genera are restricted to a very limited territory. The reader interested in this phase of the subject will do well to consult Professor Coulter's article in Vol. III, No. 2, of *THE PLANT WORLD*, which discusses the distribution of individual groups. In



FIG. 6.—Spruces bordering a peat bog. Farther back are tamaracks and pines. The flowers seen in the bog are those of the snake-mouth orchid (*Pogonia ophioglossoides*). (From MacMillan's "Minnesota Plant Life" by courtesy of the author).

respect to habitat, coniferous trees usually present well marked areas or zones; thus everyone is familiar with the tamarack swamps of the north, the cypress swamps of the south, and the tracts of pine woods where a single species is the dominant type, in many parts of the country. This is well illustrated in Fig. 6.

After these general considerations we may proceed to examine the various groups into which the Coniferae are divided. There are two

families, the Pine (Pinaceæ) and Yew (Taxaceæ). It will be remembered that the other orders of Gymnosperms, namely the Cycadales, Gnetales and Ginkgoales consisted each of a single family.

PINACEAE, the PINE FAMILY. These are distinguished mainly by the fruit, which is a true cone with distinct scales, although these are sometimes coherent into a structure closely simulating a berry, as in the junipers. The ovules are enclosed and ripen within these scales. The Pine family is itself divisible into four well-marked tribes, which those familiar with different types of our native and cultivated conifers will have no difficulty in recognizing. These are, the *Araucarieæ*, or Norfolk Island pines; the *Abietineæ*, including pines, firs, spruces and hemlocks; the *Taxodiæ*, containing the Sequoias and bald cypresses; and the *Cupressineæ*, with the true cypresses and junipers.

Tribe Araucarieæ.—Two genera, *Agathis*, with 4 species, natives of Australia and Malaysia; *Araucaria*, with 10 species, natives of South America and Australasia. The former genus consists of the kauri-pines, well known to Australian lumbermen. *A australis* yields dammar resin or gum dammar, an important article of commerce. *Araucaria* is familiar from the dwarf cultivated specimens seen in florists' windows; the foliage is of a rich dark green hue and is arranged symmetrically in horizontal whorls, one above another. In their native habitat these trees attain lofty proportions.

Tribe Abietineæ.—Eight genera, of which the most important are, *Pinus*, the pine, with 70 species of wide distribution; *Cedrus*, the cedar of Lebanon, with 3 Asiatic and African species; *Larix*, the larch, with 8 species; *Picea*, the spruce, with 12 species, also widely distributed; *Tsuga*, the hemlock, with 6 species; and *Abies*, the fir, with about 20. This group includes most of the valuable coniferous timber trees. The wood is of every variety, from the familiar soft white pine to the hard and tough cedar. The genera from which the most useful woods are secured are *Pinus*, *Picea*, *Abies* and *Cedrus*. Turpentine, a substance now constantly used for various purposes in the arts, is the product of various pines, notably in the United States of the long-leaved pine (*P. palustris*); in Europe of the Scotch pine (*P. sylvestris*) and the Corsican pine (*P. Laricio*). Various resins are obtained from other genera of the group, the well known spruce gum, which is now practically supplanted in the trade by artificial preparations, being a familiar example. Terebinth, a balsamic resin, is derived from several firs and pines; it is to this that the delightful frag-

rance of the fir-balsam (*Abies balsamea*) is due. Fig. 7 illustrates the cones and cone-scales of several native spruces, while Fig. 8 affords a view of a northern tamarack swamp.

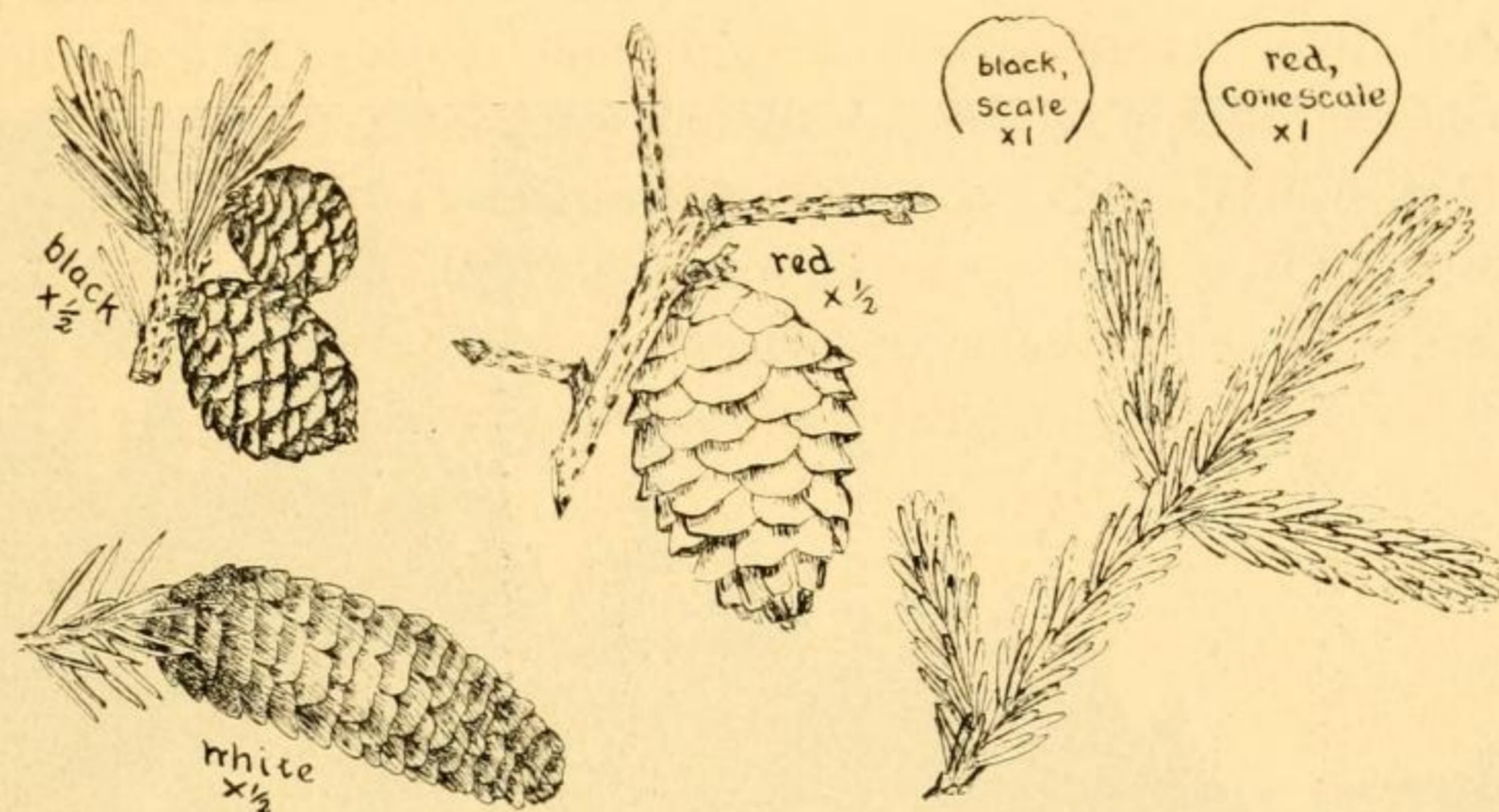


FIG. 7.—Branch, cones and cone-scales of various spruces. (From Bull. 73. Vermont Agric. Exp. Station, by Miss Anna Clark. Loaned by the Univ. of Vermont).

Tribe Taxodieae.—Seven genera, each with one or two species, all natives of eastern Asia except *Sequoia*, with 2 Californian species, and *Taxodium*, the bald cypress, with one in Mexico and one in the eastern United States. The members of this tribe furnish conspicuous examples of the vanishing type of gymnospermous vegetation to which we have already made reference (See Supplement, page 4). The stately Sequoias, monarchs of the Californian forest, are probably doomed to ultimate extinction, though the redwood (*S. sempervirens*) is much more abundant than the giant sequoia (*S. Washingtoniana*), which exists now only in a few carefully preserved groves. The enormous dimensions attained by these trees are well shown in Fig. 1 of the Supplement. The bald cypress (*Taxodium distichum*) is familiar to every one who has made a pilgrimage to the Dismal Swamp of Virginia or to any of the large tidal swamps along the southeastern Atlantic coast. Though often grown as a shade tree in southern cities it needs a wet soil in order to thrive, and in such situations it usually develops the remarkable “knees” to a wonderful extent. These knees are woody projections thrown up around the base of the trunk, conical in outline, with a rounded apex, projecting sometimes a foot or more above the surface of the swamp. The bole of the trunk itself is often enormously enlarged, serving as a buttress to anchor the tree firmly in place. A similar enlargement may be seen in many other

trees growing in such situations, and illustrates an adaptation to environment of which plant life furnished so many interesting examples. The purpose of the knees is not only to furnish the tree with props,



FIG. 8.—Tamarack swamp with border of sedges. (From MacMillan's "Minnesota Plant Life" by courtesy of the author).

but to admit air to the roots, as is proven by the fact that the trees are frequently killed when flooded above the tops of the knees.

Tribe Cupressineae.—Nine genera, the species of which are very widely distributed. The most important are *Callitris*, with 15 African and Australian species; *Libocedrus*, with 8 species in America and New Caledonia; *Cupressus*, with 12 widely scattered species; *Chamaecyparis*, with 4 in North America and Japan; and *Juniperus*, containing 30 species, distributed throughout the whole temperate zone. Several species of *Chamaecyparis*, particularly the Lawson's cypress (*C. Lawsoniana*) and the yellow cypress (*C. Nutkaensis*) both occurring on the Pacific coast, are valued both as timber trees and as ornamental shrubs in cultivation. *Cupressus* and *Libocedrus* also furnish valuable timber. An African species of *Callitris*, the sandarac tree, yields sandarac, which is a white resin, used both as an incense and in

the preparation of a light varnish. The wood of this tree is of a handsome mahogany color, and is extensively used in Morocco in the construction of mosques and similiar buildings. The junipers have cones in which the scales cohere into a fleshy berry, well known as "juniper berries." These are usually highly aromatic, and those of the common juniper (*J. communis*) yield a volatile oil used in medicine as a diuretic and stimulant; they are also employed in the manufacture of gin. The wood of our common red cedar (*J. Virginiana*) is almost exclusively used in lead-pencil manufacture.

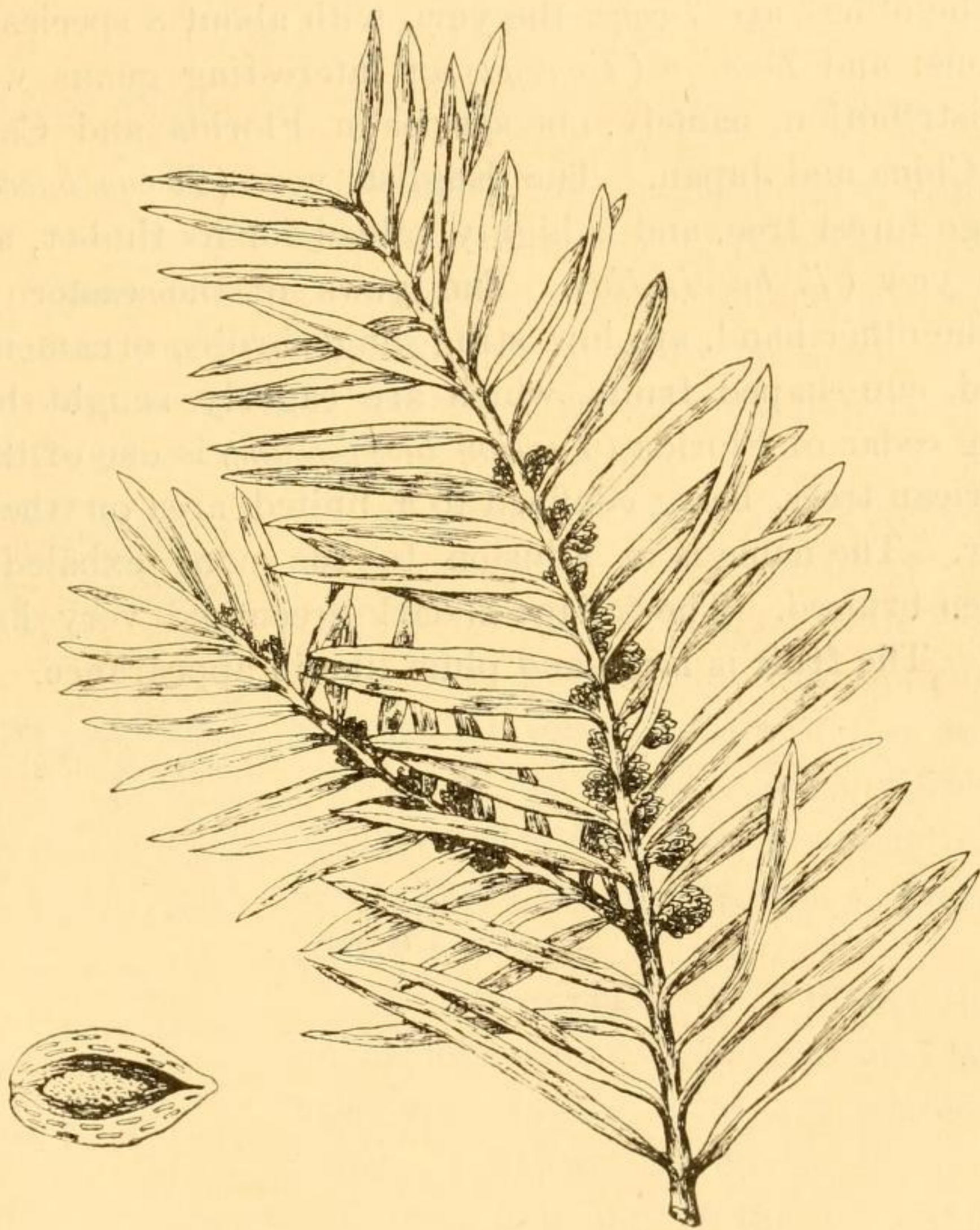


FIG. 9.—Leaves and staminate flowers of the stinking cedar (*Taxodium taxifolium*). Also section of fruit: the whole reduced one-half.

TAXACEAE, the YEW FAMILY. This is a much smaller group than the Pinaceae, consisting only of two tribes. The family is distinguished chiefly by the fruit, which is not a perfect cone, the ovules projecting beyond the scales or the latter wholly absent; the seed is



usually invested with a hard or pulpy integument known as an aril. Frequently the fruit resembles a plum in having an outer fleshy coating and a hard seed within. The foliage exhibits more diversity than in the Pine family.

Tribe Podocarpeae.—Four genera, three of eastern Asia, and one containing a single Patagonian species. The largest genus, *Podocarpus*, includes about 40 species, several of which are cultivated as ornamental shrubs.

Tribe Taxeae.—Four genera, two confined to eastern Asia and Malaysia; the others are *Taxus*, the yew, with about 8 species of temperate regions; and *Tumion* (*Torreya*) an interesting genus with a remarkable distribution, namely, one species in Florida and California, and two in China and Japan. The English yew (*Taxus baccata*) becomes a large forest tree, and is highly valued for its timber, as is also the Oregon yew (*T. brevifolia*). The yews of the eastern United States, on the other hand, are low straggling shrubs, ornamental only for their red, cup-shaped fruits, which are eagerly sought by birds. The stinking cedar of Florida (*Tumion taxifolium*) is one of the rarest North American trees, being confined to a limited area on the Apalachicola river. The name is in allusion to the odor exhaled by the herbage when bruised. The foliage is dark green and very handsome (see Fig. 9). The fruit is large and plum-like in appearance.

SUPPLEMENT.

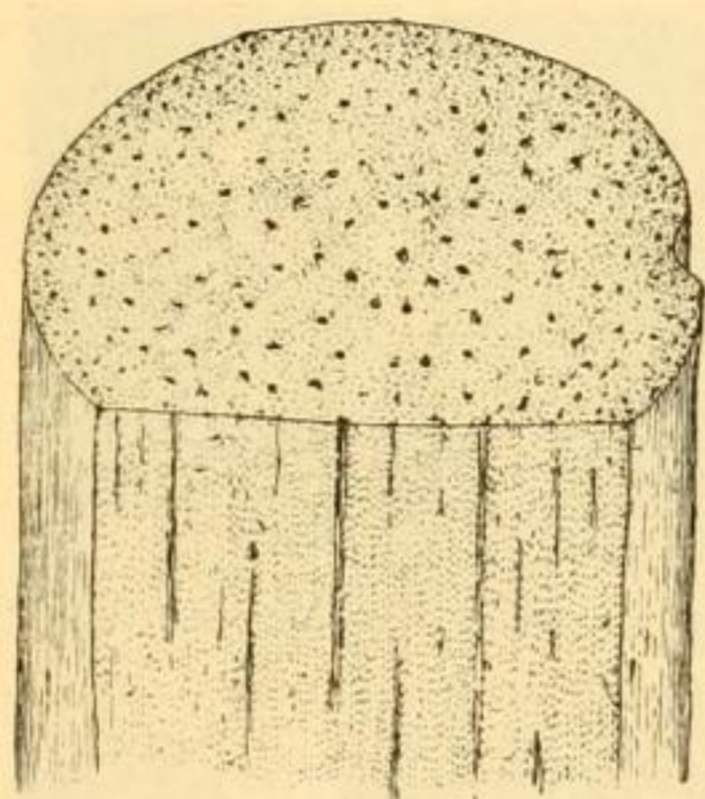
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CHAPTER III.

Class Angiospermae.—From Screw-pines to Tape-grass.

WE have already discussed and explained the differences between the two classes of flowering plants known as Angiospermae and Gymnospermae (see Supplement, page 4). The Angiospermae are divided into two general sections, each of which may be easily recognized, and which are of such importance that their names and characters should be memorized:



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FIG. 10.—A corn-stalk, showing longitudinal and cross-section, with the scattered bundles.

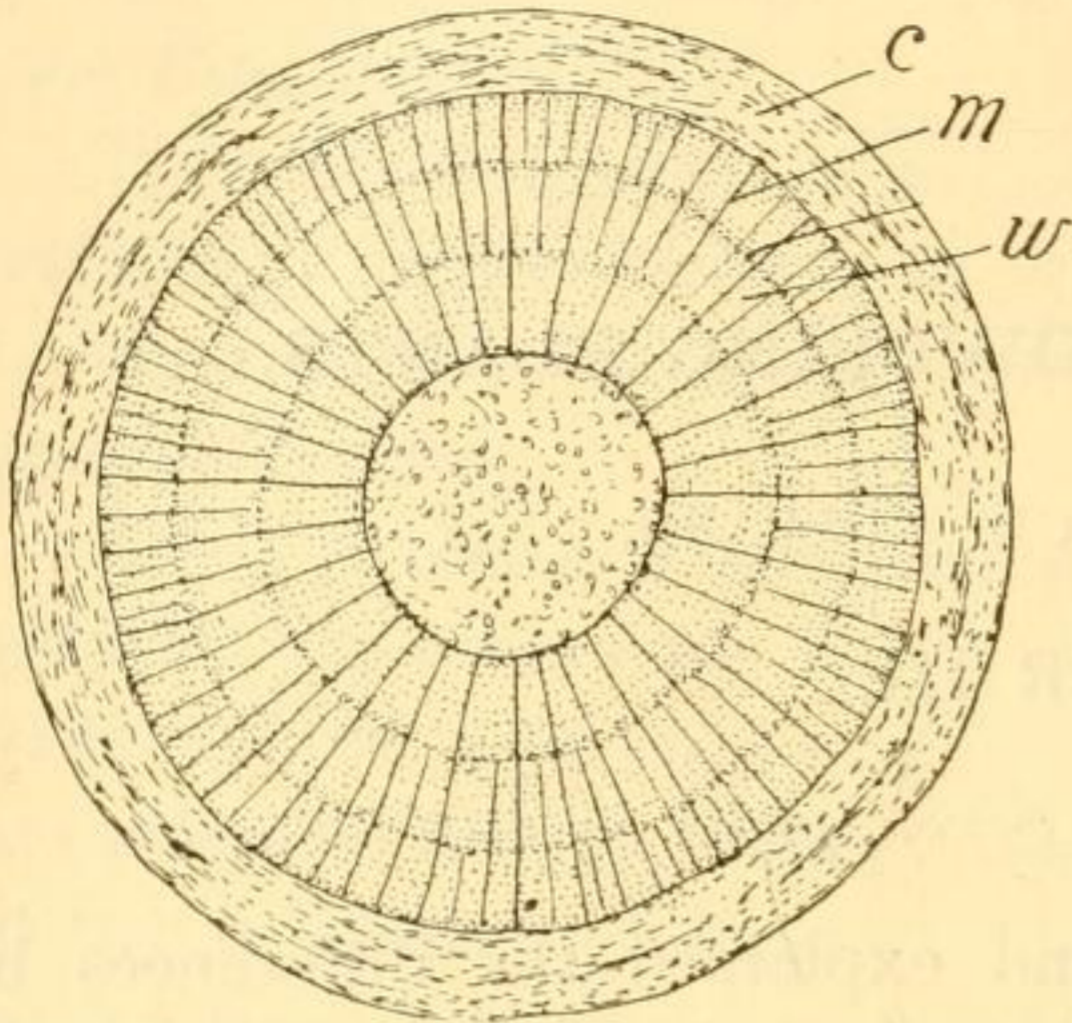
1. MONOCOTYLEDONS. Plants that produce on germination a single seed-leaf or cotyledon. Leaves for the most part with veins running from base to apex, or from midrib to margin in parallel series. Part of the flower nearly always in threes or some multiple of three. Wood of the stem with no annual rings or layers. Examples, palms, lilies, grasses, sedges. (See Fig. 10.)

2. DICOTYLEDONS. Plants that produce on germination usually two seed-leaves or cotyledons. Leaves with reticulated or netted veins. Parts of the flower rarely in threes, mainly in or fives fours, or some multiple of these numbers. Wood of the stem with marked annual rings or layers. Examples, maples, elms, buttercups, daisies, peas. (See Fig. 11.)

The great mass of our northern vegetation, including almost all the native trees, belongs to the second class. The Monocotyledons are the simplest and lowest of the flowering plants; this is proven not only by their structure, but by the fact that in past geological time

they appeared on the earth's surface in advance of the Dicotyledons.

The three Monocotyledonous orders which will be discussed in this paper consist entirely of aquatic or marsh plants, most of them with inconspicuous flowers and little or no economic value. (See Fig. 12.) The Pandanales are herbs, shrubs or trees, their flowers with a perianth composed merely of bristles or chaffy scales. The Helobiae (so named in allusion to their marsh loving propensities) are all herbs, with a fleshy green or corolla like perianth; while the Triuridales, comprising a single family, consist mostly of saprophytic herbs, or plants deriving their subsistence from decaying vegetable matter, and thus wholly destitute of leaves.



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FIG. 11.—Section of box-elder twig showing the annual rings of growth, the vascular region (w) the pith rays (m) and the cortex (c).

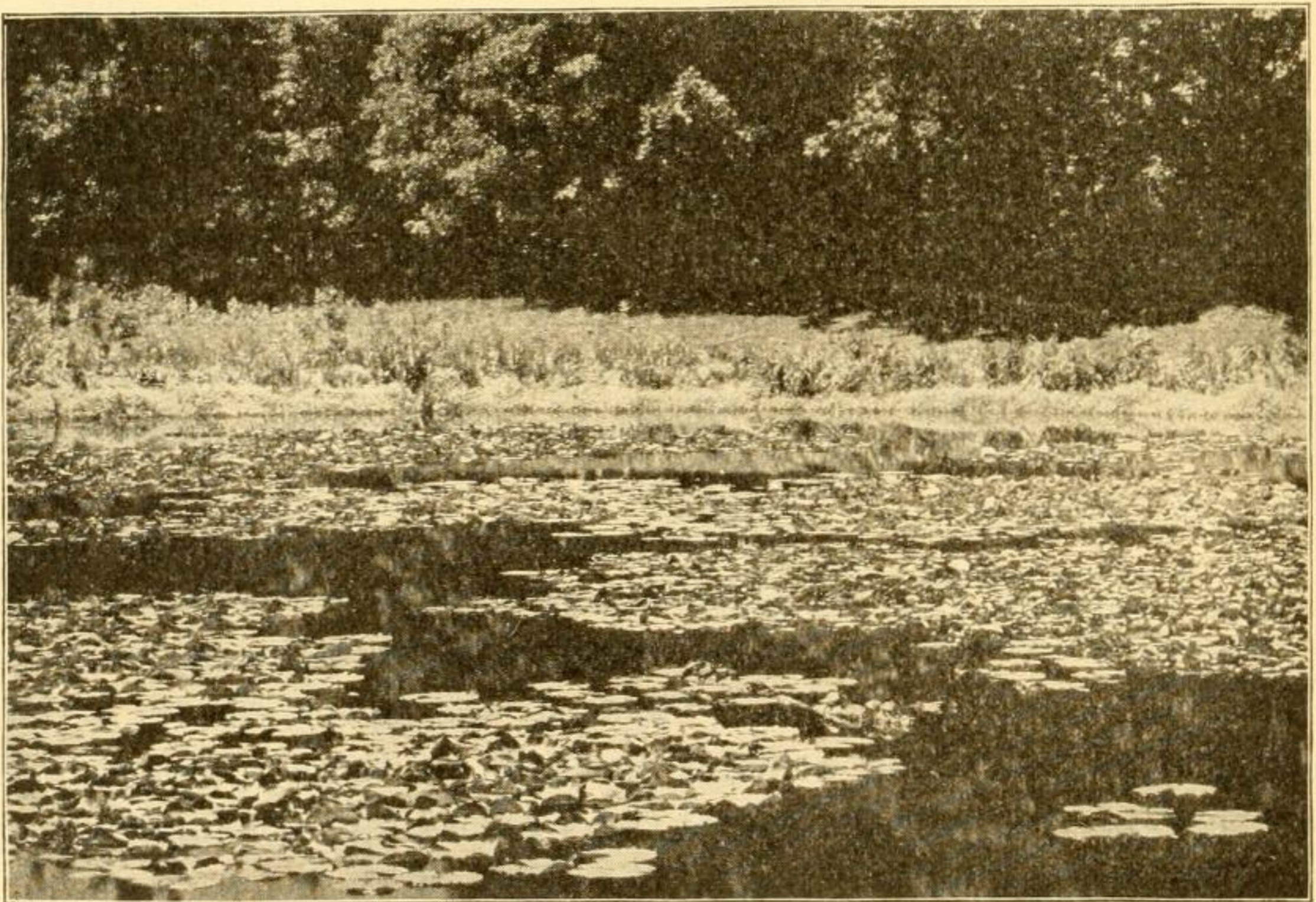


FIG. 12.—Zones of aquatic vegetation. In the center pond lilies; at the edge smartweed; farther back cat-tails, blue flags, sweet flags and sedges; still farther back soft turf with grass, moss, sedges and milkweed. (From MacMillan's Minnesota Plant Life, by courtesy of the author.)

ORDER PANDANALES.

Family Pandanaceae.—Screw-pine Family. Two genera, natives exclusively of the tropics of the Old World. The plants are distinguished by their long and attenuate leaves of firm texture like those of a century plant; the margins and keel are usually spiny. The small flowers, quite destitute of any sort of perianth, are subtended by numerous bracts and are borne in dense clusters; they consist of many stamens and an ovary composed of a single carpel, succeeded by a large and fleshy fruit with a hard or woody external surface. Several species of *Pandanus* are common foliage plants in greenhouses, their long arched leaves and graceful habit rendering them particularly appropriate as center pieces in groups. In their native habitat the plants form impenetrable swamps, producing numerous interlacing aerial roots like those of the mangrove.

Family Typhaceae.—Cat-tail Family. This contains but a single genus, *Typha*, which is always easily recognizable. The plants are stout and reed-like in habit, with long sword-shaped leaves and wand-like spikes which consist of innumerable tiny flowers, reduced to mere stamens and pistils, with no perianth or floral envelope, but with numerous intermixed bristles. The upper portion of the spike, at flowering time, is lighter in color and less dense; this is composed entirely of stamens, which soon fall away, leaving the pistils below to form a cotton-like mass in fruit. The flowers are thus said to be monoecious (Greek, dwelling in one household), because the two sexes, although separate, occur on the same plant. *Typha* contains about 12 species, widely distributed in temperate and tropical regions, though always found in marshes. In many of our western states the spikes are used as “swabs” for the purpose of cleaning lamp chim-

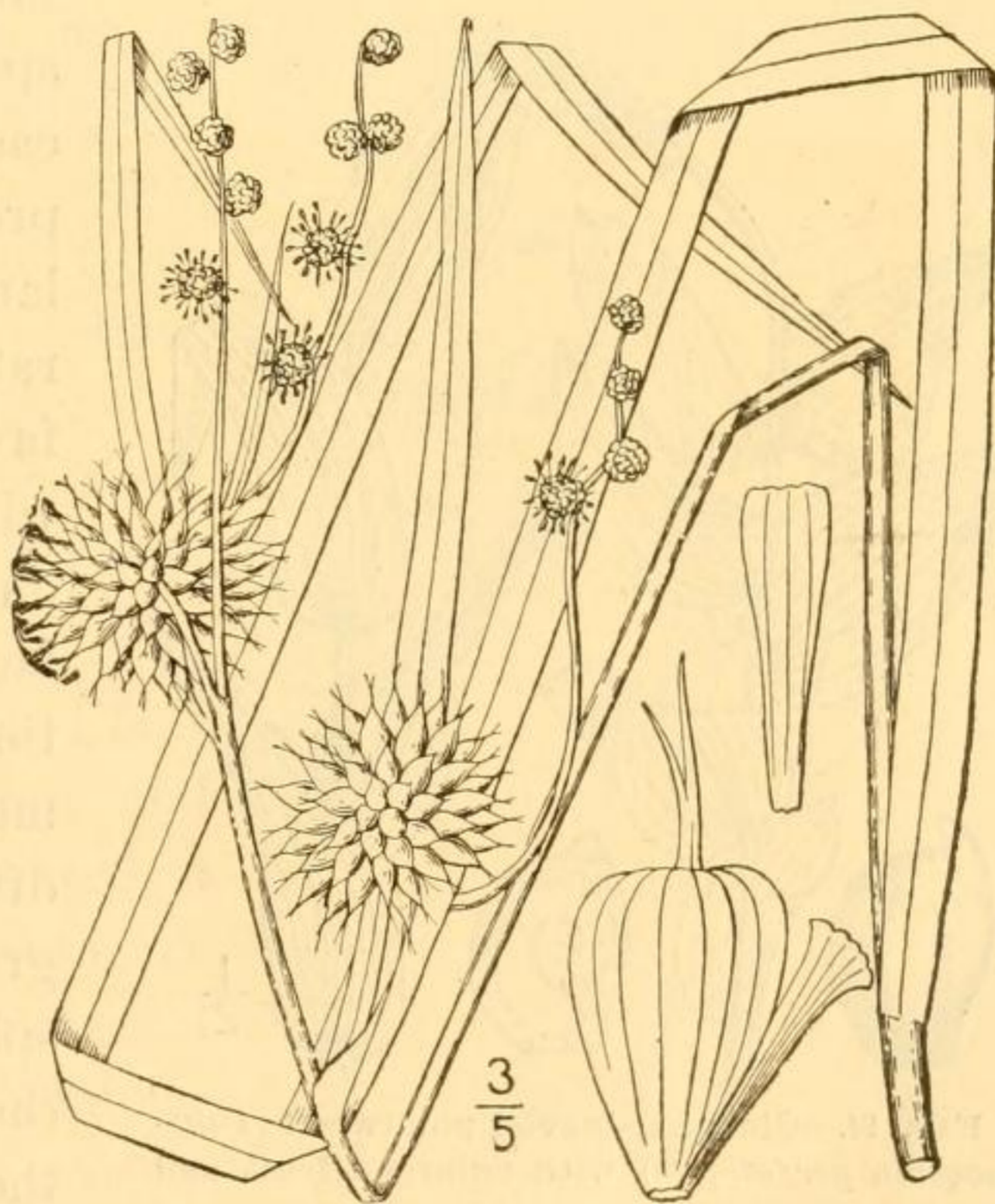


FIG. 13.—The broad-fruited bur-reed (*Sparganium eurycarpum*) showing flowering branch and a detached fruit enlarged. (After Britton and Brown, Ill. Fl. North U. S.)

neys. The pollen, which is produced in great quantities during the flowering season, is sometimes employed in place of lycopodium spores as an absorbent powder.

Family Sparganiaceae.—Bur-reed Family. This also consists of a single genus, *Sparganium*, and it was formerly included among the cat-tails. The plants possess an entirely different aspect, however; the flowers are monoecious, as in *Typha*, but they are borne in several globular heads on the upper branches of the stem, and not in a single terminal spike. (See Fig. 13.) The fruit is hard and nutlike, much larger than that of the cat-tail, and without any intermixed bristles, while the leaves are thin and grasslike. *Sparganium* contains about 8 species, natives of temperate regions; they are not known to possess any economic uses.

ORDER HELOBIAE.

Family Naiadaceae.—Pondweed Family. About 10 genera, widely distributed, of which *Potamogeton* is the only one of much size or

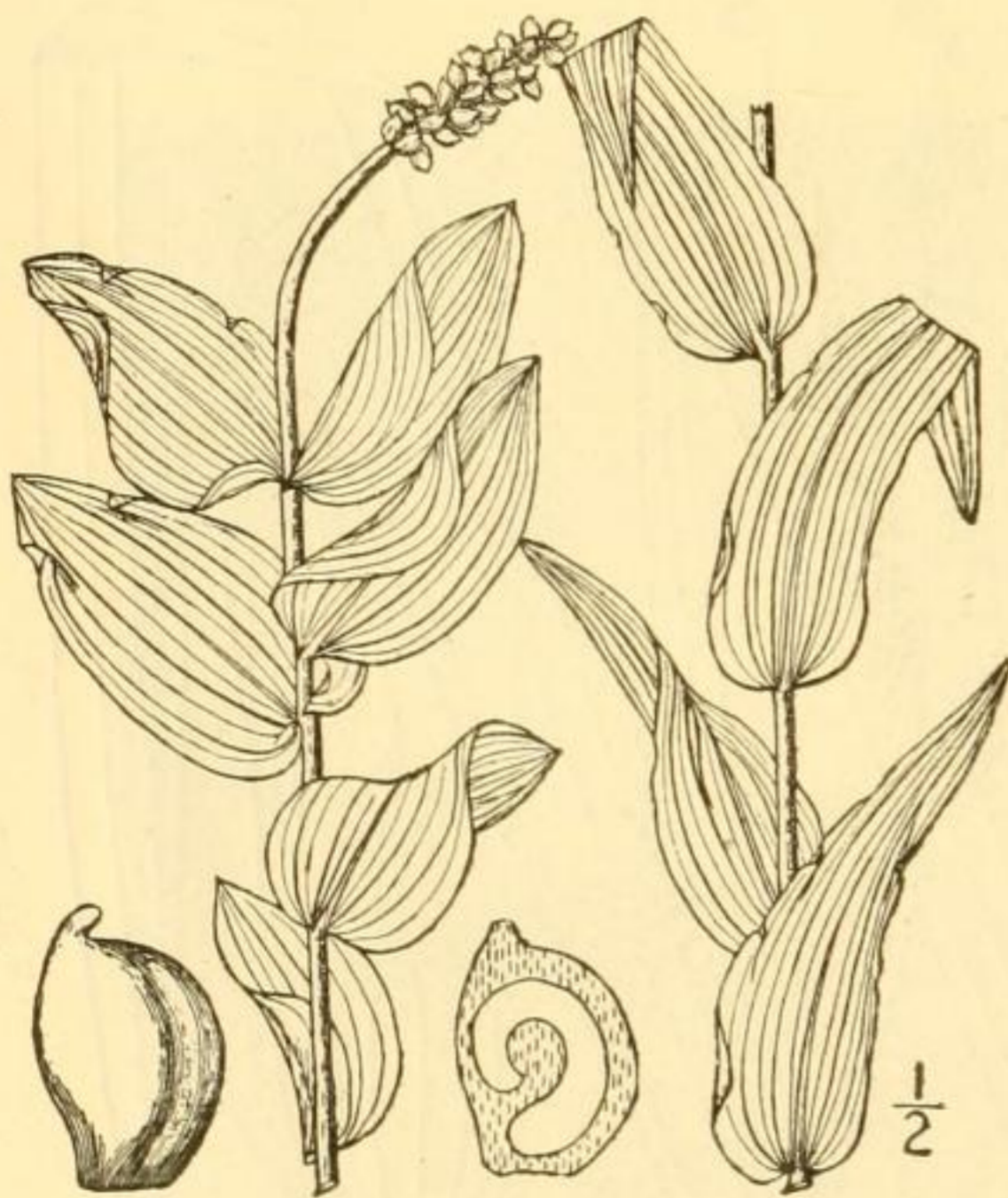


FIG. 14.—Clasping-leaved pondweed (*Potamogeton perfoliatus*) with enlarged fruit and section of the latter. (After Britton and Brown, Ill. Fl. North. U. S.)

importance, containing about 50 species, 30 of which occur in the eastern United States and a large proportion of them in New England alone. Slow streams and rather shallow ponds form the favorite haunts of these plants, whose smooth oval leaves floating on the surface of the water may be noticed in many such situations. All the pondweeds are immersed aquatics with slender, often branching stems and small greenish flowers usually borne in spikes; they are either perfect (having the stamens and pistils in the same flower), monoecious or dioecious, in some cases wholly destitute of floral envelopes, in others

with a perianth of four distinct segments. In this latter respect it will be seen that they are exceptional among the monocotyledons, which it will be remembered are usually distinguished by the three-

parted perianth. The ovary is composed of several distinct carpels which become small stone fruits or nutlets. A curious feature of the pondweeds, particularly in *Potamogeton*, is the difference in shape often exhibited between the immersed leaves and those that float on the surface of the water. Thus *P. Spirillus* has its floating leaves oval or elliptical, while its submersed leaves are narrowly linear; this peculiarity is the result of the plant's adaptation to the conditions under which it grows, the exposure to air and sunlight tending to the production of expanded blades. In species which grow wholly submerged there is no difference in the shape of the leaves. (See Fig. 14.) The genus *Aponogeton*, composed of about 15 Old World species, contains some beautiful ornamental aquatics, known as lattice-plants on account of the open lace-like tissues of their leaves, which appear as if pierced by many holes.

Family Scheuchzeriaceae.—(Juncaginaceae). Arrow-grass Family. Four genera and only about 10 species, of wide distribution. All are marsh plants, with rush-like or sedge-like leaves and small perfect flowers born in spikes or racemes. The perianth is in two series, thus showing traces of differentiation into a calyx and corolla; the ovary is composed of several carpels, slightly united. *Triglochin*, the best known genus, with three North American species, is found in salt marshes along the coast and in alkaline situations in the interior of the continent, its small greenish spike and linear or filiform leaves being quite inconspicuous.

Family Alismaceae.—Water-Plantain Family. Thirteen genera and about 65 species, widely distributed in fresh water swamps. The plants are herbs with long petioled leaves and scapose flowers borne in broad panicles or racemes. The flowers vary greatly in structure, being perfect, monoecious or dioecious; but they are always borne in whorls on the peduncle, and possess a perianth, usually in two distinct series. The ovaries are often numerous, each carpel becoming a small

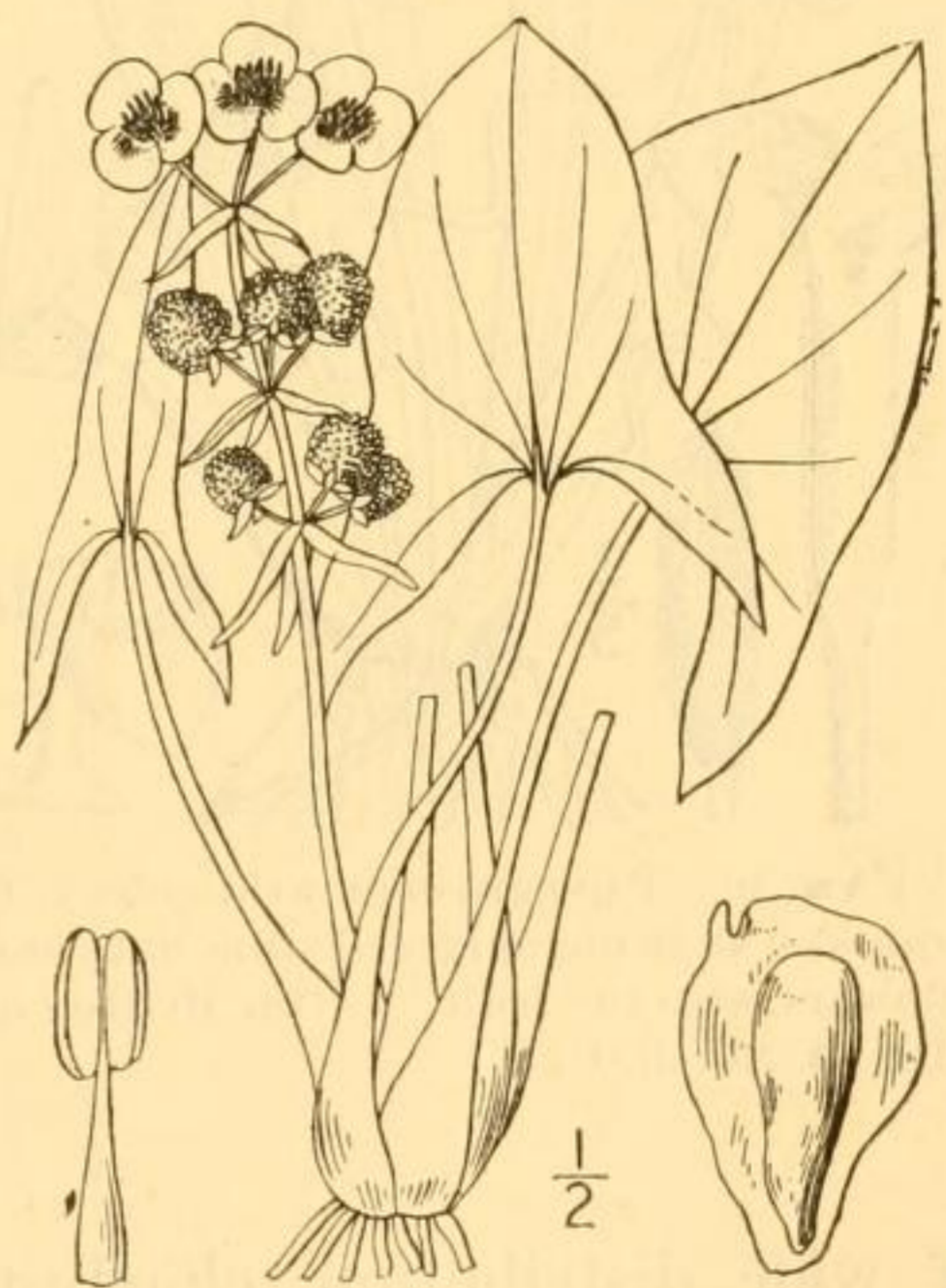
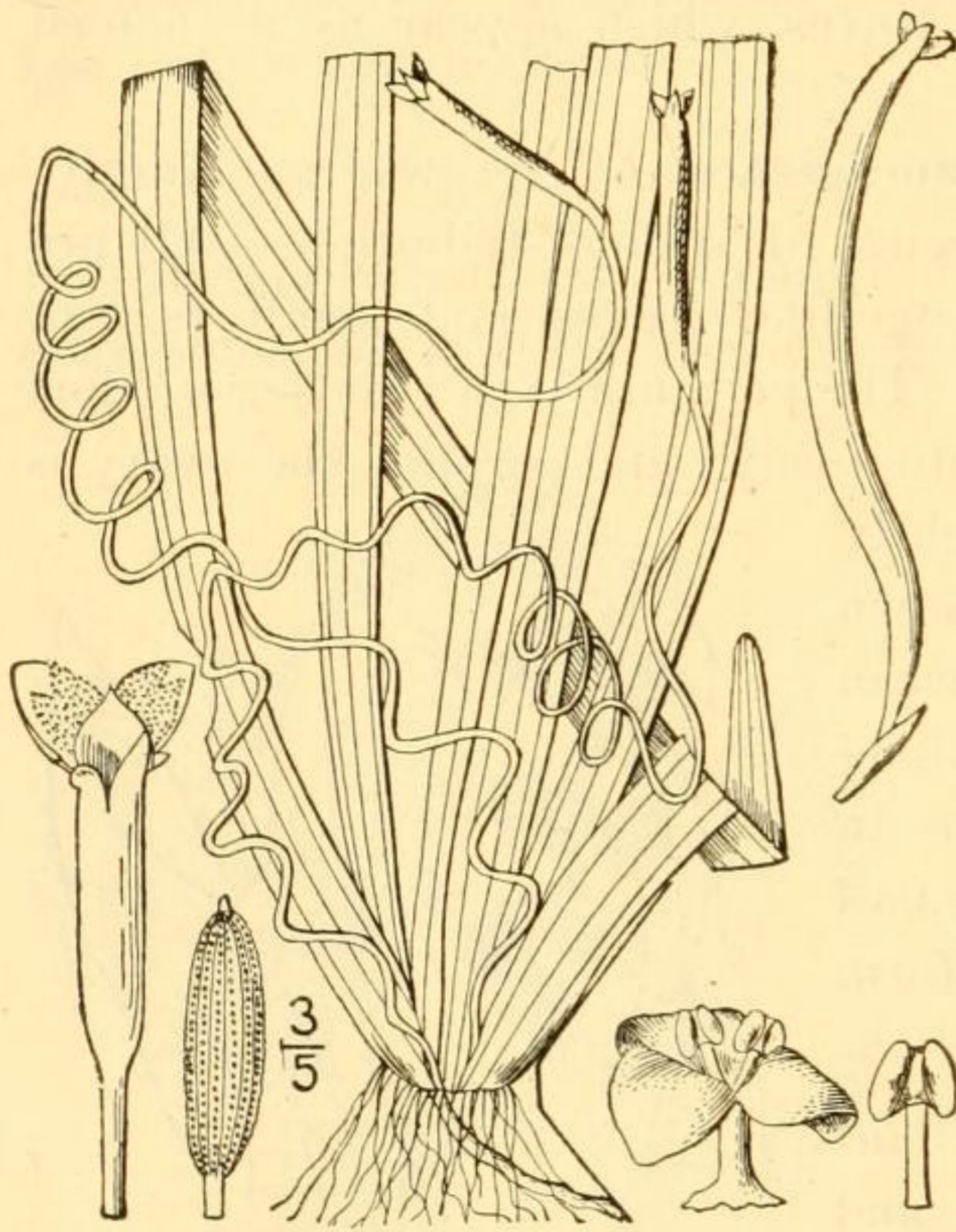


FIG. 15.—Arum-leaved arrowhead (*Sagittaria arifolia*) showing whole plant reduced with enlarged fruit and stamen. (After Britton and Brown, Ill. Fl. North. U. S.)

flattened achene somewhat like that of a buttercup. The plantain-like leaves from which the popular name of the family is derived are most conspicuous in *Alisma*, which is a familiar bog plant throughout the continent. In this genus the flowers are small and inconspicuous, but in *Sagittaria* they are often of some beauty, the inner perianth series, or corolla, consisting of three large white petals of the texture of cr pe. *Sagittaria* is called arrowhead from the shape of its leaves, which exhibit great diversity of form, but in many species are more or less like an arrow or spear head in outline. (See Fig. 15.)

Family Butomaceae.—Water Poppy Family. Four genera, each monotypic, or consisting of a single species, and all exotics. The

characters of the family, however, are well illustrated in the beautiful yellow water poppy (*Hydrocleys nymphoides*) so often cultivated in ponds and tubs. The plants are herbs with extensively creeping rootstocks, or branching stems, and scapose flowers, solitary in the water poppy and umbelled in the other genera; the flowers are perfect, with a perianth composed of calyx and corolla, the latter often conspicuous. The fruit resembles that of the arrowhead or water plantain, but the ovary contains more numerous ovules.



FAM. 16.—Tape grass or wild celery, (*Vallisneria spiralis*) showing enlarged staminate and pistillate flowers, also the fruit. (After Britton and Brown, Ill. Fl. North. U. S.)

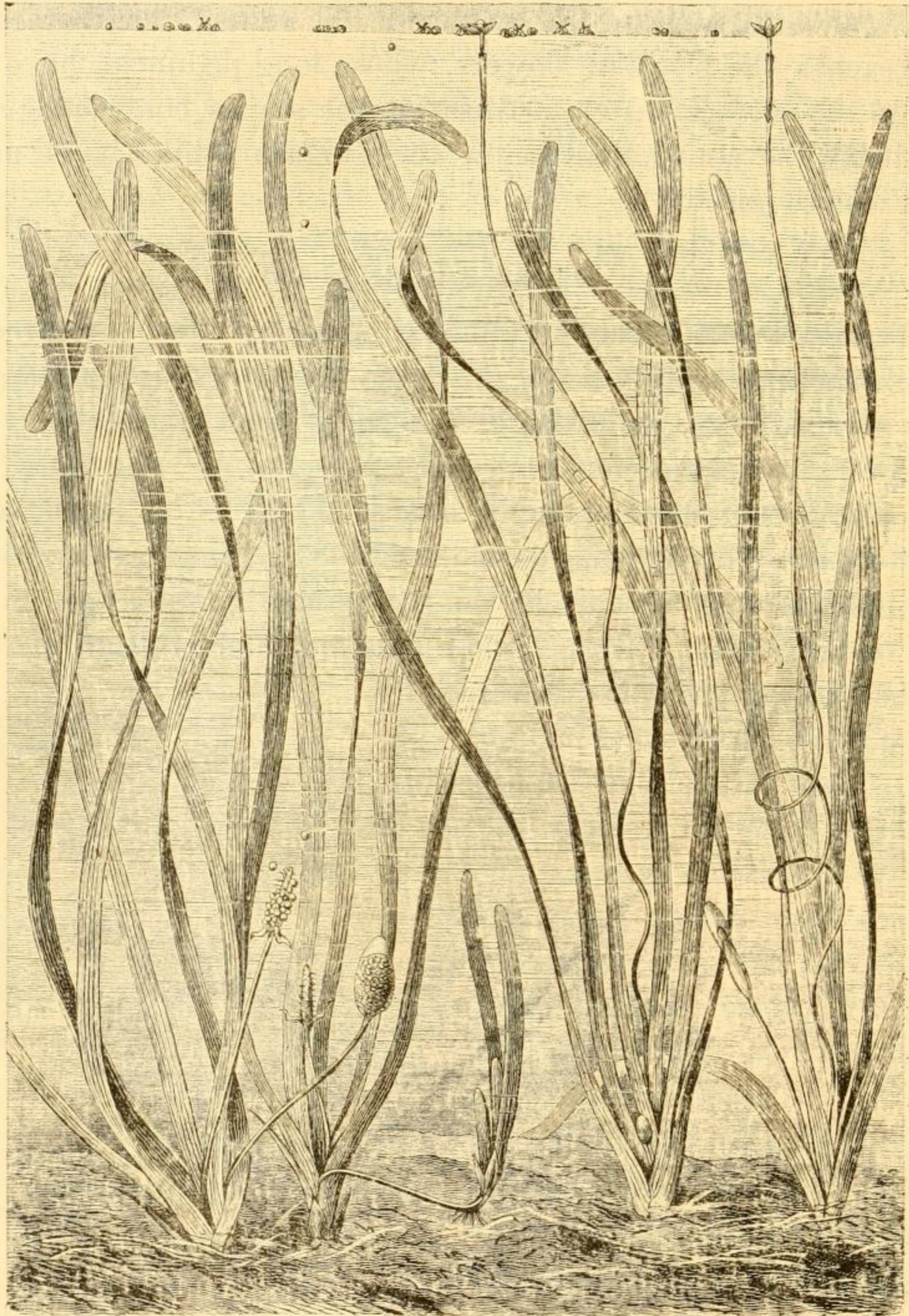
Family Vallisneriaceae (Hydrocharidaceae).—Tape-grass or Frog's-bit Family. Fourteen genera and 40 species

of wide distribution, chiefly tropical. The only genera occurring in American are *Vallisneria*, *Philotria* and *Halophila*. The family is distinguished mainly by the dioecious flowers, produced from the axils of enveloping bracts known as spathes; there is a small perianth composed of three to six segments. It is an interesting fact that *Vallisneria*, the true eel-grass or "wild celery", whose long ribbon-like

strands are often seen on sea beaches, furnishes the chief food for the wild ducks, and contributes much to the delicate flavor of the canvas-back. The mode of fertilization in this plant is remarkable. The staminate flower becomes detached while still in the form of a bud, and expands floating on the surface of the water; the liberated pollen soon reaches the pistillate flowers, whose long peduncles have brought them to the surface; after fertilization the scapes contract spirally, so as to bring the young fruit below the surface while it is maturing. (See Figs. 16 and 17.)

ORDER TRIURIDALES.

Family Triuridaceae.—Tailflower Family. Two or three genera and few species, entirely tropical. They are terrestrial and saprophytic herbs of small size, yellowish or reddish in color and entirely leafless; the flowers are monoecious, borne in racemes, or sometimes solitary; the perianth consists of a single series of three or more segments. The flowers are often fringed, while those of *Triuris* are provided with three long tail-like appendages to the perianth lobes, thus giving the name to the family. These little plants are interesting to the botanist, but they are of no economic value.



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FIG. 17.—Tape-grass or wild celery (*Vallisneria spiralis*) showing habit of growth and mode of fertilization. (After Kerner.)

SUPPLEMENT.

THE FAMILIES OF FLOWERING PLANTS.

By CHARLES LOUIS POLLARD.

CHAPTER IV.

Order Glumiflorae.—The Grasses and Sedges.

THERE are probably no two families of flowering plants more likely to be confused by the amateur than the Gramineae and Cyperaceae, known popularly as the grasses and sedges. The

farmer would designate both groups by the comprehensive term "hay", and would find examples of each in the mowings from salt marsh as well as from upland meadow. There are, however, important differences between the families, and since from the economic standpoint the grasses are of the highest value, while the sedges are nearly worthless, it is well to understand these differences thoroughly at the outset.

Family Gramineae (sometimes called *Poaceae*).—Grass Family. This is one of the largest families of flowering plants, over 300 genera and 3500 species being recognized. They are widely distributed in all countries, and present astonishing extremes in size from the diminutive herbaceous *Phippsia* of arctic re-

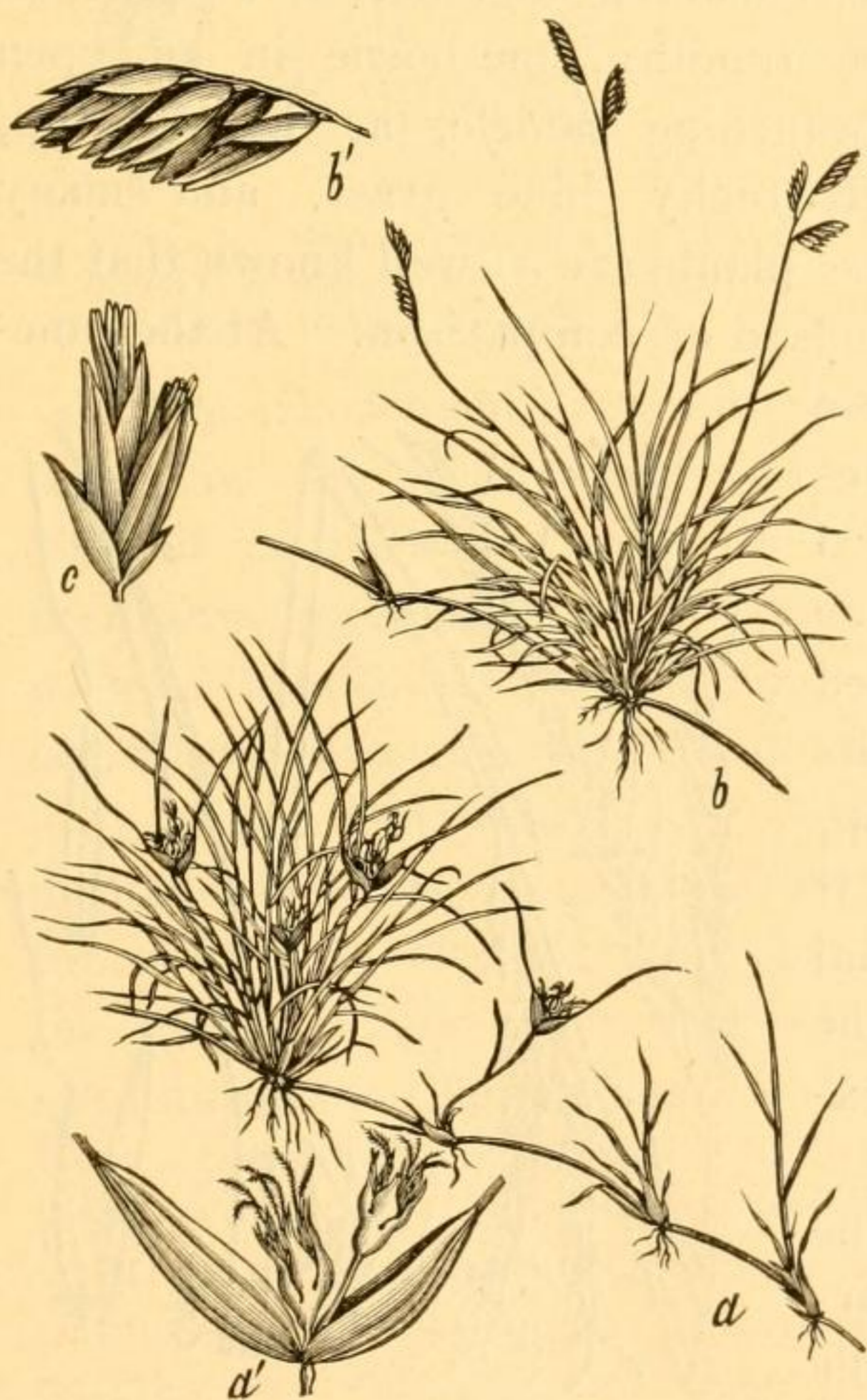


FIG. 18.—Buffalo grass, *Bulbilis dactyloides*. (After Scribner, Bull. No. 7, Div. of Agrost., U. S. Dept. of Agric.)

gions to the lofty arborescent bamboos of the tropics. The inflorescence consists of what are technically called *spikelets*, each of which



FIG. 19.—Barnyard grass (*Panicum Crus-galli*). (After Britton and Brown, Ill. Fl. Northern U. S.)

is made up of small imbricated chaffy scales. Some of these scales are empty; others enclose the stamens, usually three in number, and the pistil; and each of these flower-bearing scales usually encloses an additional, very slender scale known as the *palet*. Every individual floret thus consists of the essential organs of reproduction, surrounded by two protecting scales; one or more of the florets are borne together on a slender axis, forming a spikelet; while the innumerable spikelets may be clustered together in a spike, as in timothy, or borne in an open branching panicle, as in red top, Kentucky blue grass, and many

other species. The leaves of these plants are so well known that the term grass-like is common as a standard of comparison. At the junction of leaf and stem, where the base of the leaf usually forms a completely enwrapping sheath, will be noticed in most cases a peculiar membranous ring or protuberance; this is called the *ligule*, a name derived from its suggestion of a little thong or strap, and it is an indisputable proof, if present, that we have a grass and not a sedge or rush before us. The grass stem or *culm* is hollow, except at the joints.

Little need be said of the value of grasses for forage and pasturage; indeed they furnish nine-tenths of the subsistence of domesticated herbivorous animals, and with the



FIG. 20.—Forked Beard-grass (*Andropogon furcatus*). (After Britton and Brown, Ill. Fl. Northern U. S.)

possible single exception of *Lolium temulentum*, no species is poisonous or even injurious to stock. All of our cereals, wheat, rye, barley,

oats, rice, maize, etc., are derived from various grasses, many of which have their wild relatives growing abundantly in our fields. Thus the sorghum of commerce belongs to the same genus as the dreaded "Johnson-grass" of the south (*Sorghum halepense*), one of the worst usurpers of cultivated lands.

Its value as a source of food products alone would lend importance to the grass family; but besides their primary use in furnishing nutrition the grasses exhibit many economic uses. Some species are used for hat-plaiting, mat-weaving and basket-weaving; others furnish material for the paper industry, and the genus *Andropogon* contributes to the manufacture of perfumery.

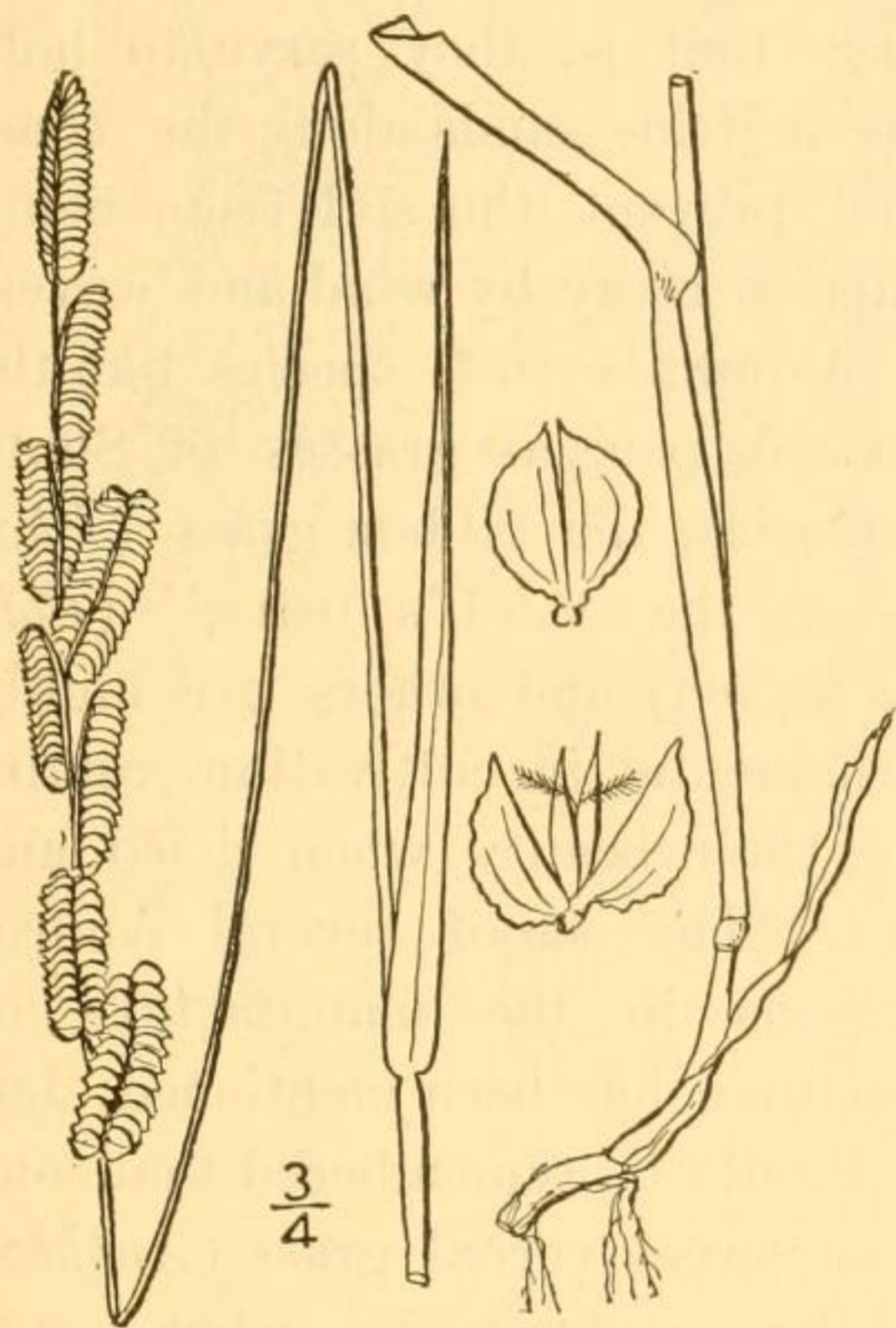
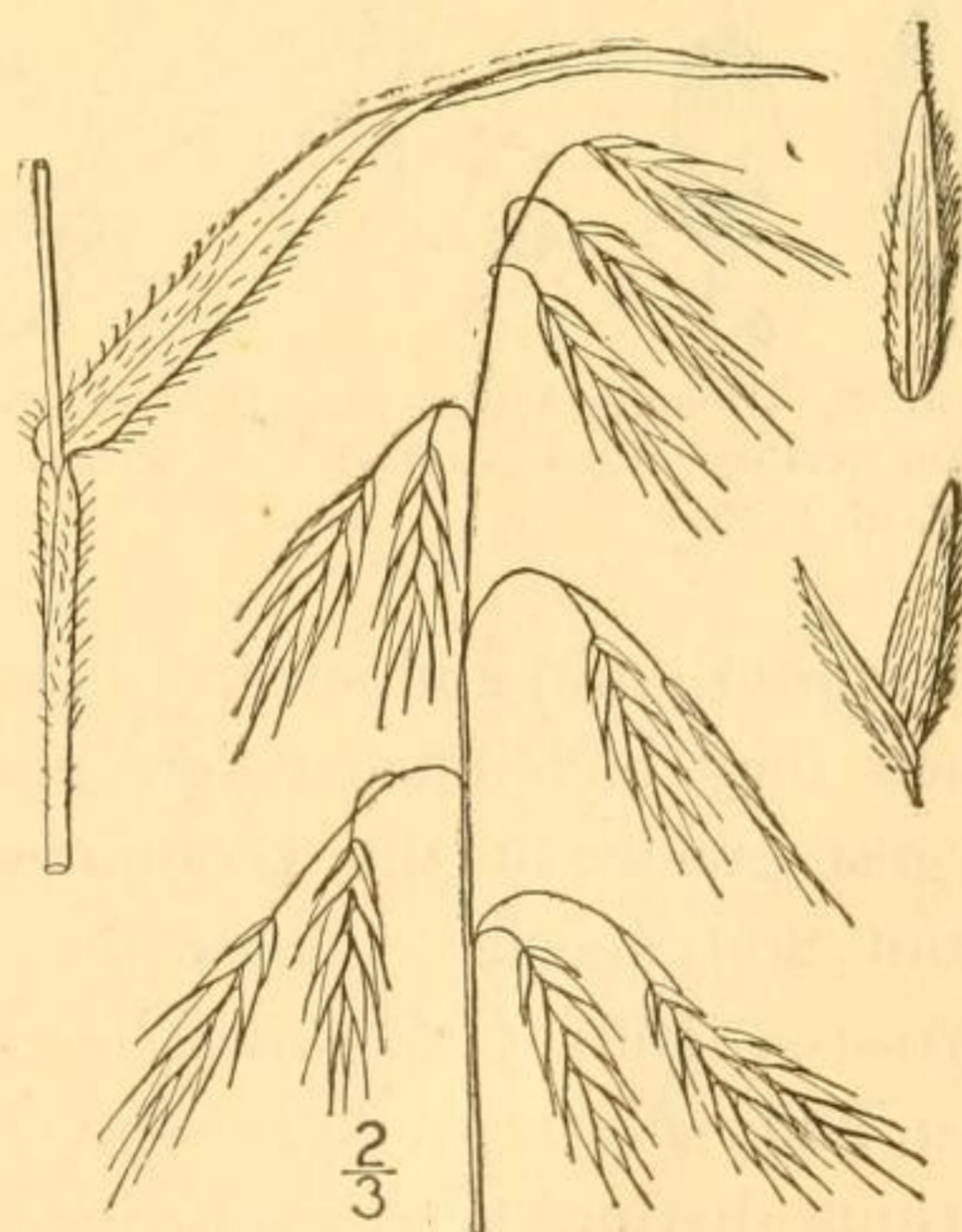


FIG. 21.—Beckmannia grass. (*Beckmannia erucaeformis*) (After Britton and Brown, Ill. Fl. Northern U. S.)

The arborescent grass known as Bamboo (*Bambusa*) is a great factor in the industrial arts of oriental countries. Boats, houses, furniture, quill-work, fences, water-wheels, handles for tools, umbrellas, knives, and countless small objects of use and beauty will be remembered as formed from the tough tubes of this oriental grass, while the young shoots are preserved as sweetmeats, and lampwicks are made from the pith. Bamboo carvings rival ivory in their delicacy and durability, the polished joints of the plant serve as writing tablets for the natives of Sumatra, and even telescopes have been made of bamboo stalks.



FAM. 22.—Kalm's chess (*Bromus Kalmii*). (After Britton and Brown, Ill. Fl. Northern U. S.)

Many grasses with rapidly growing and branching rootstocks as the beach grass (*Ammophila arenaria*) share with numerous sedges the

important function of sand-binders; that is, they serve to hold the drifting sands along the coast and prevent the soil from being carried away by wind and waves.

A number of species like the various pampas grasses of South America, the ribbon-grass (*Phalaris*) the "Job's tears," (*Coix lachryma*) and others are highly ornamental in cultivation, retaining their beauty when dried and cut. The use of several *Andropogon*s in the manufacture of perfume has been mentioned; but it should be remembered that our own sweet vernal grass (*Anthoxanthum odoratum*) when cut, properly dried and, placed between thin papers will exhale a delicate fragrance far superior to that of any sachet powder.

While enumerating the uses of this family we must reluctantly admit that it contains also some of

the worst weeds known to farmers. The couch grass (*Triticum repens*) the crab grass (*Syntherisma sanguinalis*) and several others are extremely difficult to eradicate

when they have once taken possession of the ground. Among the largest genera of the Gramineæ may be mentioned *Andropogon*, with about 200 species; *Paspalum*, with 300; *Panicum*, with nearly 800; *Agrostis*, 100; *Calamagrostis*, 150; *Danthonia*, 100; *Eragrostis*, 100; *Poa*, 200; *Festuca*, 250; and *Bambusa*, 50. The figures illustrate various distinct types, showing in each case enlarged views of the inflorescence as well as the habit of the plant; the general similarity of structure however, will be noticed throughout.

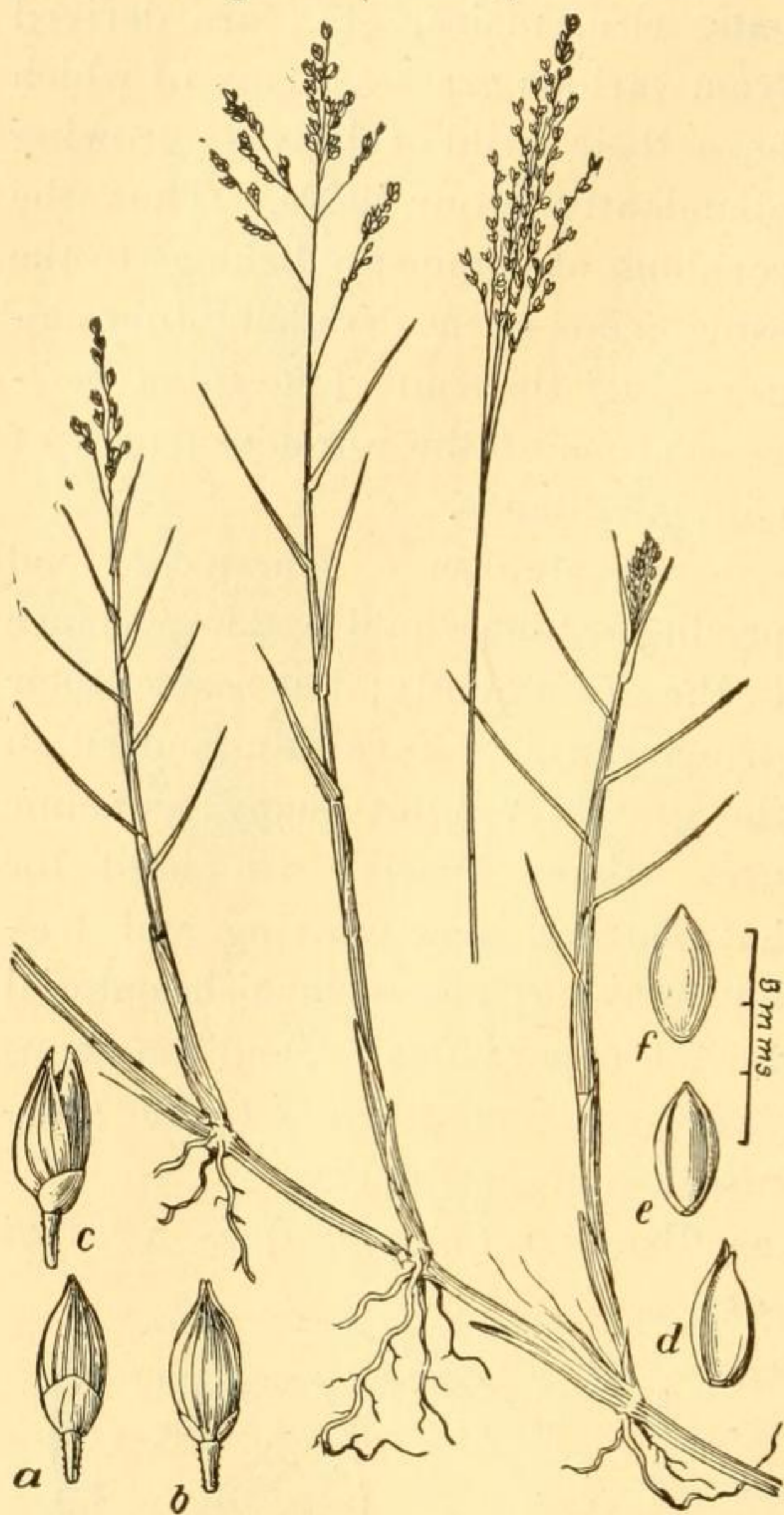


FIG. 23.—Creeping Panic-grass (*Panicum repens*). (After Scribner, Bull. No. 7, Div. of Agrost., U. S. Dept. of Agric.)



FIG. 24.—Wild rice, *Zizania aquatica*. (After Britton and Brown, Ill. Fl. Northern U. S.)



FIG. 25.—Minnesota Muhlenbergia (*Muhlenbergia ambigua*). (After Britton and Brown, Ill. Fl. Northern U. S.)

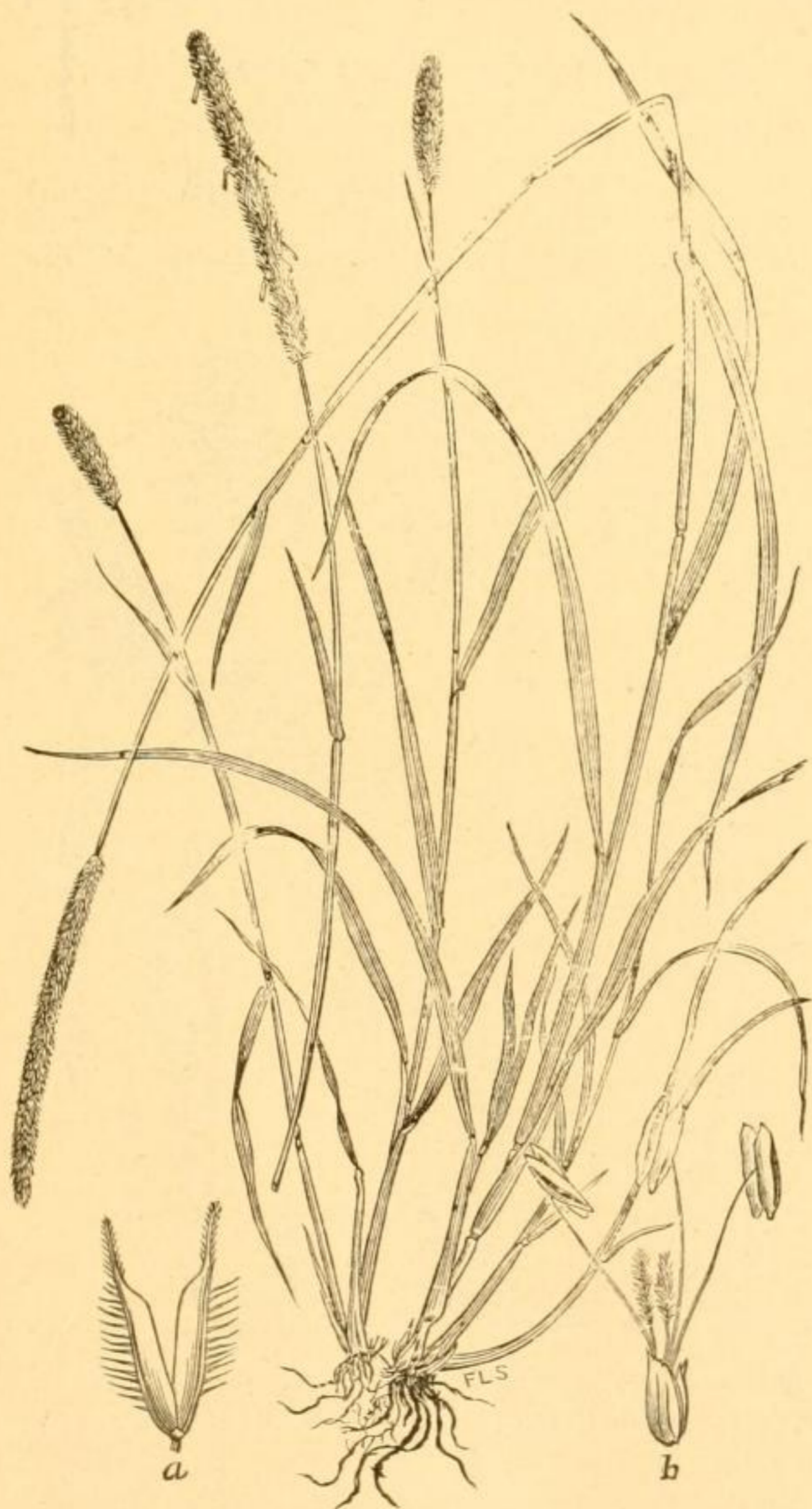


FIG. 26.—Timothy grass (*Phleum pratense*). (After Scribner, Bull. No. 7, Div. of Agrost., U. S. Dept. of Agric.)



FIG. 27.—Broom grass, *Andropogon Virginicus*. (After Scribner, Bull. No. 7, Div. of Agrost., U. S. Dept. of Agric.)

SUPPLEMENT.

THE FAMILIES OF FLOWERING PLANTS.

By CHARLES LOUIS POLLARD.

CHAPTER IV. (*Continued.*)

THE family Cyperaceae, or Sedge family, is less extensive than the Grass family, embracing 75 genera and about 2800 species, 700 of which are contained in the single genus *Carex*. Sedges are widely distributed over the globe, some genera being characteristic of arctic or high alpine regions, while others form impenetrable jungles or



FIG. 28.—Straw-colored Cyperus (*Cyperus strigosus*.) After Britton and Brown, Ill. Fl. Northern U. S.

“brakes” in tropical swamps. The larger proportion of the species prefer wet ground, although many of our commonest forms may be found along dry roadsides or in upland meadows.

The economic uses of these plants are not very extensive. The stems of the common bulrush, *Scirpus lacustris* afford material for the manufacture of mats, baskets, and the so-called “rush-bottomed” chairs; while certain species of *Carex* and *Cyperus* are not without value as forage plants. Many sedges growing along the sea coast perform important service as “sand binders.”

There are many points of similarity in floral structure between the sedges and the grasses. In

both the inflorescence consists of spikes or panicles, made up of small

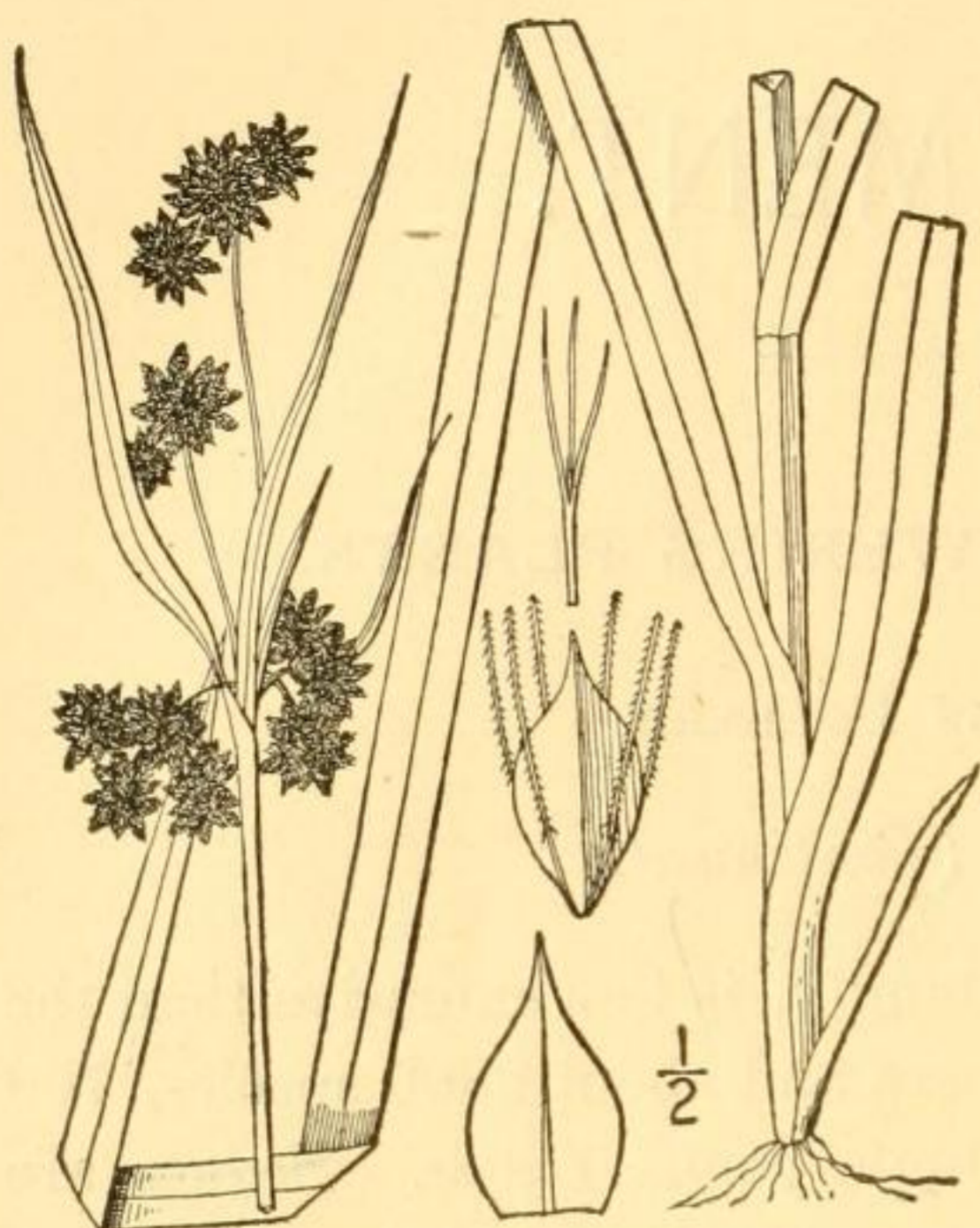


FIG. 29.—Dark green Bulrush (*Scirpus atrovirens*). After Britton and Brown, Ill. Fl. Northern U. S.

spikelets; but the flower-bearing scale in a sedge is single, while in a grass it is double. Moreover the sedges often exhibit some traces of a floral envelope in the shape of a crown of bristles, while the grasses are quite destitute of perianth. The sedge leaves are sometimes flat and grass-like, sometimes slender and wiry, or "terete," as they are technically called. The little thong-shaped appendage called a ligule, borne at the junction of leaf and stem in grasses, is entirely wanting in the sedges; and finally, the latter family have stems that are solid and more or less three-angled. Figure

28 illustrates a species of *Cyperus* common in the eastern United States, and will afford a good idea of the general plan of structure in the group. Figures 29 and 30 represent types of the two large genera *Scirpus* and *Carex*.

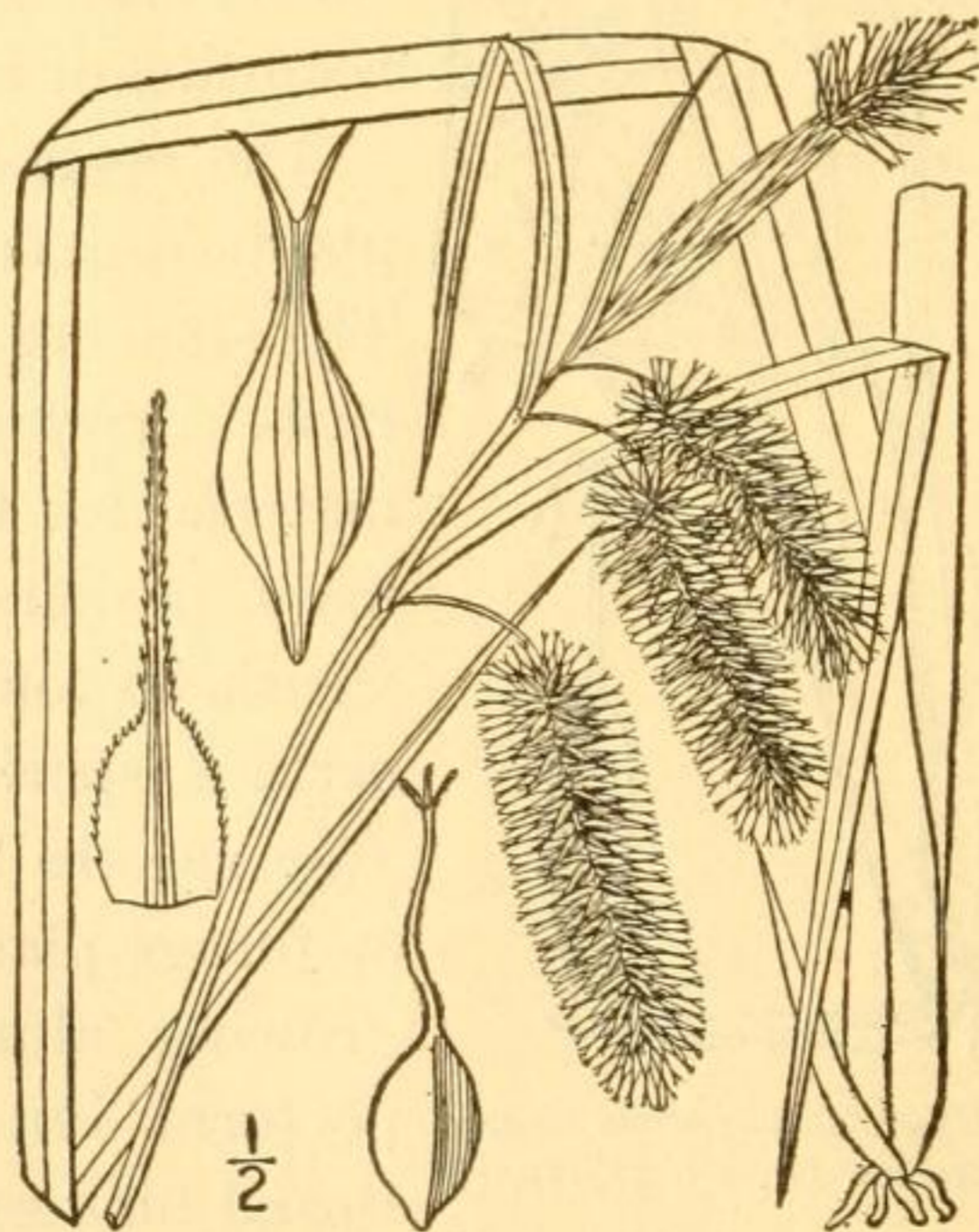


FIG. 30.—Bristly Sedge (*Carex comosa*). After Britton and Brown, Ill. Fl. Northern U. S.

CHAPTER V.

Order Principes. The Palms.

This order comprises but a single family, the Palmaceae or Palm family, an extremely well marked natural group of plants, so characteristic in their aspect that the term "palm-like" whether applied to leaf or trunk, is to most persons self-explanatory. The family consists entirely of trees and shrubs, and is now essentially tropical in its distribution, although there is geological evidence that palms were found throughout the United States before the glacial epoch. There are about 150 genera and 1000 species, of which seven genera are represented by one or more species each in the extreme Southern States and in Southern California, while two, the date and cocoanut palm, occur spontaneously as escapes from cultivation.

The palm stem is one of our most typical examples of the so-called endogenous structure among the Monocotyledons (See Supplement, page 15). A cross-section shows no annual rings or circles of wood, but a homogeneous mass of pith through which the bundles of woody fiber will be found irregularly distributed. Palms have no true bark, but the external rind is often very hard, and difficult to cut with an axe. The growth is from a terminal bud, and the leaves are produced in a graceful cluster at the summit of the stem; as the lower ones decay and fall off, their sheathing petioles remain, forming a fibrous network. The flowers are borne in dense, fleshy flower clusters to which the term *spadix* is applied; they are usually enveloped or subtended by a large tough bract called a *spathe*. The flowers or monœcious or diœcious, the male and female sporophylls being borne separately on the same or different plants. We find in this family the first well-marked floral envelope, consisting of two series (calyx and corolla); it is usually leathery in texture, and green or yellow in color. The stamens are from three to six; and the fruit is either a drupe or stone fruit, as in the date, or a berry, as in the common cabbage palmetto of the South.

From the economic standpoint the palms constitute the most important family among the monocotyledons; the trunks and leaves furnish building materials; in addition to their edible fruits they yield starch, sugar and oils, as well as various useful fibers; almost all the species are ornamental, and many respond well to cultivation. In this connection it will be profitable to examine the leading subdivision of

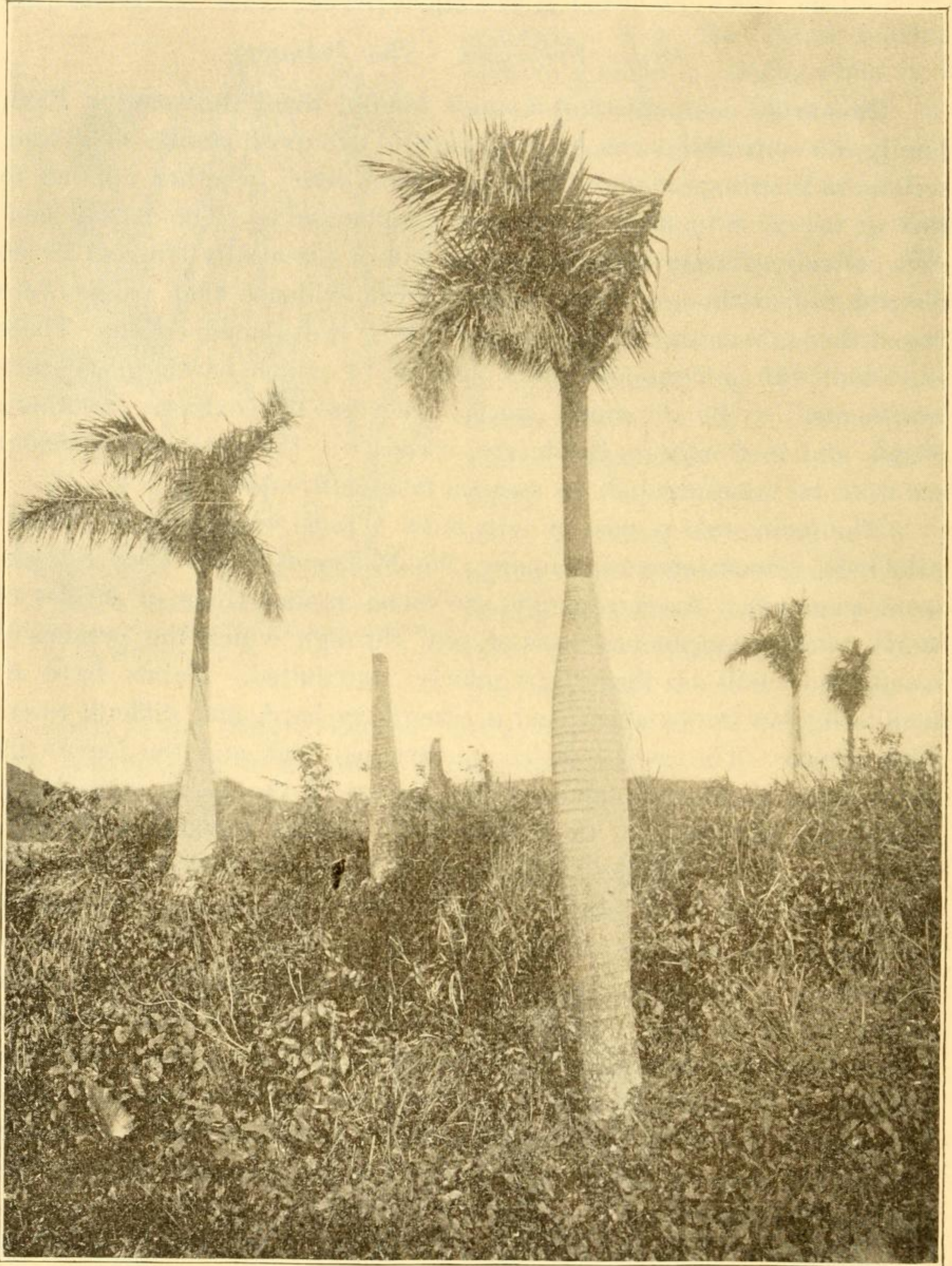


FIG. 31.—Royal palm (*Oreodoxa regia*). After a photograph made by Mr. G. N. Collins at Rio Piedras, Porto Rico.

family, and the more important genera contained in each.

1. Subfamily Coryphoideæ. The type genus, *Corypha*, includes a number of useful palms, such as the talipot (*C. umbraculifera*) the taliera (*C. Taliera*) and the gebang (*C. gebanga*). The leaves in this group are mainly fan-shaped, and are utilized not only in the manufacture of fans, but of hats, baskets and other articles. Walking-sticks are made from the stems of the Penang lawyer, a species of *Licuala* growing in Penang. The genus *Chamaerops* includes the only palm growing in Southern Europe; it is a dwarf species, similar in general appearance to the saw palmetto of our southern pine barrens. The date palm (*Phoenix dactylifera*) is the most important tree of this tribe; its uses are too well known to require discussion. Within recent years the date has been introduced into cultivation in certain parts of Arizona, with fair prospect of success. The common Chinese fan palm of cultivation belongs to the genus *Livistona*.

2. Subfamily Borassoideæ. This includes the Palmyra palm (*Borassus flabelliformis*) which is one of the sources of palm wine and palm sugar known as *jaggery*. The leaves are used for thatching, and for the manufacture of many useful articles; the fruit contains edible seeds, and its pulp is roasted and eaten. Probably no other species of palm yields a greater variety of products than this. The doum palm (*Hyphæne Thebaica*) is unique in the possession of branching stems; its fruit is a staple article of diet in Arabia. The singular fruits known as "sea-cocoanuts" are the product of a palm known as *Lodoicea Sechellarum*; it is something of a botanical curiosity, being confined to the Seychelles Islands, and is likely to become extinct in the near future.

3. Subfamily Lepidocaryoideæ. The South American ita palm, *Mauritia flexuosa*, is another species affording many useful products; it furnishes a valuable fiber, and is one of the sources of *jaggery*. The genus *Calamus* includes a large number of species, all Asiatic, known as rattan or cane palms; some are low bushes, others climb by means of hooked spines on their leaf-stalks. Rattan is a familiar article of commerce derived from these species, while several yield a good quality of sago or starch, and one, *C. Draco*, the drug known as dragon's blood.

4. Subfamily Ceroxyloideæ. The betel palm, *Areca Catechu*, and the numerous species of *Arcea* seen in cultivation afford illustrations of the beauty of palms belonging to this genus. Their long

pinnate leaves are arched in graceful curves, and they frequently attain lofty proportions. The royal palm, *Oreodoxa regia*, is common in the West Indies; the fine photograph reproduced in Figure 31 was made in Porto Rico by Mr. G. N. Collins. The conspicuous swelling of the trunk affords an easy means of recognizing this tree. The cocoanut palm (*Cocos nucifera*) is familiar to most persons; it is quite common on the Florida Keys and is employed as a shade tree in Key West (See Fig. 32). Many other genera of pinnate-leaved palms belonging to this family afford beautiful examples for cultivation. The

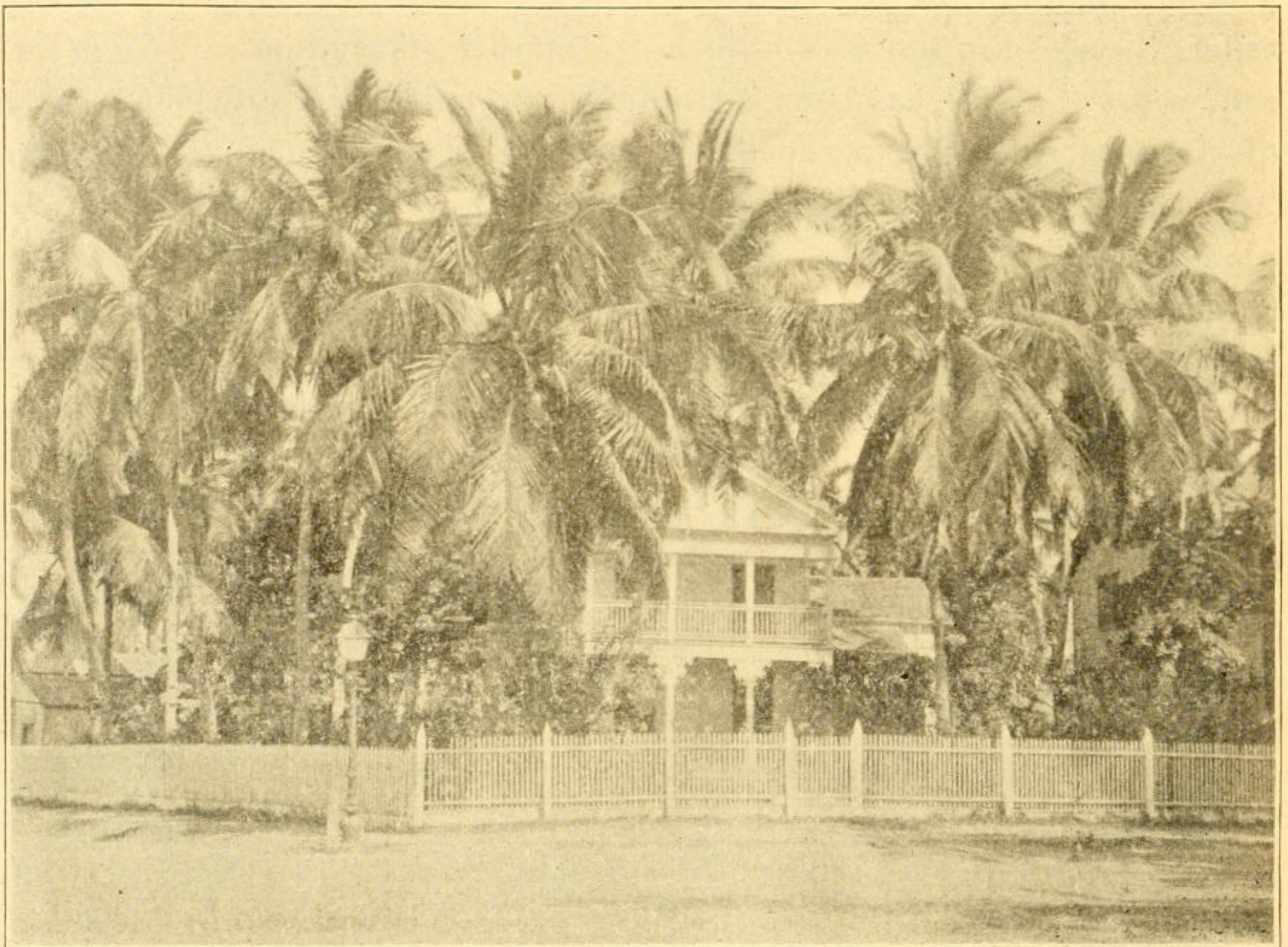


FIG. 32.—Cocoanut palms around a dwelling in Key West. After a photograph by Mr. G. N. Collins.

oil palm (*Elæis Guineensis*) is a native of Western Africa, and is one of the chief sources of palm oil. This group also includes the coquita palm of Chili (*Jubæa spectabilis*) and the piassata of Brazil (*Attalea funifera*).

5. Subfamily Phytelephantoideae. The principal genus of this group is the type, *Phytelephas*, native of tropical America, and put to numerous local uses by the natives.

6. Subfamily Nipoideae. The Nipa palm, *Nipa fruticans*, is common in the Indo-Malayan region. In the Philippine islands and elsewhere its leaves are used for thatching in preference to those of any other palm.

We may dismiss the consideration of this group with a brief allusion to the order *Synanthae*, consisting of the single family *Cyclanthaceae*, containing over forty species comprised in two genera, natives of tropical America. They are palm-like plants of no especial ornamental or economic value.

SUPPLEMENT.

THE FAMILIES OF FLOWERING PLANTS.

By CHARLES LOUIS POLLARD.

CHAPTER VI.

Order Spathiflorae. Spathe-bearing plants.

Family Araceae.—Arum family. This well known group is represented in the United States by a number of common plants, but its greatest development is in the tropics, both of the old and new world. The family contains about 105 genera and 900 species; the vast majority are coarse erect herbs, although some of the tropical forms are climbing fleshy shrubs. The root is usually either tuberous or cormose,* and contains an acrid poisonous principle; it usually abounds, however, in starch, and in certain genera yields an excellent quality of arrowroot when proper precaution is taken to extract the poisonous element. The leaves are basal, long-petioled, simple or compound, often of large size.

The flowers are usually monoecious or dioecious, at most with mere traces of perianth, and are densely crowded on a fleshy axis or spike known technically as a *spadix*. Often the staminate flowers occupy the upper and more elongated portion of the spadix, while the pistillate flowers are crowded in a globose mass below. This is well seen in the common cultivated calla lily. Overarching or completely enveloping the spadix is a large leaf-like bract known as a spathe, which is characteristic of this order of plants. In the skunk cabbage the spathe is dark purple and green, and forms an enwrapping hood or cowl. In the jack-in-the-pulpit the upper portion droops like a graceful canopy over the projecting spadix, while the lower portion is united

*A corm is a fleshy, underground stem, resembling a bulb, but solid in structure, i. e., not composed of scales. The Jack-in-the-pulpit affords a good illustration in the family under discussion.

into a cup-shaped cover for the rapidly developing green berries which later turn a brilliant scarlet. The golden-club (*Orontium aquaticum*) dispenses with the spathe as soon as its bright yellow flowers open, the former remaining only as a withered bract at the base.

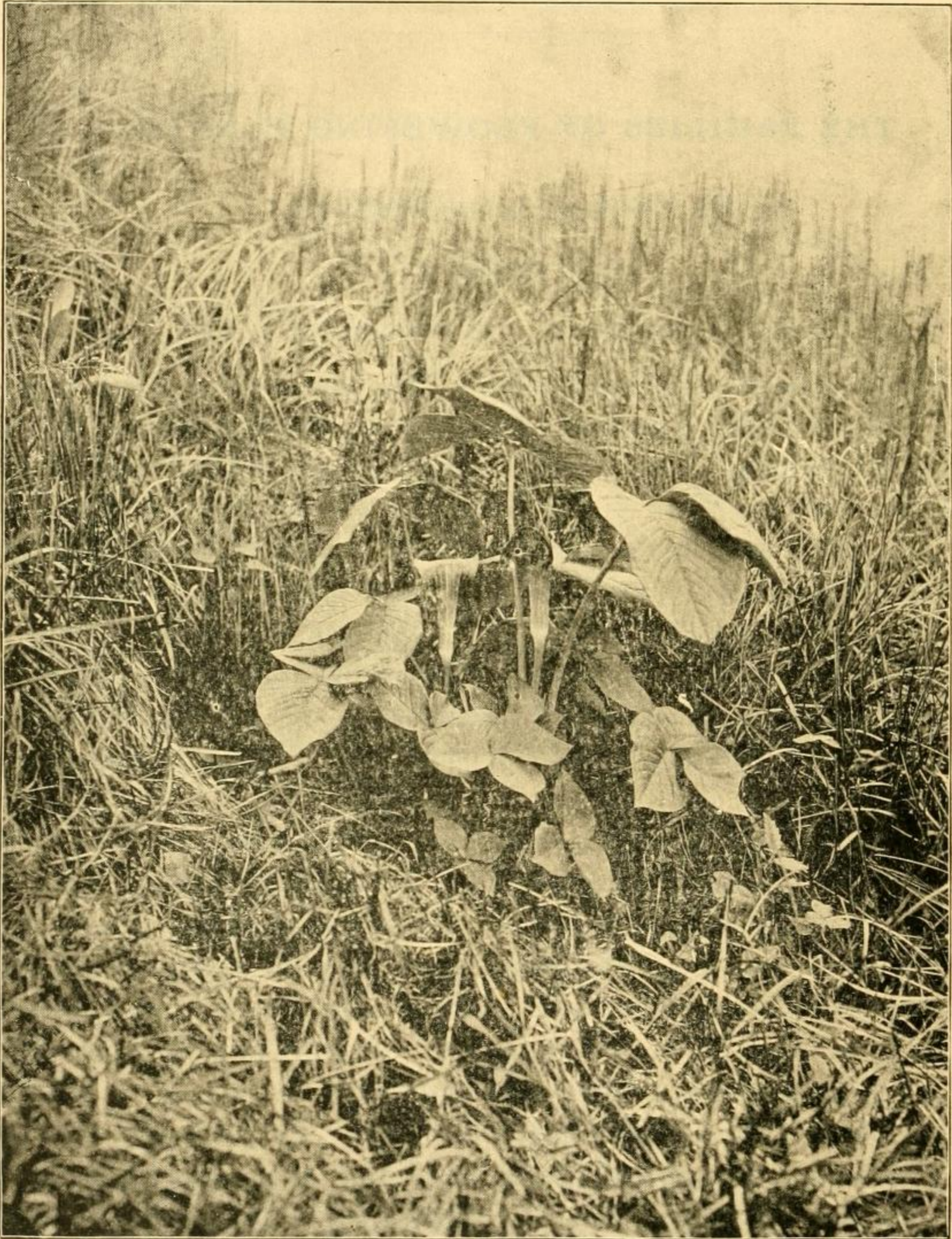


FIG. 33.—The jack-in-the-pulpit (*Arisema triphyllum*) showing hooded spathes. (From Macmillan's "Minnesota Plant Life," by courtesy of the author.)

In addition to the native aroids mentioned above there are numerous handsome tropical exotics which commonly grace our greenhouses.

Caladium is a genus in which the leaves are highly ornamental, being variegated in shades of pink, purple and green. Florists sell under this name the common lawn plant called "Elephant's-ear," which really belongs to the entirely different genus *Colocasia*, and is highly important in the tropics. It is there called *taro*, and is everywhere cultivated for the arrowroot yielded by its enormous roots. Another peculiar confusion of names is to be seen in the case of the calla of cultivation, which belongs to the genus *Aroides*. The genus *Calla*, containing a single species, *C. palustris*, is a small bog herb of the

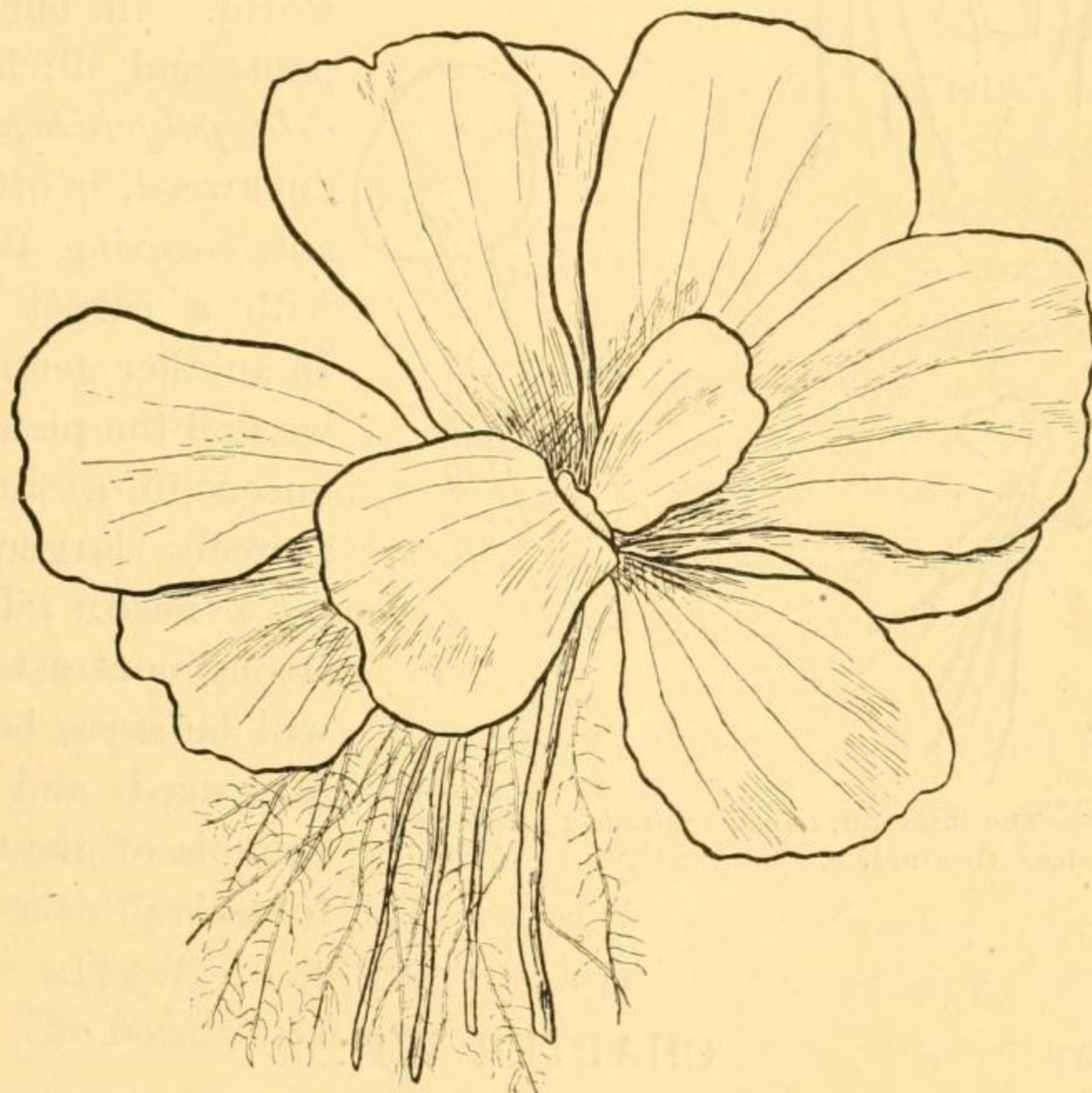


FIG. 34.—The floating arum (*Pistia spathulata*), one-half natural size. Original.

northern United States, often called water arum, and bearing only a superficial resemblance to the more pretentious plant of our window gardens. Other ornamental genera of cultivation are *Anthurium*, *Pothos*, and *Monstera*. Reference should be made to the peculiar *Pistia*, a succulent free floating plant very different from an ordinary arum, found in the streams of Florida and most tropical regions. (See Fig. 34.)

Family Lemnaceae. Duckweed Family. This group is of unusual interest, as containing the smallest known flowering plants.

They are supposed to be degenerate Aroids, and consist merely of a little disc-shaped, free-floating body, rarely exceeding one-third of an

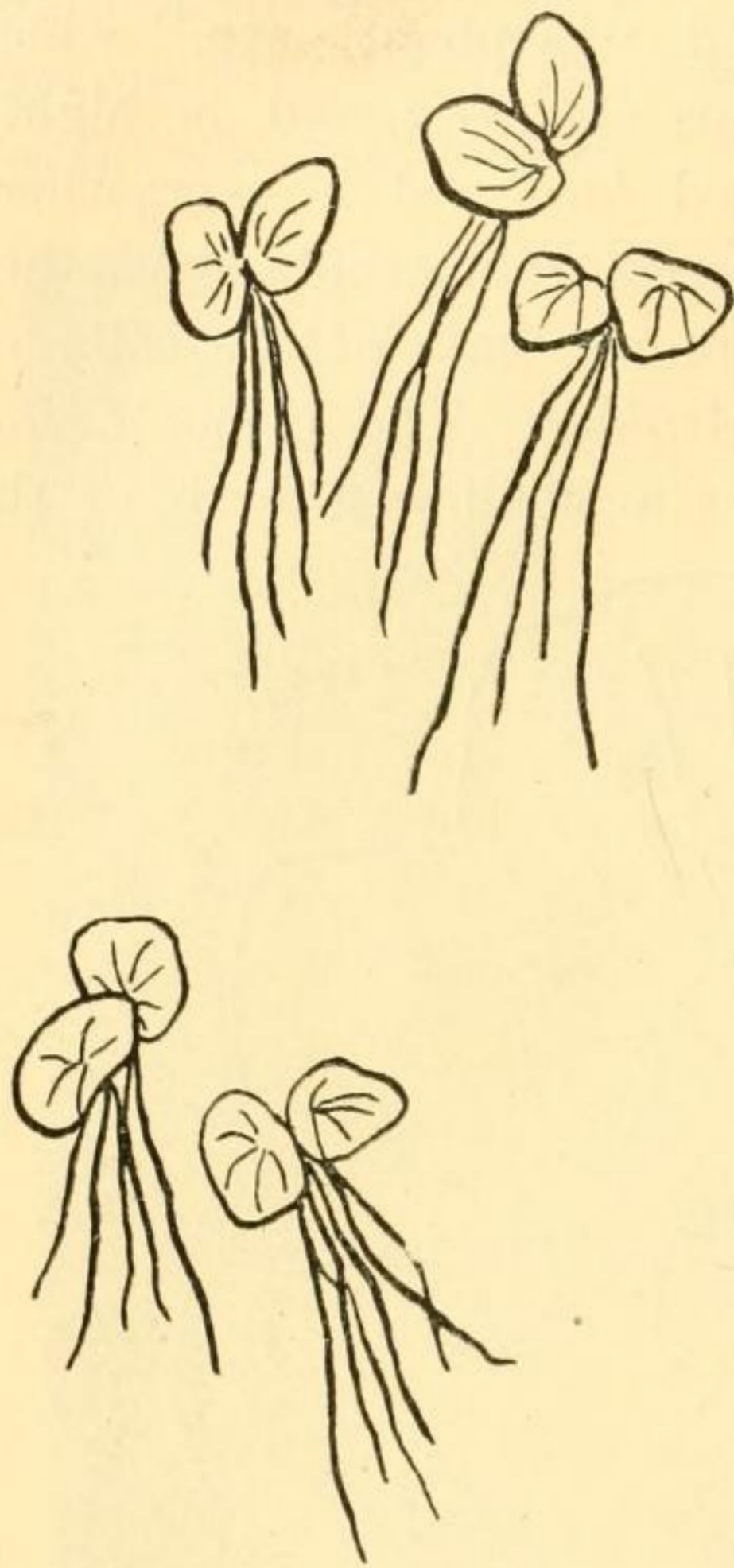
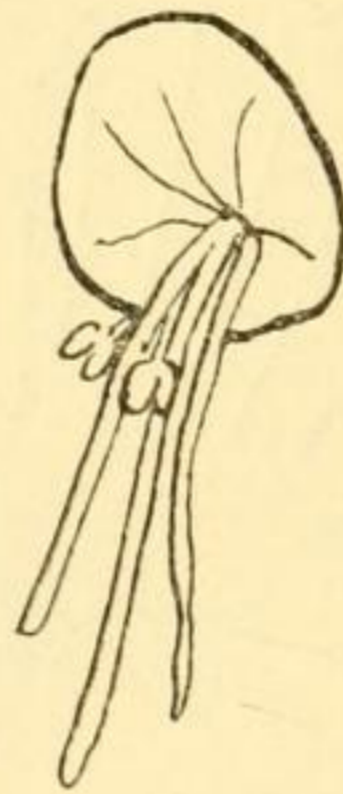


FIG. 35.—The large duckweed (*Spirodela polyrrhiza*), natural size. Original.



inch in diameter, and bearing on the under surface a single stamen or pistil and several minute rootlets. There are but three genera and only 25 species known throughout the world. In our stagnant pools and ditches *Spirodela polyrrhiza*, the large duckweed, is often abundant, covering the surface with a carpet of green. In another genus, *Wolffia*, we find the plant body reduced to a little grain scarcely larger than a pin's head. There is a strong contrast in size, it will be seen, between the duckweed and the giant Sequoia of the Californian forest!

CHAPTER VIII.

Order Farinosae.

Passing over the comparatively unimportant families Flagellariaceae, Restionaceae, and Centrolepidaceae, we come to the

Family Mayacaceae. Mayaca family. This is represented by a single genus, *Mayaca*, with seven species, one of which, *M. Aubleti*, reaches the southern United States. It is a delicate little creeping bog plant, with a habit strongly suggestive of a moss, bearing slender peduncled star-shaped flowers with a perianth composed of three sepals and three white or pink petals. (See Fig. 36.)

Family Xyridaceae. Yellow-eyed Grass family. Two genera, *Xyris* and *Abolboda*, comprising about 60 species. The plants are

tufted herbs with slender, grass-like stems, terminated by a dense

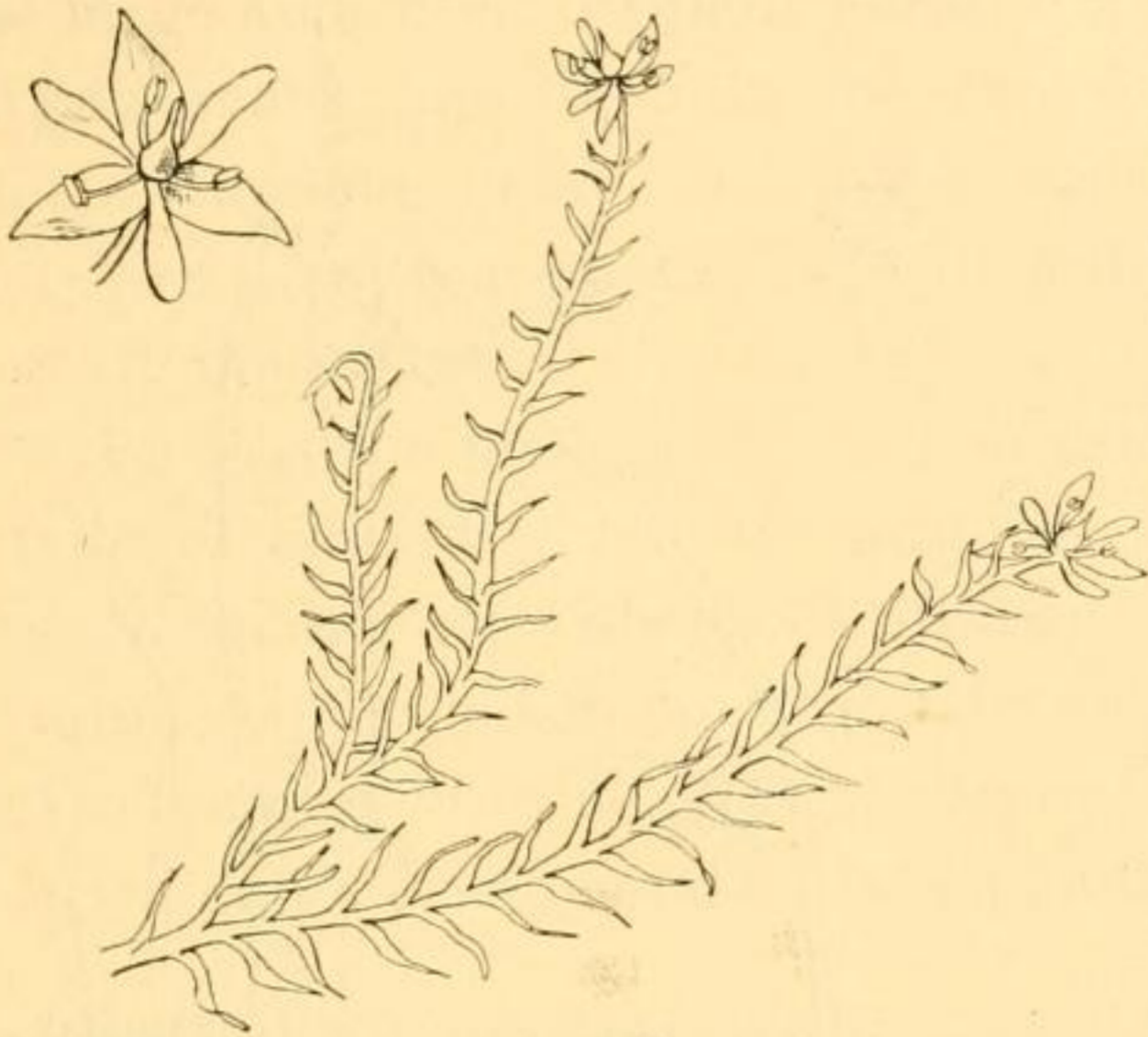


FIG. 36.—*Mayaca* (*Mayaca Michauxii*) showing plant of natural size, and enlarged flower. Original.

spike composed of brownish scales or bracts, from the axils of which appear a few small, evanescent, bright yellow flowers. The structure of the sepals and pistal is most beautiful, but very complicated, and it can be studied advantageously only by a botanist. The stems are frequently twisted like a corkscrew, whence one of the species is called *Xyris torta*. The genus is scarcely represented in the northern states, but numerous species are scat-

tered over the southern pine barrens.

Family Eriocaulonaceae. Pipewort Family. Six genera and about 350 species, widely distributed in tropical regions, and particularly abundant in South America. Three genera reach the Southern United States, and one species of *Eriocaulon* extends even to Newfoundland. The plants grow in bogs or shallow water, and farther South usually in moist pine barrens; they are scapose, with basal grass-like leaves, and long-peduncled globose heads of very small white or greenish flowers. The perianth is in two series, forming a distinct calyx and corolla, as may be seen in the enlarged flower in Figure 38. The family possesses no economic and little ornamental value.

Family Rapateaceae. Rapatea Family. A single genus, *Rapatea*, with about 20 South American species. They are rush-like herbs, and were formerly classed with the true rushes (*Juncaceae*) but differ materially in certain structural characters.

Family Bromeliaceae. Pineapple Family. Everyone who has visited the southern states has noticed and admired the graceful southern moss, long moss or gray moss, as it is variously called. In Florida, too, a pineapple plantation is not an uncommon sight; and yet who would connect these two plants in any way if they had not chanced to observe the similarity of floral structure?

There is much more diversity of habit among the Bromeliaceae

than in the other families belonging to the same order. They are either epiphytes, that is, growing attached to other plants, or terrestrial; the examples just cited, of the long moss and the pineapple, illustrate both classes. In this connection the distinction between an epiphyte and a parasite should be carefully noted. An epiphyte attaches itself to another plant, usually a tree or shrub, but derives no nourishment from the tissues of its host. Such plants can be successfully grown in greenhouses upon pieces of wood, as is the case



FIG. 38.—Pipewort (*Eriocaulon septangulare*). Showing enlarged flower and whole plant, natural size. Original.

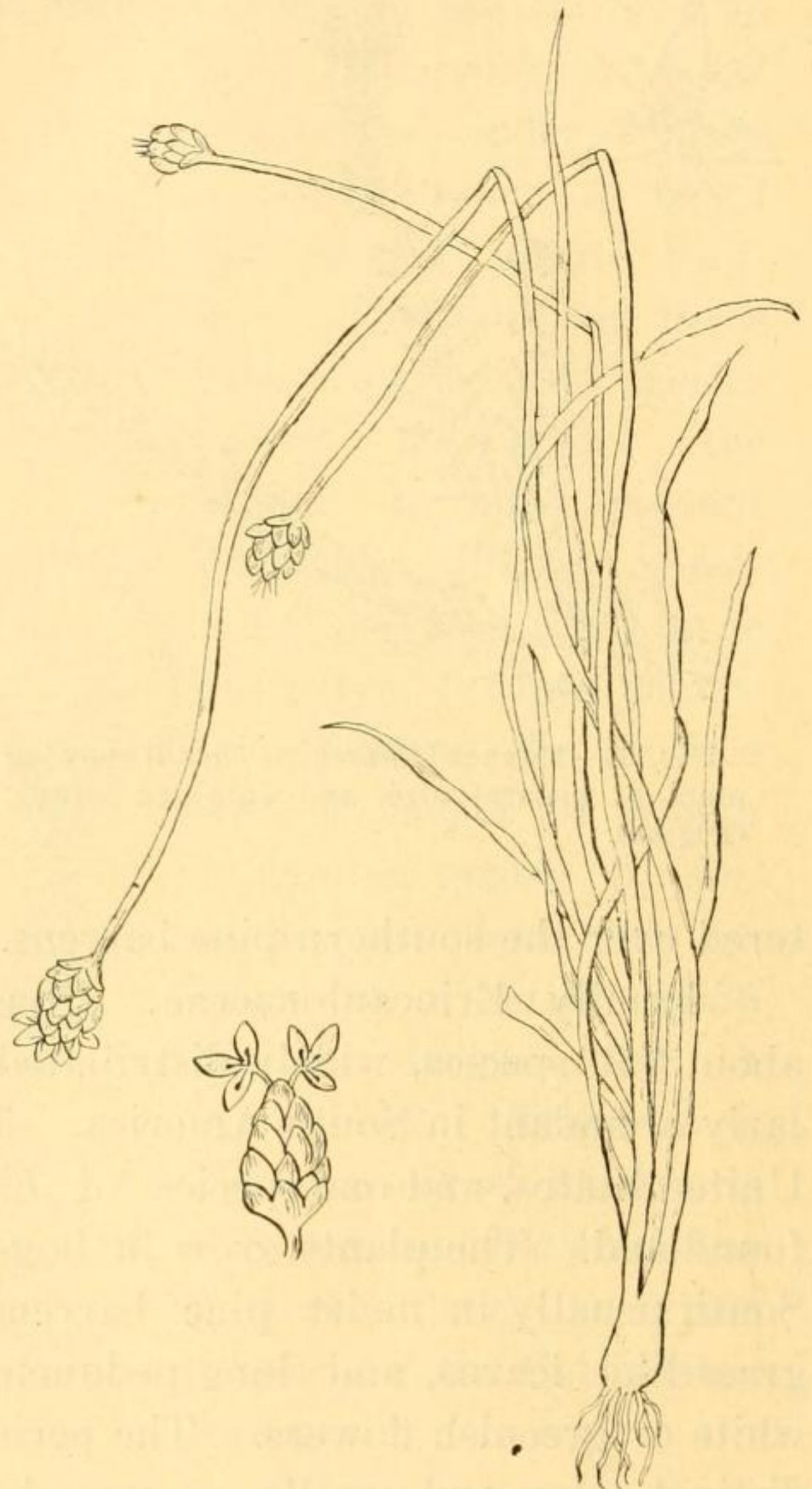


FIG. 37.—Yellow-eyed grass (*Xyris torta*). Showing portion of plant and enlarged flower. Original.

with many of our showiest orchids. A parasite, on the other hand, derives its sustenance either wholly or in part from the host to which it is attached.

The Bromeliaceae contain about 35 genera and 900 species, entirely of tropical or subtropical distribution. They have fleshy, often scurfy leaves, and flowers for the most part in dense spikes or panicles. The calyx and corolla are distinct, often

of showy colors, and the inflorescence is rendered more conspicuous by the large and often brilliant floral bracts. *Tillandsia* is by far the largest genus, and the only one represented in the United States, although the long moss (*Tillandsia usneoides*) is sometimes considered, and with good reason, the type of a distinct genus. All the *Tillandsias* are epiphytic.

Besides the pineapple (*Ananas Ananas*) which is important as an article of diet, this family supplies several important fibre plants. Travellers to Porto Rico will probably observe the pinguin (*Bromelia Pinguin*) which is commonly used as a hedge plant, and yields a juice locally employed in medicine. Many other genera are in greenhouse cultivation as ornamental foliage plants.

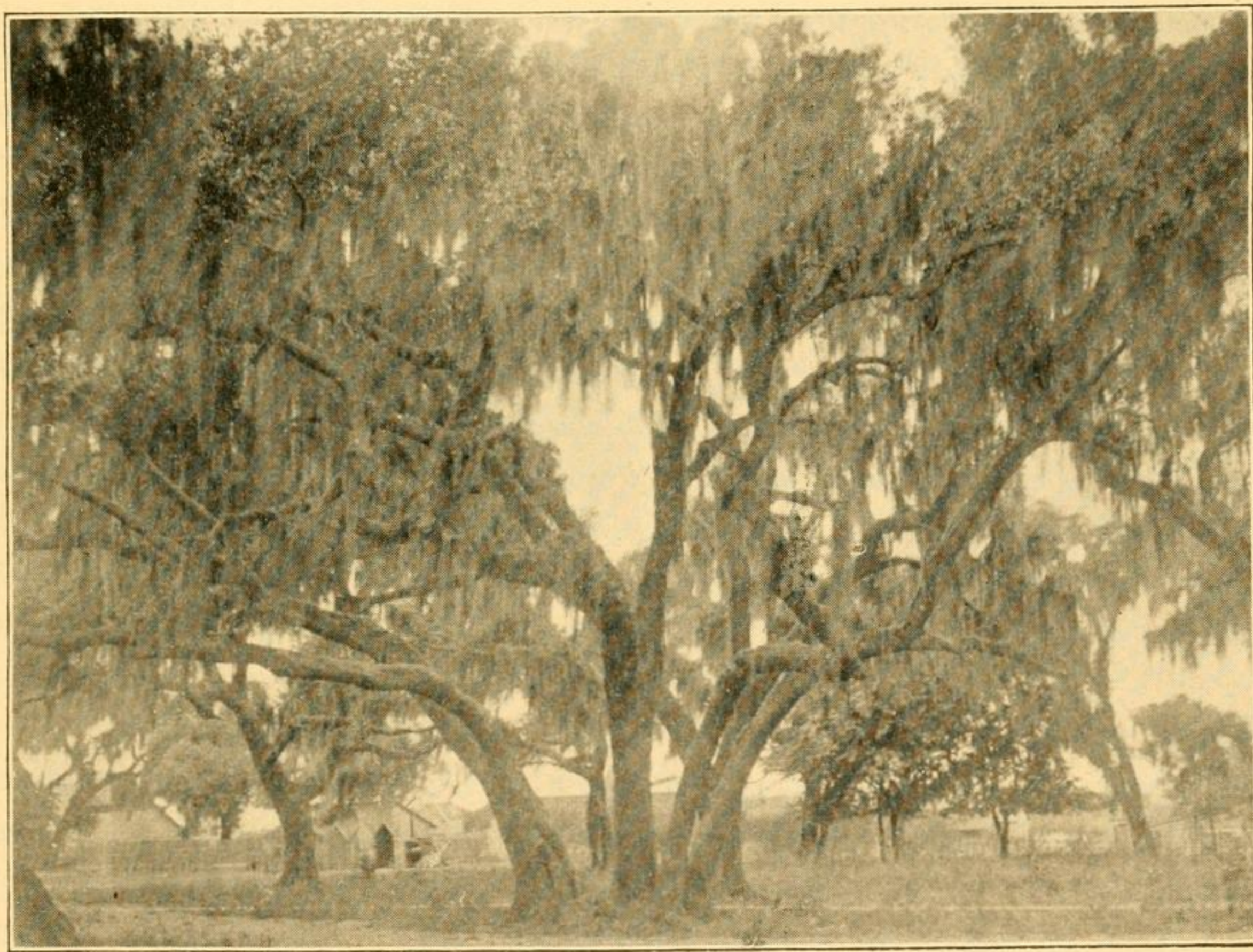


FIG. 39.—Spanish moss (*Tillandsia usneoides*) growing on live oak at Tampa, Florida. After photograph by Mr. G. N. Collins.