

20. W. S. Hubbard, *J. Ind. Eng. Chem.*, 9, p. 520 (1917).
21. *Ibid.*
22. Mossler, *Pharm. Post*, 46 (1917), p. 313.
23. U. S. Pharmacopoeia, IX (1916), p. 37.
- 24, 25, 26, 27. Westman and Rowat, *J. Am. Chem. Soc.*, March, pp. 559, 560, 561 (1918).

THE LABORATORIES OF THE
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THE RECOGNITION AT SIGHT OF POISONOUS AND MEDICINAL PROPERTIES IN UNKNOWN PLANTS.*

BY H. H. RUSBY, M.D.

The following paper is based on three simple facts:

1. There are certain groups of plants whose members are so uniform in medicinal or poisonous properties, or both, that the mere recognition of a plant as belonging to one of them is sufficient to indicate its general medicinal usefulness or its dangerous nature.
2. Associated with these physiological relationships are genetic relationships which are clearly indicated by the structural characteristics.
3. These structural characteristics are so manifest that the physician or pharmacist who possesses a fair practical knowledge of structural botany can at once recognize them, and thus be enabled, in cases of emergency, to utilize the plant medicinally or to avoid it if poisonous, in the absence of other knowledge concerning it.

Centuries ago, before the relationships among plants were understood, and when there was a complete absence of knowledge concerning the nature of medicinal action, mankind believed in divine revelation regarding medicinal treatment, which was supposed to be afforded only to the priesthood, who based thereon their claims to service as physicians. Later, a belief developed that this revelation had been made to all mankind, through the impression upon each medicinal plant of some visible sign of the nature of its medicinal action. This idea persists to some extent to the present day. One of my earliest recollections was that of being taken out by a neighbor, descendant of an old family of Dutch settlers, who explained to me the theory of signatures. "You will find," said he, "if you hunt close enough, that every plant has a sign somewhere that shows what part of the body it is good for." We pharmacists see this belief perpetuated in the common names of many of our drugs, as the blood root, the liver leaf, Solomon's seal, golden seal, lungwort moss, snake root and Devil's bit.

There have been various other so-called methods by which one was supposed to be able to judge the physiological properties of plants. A quarter of a century ago, a story went the rounds of the public press to the effect that the peculiar lurid-purple color that we observe upon the stem of the castor-oil plant, the pokeberry and the angelica, was always indicative of medicinal or poisonous properties, or both. I remember another to the effect that finely divided leaves, as seen

* A lecture, illustrated by lantern slides, before the Chicago Convention, A. Ph. A., 1918. Contributed to Scientific Section.

in conium and ragweed, possessed the same significance. Probably all here present are familiar with the story that has several times circulated in American newspapers, and doubtless will do so again, that poisonous fungi can always be known by their turning a silver spoon black when used for stirring them in cooking.

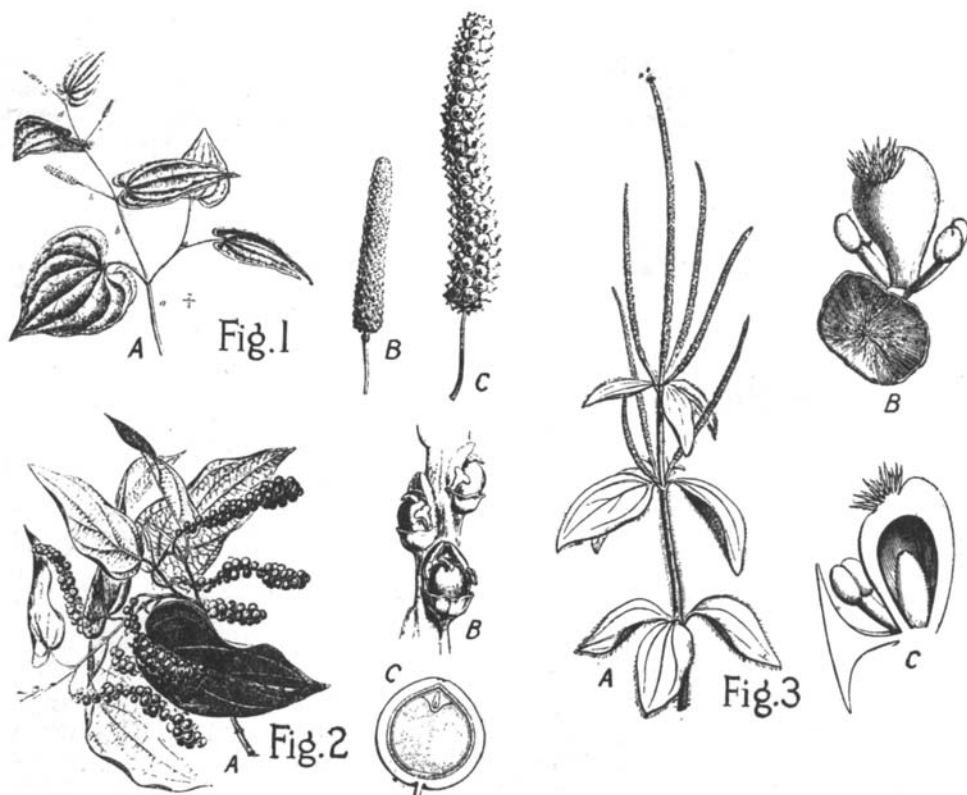
Science has taught all who are willing to learn that there are no such easy roads to reliable knowledge regarding plant properties. Judgment in this direction must depend upon accurate detailed information, studiously acquired. Nevertheless, it is possible for us, through the assembling and comparison of a great number of data, to reach certain generalizations that may be of value in cases of emergency.

It is my belief, based on many years of personal experience, that attention to the following illustrations, with their accompanying description, may be of great service to those who may find themselves separated from their base of supplies and dependent for drugs upon their utilization of the resources of the fields and forests about them.

A good illustration of my subject is found in

THE PIPERACEAE OR PEPPER FAMILY.

This small family, comprising only some eight or ten genera, even if we include the Lizard-Tail Family or *Saururaceae*, is exceedingly uniform in its aromatic



Piperaceae.—The characters of this family are so uniform that any of its members can be recognized through reference to these illustrations. Fig. 1 illustrates *Piper longum* and *P. nigrum*; Fig. 2, *P. nigrum*; Fig. 3, *Peperomia*.

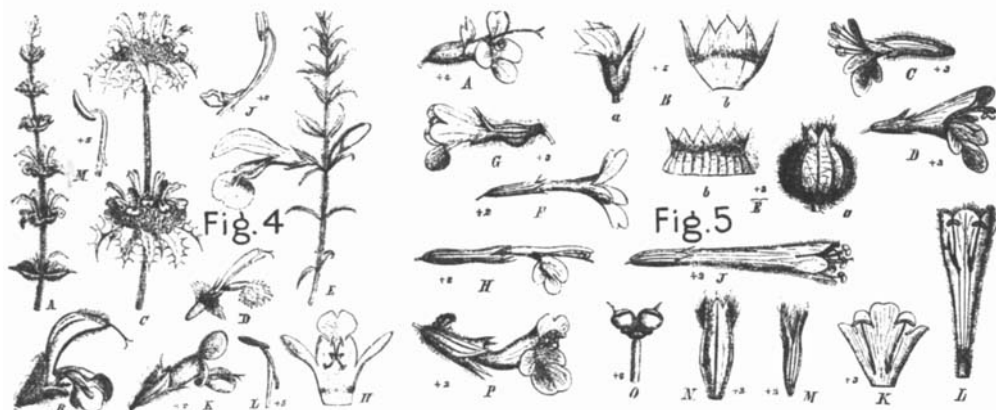
and pungent properties. We are all familiar with the properties and uses of Pepper, Cubeb and Matico, and these are shared by something like a thousand other species of the family, which are natives of the Old and New World tropics. In the pepper genus alone there are some five or six hundred species and, so far as my experience goes, they are practically all more or less pungent and disinfectant in their nature, and highly stimulant to the natural bodily functions. I have seen a great many of them confidently used in native practice in the treatment of serious disorders, and in some cases, a number of species would be used indiscriminately. In one extensive region I found an endemic disease called *espondia*, resembling some forms of cancer in its nature, symptoms and course, and regarded as almost invariably fatal to the natives attacked by it. Two of these natives, whom I had unsuccessfully treated with sulphuric acid charcoal paste, were afterwards completely cured by their fellow Indians through the continuous application, during several days and nights, of heated leaves of a species of *Piper*. The attendants worked in relays, the exhausted leaves being removed and fresh, hot ones applied at intervals of a few minutes.

The characters of these plants as indicated in the accompanying picture are unmistakable.

The members of a number of families are essentially aromatic, yielding volatile oils on distillation. While there are important differences in the action of different individuals of the same family, there is at the same time sufficient uniformity to enable the physician to use them almost indiscriminately for some purposes. It is therefore of considerable importance that the family characters of the aromatic plants should be readily recognized.

THE LABIATAE OR MINT FAMILY.

The members of this family are, almost without exception, good carminatives and intestinal disinfectants, as typified in the mints, thymes, marjorams and pennyroyals. Although poisonous effects may be obtained from excessive amounts of the volatile oils, the plants themselves must be considered as non-poisonous.

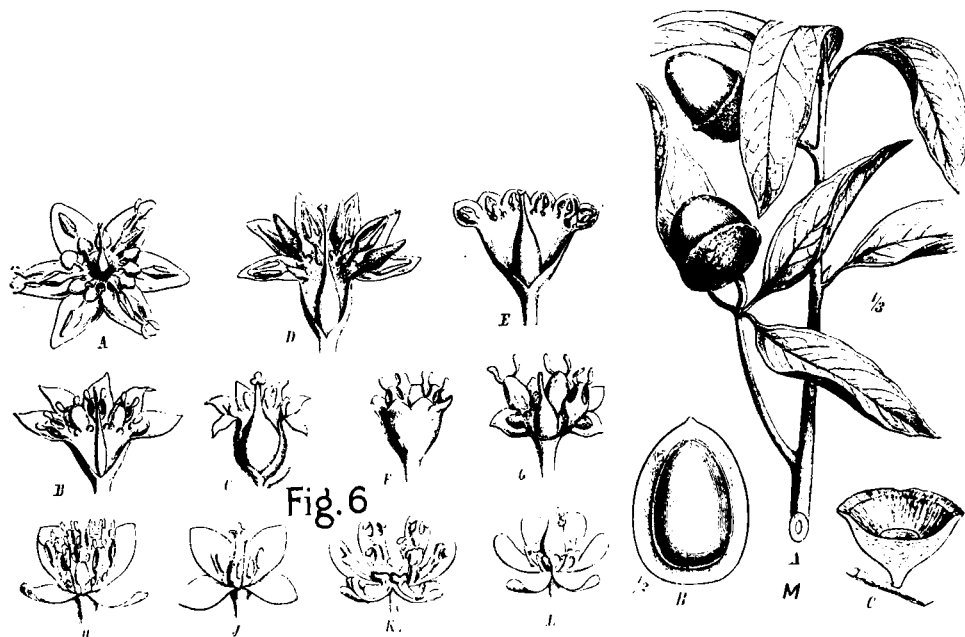


Labiatae.—Fig. 4, species of *Salvia*, well displaying the habit of leaves and inflorescence, as well as the bilabiate calyx and corolla. Fig. 5 shows variations in form of calyx and corolla, and good illustrations of diandrous and didynamous androecia. A and B show *Thymus*; C, *Hyssopus*; D, F, G and J, *Satureia*; E, *Saccocalyx*; H, K and L, *Hedroma*; M, *Pogogyne*; N, *Thymra*; O, *Dicerandra*; P, *Melissa*.

These plants are very easily recognized by their square stems, opposite, oilbearing leaves without stipules, usually bi-labiate calyx and corolla, diandrous or didynamous androecium and 2-carpelled ovary which divides in the fruit stage into four small nutlets. Members of this family are found in nearly all parts of the world and one could, with certain safety and efficiency, employ almost any plant possessing the foregoing characters for the effects mentioned.

THE LAURACEAE OR LAUREL FAMILY.

In this family, as typified by camphor, cinnamon, coto and sassafrass, we have still more powerful intestinal stimulants and disinfectants and these properties are even more uniform throughout the family than in the Labiatae. The natives of many tropical regions rely upon one or another of them in the treatment of the most severe intestinal disorders. The extracted active principles may be more actively poisonous than those of the former family, yet the drugs themselves are equally harmless, and one may resort to the use of any of their barks, the portion usually most active, without fear of harmful results, or doubt as to their medicinal value.

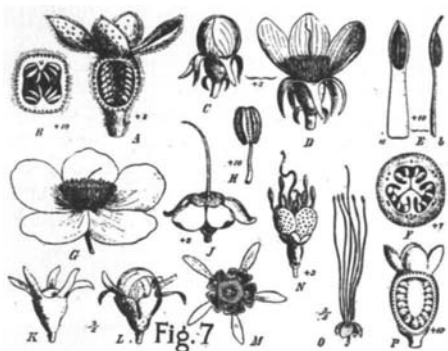


Lauraceae.—Fig. 6, typical flowers, showing the regular 6-parted perigone, with several sets of stamens, some of them imperfect, the 4 locellae of the anthers embedded in a large fleshy connective and the valvular dehiscence. A represents *Bailethymia*; B and C, *Ampelodaphne*. D, *Cryptocarya*; E, *Alouia*; F and G, *Acroclonium*; T and J, *Laurus*; K and L, *Lindera*; M, the leaves and fruit of *Nectandra*, well characterizing those of the family.

Lauraceous plants are rather rare in temperate and arid regions, but in most tropical forests they occupy about the same position as to abundance as do the oaks in our own forests, while the variety is vastly greater. A botanist who is familiar with the family is never at a loss to recognize one of them by their leaf-characters alone, although these characters can scarcely be described in words. By their flowers, however, as well as by their fruits, they are easily recognized. Their flowers are 3-nerous, with the ovary superior, there being two, three or four sets of stamens, one or more of the sets usually sterile, and the anthers almost always divided into four locellae, with valvular dehiscence, the upper pair of locellae smaller, and all four immersed in a fleshy, flattened connective. Whenever these characters are clearly seen, identity may be regarded as established. Nearly everyone knows the character of the Sassafras fruit, with a peculiar, more or less fleshy cup at the base. This is the fruit form that characterizes the family as a whole.

Still more easy of recognition are the third and fourth members of this group of aromatic medicinal families, namely the *Myrtaceae* and *Umbelliferae*.

THE MYRTACEAE OR MYRTLE FAMILY.



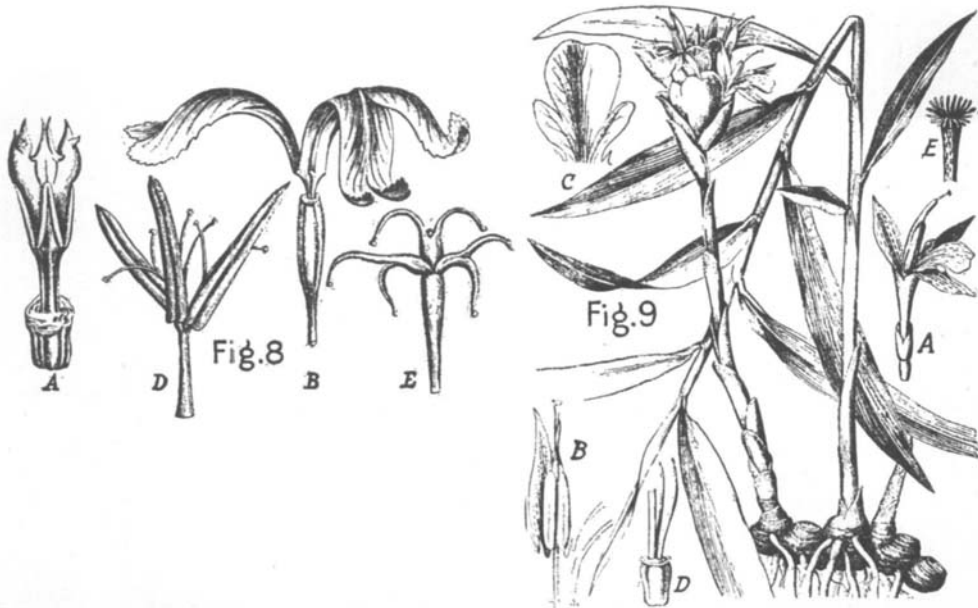
Myrtaceae.—Fig. 7 illustrates the opposite estipulate leaves, the 4- or 5-merous flowers, adherent calyx and numerous stamens borne on its margin. The leaves are pellucid-dotted. A to C represent *Blepharocalyx*; D to H, *Pimenta*; J to M, *Mitranthes*.

The properties of this family are well and commonly made known through cloves, allspice, eucalyptus, cajuput and myrtle. Many of them are relatively weak in activity but pretty nearly all have oil-bearing leaves, and properties similar to those of the families already discussed. The plants are in practically all cases shrubs and trees. Their leaves are opposite and destitute of stipules, and bear pellucid dots indicating the oil glands. The flowers are almost without exception regular and are usually 4-merous. The ovary is inferior and the petals and numerous stamens are borne on the margin of the adherent calyx tube. Recognition is almost infallible.

THE ZINGIBERACEAE OR GINGER FAMILY.

This family of monocotyledons may be included among the useful carminatives and intestinal stimulants, and usually possesses in addition agreeable flavoring properties, as observed in ginger, turmeric, zedoary and cardamom.

Its members are free from poisonous properties as ordinarily used, so that one is quite safe in resorting to the use of one of them, if quite sure of its family. There is here, however, some danger of confusion with the related Iris family and it is necessary to be closely discriminating in selection. It is worthy of note that the ginger family is not represented in temperate regions, while plants of the Iris family, although not uncommon in the tropics, are more particularly char-



Iridaceae and Zingiberaceae.—Fig. 8 illustrates *Iris* with its three regular and perfect stamens. Fig. 9 illustrates *Zingiber*, with only one of its anthers perfect, the others being petaloid.

acteristic of temperate and sub-tropical regions. The flowers of the ginger family are irregular and usually possess six stamens, but anywhere from one to five of these are destitute of anthers.

THE IRIDACEÆ OR IRIS FAMILY.

Although this family is totally different in its physiological action and medicinal uses from the preceding, it is considered here because of a superficial similarity in the appearance of the plants of the two. This similarity need deceive no one, because the Iridaceæ possess regular flowers, with only three stamens, all perfect.

The members of this family are, without exception so far as I know, strongly and usefully purgative, but they are irritant poisons, often violently so, in over doses.

THE UMBELLIFERÆ OR PARSLEY FAMILY.

No family is more readily recognized than this one, notwithstanding that there are wide superficial differences. The most certain marks of identity are the umbellate flowers and fruits and the structure of the latter, consisting of two mericarps attached to a carpophore. Their alternate leaves have sheathing or clasping bases and mostly hollow petioles. These leaves are usually compound, as seen in parsley, carrot, celery and conium.

Unfortunately, we have no sure guide to the properties. The great majority of the members are innocuous, yet not a few, like conium and cicuta, are intensely poisonous. Some of the poisonous ones possess pleasant aromas, which have led to the occurrence of fatal accidents. On the whole, it can hardly be regarded as a safe procedure to employ these plants for their carminative properties, unless their individual identity and innocence have been established.

THE CONVULVULACEÆ OR MORNING GLORY FAMILY.

Reference should be made, in passing, to the properties of the plants of this well-known family. They are quite uniformly purgative, usually in all parts of the plants. The sweet potato and several others are peculiar exceptions.

THE MAGNOLIACEÆ OR MAGNOLIA FAMILY.

This is another aromatic family, but one which combines bitter qualities with the aroma and whose plants, almost without exception, are excellently useful as aromatic bitters and stomachics and, properly used, valuable antiscorbutics. In their physiological and medicinal properties, as seen in *Magnolia*, *Liriodendron* and *Drimys* barks, they are closer to the Laurel family than to any of the others previously discussed. One is quite safe in resorting to the use of these barks and very certain to secure the aromatic bitter effects referred to.

The family consists of shrubs or trees, with alternate, simple and mostly entire leaves, with or without stipules and aromatic in all their parts. They have numerous distinct stamens and distinct sepals and petals, and their numerous pistils are either distinct or immersed in an elongated fleshy torus.

THE ARISTOLOCHIACEÆ OR SNAKE-ROOT FAMILY.

Passing reference may be made to this interesting and uniformly aromatic-bitter family, the members of which cannot be mistaken, if one sees either their flowers or their fruit. The experienced botanist will identify them with equal readiness upon merely seeing a leafy stem. Their use must be resorted to with caution, because some of them are rather strongly irritant poisonous.

THE RUTACEÆ OR RUE FAMILY.



Fig. 11

Rutaceæ.—Fig. 10, *Chloroxylon*, well illustrates the habits of these plants, with their pinnate leaves, though often having only three, or even a single leaflet, while Fig. 11 well illustrates the flower-forms which, although greatly varied, always present the same basic characters. The same forms characterize the *Simarubaceæ*, except that its carpels are 1-ovuled.

This is another family which combines aromatic and bitter properties and which is in nearly all cases medicinal. Unfortunately its recognition is of but little practical value, partly because the medicinal properties are widely diversified, with no external indications of their nature, and partly because the plants are in most cases more or less poisonous, while in others little or not at all so.

The leaves are alternate and estipulate and usually compound. When held against the light they show pellucid dots, as is so well known in rue, buchu, jaborandi and orange leaves. The flowers are 4- or 5-merous and the carpels are separate or united only at the base or, at the most, so united as to result in a lobed fruit. The cells of the ovary are almost invariably 2-ovuled.

A number of families are uniform in their possession of bitter properties, without any considerable associated aroma, and are commonly used as simple bitters.

In this connection, the following may be noted:

THE SIMARUBACEÆ OR QUASSIA FAMILY.

Although quassin and some other principles extracted from the plants of this family are poisonous, the plants themselves are scarcely so, notwithstanding that there are records of mild poisoning, in the form of chronic gastritis, resulting from their continuous use, as from drinking water permeated by extracted matters from the *Ailanthus*. Almost without exception, these plants may be usefully employed as simple bitters.

They are very easy of recognition, possessing all the characters of the *Rutaceæ*, except that there is but one ovule in each carpel and the leaves have no pellucid dots.

THE MELIACEÆ OR AZEDARACH FAMILY.

In connection with the *Rutaceæ* and *Simarubaceæ*, brief reference should be made to the Azedarach family. Nearly all of its plants possess nauseating expectorant or even emetic properties similar to those of ipecac, as seen in Azedarach and Cocillana barks, and in Naregamia.

The plants have a very similar habit to that of the *Simarubaceæ*, having alternate compound leaves without pellucid dots. The general flower-structure



Meliaceæ.—The habit of these plants is much the same as that of the *Rutaceæ* and *Simarubaceæ*, but the filaments form a cup, with the anthers at its margin.

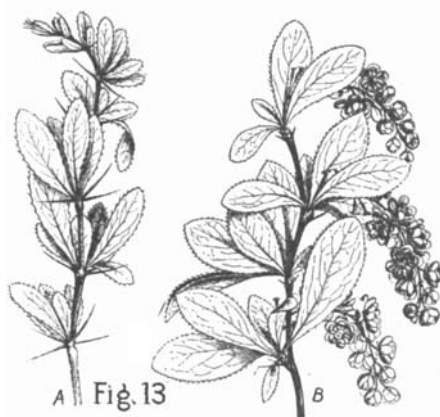
is similar, but the filaments form a cup, with the anthers borne at or near its summit.

BERBERIS AND ITS ALLIES.

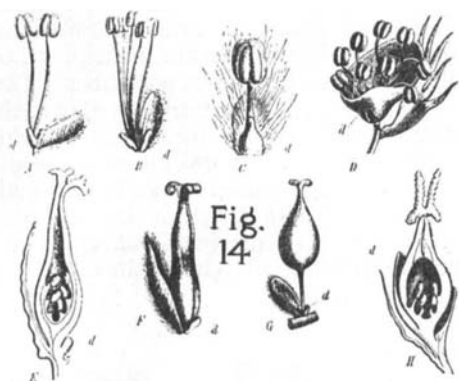
The properties of this entire group are typified in those of the species of *Berberis* which have been employed so generally in medicine, and are due to the constituent berberine. There is not the slightest difficulty in recognizing them on the part of one who has become familiar with any species of the genus.

THE SALICACEÆ OR WILLOW FAMILY.

This remarkably uniform and important family may well be included among those distinguished for bitterness, although, in addition, it has highly important anti-rheumatic and anti-periodic properties, due to itsalicin and populin, and astringent properties due to its rather large percentage of tannin. These properties are shared by every member of the family, so far as known.



Berberis vulgaris; the members of this genus present so similar an appearance that familiarity with one will lead to the recognition of all.



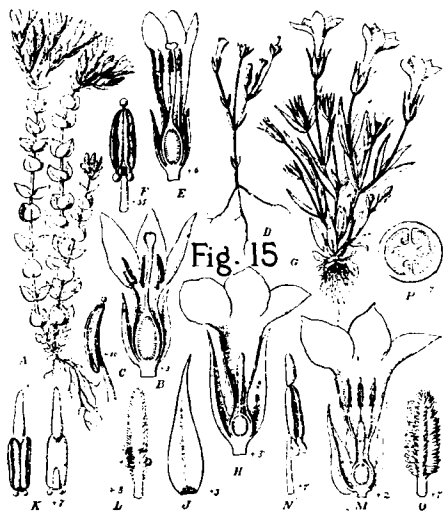
Salicaceae.—A, B, C, E, F and G illustrate the flowers, with their entire scale, of *Salix*. D and H show those of *Populus*, the scale being fimbriate.

The recognition of these plants, always shrubs or trees, is infallible and general, practically everyone being acquainted with the inflorescence of one or more species of willow and poplar, the only two genera of the family. It is true that in far northern regions the inflorescence is sometimes reduced to but one or two flowers, but the characters of these render them unmistakable. The inflorescence scales of the willows are entire, those of the poplars lacerate. It is very interesting to note that the willow furnishes the trees growing nearest to the north pole and also the most northern shrubs, after the limit of tree growth has been passed. In high northern regions, these shrubs are prostrate, covering the surface of the ground with

their branches, often only an inch or two in length.

THE GENTIANACEÆ OR GENTIAN FAMILY.

This family perhaps surpasses all others in the vegetable kingdom in the uniformity of its medicinal properties, as typified in Gentian, Chirata, Erythraea, Sabbatia and Menyanthes. Although these properties are of the simplest possible nature, those of the simple bitters, promoting the appetite and digestion and generally exciting healthy functional activities, they are of much importance in both scientific and domestic medicine. Inasmuch as these plants are most widely distributed through both sub-tropical and temperate regions, so that one can scarcely fail to find one or more of them in almost any region where he may be, and since such plants are almost invariably uniform in the possession of this property, and are equally uniform in being free from toxicity, it becomes of the greatest value to be able to recognize their family relationship at sight. I do not remember to have



Gentianaceae.—Here we see the same opposite leaves without stipules, and the tubular corollas with adherent stamens which characterize the other families of the order *Gentianales*, but here we have a one-celled though two-carpelled pistil. A to C represent *Sebaea*; D to F, *Lagenias*; G to P, *Belmontia*.

or less toxic, but in the ordinary sense of the term, the plants are not poisonous. They are, however, highly medicinal. The number which are effectively employed in native and domestic practice and which are practically unknown in professional medicine, is large. Were all other vegetable drugs to be lost and the world forced to depend upon this family, the variety and value of its drugs would undoubtedly cause surprise in scientific circles. It is not too much to say that recognition of a plant as belonging to this family justifies a presumption of its medicinal activity. Unfortunately, we cannot so judge of the nature of those activities, since they are of a very diverse character.

No other family of plants is more easy of recognition. Its adherent calyx and tubular corolla are shared by a number of others, but a glance at its opposite leaves *with stipules* suffices for identification. These stipules constitute one of the great features of interest in the family, forming its chief field of variation and specialization, and the classification of its genera can be based largely upon them.

The only families, the distinction of whose members from those of the *Rubiaceae* is difficult, and this only on superficial observation, are the *Verbenaceae* and *Apocynaceae*, both of which possess opposite leaves, often closely resembling those of the *Rubiaceae*, but never having stipules.

The plants of the *Verbenaceae* are non-poisonous, so that a mistake would

ever visited any such region where I could not have supplied myself with a good simple bitter derived from this family, had the necessity arisen.

These plants have opposite estipulate leaves, tubular corollas and adherent stamens, as do those of the other families of this order, the *Gentianales*, several of which are to be considered later. The ovary, however, is always one-celled, and the placentae are parietal. They are devoid of milky juice and have a bitter taste. There is, moreover, no stigmatic ring, as in the *Apocynaceae*.

THE RUBIACEAE OR MADDER FAMILY.

This great family, of nearly four hundred genera, and five thousand species, rich in dyestuffs, may be regarded as pre-eminent in the vegetable kingdom in the production of alkaloids, its only rival in this direction being the poppy family. Unlike the latter, it is almost free from poisonous properties. It is true that such drugs as cinchona, coffee and ipecac contain principles more



Rubiaceae.—Fig. 16 illustrates the flowers and fruits. The calyx is completely adherent to the ovary, the corollas are tubular and the filaments are adherent to it. The fruits are dicarpellary. A to E, *Chimarrhis*; F and G, *Rustia*; H, *Condaminea*; J to L, *Tresanthera*; M to O, *Pinckneya*; P, *Pogonpus*.

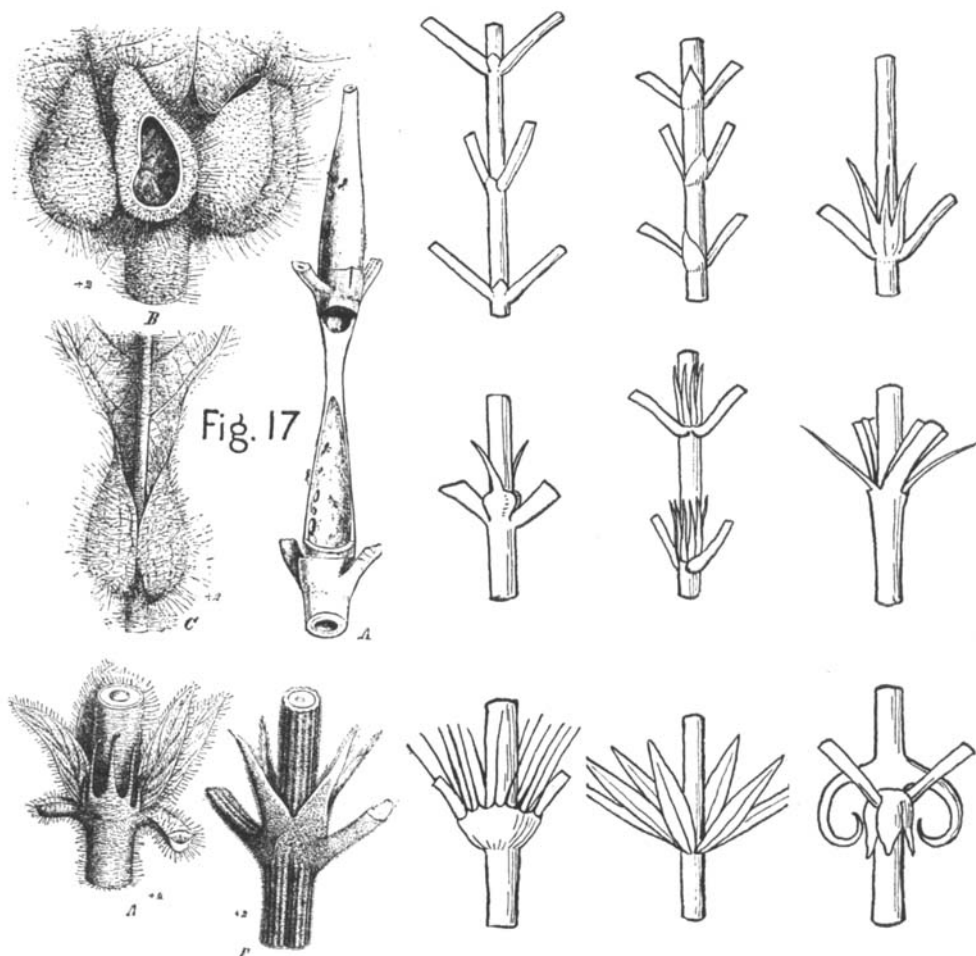


Fig. 17 illustrates a variety of stipules pertaining to the family *Rubiaceae*.

not be serious. Their medicinal importance is slight, merely because they have been little used in scientific medicine. They are by no means devoid of medicinal properties, even the humble vervain being entitled to a distinct position in the *materia medica*.

THE APOCYNACEAE OR DOGBANE FAMILY.

Hardly any other family of plants is of greater interest in my discussion than this one, from the standpoint of medicine as well as of toxicology. With the poisonous properties of *Strophanthus*, *Apocynum*, *Holarrhena*, *Kicksia*, *Oleander* and *Geissospermum* most of us are familiar, but those of *Landolphia*, *Allamanda*, *Plumiera*, *Vinca*, *Rauwolfia*, *Voucanga*, *Malouetia* and *Echites*, as well as the arrow poisons *Carissa*, *Akokanthera*, *Cerbera*, *Thevetia* and *Wrightia*, are not so generally known.

With few exceptions, the other members of the family, which are very numerous, share in these poisonous properties. These plants are exceedingly abundant and generally distributed throughout the tropical forests of both the Old and New World, so that it becomes a matter of first importance that one thrown upon his own resources should be able to recognize them at sight. This is no less important from the medical point of view, since they are with equal regularity

medicinally active as circulatory stimulants. It would be a somewhat difficult matter to find any extensive locality in the South American forests where one would be unable to find, within an hour's search, some member of this family, which he could safely and effectively employ in this way.



Apocynaceae Stigmas.—A illustrates *Landolphia*, showing the general habit, opposite stipulate leaves and tubular flowers. B illustrates *Strophanthus*, showing the tubular corolla, with adherent stamens, the anthers adhering to the stigmatic ring. C illustrates various forms of the stigmatic ring.

Aside from other characters, the members of this family are distinguished from all others by the character of the pistil. While its two ovaries are separate, and form separate fruits, its styles above the ovaries are united and possess near the summit a peculiar ring or band surrounding the style just below the stigma, to which the anthers are attached. This character, taken in connection with the opposite, stipulate leaves, milky juice and tubular flowers, renders recognition instantaneous and infallible.



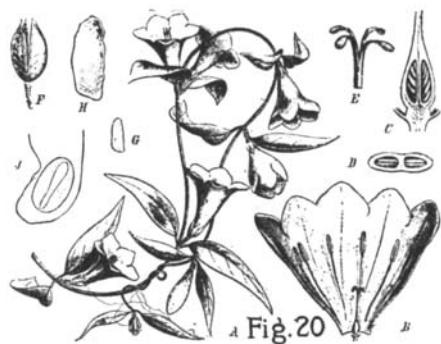
Verbenaceae.—*Tecoma* is typical. It shows the opposite stipulate leaves and tubular flowers, as in *Apocynaceae*, but there is no similarity whatever in the pistil.

Through gross carelessness, one might mistake a member of the closely related milkweed family, *Asclepiadaceae*, for this one. It also has opposite stipulate leaves, a milky juice and tubular flowers. There are peculiarities in the leaf-characters which will enable experienced botanists to tell the one from the other, although the method of doing so could not be characterized in words. The flowers, however, are quite different, being devoid of the united styles with stigmatic ring and having the pollen grains coherent in pollinia or pollinaria.

This family is destitute of the heart-stimulant properties of the *Apocynaceae* and their medicinal value is not great.

THE LOGANIACEAE OR NUX VOMICA FAMILY.

Closely related to the *Apocynaceae* stands the pre-eminently poisonous family, *Loganiaceae*, known in medicine by *Gelsemium*, *Strychnos* and *Spigelia*. The plants of the two families bear a striking superficial resemblance, but those of the *Loganiaceae* have no milky juice and possess a single two-celled ovary instead of the two distinct ovaries of the *Apocynaceae*, and are wanting in the stigmatic ring. This is a small family and its plants are almost uniformly violently poisonous. On various occasions, on encountering unknown members of this family in the tropics, I have inquired of the natives as to their properties and have never yet failed, if the natives possessed any knowledge concerning them, to be informed that they were poisonous. Aside from its important uses in medicine, this family yields largely of materials used in arrow poisons. *Potalia* is much like *Strychnos* in its action. In Mexico and in the South American Andes, I have found many species of *Buddleia* credited with dangerously poisonous properties. It is unfortunate that, although these plants are almost always medicinal, we are unable to generalize as to the nature of the medicinal properties.

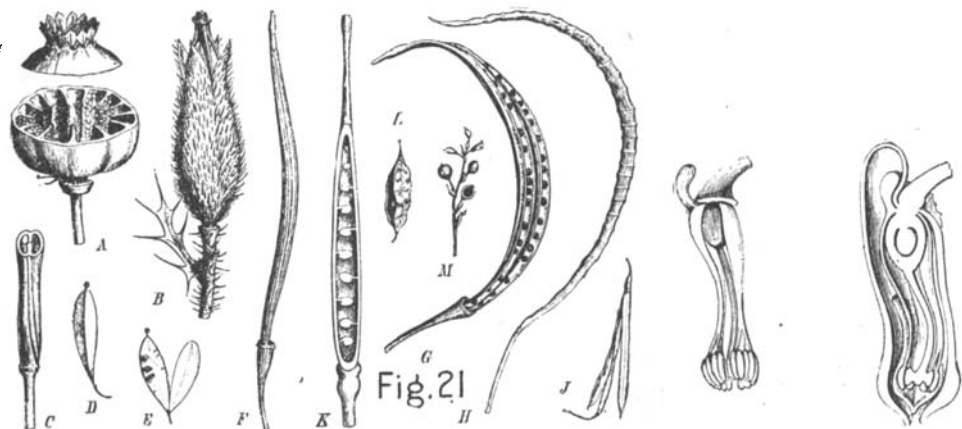


Loganiaceae.—*Gelsemium* well displays the opposite estipulate leaves and tubular corollas, with adherent stamens, as in *Apocynaceae*, but there is a single ovary and there is no stigmatic ring.

THE PAPAVERACEAE OR POPPY FAMILY.

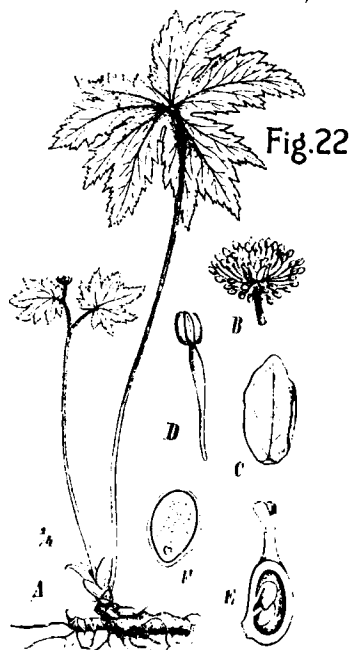
The members of this family are almost invariably alkaloidal in their composition and their alkaloids, in most cases, agree in being locally irritant and systemically narcotic, and more or less strongly poisonous. Practically every one which has been physiologically investigated has been found active, and most of them medicinally useful. Unfortunately, these medicinal properties are not sufficiently uniform to allow of generalization, but it may be said that any member of the family is worthy of chemical and medical investigation.

To one not familiar with the genera of this family, the fruit characters offer the best means of recognition. These fruits are for the most part similar to those



Papaveraceae.—Illustrates the fruits. A, that of the Poppy, is an exception; B, *Argemone*; C, *Glaucium*; D and E, *Macleaya*; F and G, *Eschscholtzia*; H, *Hypocoum*; J and K, *Corydalis*; L, *Adlumia*; M, *Fumaria*. The blood-root pod is similar to that of *Eschscholtzia*. The two pictures at the right show the spurred flowers of the *Adlumia* branch of the family.

of the bloodroot. One of my most interesting experiences in field work was in connection with a member of this family, a species of *Bocconia*. Riding my mule along a mountain trail, a pendant cluster of fruits brushed across my face. Instantly, by force of habit, I caught at it and secured a specimen. On examining it, I was struck by its close similarity to that of our common bloodroot. Dismounting, I turned back and found that it was borne upon a small tree, the bark of which exuded a thick, blood-red juice when punctured. A quantity of the bark was collected and at my first stopping place was tested. It presented undoubted evidence of containing several alkaloids. Inquiring among natives of the neighboring village, I was informed that the leaves yielded an important domestic medicine, and that its name was "Hamakari." Among the other curious things which were told me was that infants dangerously ill with fever were wrapped in the large poppy-like leaves, after strongly heating the latter at the fire. If the leaves turned black after being for some time against the skin of the infant, the indications were favorable; otherwise a fatal result might be expected. I presume that this conclusion rested upon the fact that if the infant perspired, the perspiration would cause color reactions, turning the leaves black.



Ranunculaceae.—Fig. 22 illustrates *Hydrastis*, with all parts of the flower free and distinct.

THE RANUNCULACEAE OR BUTTERCUP FAMILY.

The members of this family almost invariably contain juices which act as local irritants, and this property is in many cases found to reside in specific chemical principles such as we find in *Aconite*, *Larkspur* and *Hydrastis*. As irritants alone, these plants possess little medicinal value, but it so happens that they are also almost uniformly circulatory depressants. In *Adonis* and one or two others, we find exceptions to the rule, but the latter is sufficiently uniform to enable one thrown upon his own responsibility to rely with considerable confidence upon obtaining results in this direction by the use of a member of this family, even though he had no specific knowledge concerning it.

The family is easily recognized by its alternate, usually lobed or divided leaves, without stipules, but having the base considerably dilated. Its flowers are free and distinct in all of their parts, except for the rarely and partially coherent carpels.

THE LILIACEAE OF LILY FAMILY.

The properties of this family, as is true of the *Ranunculaceae*, are not absolutely uniform, yet they may be regarded as almost the exact counterpart of those of the latter, its members, as seen in *Squill*, *Lily-of-the-valley*, *Garlic*, etc. being almost always circulatory stimulants and powerful promoters of glandular activity.

THE LOBELIACEAE OR LOBELIA FAMILY.

In discussing this family, I desire to state that I wholly exclude from it the closely related family *Campanulaceae*, notwithstanding that many botanical authorities believe in uniting the two.

The *Lobeliaceae*, so far as known, are all powerfully poisonous, their properties being typified in our *Lobelia inflata*. For this reason it is important that they be

recognizable at sight. As poisons, they are intensely irritant and decidedly narcotic. *Isotoma longiflora*, of Cuba and other West Indian islands, has been declared by one distinguished medical botanist to be the most poisonous of all plants. Doubtless this view is incorrect, since I have known the same thing to be said in other tropical regions of various species of *Siphocampylus* and *Centropogon*, their juices so irritant that they are frequently spoken of as being "caustic." There is record of one member of this family being non-poisonous, it being claimed that the New Zealand *Laurentia* is eaten as a pot-herb. I have little doubt that there is some error connected with this report. I should expect to be poisoned were I to eat this plant.

Aside from its toxicological interest, this family, carefully used, is capable of great medicinal utility, the properties being uniformly those of our *Lobelia inflata*.

The more powerfully poisonous division of this family is distinguished by its ascending or centripetal inflorescence, irregular corolla, almost always fissured on the upper or inner side, and its anthers, usually also its filaments, being connate and irregular. Its calyx tube is always adnate. Recognition is easy and certain.

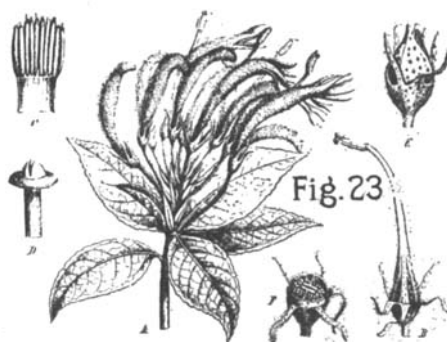
THE LEGUMINOSAE OR BEAN FAMILY.

In this instance, I include all three of the sub-families, now regarded by most botanists, myself included, as being separate families. It is quite useless to attempt to generalize as to the medicinal or poisonous properties of so diversified a group. My only object in referring to them here is to indicate their dangerous character. To those who know only the few and mostly small plants growing wild in our region, the most of them so harmless as to constitute important fodder plants, this statement may seem unwarranted, but those who know of the vast extent and abundance of this family in the tropics, where they largely compose the forest growth, will know that the statement is not an exaggerated one. The seeds of this family, and in many cases the seed-pods and foliage also, are highly albuminous and nutritive and may in emergencies be sought as food, as I have myself sought them and with great advantage. The difficulty is that, as in the case of the calabar bean, the wild lima bean and the locoweed, they often contain subtle and dangerous poisons. It must thus be regarded as an unsafe proceeding to resort to the use of any of them without some specific knowledge of their properties.

These plants are most easily recognized. Like the *Rosaceae*, they have alternate, stipulate leaves, five petals and perignous stamens. They differ from it in having but a single carpel, usually with more than two ovules, but sometimes with only one. Their leaves are usually compound. The botanist who has become at all familiar with the family however, invariably recognizes it at sight without requiring recourse to technical characters.

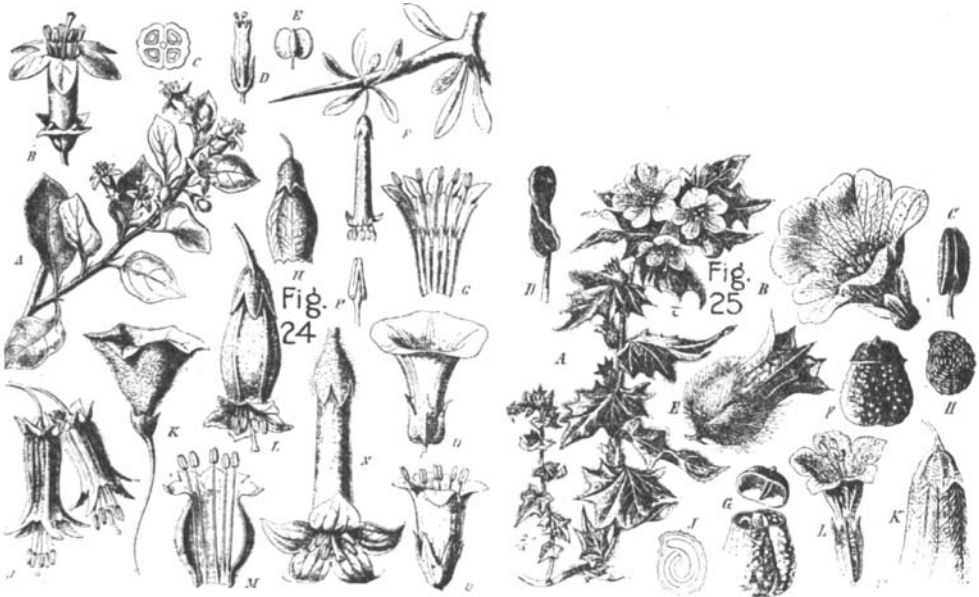
THE SOLANACEAE OR POTATO FAMILY.

Although widely separated in the vegetable kingdom from the family last considered, the two remind us in many ways of one another. Like the *Leguminosae*, the *Solanaceae* are permeated by many subtle and highly dangerous poisons, although their chemical nature is altogether different. Like the *Legu-*



Lobeliaceae.—Illustrates *Siphocampylus*, which is very similar to *Lobelia*. The corolla is fissured and through the fissure projects the coherent anthers which are well shown in B and C. E shows the calyx-tube adherent to the ovary. D shows the two stigmas and F, a cross section of the pod.

minosae, the *Solanaceae* yields many important edible products and, like it, its vegetable products are quite likely to attract the traveler who is in need of food supplies. To yield to this temptation is to court disaster, as one has never any means of knowing how the experiment is likely to terminate. Even the odor and



Solanaceae.—This important family is so large and variable as to require a number of illustrations. Fig. 24 shows the characteristic flower forms, with tubular corollas, 5 alternate stamens and 2-carpelled ovary, producing a berry for a fruit; A to C, *Grabowskia*; D and E, *Oryctes*; F and G, *Dunalia*; H, *Margaranthus*; J, *Hebecladus*; K, *Poecilochroma*; L and M, *Latua*; N, *Ichroma*; O and P, *Cacabus*; Q, *Phrodus*. Fig. 25 illustrates the capsular-fruited division of the family, as seen in A to J, *Hyoscyamus*; K, *Scopolia*; L, *Physoclaena*.

flavor are often misleading guides, these agreeable properties sometimes being associated with highly dangerous ones.

The members of the Potato Family, so far as we are here interested in them, have regular gamopetalous corollas, stamens alternate with its lobes, alternate estipulate leaves, two-celled fruits and the carpels containing numerous ovules. The corolla is plicate in aestivation and the fruit either a berry or a capsule.

THE ROSACEAE OR ROSE FAMILY.

In connection with the astringent properties of the willow family, one may well refer to those of the rose family, the members of which are almost without exception heavily provided with tannin. I refer here of course, to the Rose Family proper, not including the *Drupaceae* or Plum Family, nor the *Pomeaceae* or Apple Family. Through the Raspberry, Blackberry, Strawberry, Potentilla, Agrimonia, Spirea and many others, scientific and domestic medicine has for ages been furnished with an abundance of simple astringents of great efficacy. Since the related genera, with similar properties, are very numerous and most widely distributed, it becomes a matter of no little importance to be able to recognize the members of this group at sight. This is to be done by noting their stipulate leaves, usually compound, as seen in roses, blackberries, strawberries, etc., their five regular petals, numerous perigynous stamens, two-ovuled, mostly distinct carpels and style arising laterally from the ovary.

Only a word need be said in conclusion regarding the several families grouped under the old name *Coniferae*. Everyone is able to recognize any member of this group at sight and their medicinal and poisonous properties are too well known to call for any discussion.