

SAYRE'S MATERIA MEDICA - Part III

LEGUMINOSÆ.—Pulse Family

Herbs, shrubs, or trees with alternate and usually compound leaves. *Flowers* papilionaceous, or rarely regular. *Stamens* usually ten and mostly monadelphous or diadelphous. *Pistil* becoming in fruit a legume, from which the order takes its name. Most of the plants are innoxious; the marked exception to the rule, however, is the calabar bean.

Synopsis of Drugs from the Leguminosæ

I. Cellular.

GLYCYRRHIZA,	Root, 230.	Stylosanthes,	Herb, 244.
Abri Radix,	" 231.	Galega,*	" 245.
Baptisia,	" 233.	Trifolium Pratense,*	" 243.
Erythrophloeum,	Bark, 234.	Trifolium Repens,	" 243 a.
Cercis,	" 235.	Scoparius,*	" 246.
Saraca,	" 236.	Cassia Fistula,*	Fruit, 247.
Piscidia,	" 237.	Ceratonia,	" 248.
HÆMATOXYLON,	Wood, 238.	Tamarindus,*	" 249.
SANTALUM }	" 239.	Dipteryx,	" 250.
RUBRUM, }	" 239.	Abri Semen,	Seed, 232.
SENNA,	Leaves, 240.	Fœnum Græcum,	" 251.
Cassia Marilandica,	" 241.	PHYSOSTIGMA,	" 252.
Melilotus,	Herb, 242.	Mucuna,	Hairs, 253.

II. Non-cellular.

Araroba,	Powder, 254.	OLEUM }	Volatile Oil, 259 a.
ACACIA,	Gum, 255.	COPAIBÆ, }	Fixed Oil, 260.
TRAGACANTHA,	" 256.	Pongamia,	Resin, 261.
CATECHU }	Extractive, 257.	Copal,	Resin, 261.
(Gambir), }	" 258.	BALSAMUM }	Balsam, 262.
KINO,	" 258.	PERUVIANUM, }	" 263.
EXTRACTUM }	" 230 a.	BALSAMUM }	" 263.
GLYCYRRHIZÆ, }	" 230 a.	TOLUTANUM, }	" 263.
COPAIBA,	Oleo-resin, 259.		

230. GLYCYRRHIZA.—GLYCYRRHIZA

LICORICE ROOT

The dried rhizome and root of **Glycyrrhi'za gla'bra** typica Regel et Herder, and **Glycyrrhiza glabra glandulifera** Regel et Herder. Spanish and Russian respectively.

BOTANICAL CHARACTERISTICS.—Plants 4 to 5 feet high. *Leaves* imparipinnate; *leaflets* about 13, oval. *Racemes* axillary, flowers distinct, pale blue. *Legume* ovate, compressed.



FIG. 120.—*Glycyrrhiza glabra*—Branch.

SOURCE.—Russia exports the largest amount, Syria the smallest. Partiality for the Spanish root is now unwarranted; the dose digging, and the limited and practically exhausted fields of Spain are the causes of its deterioration. Russia, with its new and almost unlimited fields, furnishes roots rich in glycyrrhizin and extractive, much better suited for commercial purposes because better and cheaper than the Spanish root. Anatolian root ranks between the Spanish and Russian in the quality of sweetness. In commerce no attention is paid to the botanical varieties of licorice root. From the root alone it is quite impossible to determine its true botanical origin, the usual designation being from the

countries of growth, as Spanish, Russian, Anatolian, etc., although all varieties except the Spanish are often classified as "Greek root." Peeled root may now be prepared in Russia, but Syria formerly prepared it for shipment to Europe, some of which found its way into the market as "peeled Russian."

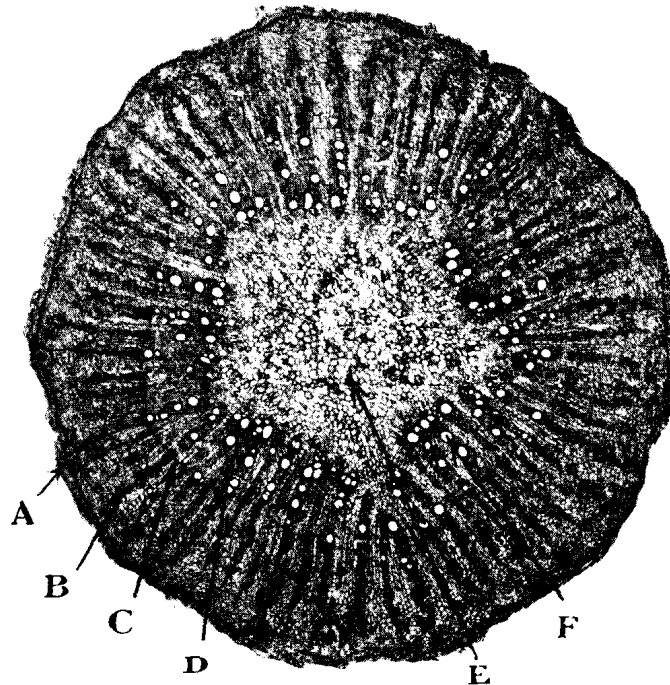


FIG. 121.—Glycyrrhiza—Cross-section of root. (13 diam.) A, Cork. B, Parenchyma of cortex C, Medullary ray. D, Xylem. E, Medulla. F, Water tube. (Photomicrograph.)

DESCRIPTION OF DRUG.—**Long, cylindrical pieces** from 5 to 25 mm. ($\frac{1}{5}$ to 1 in.) in diameter; **externally dark-brown, longitudinally wrinkled; internally of a light-yellow color; pliable, fibrous, tough, readily tearing into long, fibrous strips.** Odor peculiar, earthy, taste sweetish, afterward acrid. A **cross-section** shows a rather thick bark, the inner layer of which is composed principally of bast fibers. The **meditullium is made up of three kinds of cells**, ligneous, with oblique ends, parenchymatous, almost cubical, and large pitted ducts giving to the wood a porous appearance. Wood-wedges narrow, separated by distinct medullary rays.

Glycyrrhizal glabra glandulifera, so-called Russian, is thicker, less sweet, and more acrid than *G. glabra typica* (Spanish).

Powder.—Characteristic elements; See Part iv, Chap. I, B.

CONSTITUENTS.—Glycyrrhizin, asparagin, glycyramarin, an acrid resin, starch, etc. Glycyrrhizin is a glucosid, sparingly soluble in alcohol and ether, splitting up by hydrolysis into sugar and a brownishyellow bitter substance, glycyrrhetin; it probably exists in combination with ammonia. Ash, not to exceed 7 per cent.

Preparation of Glycyrrhizin.—Obtained from the cold infusion (from which albumen has been removed by heat) by precipitating with H₂SO₄. Purify precipitate by dissolving in very weak ammonia water 1 to 10, filtering, and evaporating.

ACTION AND USES.—Expectorant and demulcent in bronchial affections. Frequently used to disguise the disagreeable taste of other medicines, and as a sweetening ingredient for medicinal preparations. Dose: 15 to 60 gr. (1 to 4 Gm.).

OFFICIAL PRERAPATIONS.

Fluidextractum Glycyrrhizæ ,	Dose: 15 to 60 ℥ (1 to 4 mils).
Extractum Glycyrrhizæ Purum ,	5 to 60 gr. (0.3 to 4 Gm.).
Mistura Glycyrrhizæ Composita (3 per cent. of extract, with wine of antimony, paregoric, sweet spirits of niter, syrup, and mucilage of acacia),	2 to 6 fl. dr. (8 to 24 mils).
Glycyrrhizinum Ammoniatum ,	5 to 15 gr. (0.3 to 1 Gm.).
Pulvis Glycyrrhizæ Compositus (23.6 per cent., with senna, washed sulphur, oil of fennel, and sugar),	½ to 2 dr. (2 to 8 Gm.).
Elixir Glycyrrhizæ.	

230a. **EXTRACTUM GLYCYRRHIZA**—**Extract of Licorice.** Made by evaporating the aqueous extract of the root. It is found in market in black, brittle, cylindrical rolls about 150 mm. (6 in.) long; flexible when warm, but when dry breaks with a brittle, conchoidal fracture, showing a glossy surface; odor characteristic; taste sweet., It yields a brown powder. It contains glycyrrhizin, both free and combined with ammonia, to which combination its sweetness is due, glycyrrhizin itself being almost tasteless. It is an excellent demulcent, the presence of a small piece in the mouth often allaying cough by coating and thus protecting the irritated membrane. Not less than 60 per cent. of the extract of glycyrrhiza should be soluble in cold water. Dose: 15 to 60 gr. (1 to 4 Gm.). Ash, not more than 6 per cent.

OFFICIAL PREPARATIONS.

Trochisci Ammonii Chloridi (each troche containing about 3 grains each of glycyrrhiza and $1\frac{1}{2}$ of ammonium chloride, with sugar, tragacanth, and syrup of tolu), Dose: 1 or 2 troches.
Trochisci Cubebæ.

231. **ABRI RADIX.**—INDIAN LICORICE. The root of **A'brus precato'rius** Linné, indigenous to India, naturalized in most tropical countries. Reddish-brown, twisted pieces, having a thin bark, and a medullium composed of alternating zones of porous wood-bundles and parenchyma, traversed by medullary rays. Inodorous; taste bitter, afterward sweetish. It is thought to contain glycyrrhizin, and is used as a demulcent like glycyrrhiza.

232. **ABRI SEMEN.**—PRAYER, BEADS. JEQUIRITY. The seeds of **A'brus precato'rius** Linné. Subglobular, about 5 to 8 mm. ($\frac{1}{5}$ to $\frac{1}{3}$ in.) long, scarletred, glossy, with a black spot at the hilum; inodorous; taste bean-like. They contain two proteids, paraglobulin, and albumose, which are irritating to the eyes. A weak infusion of the seed is used in granular ophthalmia.

233. **BAPTISIA, N. F.**—WILD INDIGO. The root of **Bapti'siatincto'ria** R. Brown. *Habitat:* United States. It contains baptisine (acrid, poisonous), baptisin (a bitter glucoside), and baptin (a purgative glucoside). Chiefly used for its antiseptic properties, in lotion and ointment, although it acts also as an emetic and cathartic. Dose: 5 to 15 gr. (0.3 to 1 Gm.).

234. **ERYTHROPHLOEUM.**—SASSY BARK. A poisonous bark from **Erythrophloe'um guineens'e** Don, used as an ordeal in Africa, where the tree grows, and therefore sometimes called doom-bark. It is in thick, warty, curved pieces, reddish-brown, fissured. Inodorous; taste astringent and bitter. It contains an alkaloid, **erythrophleine**, which gives it an action on the heart similar to **digitalis**; also astringent, emetic, diaphoretic, and analgesic. Dose: 5 to 15 gr. (0.3 to 1 Gm.).

Preparation of Erythrophleine.—Treat concentrated aqueous solution- of the alcoholic extract of the bark with ammonia and exhaust the mixture with acetic ether. The alkaloid is yielded on evaporation.

235. **CERCIS CANADENSIS** Linné.—REDBUD. The bark of this indigenous tree has been recommended as a mild, non-irritating, but active astringent in diarrhea and dysentery. Also used as a local application to mucous membranes. Dose of fluidextract: 15 to 60 drops (1 to 4 mils) .

236. **SARACA INDICA** Linné.—ASOCA. (Bark.) Much employed by the Hindoo physicians as a sedative in the treatment of uterine affections; it is also astringent. Dose of fluidextract: 15 to 60 drops (1 to 4 mils)

237. **PISCIDIA**.—JAMAICA DOGWOOD. The bark of **Piscid'iaerythri'na** Jacquin. *Habitat*: West Indies. Quills or curved pieces about 4 mm ($\frac{1}{6}$ in.) thick; externally of a dark, yellowish-gray color, ridged longitudinally. **Odor opium-like when broken.** Taste bitter, acrid, producing a burning sensation in the mouth. Used as a **mild soporific for children and aged persons**, and for those not able to bear a strong narcotic like opium. Dose: 15 to 45 gr. (1 to 3 Gm.).

238. **HÆMATOXYLON, N.F.**—**HÆMATOXYLON**

LOGWOOD



FIG. 122.—*Hæmatoxylon campechianum*—Branch.

The heart-wood of **Hæmatox'ylon campechia'num** Linné Usually found in commerce in the form of **deep, brownish-red chips**.—When the surface has a greenish metallic luster, the wood has undergone fermentation and should be rejected. Odor slight; taste sweetish, astringent.

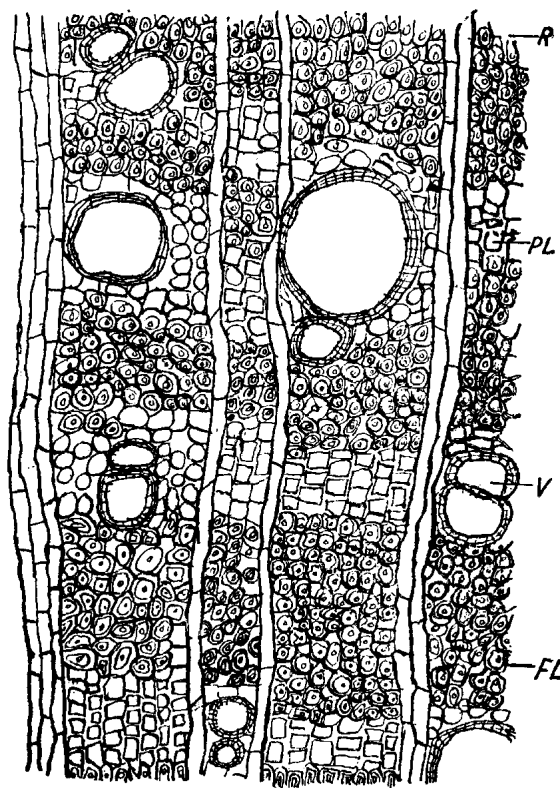


FIG. 123.—*Hæmatoxylin*—Cross-section of wood. *P*, Medullary ray, consisting of two vertical rows of cells, to which the black line from *R* should be extended. *V*, Pitted vessels. *FL*, Ligneous fibers. *PL*, Wood parenchyma.

CONSTITUENTS.—**Hæmatoxylin**, $C_{16}H_{14}O_6$, sweet, colorless crystals, giving to the wood its characteristic colors by the combined action of the oxygen of the air and the alkaline bases existing in the wood; it is readily soluble in hot water and alcohol, sparingly in cold water; by the action of ammonia and oxygen in the air dark purple scales of hæmatein, $C_{16}H_{12}O_6$, are formed, often observable as the fine greenish hue upon logwood chips. This principle gives a blue color with alkalies. Haematoxylin also contains tannin, fat, resin, and a trace of volatile oil. With an alkali haematoxylin gives a purple color, brazil-wood a red color, and red saunders is not affected.

Preparation of Hæmatoxylin.—To ethereal extract add water and allow to crystallize; add a little H_2SO_3 or sulphite to prevent oxidation. Yellowish prisms of sweetish taste, violet-blue, with alkalies. Soluble in alcohol and water. Sunlight causes a red color.

ACTION AND USES.—A mild astringent. Dose: 30 to 60 gr. (2 to 4 Gm.), in decoction or extract. A solution of hæmatoxylin as a staining fluid in microscopy is one of the most useful, as it stains both lignified and cellulose tissue, but not suberin or cutin. It is also one of the very best nuclear stains.

PREPARATION: Ext. Hæmatoxyli, N.F. Dose, 1 Gm. (15 gr.).

239. SANTALUM RUBRUM.—RED SAUNDERS

RED SANDALWOOD

The heart-wood of *Pterocar'pus santali'nus* Linné.



FIG. 124.—*Pterocarpus santalinus*—Branch.

BOTANICAL CHARACTERISTICS.—A large tree with dark red, heavy, and compact wood; a reddish juice exudes from its bark. *Racemes axillary; flowers yellow, streaked with red. Legumes orbicular.*

HABITAT.—Madras.

DESCRIPTION OF DRUG.—In commerce usually in deep reddish-brown raspings or small chips, or a coarse powder; tasteless and nearly odorless. The wood consists mostly of the lower parts of the stem, and thick roots, imported in irregular logs of various sizes, usually deprived of the bark, and externally of a dark-brown color; internally of a rich red color, showing in transverse sections circles of a lighter tint. Used in

Compound Tincture of Lavender.

Powder.—Microscopical elements of: See Part iv, Chap. I, B.

CONSTITUENTS.—The most important constituents are the **red coloring matter, santalin**, in needles, soluble in alcohol, ether, acetic acid, and alkaline solutions, but insoluble in water, and only slightly soluble in boiling water and santalic acid, $C_{15}H_{14}O_5$. The yellow ethereal solution is turned to violet by alkalis. Santol, pterocarpin, and homopterocarpin are also constituents. Ash, not to exceed 3 per cent.

Preparation of Santalin.—Precipitate alcoholic tincture with lead acetate; decompose this precipitate with H_2S in presence of alcohol and evaporate. Red needles are obtained, which are inodorous, tasteless, resinous; soluble in the alkalis with violet, and in ether with yellow color.

ACTION AND USES.—Of no value medicinally. Used in pharmacy for coloring preparations.

OFFICIAL PREPARATION.

Tinctura Lavandulæ Composita.

240. SENNA.—SENNÄ

SENNÄ

The dried leaflets of **Ca'ssia acutifo'lia** Delile and **C. angustifolia** Vahl.

BOTANICAL CHARACTERISTICS.—The acute-leaved senna, *C. acutifo'lia*, is a leafy shrub 2 to 5 feet high, bearing axillary racemes of yellow flowers. *Legume* flat, broadly oblong, very slightly curved inward, rounded at the extremities, terminating in an indurated and nearly obsolete style.

SOURCE.—**Alexandria senna**, exported by the way of Alexandria, is derived from *Ca'ssia acutifo'lia*, a species growing wild abundantly in upper Egypt, Nubia, etc. **India senna** (*C. angustifo'lia*) is obtained **chiefly in Arabia**, reaching western ports by way of Bombay and other Indian ports; sometimes called Mocha senna, as originally from that port. **The same plant in cultivation yields Tinnevelly senna.** The plant yields two annual crops, the best at the close of the rainy season (September), and the other during the dry season. Prepared for market by the natives, who carry it there on camels, where it is cleaned (garbled) and sold.

DESCRIPTION OF DRUG.—Both the Alexandria and the India senna consist of leaflets, **a prominent distinction between the two being their size**; the former, the acutifolia, is described as follows: Lanceolate or ovatelanceolate, 1.5 to 3 cm. long, 5 to 8 mm. broad; apex acute, mucronate; base unequal, acute; margin entire; upper surface light green, nearly glabrous, midrib sometimes depressed, veins of first order more or less prominent; under surface light grayish-green, midrib prominent, minutely pubescent, especially near the veins; petiole about 1 mm. long; texture coriaceous, fibrous; odor slight; taste somewhat bitter. *Powder*: Light green; non-secreting hairs 0.1 to 0.2 mm. long, one-celled, thick-walled, the wall of the upper part strongly cuticularized; calcium oxalate crystals rosette-shaped or in monoclinic prisms. The powder of Indian senna (*C. angustifolia*) is dark green and has relatively few non-secreting hairs. (For fuller particulars of the microscopical distinction of the two powders, see article by the author, "Amer. Jour. Pharm.," June, 1897, p. 298.) The India senna is by far a cleaner senna; senna should be free from stalks and other inert materials, and from Argel leaves (*Solenostem'ma ar'gel*, N. O. Asclepiadeæ), which are thick, even at the base, and one-veined.

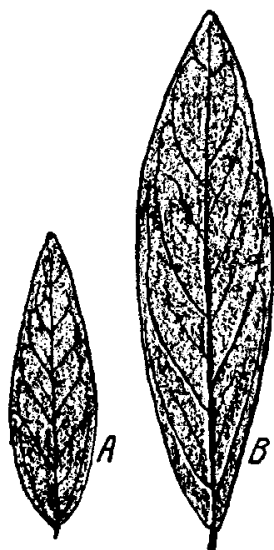


FIG. 125.—A, Alexandria senna. B, India senna.

Powder.—Characteristic elements: See Part iv, Chap. I, B

CONSTITUENTS.—The purgative action of senna depends upon a sulphuretted glucoside, **cathartic acid**, insoluble in alcohol, soluble in water, but rendered partially or wholly inert by prolonged evaporation or boiling of its solution. Senna **also contains chrysophan**, phæoretin, sennacrol, and glucosennin, $C_{22}H_{18}O_8$; this latter is probably an emodin glucoside. The emodin is said to be identical with that found in Barbadoes and Cape Aloes. The principles giving the odor and taste to senna, also its griping action, are extracted by alcohol, somewhat affecting the cathartic action, however. Ash, not more than 12 per cent. not less than 3 per cent.; insoluble in HCl.

EMODIN TEST.—This test is applied to the emodin-bearing drugs such

as Rhubarb, Aloes, Senna, etc. The tests as applied are practically the same. For Senna it is as follows: Mix 0.5 Gm. of powdered Senna with 10 mils of an alcoholic solution of potassium hydroxide (1 in 10), boil the mixture for about two minutes, dilute it with 10 mils of water and filter. Now acidify the filtrate with hydrochloric acid, shake it with ether; remove the ethereal layer and shake it with 5 mils of ammonia water; the latter is colored yellowish-red.

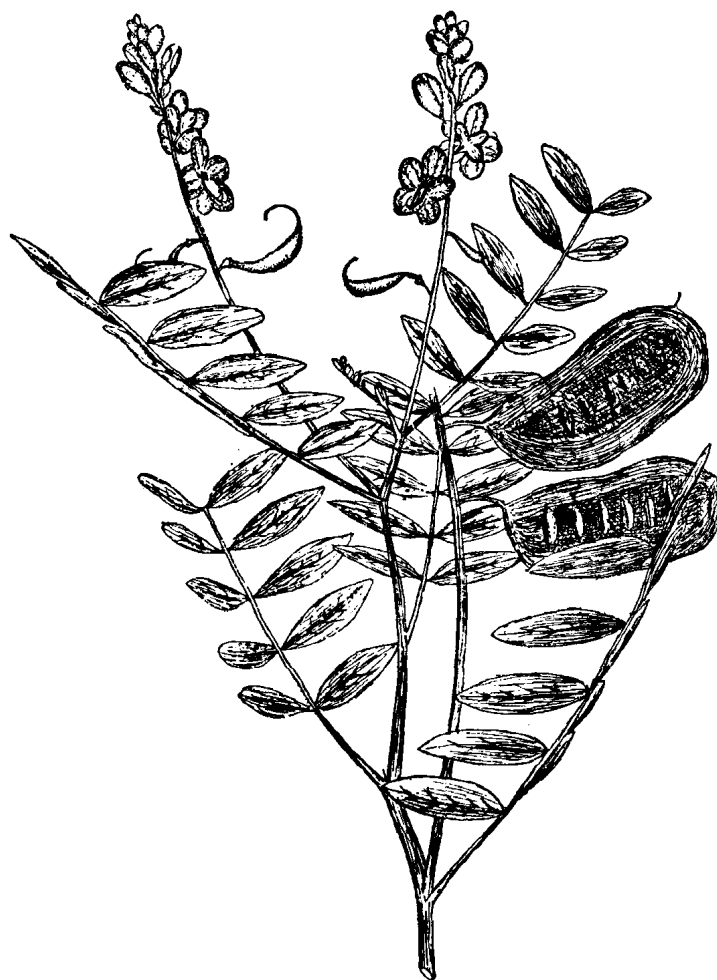


FIG. 126.—*Cassia acutifolia*—Branch showing flower and fruit.

Preparation of Cathartic Acid.—Rhubarb or senna may be treated separately as follows: Moisten the drug with alcohol. Macerate 48 hours and percolate with strong alcohol till exhausted, to remove chrysophanic acid, resin, etc. Exhaust the marc with 60 per cent. alcohol. Evaporate the percolate at 50°C. to syrup, with constant stirring. Precipitate extract with 85 per cent. alcohol and filter to remove gum. The filtrate, after evaporating to a syrupy consistence, is added to a large excess of absolute alcohol. The brown precipitate thus produced is spread on glass to dry. It is then in light, shining scales.

ACTION AND USES.—A prompt and efficient cathartic. Its griping action may be prevented by combining it with an aromatic and one of the alkaline salts, or, as before stated, by first extracting the griping principle with alcohol. Dose: 2 to 8 dr. (8 to 30 Gm.).

OFFICIAL PREPARATIONS.

Infusum Sennæ Compositum (6 per cent., with manna and Epsom salts, each, 12 per cent., and fennel 2 per cent.),	Dose: 1 to 2½ fl. oz. (30 to 75 mils).
Syrupus Sennæ (25 per cent. of Fl'ext.),	1 to 4 fl. dr. (4 to 15 mils).
Fluidextractum Sennæ ,	½ to 4 fl. dr. (2 to 15 mils).
Pulvis Glycyrrhizæ Compositus (18 per cent.),	1 to 2 dr. (4 to 8 Gm.).
Syrupus Sarsaparillæ Compositus , ...	4 fl. dr. (15 mils).

241. **CASSIA MARILANDICA** Linné.—AMERICAN SENNA. (Leaflets.) Oblonglanceolate, about 25 mm. (1 in.) in length, mucronate at the apex and uneven and short-stalked at base; lower surface lighter green than upper surface. They have a weaker odor and taste than senna, but have similar medicinal properties, their action depending upon the same principle, cathartic acid.

242. **MELILOTUS**, N.F.—SWEET CLOVER. The flowering tops of **Melilotus officinalis** Willdenow. The small yellowish or white flowers are in a close, rounded raceme on an angular stem; leaves serrate, trifoliate; odor fragrant, honey-like; taste aromatic and bitter. They contain melilotol (a fragrant volatile oil), coumarin (the aromatic principle of tonka), cumaric acid, and melilotic (hydrocumaric) acid, having a honey-like odor. An infusion is used as a stimulant and antispasmodic in whooping-cough, but it is generally used as a local anodyne in poultices.

243. **TRIFOLIUM PRATENSE** Linné (Trifolium, N.F.).—The flowering tops of this, our common red clover, are now being used quite extensively as an alterative; they are also deobstruent and sedative in whooping-cough.

243a. **TRIFOLIUM REPENS**.—WHITE CLOVER. The tops are used in whooping-cough and other spasmodic affections, in the form of infusion.

244. **STYLOSANTHES ELATIOR** Swartz.—PENCIL PLOWER. This herb is much used in domestic practice as a uterine sedative and tonic. The fluidextract is not miscible with water. Dose of fluidextract: 10 to 20 drops (0.6 to 1.3 mils).

245. **GALEGA**, N.F.—GOAT'S RUE. The herb of **Galega officinalis** Linné. Europe. Recently introduced. An erect glabrous perennial, about three feet high. Leaves alternate, oddly pinnate, and stipulate; stipules lanceolate; leaflets smooth, lanceolate, and mucronate. Flowers in loose, axillary racemes longer than the leaves; blue, appearing in June or July. *Preparation*: Fluidextract. *Properties*: Vermifuge, nervous stimulant, galactagogue. In typhoid conditions diuretic and tonic. Dose: 15 to 20 minims.

246. SCOPARIUS, N.F.—SCOPARIUS

BROOM

The dried tops of *Cytisus scoparius* (Linné) Link. *Habitat*: Europe and Asia.



FIG. 127.—*Cytisus scoparius*—Flowering branch and pod.

DESCRIPTION OF DRUG.—**Thin, flexible, branched twigs**, pentangular and winged, nearly smooth, and of a dark greenish-brown color; as found in the market they are usually free from the small trifoliate leaves. Odor slight, stronger when bruised; taste **very bitter**.

Powder.—Greenish-brown. Characteristic elements: Sclerenchyma with bast fibers, long, thick-walled, associated with crystal fibers containing calcium oxalate prisms; ducts, spiral, annular, and reticulate; trichomes, non-glandular (0.5 to 0.7 μ in diam.), thick-walled, yellowish, one-celled; pollen, brownish; grains, oval.

CONSTITUENTS.—A neutral crystalline principle, **scoparin**, $C_{20}H_{20}O_{10} + 5H_2O$, to which the diuretic action is due, and the colorless, volatile, liquid alkaloid, **sparteine**, $C_{15}H_{26}N_2$, acting as a powerful cardiac tonic; this is oily, very bitter, soluble in alcohol, chloroform, and ether; it has been made official as the salt, *sparteinae sulphas*. Prisms freely soluble in water. Oxidation products, such as oxysparteine, $C_{15}H_{24}N_2O$, produce an increase of heart activity, while dioxysparteine, $C_{15}H_{26}N_2O$, produces an inverse effect upon the heart. Sparteine has an anilinelike odor.

Preparation of Scoparin.—Allow a concentrated decoction of broom-tops to gelatinize; express and purify the jelly-like mass by repeated solution in hot water, and finally in hot alcohol.

Preparation of Sparteine.—Extract plant with acidulated water and distil concentrated liquid with NaOH. A colorless oily liquid, forming crystalline salts. Sulphate official.

ACTION AND USES.—*Scoparius* is a reliable diuretic and laxative in small doses Of 10 to 30 gr. (0.6 to 2 Gm.), and is an efficient remedy in dropsy. Dose of *sparteinae sulphas*: $\frac{1}{8}$ to 1 gr. (0.0081 to 0.065 Gm.). Used to regulate heart action.

247. CASSIA FISTULA, N.F.—CASSIA FISTULA

PURGING CASSIA

The dried fruit of *Cas'sia fist'ula* Linné.

BOTANICAL CHARACTERISTICS.—Tree from 20 to 50 feet high, with showy *racemes* 1 to 2 feet long, of bright yellow, fragrant *flowers*, followed by cylindrical pods of the same length. *Legume* woody, indehiscent. Tropical, extensively cultivated.

DESCRIPTION OF DRUG.—Cylindrical pods or legumes 450 to 600 mm. (18 to 24 in.) long and about 25 mm. (1 in.) in diameter, with a blackish-brown, woody pericarp; indehiscent, but with two smooth sutures or bands on opposite sides running the whole length of the pod, and showing the union of the two valves. The dorsal band is marked with a fine ridge, while the ventral band is seemingly divided into two by a shallow, longitudinal groove. **The interior of the pod consists of numerous (25 to 100) transverse cells, each containing a single, flattish, glossy, red-brown seed, imbedded in a**

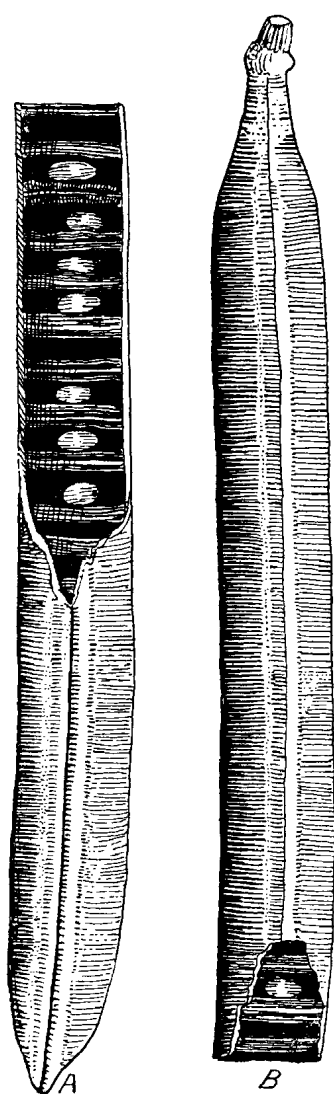


FIG. 128.—*Cassia fistula*, two-thirds natural size. A, Ventral view. B, Dorsal view.

sweet, blackish-brown pulp; odor prune-like.

CONSTITUENTS.—The pulp, which is the part used, consists mainly of sugar (about 60 per cent.), with mucilage, pectin, albuminoids, and organic salts.

ACTION AND USES.—A mild laxative, generally combined with other mixtures. Dose: 1 to 8 dr. (4 to 30 Gm.).

248. **CERATONIA**.—ST. JOHN'S DREAD. The fruit of **Cerato'niasil'iqua** Linné. *Habitat*: Southern Europe. Broad, flat pods, brown and glossy, divided into six to twelve transverse cells, in each of which is a sweet, black pulp having a single seed imbedded in it. This pulp is used as a laxative and demulcent, but chiefly as an ingredient in expectorant mixtures.

249. TAMARINDUS, N.F.—TAMARIND

TAMARIND

The preserved pulp of the fruit of **Tamarin'dus in'dica** Linné (the Indian date).

A **tough, reddish-brown mass**, made adhesive by the syrup in which the fruit is preserved. This preserved pulp **consists of a fibrous or stringy mucilaginous mass**, the thin membranous epicarp (the pericarp being removed), and numerous large, somewhat quadrangular, brown seeds, each inclosed in a tough membrane; inodorous; taste sweetish and acidulous.

CONSTITUENTS.—Tartaric acid and acid potassium tartrate, with traces of citric and malic acids. These organic salts amount to about 10 per cent.

ACTION AND USES.—Laxative and refrigerant, in confection of senna. Dose: 1 to 8 dr. (4 to 30 Gm.).

250. **DIPTERYX**.—TONKA BEAN. The fruit of a large tree, **Dip'teryx odora'ta** Willdenow, growing in Guiana. Oblong, flattened, rounded at each end, 37 to 50 mm. (1½ to 2 in.) long; pericarp thin, wrinkled, of a dark-brown color, somewhat glossy, and often covered with small, white crystals of coumarin; internally oily, pale brown; odor fragrant, similar to vanilla; taste aromatic and bitter. Its odor is due to the aromatic, crystalline principle **coumarin**. Used as a flavor, as an adulterant of vanilla, and to flavor cigars.

250a. **COUMARINUM**.—COUMARIN. The anhydride ($C_6H_4(CH)2OCO = 146.05$) of ortho-oxycinnamic acid, occurring naturally in Tonka, Melilot and other plants, or prepared synthetically, N.F.

251. **FŒNUM GRÆCUM**.—FENUGREEK. The seeds of **Trigonel'la foenum-græ'cum** Linné. *Habitat*: India and the Mediterranean Basin. Brownish or yellowish, rhomboid seeds, about 3 mm. (1/8 in.) in diameter, often wrinkled or distorted. They are divided into two equal lobes by a deep furrow running from the hilum on the sharper

edge, diagonally across the sides. Odor peculiar, characteristic; taste mucilaginous and bitter. Used mostly as a demulcent in condition-powders.



FIG. 129.—*Trigonella fœnum græcum*.—Branch.

252. PHYSOSTIGMA.—PHYSOSTIGMA

CALABAR BEAN

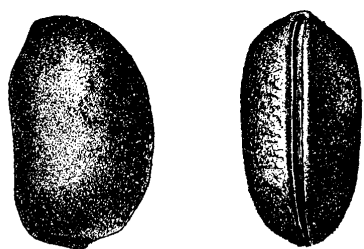
The ripe seed of **Physostig'ma veneno'sum** Balfour, yielding, by official assay, not less than 0.15 per cent. of alkaloids of Physostigma.

BOTANICAL CHARACTERISTICS.—A lofty, half-shrubby, twining plant, obtaining its name from its peculiar footed stigma. *Leaves* trifoliate, leaflets ovate. *Flowers* purplish-pink, in axillary racemes. *Legume* about 7 inches long.

HABITAT.—Africa.

DESCRIPTION OF DRUG.—About the size of a pecan nut, oblong, some what flattened, and **kidney-shaped**, invested with a light to **deep chocolate-brown testa**. Along its entire convex edge there extends a prominent black furrow, bordered on each side by a reddish ridge, and traversed the entire length by the raphe as a little ridge in the center. This raphe is **terminated at one end by a small funnel-shaped depression, the micropyle**. Exalbuminous, embryo large, the cotyledons are concavo-convex, the concave surfaces inclosing a rather large cavity, thus enabling the bean to float upon water. Nearly odorless; taste bean-like, afterward acrid. Spurious calabar beans have been called “calibears” in European commerce, those occurring the most frequently belonging to the following species: *Entada scandens*, *E. gingalobium* D. C., *Mucuna urens* D. C., and seeds of oil palms, *Elæis Guineensis*. E. H. Holmes called attention to certain specimens of calabar beans of commerce bearing a close resemblance to the genuine beans. They were longer, of circular cross-section, and the hilum did not extend the full length of the beans. They also differ chemically, as upon touching the cotyledons with a solution of potassa a permanent yellow tint was produced, and upon treating the spurious article similarly a deep, almost orange, color is formed, turning to a greenish hue. It has been found that the ordinary test-reagents for alkaloids are so sensitive for physostigmine (eserine) that one one-millionth part of a gram may

be recognized. The poisonous qualities reside in the seeds, especially in the cotyledons. It has been ascertained that the leaves and stems are not poisonous.



Powder.—Characteristic elements: See Part iv, Chap. I, B.

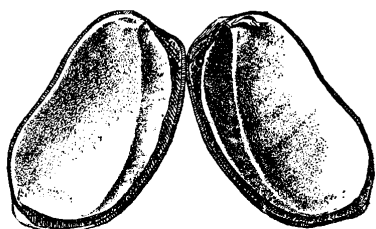


FIG. 130.—Calabar bean.

CONSTITUENTS.—**Physostigmine**, $C_{15}H_{21}N_3O_2$ (also known as **eserine**), contracting the pupil of the eye; calabarine, a tetanizing principle, a derivative of physostigmine; eseridine, $C_{15}H_{23}N_3O_3$ (producing purgation); and physosterin, a neutral principle closely related to cholesterin. These principles are soluble in

alcohol. Physostigmine is amorphous, tasteless, reddened by potassa,

soda, and lime when exposed to the air, due to absorption of oxygen. The drug sometimes contains over 0.15 per cent. of the alkaloid Physostigmine. Ash, not exceeding 3 per cent.



FIG. 131.—*Physostigma venenosum*—Portion of plant and fruit.

Preparation of Physostigmine (Eserine).—Treat powdered drug (mixed with 1 per cent. tartaric acid) with water. Shake out coloring matter with ether, make aqueous solution alkaline with an alkaline bicarbonate, and shake out alkaloid with ether. Evaporate ethereal solution.

Preparation of Eseridine (Calabarine).—Precipitate the alkaloid from the liquid from which physostigmine has been separated by lead subacetate and ammonia;

evaporate the filtrate, treat the residue with alcohol, precipitate with phosphotungstic acid, and decompose with baryta. It is converted into physostigmine by hydrolysis.

Preparation of Physosterin.—Exhaust beans with petroleum ether and evaporate solvent.

ACTION AND USES.—Physostigmine is used in medicine chiefly for three purposes: as a depressant for the spinal cord; as a stimulant to the intestinal muscles; and to contract the pupils. As a motor depressant physostigmine is useful in the treatment of tetanus and strychnine poisoning. Its greatest value in internal medicine is as a stimulant to intestinal muscles in paralytic forms of colic, but especially in chronic constipation in conjunction with cathartic drugs.

Physostigmine stimulates the secretory nerve-endings of glands and the nerve-endings of striated and smooth muscle. It therefore antagonizes the effects of atropine and curare.

If a drop of 1:200 aqueous solution of eserine is placed in the eye, contraction of the pupil begins in one or two minutes and reaches its maximum in one-half to one hour.

When the alkaloid calabarine is present in excess in the drug, and is taken in overdose, convulsions develop. Dose of drug: 1 to 4 gr. (0.065 to 0.25 Gm.).

OFFICIAL PREPARATIONS.

Physostigminæ Salicylas ,	Dose: $\frac{1}{120}$ to $\frac{1}{30}$ gr. (0.0005 to 0.00216 Gm.).
Extractum Physostigmatis ,	$\frac{1}{10}$ to $\frac{1}{2}$ gr. (0.0064 to 0.0324 Gm.).
Tinctura Physostigmatis (10 per cent.),	10 to 40 μ (0.6 to 2.6 mils).

253. **MUCUNA.**—COWAGE, OR KIWACH, the Hindustan name, vulgarly corrupted into cow-itch. The hairs from the pods of **Mucu'na pru'riens** De Candolle, a high-climbing plant growing in tropical Africa, America, and India. These hairs are about 3 mm. ($\frac{1}{8}$ in.) long, stiff, brown-red, and readily penetrate the skin, causing violent itching. Detached from the pod (which forms an article of diet in India) by dipping it in honey and then scraping. An electuary is used in doses of a teaspoonful to a tablespoonful. Cowage acts as an **anthelmintic mechanically**, penetrating the bodies of the worms and thus irritating and dislodging them.

254. **ARARоба.**—GOA POWDER. A mixture of neutral principles obtained from radial fissures in the wood of a Brazilian tree, **Andi'ra araro'ba** Aguiar. This powder

is of a light yellow color, with a somewhat earthy appearance, turning dark brown or purplish on exposure; somewhat crystalline, rough, and mixed with pieces of wood-fiber; inodorous and very bitter. It consists chiefly of chrysarobin (Chrysarobinum). Used externally, in ointments, in skin diseases caused by fungi.

255. ACACIA.—ACACIA

GUM ARABIC

A gummy exudation from *Aca'cia sen'egal* Willdenow and of other species of Acacia.

BOTANICAL CHARACTERISTICS.—A small tree about 20 feet high, with a gray bark. *Leaves* bi-pinnate. *Flowers* pale yellow, in dense spikes. *Legumes* broad, three to four inches long.

HABITAT.—The acacia tree forms dense scrubby forests in the sandy regions watered by the Senegal, and in Abyssinia and Kordofan.

DESCRIPTION OF DRUG.—In roundish, brittle **tears or broken fragments about the size of a pea**, or larger, with an opaque appearance, due to the numerous fissures. Inodorous; **taste mucilaginous and insipid**. Soluble in water, forming a thick mucilaginous liquid; **insoluble in alcohol**. The aqueous solution has an acid reaction and yields gelatinous precipitates with subacetate of lead, ferric chloride, and concentrated solution of borax. Oxalates precipitate the calcium base. There are two kinds of “powdered acacia” on the market, the “granulated” and the “finely dusted.” The former is more soluble and less liable to form lumps, and is, therefore, preferable for pharmaceutical purposes.

VARIETIES AND GRADES.—The Kordofan and Senegal gums are the product of *A. Senegal*. The former has been described above. Gum Senegal, deriving its name from the river Senegal, comes in larger tears than the former, varying in color between yellow and yellowish-brown, being less fissured and more transparent. As to the grades of gum, it may be said that the quality entering the market varies exceedingly in its solubility, viscosity of its mucilage, and its color. In the market the grades are designated by numbers, No. 1 being the best carefully selected tears, No. 2 the next best, and so on until several selections have been made, the remaining colored pieces containing impurities being termed “sorts;” but this term is sometimes applied to unsorted gum arabic, often consisting of a mixture of the lower grades. The terms “strong” and “weak” have been applied, designating the quantity of

moisture, the strong being the drier and probably the most soluble; the weak being that which possibly swells in water, does not completely dissolve, and hence yields a relatively small percentage of mucilage.



Acacia Senegal.

Mesquite gum is obtained from *Prosopis juliflora*, found in Southwestern America and South America. Quite abundant in some portions of Texas and New Mexico. It occurs in colorless or amber-brown tears; resembles gum arabic somewhat in fissures; specific gravity, solubility, its behavior to nitric acid, and the amount of ash yielded

upon incineration (2.1 to 3 per cent.). Its aqueous solution is not precipitated by subacetate of lead, ferric salts, or borax. Acetate of lead, with ammonia added subsequently, yields a gelatinous precipitate. These reactions, however, differ to some extent in different samples.

CONSTITUENTS.—**Arabic acid**, $C_{12}H_{22}O_{11}$, **combined with calcium, magnesium, and potassium**, to the presence of which its solubility is due; boiled with dilute acid it yields arabinose or arabin sugar. A solution of the gum is **unaffected by neutral lead acetate**. The gum contains about 14 per cent. of moisture and some sugar. Ash, not exceeding 4 per cent.

Preparation of Arabic Acid.—Obtained by adding alcohol to acidified (HCl) mucilage, and drying the precipitate. It yields arabinose in prismatic crystals when boiled with acids and possibly also galactose.

Powder.—Not more than 1 per cent. should be insoluble in water (limit of dirt, etc.), nor should the powder contain more than 15 per cent. moisture.

ACTION AND USES.—Demulcent. Used in pharmacy for suspending insoluble matters in water, as in emulsions, and as an excipient.

Powder—Elements of: See Part iv, Chap. I, B.

OFFICIAL PREPARATIONS.

Mucilago Acaciæ (34 per cent.).

Syrupus Acaciæ (10 per cent. of acacia),. Dose: 1 to 8 fl. dr. (4 to 30 mls).

Pulvis Cretæ Compositus (20 per cent.), used as an excipient.

256. TRAGACANTHA.—TRAGACANTH

GUM TRAGACANTH

The spontaneously dried gummy exudation from **Astra'galus gum'mifer** Labillardiere, or from other Asiatic species of Astragalus.

BOTANICAL CHARACTERISTICS.—A small, tangled, spiny bush of compact growth, the *petioles* being converted into long spines. *Flowers* yellow, in axillary clusters. *Legume* partially two-celled.



Astragalus gummifer

HABITAT.—Western Asia.

DESCRIPTION OF DRUG.—The flake tragacanth comes in transversely lined, **curved, and contorted bands**, somewhat resembling fragments of oyster shell, but **tough and horny**; color whitish or yellowish, **translucent**. Taste insipid, sometimes faintly bitterish; inodorous. It is difficult of pulverization, made less so, however, by the use of a warm mortar. It does not dissolve in water, but swells up and forms a thick, gelatinous mass.

VARIETIES.—Very narrow bands or strings variously coiled. Tragacanth in sorts—stratified or nodular, conical and subglobular pieces, more or less brown, often adulterated with the gum of the almond and plum trees.

Powder.—Elements of: See Part iv, Chap. I, B.

CONSTITUENTS.—**Traganthin** or **bassorin**, $C_6H_{10}O_5$, constituting about 43 per cent., swelling up in water, but not dissolving; and **arabin**, the calcium salt of gummic acid, soluble in water, but not identical with the arabin or arabic acid of acacia. Ash, not more than 3.5 per cent.

ACTION AND USES.—Used as a demulcent, but rarely, however, on account of its insolubility. Chiefly used in pharmacy to give consistence to lozenges, etc.

OFFICIAL PREPARATION.

Mucilago Tragacanthæ (6 per cent.).

257. CATECHU.—CATECHU

An extract prepared from the heart-wood of **Aca'cia cat'echu** Linné.

BOTANICAL CHARACTERISTICS.—Small tree with straggling, thorny branches, and compact, dark red wood. *Leaves* bipinnate; *petiole* angular, with prickles on its under side. *Flowers* pale yellow. *Legume* about three-seeded.

SOURCE.—The tree is common in most parts of India and Burmah, where the export of cutch forms, next to the sale of timber, the most important item of forest revenue. It abounds in the forests of tropical Eastern Africa, but in many places where the tree abounds it is only valued for its wood. In comparatively few regions is any extract manufactured. From *Acacia suma*, a nearly related species growing in Southern India, catechu is also made. The extract from these two species of acacia furnishes a

variety of catechu, but a catechu formerly prescribed as *Catechu pallidum* (pale catechu), gambir, is official in the present Pharmacopoeia and is described as follows:

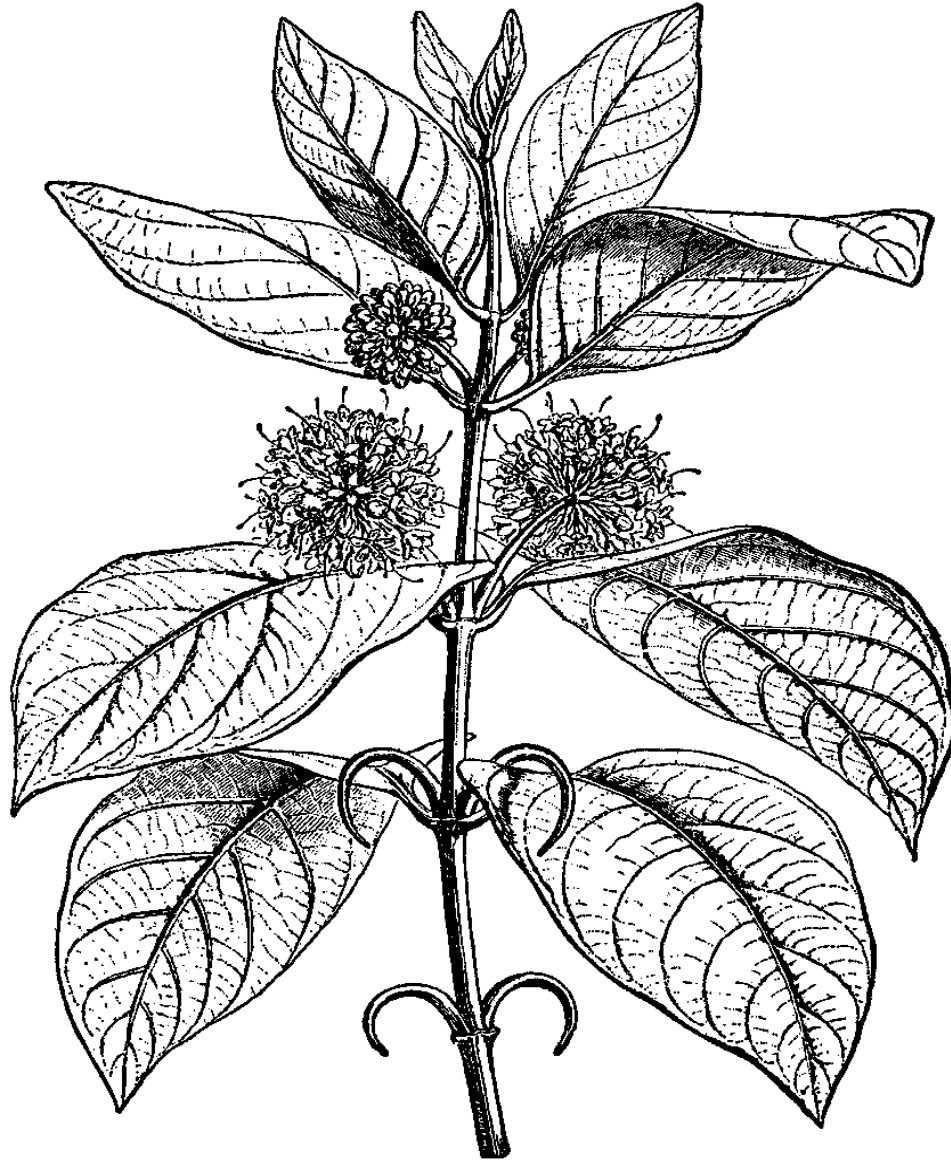


Acacia Catechu.

GAMBIR

GAMBIR (CATECHU)

An extract prepared from the leaves and twigs of **Ourouparia Gambir** (Hunter) Baillon (Fam. Rubiaceæ).



Ourouparia Gambir: blooming twig with the tendrils.

Irregular masses of cubes about 25 mm. in diameter; externally reddish-brown, pale brownish-gray or light brown; fracture dull earthy, friable, crystalline; inodorous, bitterish, very astringent with a sweetish after-taste.

Not less than 70 per cent. should be soluble in alcohol; the ash should not be more than 5 per cent., and starch should not be present.

CONSTITUENTS.—Mainly **catechu-tannic acid**, 45 to 55 per cent., which does not produce gallic acid on exposure to air as does the tannin of galls; it is turned blackish-green by ferric salts. Catechin is an interesting principle which, by dry distillation, yields pyrocatechin, or catechol, $C_6H_6O_2$, which, with ferric chloride, gives a dark green color by ammonia changing to violet. Ash, not more than 9 per cent.

Preparation of Catechin.—On allowing the decoction of catechu to stand several days, crude catechin is deposited. This deposit is purified to white silky needles by dissolving in dilute alcohol, washing with ether, and evaporating from hot aqueous solution. It has a sweetish taste, is precipitated by albumen, but not by gelatin.

ACTION AND USES.—A powerful astringent like kino. Dose: 8 to 30 gr. (0.5 to 2 Gm.).

OFFICIAL PREPARATION.

Tinctura Gambir Composita (5 per cent.,
with saigon cinammon 2.5 per cent.), Dose: 15 to 60 drops (1 to 4 mils)

258. KINO.—KINO

KINO

The spontaneously inspissated juice of **Pterocar'pus marsu'pium** (Roxburgh).

BOTANICAL CHARACTERISTICS.—A leafy tree 40 to 50 feet high, with reddish-brown bark. *Leaflets* 5 to 7, coriaceous, dark green, shining, 3 to 5 inches long. *Flowers* yellowish-white. Legume woody, indehiscent.

SOURCE.—East Indies. We have several varieties other than the Malabar (East India), the official kind as described above namely, African or Gambia kino (*P. erinaceus*), Palas or Bengal kino (*Butea frondosa*), Botany Bay or Eucalyptus kino (*E. amygdalina*), from Australia, and West Indian or Jamaica kino (*Coccoloba uvifera*). These all furnish extractives known as kino.

A new kind of kino from the juice of the bark of several kinds of Asiatic *Myristica* has been noticed, differing from the Malabar by containing, in the crude state, calcium tartrate. By this characteristic it may easily be distinguished from the official and other kinos of the market.

DESCRIPTION OF DRUG.—Small, **dark reddish-brown, shining, angular fragments**, much lighter and nearly transparent in thin layers. Adheres to the teeth when chewed, and colors the saliva a deep red; odorless; taste sweetish and **astringent**. The powder is of a brownish-red color.

Powder.—Elements of: See Part iv, Chap. I, B.



FIG. 132.—*Pterocarpus marsupium*—Branch.

CONSTITUENTS.—Kino-tannic acid (colored black-green by ferric salts, in neutral solution; violet by ferrous salts), kinoin, neutral crystalline prisms, pyrocatechin, kino-red, pectin, and ash. Ash, not exceeding 3 per cent.

Preparation of Kinoin.—Boil kino with dilute HCl and agitate clear solution with ether. Evaporate off the ether. Heating this to 266°F., an insoluble amorphous kino-red is obtained.

Pyrocatechin results from the dry distillation of kino, or is obtained by treating kino with ether.

ACTION AND USES.—A powerful astringent. Dose: 8 to 30 gr. (0.5 to 2 Gm.).

OFFICIAL PREPARATION.

Tinctura Kino (5 per cent.) Dose: 1 to 2 fl. dr 4 to 8 mils) .



FIG. 133.—*Copaiba langsdorffii*—Branch.

259. COPAIBA.—COPAIBA

BALSAM COPAIBA

The oleoresin of **Copai'ba langsdorffii**¹ O. Kuntze, and of other species of Copaiba.

BOTANICAL CHARACTERISTICS.—Lofty forest trees, natives of Central America, bearing alternate, pinnate leaves. The wood of the trees is *replete with oleoresin*, sometimes even to bursting.

SOURCE AND COLLECTION.—This oleoresin is derived from several species of copaiba, as *C. officinalis* (Carthagenae), *C. langsdorffii* (Sao Paulo), *C. multifuga* (Para). These furnish the several commercial varieties. Obtained by making large augur holes, square or wedge-shaped boxes, into the center of the trunk, where the oleoresin collects. Sometimes these openings are closed or sealed with wax, and of ten the pressure from the high liquid column is said to burst the trunk with a very loud report.. A tree may yield from 10 to 12 gallons.

If 4 fluidrams of the above varieties of copaiba be mixed with 1½ fluidrams of aqua ammonia and shaken in a test-tube, the mixture will be clear, but milky if more alkali or fixed oil be present. Maracaibo (Colombia copaiba) is thicker, darker, not always clear. It solidifies, however, with magnesia and contains from 20 to 40 per cent. of the volatile oil.

DESCRIPTION OF DRUG.—A more or less viscid, yellow or light brown, transparent liquid, of about the consistence of olive oil; specific gravity, 0.950 to 0.955 at 25°C. (77°F.); it becomes thicker and darker with age, the volatilization and the oxidation of the volatile oil leaving a greater proportion of the soft resin. Odor peculiar, aromatic; taste bitter, acrid, and nauseous.

Para copaiba is a pale, limpid liquid containing from 60 to 90 per cent. of volatile oil. Maranham and Rio Janeiro copaiba are of the consistence of olive oil, and contain a somewhat smaller proportion of volatile oil—40 to 60 per cent. Maracaibo copaiba is dark yellow or brownish, thick, somewhat turbid. It contains from 20 to 40 per cent. of oil of copaiba.

CONSTITUENTS.—**Volatile oil**, upon which its value mostly depends; a bitter principle, **and two resins, copaibic acid**, C₂₀H₃₀O₂ (soluble in ammonia and absolute alcohol), and a viscid, non-crystalline resin. Para copaiba contains oxycopaivic acid, C₂H₂₈O₃; Maracaibo copaiba, metacopaivic acid, C₂₂H₃₄O₄. Copaiba contains no benzoic nor cinnamic

¹ Sometimes written, incorrectly, lansdorffii (Lloyd).

acids, hence the term balsam is a misnomer.

Preparation of Copaibic Acid.—Mix nine parts of copaiba and two parts of ammonia (sp. gr. 0.95); lower the temperature to 10°C.; crystals of copaibic acid are then obtained, which agree with abietic acid in composition, but not in properties.

ACTION AND USES.—Stimulant, diuretic, laxative. Its principal action, however, is on mucous membranes. Dose: 15 drops (1 mil), in emulsion.

259a. **OLEUM COPAIBÆ.**—OIL OF COPAIBA. A volatile oil distilled from copaiba. A pale yellowish liquid of an aromatic, bitterish taste, and having the general properties of the oleoresin. It is a pure hydrocarbon having the formula $C_{20}H_{32}$. Dose: 5 to 15 drops (0.3 to 1 mil), in emulsion.

260. **PONGAMIA OIL.**—KURUNG OIL. A deep yellow, or reddish-brown, fixed oil expressed from the seeds of an East Indian tree, **Ponga'miagla'bra** Ventenat. It is used by the natives as a local application in skin diseases and rheumatism; especially recommended in pityriasis versicolor, and other cutaneous diseases due to fungous growth.

261. **COPAL.**—GUM COPAL. A resin found as a fossil in Zanzibar, or exuding from various species and genera of trees of the natural order **Leguminosae**,² growing in South America, West Indies, and Africa. Yellowish or brownish, irregular masses, often with a wrinkled surface; breaks with a glossy conchoidal fracture; odorless and tasteless. Used in making varnishes.

262. BALSAMUM PERUVIANUM.—BALSAM OF PERU

BALSAM OF PERU

A balsam exuded from the bruised trunk of **Tolui'fera pereireæ** Baillon.

BOTANICAL CHARACTERISTICS.—A leafy tree, with wood containing a liquid balsam. *Leaves* imparipinnate; *leaflets* 5 to 11, alternate. *Racemes* 6 to 7 inches long. *Fruit* a one-celled, one-seeded pod about $3\frac{1}{4}$ inches long; *mesocarp* fibrous, the inner part with receptacles of oleoresin.

SOURCE AND COLLECTION.—This valuable tree grows in the wild forests of San Salvador, singly or in groups. The trees, owned by individuals, are carefully guarded. The balsam is collected by loosening the bark with a blunt mallet for some distance in four alternate sections so as not to kill the tree. The loosened bark soon splits; it is set on fire

² ...and Burseraceae - MM

and charred, leaving the wood bare. Pockets thus made are covered with rags to absorb the exuding balsam. These, when saturated, are thrown into boiling water, as a means of separating the balsam, which collects at the bottom of the vessel. The annual yield per tree, is about twenty pounds. The fruit yields by expression a white balsam (balsam blanco, white Peru balsam), having a tonkalike odor, which contains a crystallizable resin. The name Myroxylon, as sometimes applied to the balsam, suggests the fact that for a long time it was supposed to be derived from a species of Myroxylon (*M. peruiferum*).



FIG. 134.—*Toluifera pereira*—Flowering branch and fruit.

DESCRIPTION OF DRUG.—A brownish-black, oleoresinous, non-viscous liquid, transparent in thin layers, and, by transmitted light, a bright red-brown; heavier than water; odor balsamic and vanilla-like; taste warm, bitterish, afterward acrid.

CONSTITUENTS.—Benzoic and cinnamic acid, cinnamein (the cinnamate of benzyl alcohol) constituting the greater part, about 60 per cent.; resin 32 per cent., and small quantities of benzyl alcohol, $C_6H_5CH_2-CH_2OH$; benzylic benzoate, $C_7H_5(C_7H_7)O_2$; stilbene, $C_{14}H_{12}$; styrol, C_8H_8 ; styracin; toluol, C_7H_8

ACTION AND USES.—Stimulant, expectorant, and stomachic. Externally in ointment. Dose: 8 to 30 gr. (0.5 to 2 Gm.).

263. BALSAMUM TOLUTANUM.—BALSAM OF TOLU

BALSAM OF TOLU

A balsam exuding from incisions in the trunk of **Tolui'fera Balsamum** Linné.

BOTANICAL CHARACTERISTICS.—A lofty evergreen tree with warty branches; the wood contains a liquid balsam, which exudes when incisions are made. *Leaflets* 7 to 8, ovate-oblong. *Legume* indehiscent, with winged expansions and a winged stalk; very broad at apex.

HABITAT.—Venezuela and New Granada.

COLLECTION.—The balsam is obtained by making V-shaped incisions through the bark and collecting the exudate in small cups or calabashes. It is imported from Venezuela in tins holding from ten to twenty-five pounds. This tapping of the tree continues for eight months, causing the tree to become partially exhausted, showing itself in the lessened foliage. A spurious article has been found on the market. It has a soft consistence, is very sticky, especially when chewed, and under the microscope shows only an occasional crystal. On distilling a portion of this balsam with water, it was observed to contain more of a fragrant volatile oil and less cinnamic acid than the genuine drug.

DESCRIPTION OF DRUG.—A very viscid, yellowish-brown semi-solid, with a sweet, fragrant odor, and feebly aromatic taste. Long kept, it gradually hardens into a more or less solid mass, which is brittle in the cold. Soluble in volatile oils, alcohol, chloroform, glacial acetic acid, and solution of potassa. Readily fusible, and burns with an aromatic odor.

CONSTITUENTS.—A volatile oil (chiefly toluene, $C_{10}H_{16}$), a resin, free acids (cinnamic and benzoic), and benzylic ethers of these, principally of the former. If a thin layer of the balsam be viewed under the microscope, numerous crystals of the free cinnamic acid are seen.



FIG. 135.—*Toluifera balsamum*—Branch and fruit.

ACTION AND USES.—Stimulant expectorant, similar in action but weaker than balsam of Peru. The syrup is used as an agreeable basis for cough mixtures. Dose of the balsam: 8 to 30 drops (0.5 to 2 Mils).

LINACEÆ.—Flax Family

Stems herbaceous; annual or perennial, rarely woody plants closely allied to the mallows, remarkable, however, in having the inner fiber of the bark very tenacious, and for the mucilaginous covering of the seed, in which there is an abundance of drying fixed oil. A few are bitter.

264. LINUM.—LINSEED

FLAXSEED

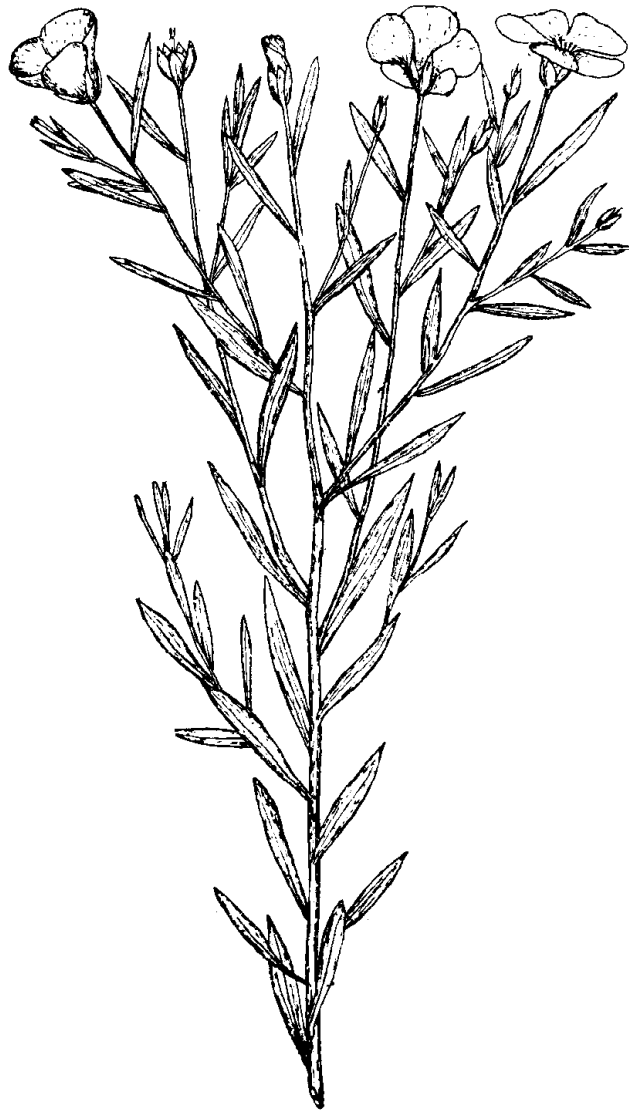


FIG. 136.—*Linum usitatissimum*.

The ripe seed of **Li'num usitatis'simum** Linné, including not more than 3 per cent. of other harmless fruits, seeds or foreign matter.

BOTANICAL CHARACTERISTICS.—The common flax is an annual; stem corymbosely branched at top. *Leaves* sessile, linear-lanceolate, smooth. *Flowers* in a corymbose *panicle*, with sky-blue petals. *Pod* about the size of a pea, of 5 united carpels (into which it splits in dehiscence), and 5-celled, with two seeds hanging from the summit of each cell, which is partly or completely divided into two by a false partition projecting from the back of the carpel, the pod thus becoming 10-celled.

HABITAT.—All temperate countries.

DESCRIPTION OF DRUG.—**Oblong-ovate, flat**, obliquely pointed at one end and blunt at the other. The brown, glossy, polished surface is seen, under the lens, to be marked with fine pits, and to be covered with a transparent **mucilaginous epithelium** that swells in water. The hilum occupies the slight hollow just below the apex. The embryo is oily, whitish, and inodorous. Taste mucilaginous, oily, and slightly bitter. Flaxseed meal is of a brownish-gray color, and has a slight odor.

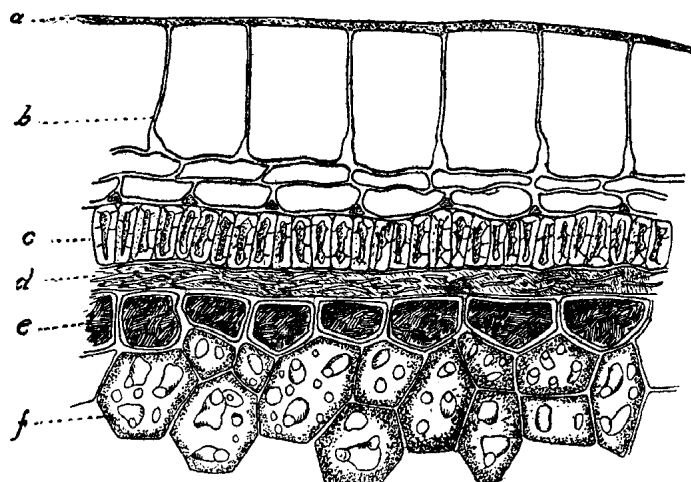


FIG. 137.—Cross-section of Flaxseed. *a.* Epithelium. *b.* Epidermal cells in swollen condition. *c.* Stone cells. *d.* Layer of collapsed cells for building stone cells. *e.* Pigment coat. *f.* Containing oil.

Powder.—Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—A viscid yellow fixed Oil, 30 to 35 per cent., proteids 25 per cent., resin, wax, a small quantity of amygdalin. The powder upon extraction with petroleum should yield not less than 30 per cent. of fixed oil, 98 per cent. of which should be saponifiable. An althæa-like mucilaginous substance resides in the epithelial layer, which swells considerably in water. This gummy matter from the investing coat is rapidly imparted to hot water, forming a thick, viscid mucilage, precipitated by alcohol and lead subacetate. The gummy principle is

considered as transformed starch, which latter exists in the immature seed, but is absent in the ripe seed. Ash, not exceeding 6 per cent.

264a. **OLEUM LINI**.—A **yellowish fixed oil expressed** (for medicinal use) **from the seed without heat**, having a slight, pleasant odor, and a bland taste; on exposure to the air it gradually thickens and acquires a strong odor and taste. The oil used in the arts is obtained on a large scale by roasting the seeds before being pressed, in order to destroy the gummy constituents of the coating. It does not congeal above -20°C . (-4°F .). The most characteristic principle in the oil is linolein, $\text{C}_{12}\text{H}_{28}\text{O}_2$, a glyceride of linoleic acid, and considered to be a mixture of two acids—linolic, $\text{C}_{18}\text{H}_{32}\text{O}_2$, and linolenic acid, $\text{C}_{18}\text{H}_{30}\text{O}_2$. The drying property of the oil resides in this constituent.

ACTION AND USES.—The whole seed is used in decoction as a demulcent; ground flaxseed is a favorite farina for poultices; the expressed oil is laxative, and, in combination with lime-water (*Linimentum Calcis*), is much employed as a protective in burns, etc.

OFFICIAL PREPARATION.

From *Oleum Lini*.

Linimentum Calcis (equal parts of linseed-oil and lime-water).

265. **COCA**.—**COCA** (U.S.P. VIII)

ERYTHROXYLON

The dried leaves of **Erythrox'ylonCo'ca** Lamarck (Fam. Erythroxylaceae,) known commonly as **Huanuco** (Bolivian) **Coca**, or of **E. Truxillense** Rusby, known commercially as **Truxillo** (Peruvian) **Coca**, yielding, when assayed by U.S.P. process, not less than 0.5 per cent. of ether-soluble alkaloids of coca.

BOTANICAL CHARACTERISTICS.—Shrub about 6 feet high, with bright green leaves, size and shape similar to those of tea, and white blossoms, which are succeeded by small scarlet berries. When the leaves mature, the branches are stripped and the leafless plant is soon again covered with verdant foliage. The plant is propagated in nurseries from the seed.

SOURCE.—The shrub bearing coca leaves is extensively cultivated on the slopes of the Andes about 2,000 to 5,000 feet above the sea level, in **Peru and Bolivia**. The province of La Paz in Bolivia produces about the largest crops. That of Bolivia is considered superior to the Peruvian, although the latter country produces double the quantity. In this latter country, especially owing to the European demand, the

cultivation has considerably increased. The annual production reaches the enormous figures of about one hundred million pounds. Two varieties, "Trujillo" and "Huanuco," having different characteristics, come to this market, the former named after the port Trujillo in the northern part of Peru, and the latter from the city of Huanuco, in the central part of Peru. The culture of coca leaves has been tried in other countries, but with questionable results, except, perhaps, on the Island of Java. The plant yields its first crop when eighteen months old, and continues to bear about forty years. There are two pickings —and September; the latter is considered the best and most abundant. The leaves are laid out in a paved drying yard and afterward pressed in drums (tambors) of plantain leaves, the tambor weighing forty pounds net.

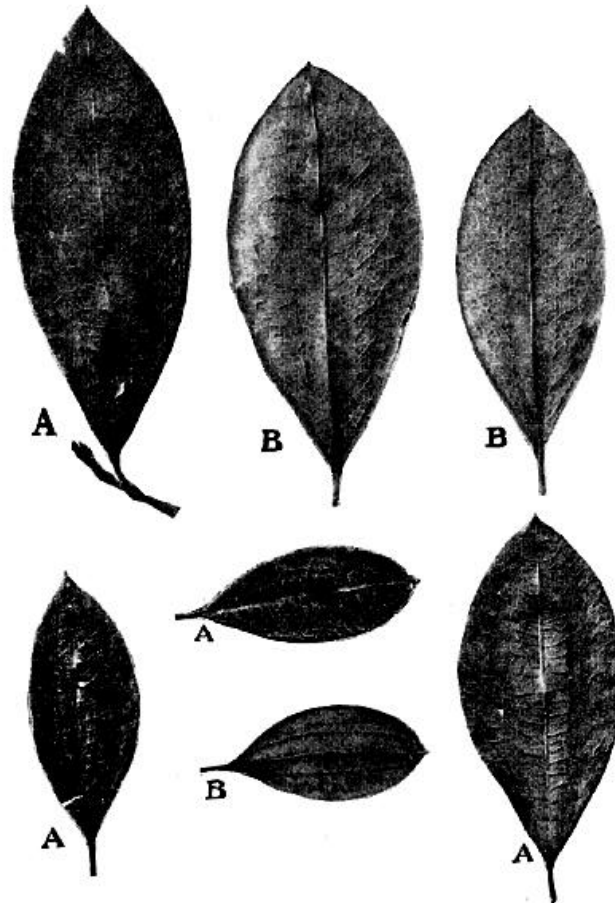


FIG. 138.—Coca Leaves—A, Upper side. B, Under side. (Photograph. Natural Size.)

DESCRIPTION OF DRUG.—*Huanuco Coca*.—Greenish-brown to clear brown, smooth and slightly glossy, thickish and slightly coriaceous, stoutly and very short petioled; blade 2.5 to 7.5 cm. long and nearly elliptical, with a very short and abruptly narrowed basal portion and a short point, the margin entire; midrib traversed above by a slight ridge, very prominent underneath, the remaining venation obscure, especially above; underneath, two conspicuous lines of collenchyma tissue run longitudinally on either side of the midrib and about one-third of the distance between it and the margin, the enclosed areola being of a slightly different color from the adjacent surface; odor characteristic; taste bitterish, faintly aromatic, followed by a

numbness of the tongue, lips, and fauces.

Truxillo Coca.—Pale green, thin, brittle and usually much broken, smooth but not shining, shortly and stoutly petioled; blade 1.6 to 5 cm. long and one-third to one-half as broad, obovate to oblanceolate, narrowed from near the middle into the petiole, usually with a slight projecting point at the summit, the margin entire; underneath two irregular lines of collenchyma tissue, usually incomplete or obscure, and frequently wanting, run beside the midrib; odor more tea-like than that of Huanuco Coca; taste and numbing effect similar.

Powder.—Greenish. Characteristic elements: Calcium oxalate of parenchyma in prisms, 3 to 10 μ in diam.; sclerenchyma, bast, and crystal fibers; small papillæ on under epidermal cells.

CONSTITUENTS.—A volatile liquid alkaloid, **hygrine**, and **cocaine** ($C_{17}H_{21}NO_4$), which has been found to be a compound body represented in a methyl benzoyl compound of another organic base, **ecgonine** ($C_9H_{16}NO_3$). There are also present in the leaves **benzoyl ecgonine**, a methyl compound of which constitutes the **alkaloid cocaine**. This complex body cocaine is readily decomposed into its component parts, methyl alcohol, benzoic acid, and ecgonine, by heating with HCl. Hydrochloric acid is, therefore, unsuitable for the extraction of cocaine in the process of its manufacture. The percentage of cocaine varies greatly, hence it is important to assay the leaves and its preparations. Assay shows an average of 0.5 per cent. of ether-soluble alkaloids of the leaf.

Preparation of Cocaine.—Exhaust the powdered drug by repercolation with water acidulated with 5 per cent. H_2SO_4 . Agitate the concentrated liquid with pure coal oil and an excess of Na_2CO_3 . The oily liquid is then shaken with acidulated water and again precipitated by Na_2CO_3 in the presence of ether. From the ethereal solution the alkaloid can be obtained on evaporation.

COCAINA (U.S.P. IX).—Cocaine. Average dose: 0.015 Gm. ($\frac{1}{4}$ gr.).

ACTION AND USES.—**Stimulant** to digestion, the brain, and respiration. **Checks the process of wasting**, enabling the laborer to endure a greater amount of physical exertion with a small amount of food. For this purpose the leaves are habitually chewed by the natives. Dose: 15 to 60 gr. (1 to 4 Gm.). Cocaine is a valuable local anæsthetic. Applied to mucous surfaces and injected subcutaneously. Dose: $\frac{1}{2}$ to 1 gr. (0.0324 to 0.064 Gm.).

Solutions of the alkaloid in olive and castor oil are stable. Cocaine hydrochloride ointment should not be made with lard or vaseline, as it is insoluble in these fats. If the hydrochloride be dissolved in a little water before admixture, a stable ointment is effected.

COCA PRÆPARATA, N.F. 1 to 4 fl. dr. (4 to 15 Mils) .

GERANIACEÆ.—Geranium Family

Herbs with opposite or alternate leaves, usually stipulate, simple or compounds. *Flowers* regular or irregular; *carpels* prolonged above into beaks terminated by the styles, which give rise to the name Cranesbill, applied to the principal genus.

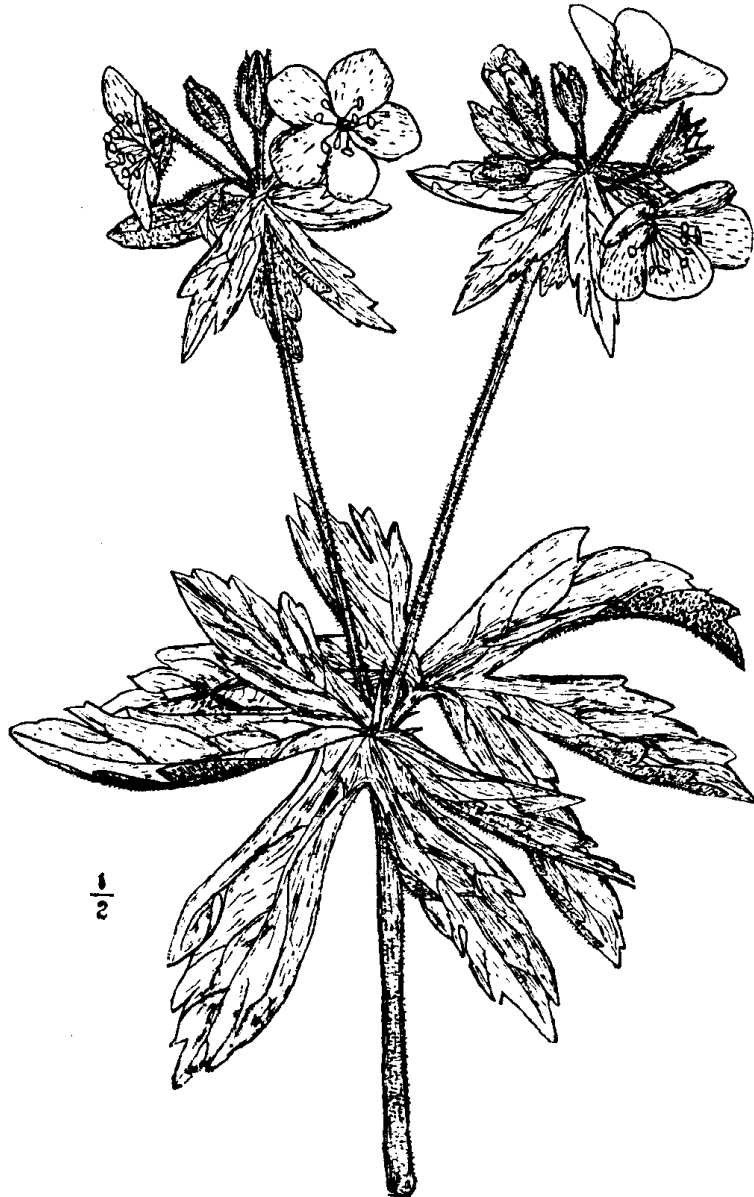


FIG. 139.—*Geranium maculatum*—Flowering branch.

266. GERANIUM.—GERANIUM, N.F.

CRANESBILL

The dried rhizome of **Gera'nium macula'tum** Linné.

DESCRIPTION OF DRUG.—**Rough, knotty, cylindrical, horizontal, rhizome**, 50 to 75 mm. (2 to 3 in.) long, and 10 mm. ($\frac{2}{5}$ in.) thick; longitudinally wrinkled, tuberculated, very hard, and sometimes beset with shriveled, brittle rootlets; externally dark brown; fracture short, reddish-gray, showing a thin bark, several small, yellowish wood-wedges forming a circle near the cambium line, and a large pith; medullary rays broad. The rootlets have a thick bark and a thin central column of fibrovascular tissue. Inodorous; taste astringent.

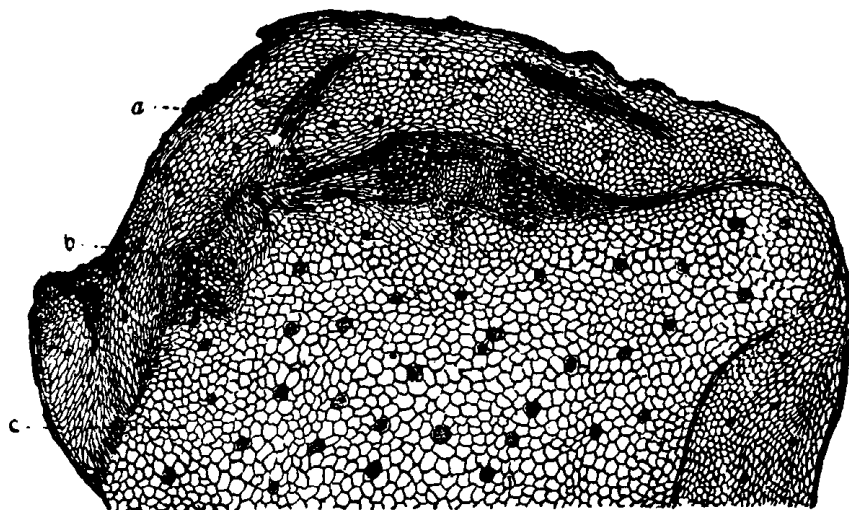


FIG. 142.—Cross-section of Cranesbill. *a.* Bark. *b.* Wood-wedge. *c.* Pith. (12 diam.)

Powder.—Grayish-brown. Characteristic elements: Large aggregate crystals of calcium oxalate; ducts porous and reticulate; parenchyma with crystals and starch.

CONSTITUENTS.—Tannic (12 to 37 per cent.) and gallic acids, with resin, starch, gum, pectin, and a red coloring matter. Both alcohol and water extract its virtues.

ACTION AND USES.—A valuable and pleasant astringent. It has been claimed that the rhizome contains mucilaginous material which, acting as a demulcent, makes a decoction a much more desirable preparation than a simple solution of tannin. The fluidextract is said to be useful in buccal ulcer, etc. Dose: 15 to 30 gr. (1 to 2 Gm.).

267. **IMPATIENS PALLIDA**.—JEWEL WEED. Indigenous herb occasionally used as an alterative and diuretic in infusion. Dose: 1 dr. (4 Gm.) . **Impa'tiens balsam'ina**, the touch-me-not of the gardens, has the same properties.

ZYGOPHYLLACEÆ

The wood of many species of this order is remarkable for its excessive hardness. The two official drugs from the order are the wood, 75, and resin, 76, of guaiacum.

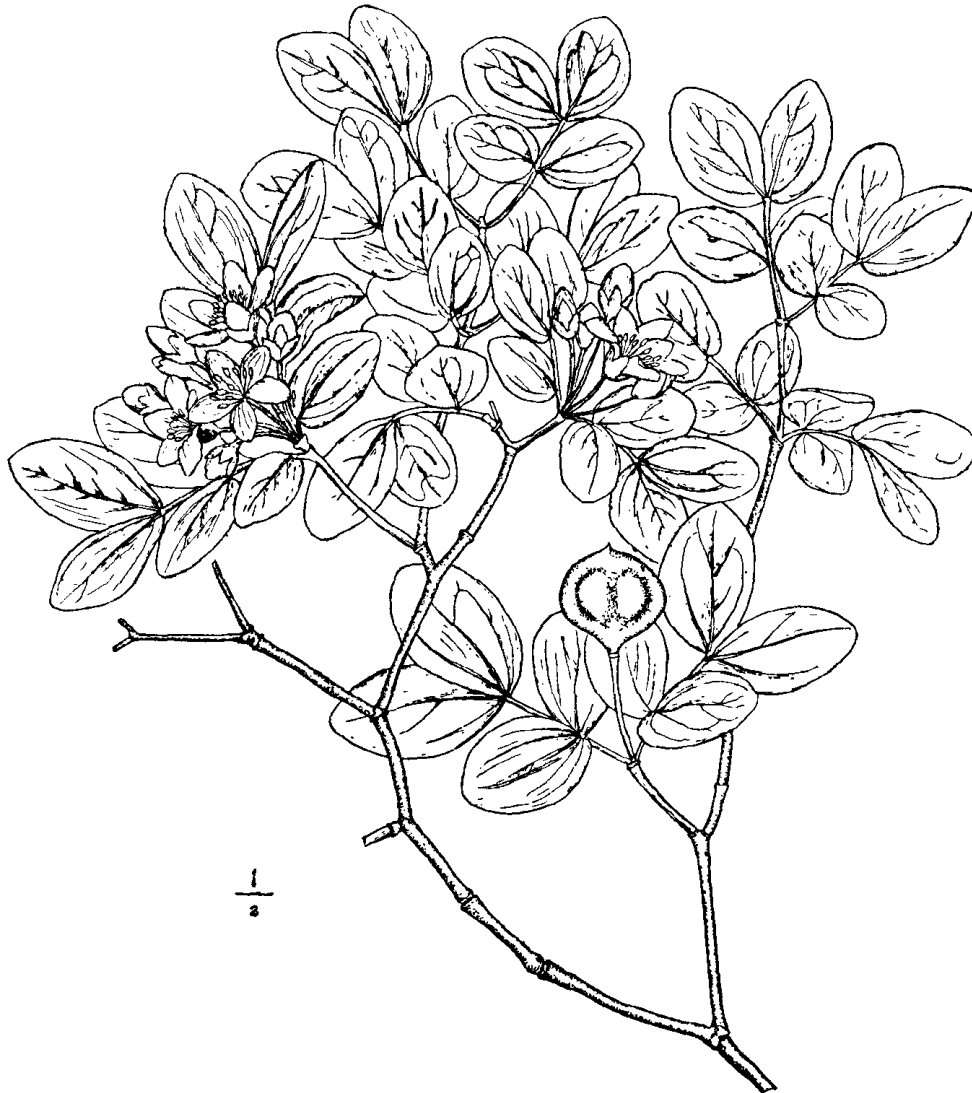


FIG. 140.—*Guaiacum sanctum*—Flowering branch.

268. **GUAIACI LIGNUM**, N.F.—**LIGNUM VITÆ** The heart-wood of **Gua'iacum officina'le** and **G. sanctum** Linné. Greenish-brown, resinous raspings or chips, mixed with yellowish particles of the sap-wood; odor slight, agreeable, increased by heating or rubbing; taste slightly aromatic, but irritating and persistent after chewing some time. The heart-wood of guaiac is imported in billets or logs and used for turning out various instruments and utensils, the shavings from these being used in pharmacy. The **sap-wood** is yellowish, the **heart-wood** dark greenish-brown, hard and heavy, remarkable in that its specific gravity is such as to sink in water. **Constituents:** The **resin** (soluble in alcohol and alkaline fluids) is the most **important constituent**, of which it contains about 26 per cent.; it also contains 0.8 per cent. of bitter, pungent extractive. The wood or chips are turned a bluish-green by the action of nitric acid fumes.

Stimulant, diaphoretic; also a reputed antirheumatic and antisyphilitic. Generally given in the form of compound decoction of sarsaparilla. Dose: 15 to 60 gr. (1 to 4 Gm.).

269. GUAIIACUM.—GUAIIAC

GUM GUAIIAC

The resin from the wood of *Gua'iacum officina'le* Linné and of *G. sanctum*.

SOURCE.—Obtained from natural exudation or from incisions into the trunk, occasionally by boring longitudinally through a billet, placing one end in the fire, and catching the melted resin as it exudes from the hole in the other end; more commonly, however, by extracting the chips or raspings with a boiling solution of common salt.

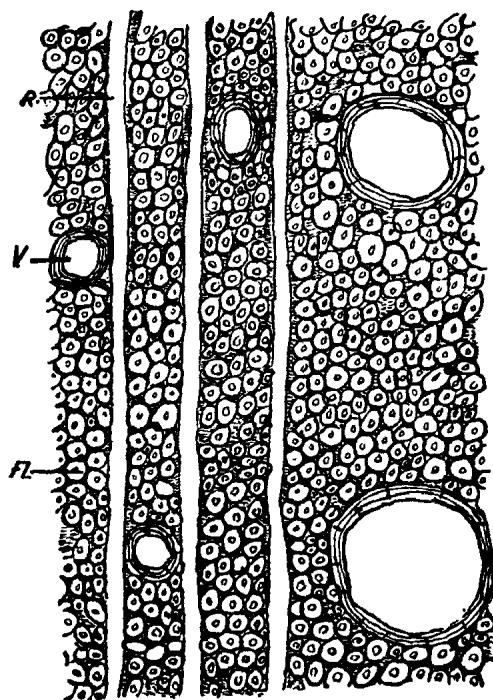


FIG. 141.—*Guaiacum*—Cross-section of wood. R. Medullary rays, composed of one, two, and three ranges of cells. V. Closed vessels. F. Ligneous fibers, very much developed and forming concentric zones.

DESCRIPTION OF DRUG.—**Greenish-brown, irregular masses**, containing fragments of wood and bark; brittle, breaking with a glossy fracture; in thin pieces, transparent. The powder is gray when fresh, but **becomes green on exposure**, and blue when in contact with oxidizing agents. Odor slight, balsamic, when heated resembling benzoin; taste slightly irritating.

CONSTITUENTS.—**Guaiacic acid**, β -resin (11.75 per cent.), and guaiac yellow, $C_{20}H_{20}O_7$, soluble in milk of lime; guaiaretic acid, $C_{20}H_{24}O_4$, 11.15 per cent.; **guaiaconic acid**, 50 per cent., and gum and ash in small quantity. Guaiacene, guaiacol, cresol, and pyroguaiacin are obtained by dry distillation. The coloring matter crystallizes in pale yellow or quadratic octahedra having a bitter taste. Ash, not exceeding 4 per cent.

The so-called “guaiacum oil” is obtained by boiling guaiacum resin with solution of sodium carbonate, allowing to cool, filtering, saturating the filtrate with carbon dioxide, again filtering, extracting the oil with ether, and allowing the solvent to evaporate. The product is soluble in water, alcohol, and ether. From the alkaline liquid acids precipitate the yellow coloring matter (“guaiacum yellow”), which imparts a blue color to strong sulphuric acid.

The blue color which guaiacum resin produces with certain oxidizing agents is due to an oxidation product of guaiaconic acid.

ACTION AND USES.—Stimulant, diaphoretic, and alterative; also a mild purgative. Dose: 5 to 30 gr. (0.3 to 2 Gm.).

OFFICIAL PREPARATIONS.

Tinctura Guaiaci (20 per cent.),.....Dose: 30 to 60 m (2 to 4 mils).
Tinctura Guaiaci Ammoniata (20 per cent.),..... 30 to 60 m (2 to 4 mils).

RUTACEÆ.—Rue Family

To facilitate study, this order has been divided, one of the subdivisions being the sub-order Aurantieæ (see below). The rueworts are remarkable for yielding acrid and resinous principles and volatile oil. *Ruta montana*, growing in Spain, is so extremely acrid that it raises pustules on the skin of those who gather it. The peduncles and flower of the European Dittany are so laden with volatile oil that the plant ignites at the approach of a lighted candle.

Synopsis of Drugs from the Rutaceæ

<p>A. <i>Barks.</i> XANTHOXYLUM, 270. Angustura, 272. Ptelia Trifoliata, 273.</p>	<p>B. <i>Leaves.</i> BUCHU, 274. PILOCARPUS, 275. Ruta, 276.</p>	<p>C. <i>Fruits.</i> Bela, 277. *Xanthoxyli Fructus, 271.</p>
---	---	---

270. XANTHOXYLUM.—XANTHOXYLUM

PRICKLY-ASH BARK

The bark of **Xanthoxylum americanum** Miller, and of **Fagara clava-herculis** Linné, known in commerce respectively as Northern Prickly-ash and Southern Prickly-ash.

BOTANICAL CHARACTERISTICS.—The northern prickly-ash, *X. americanum*, bears its *leaves* and *flowers* in sessile, axillary, umbellate clusters; *leaflets* 2 to 4 pairs, and an odd one, obovate-oblong, downy when young. The southern prickly-ash, *F. clava-herculis*, bears its *flowers* in an ample terminal cyme, appearing after the *leaves*; leaflets 3 to 8 pairs, and an odd one, ovate or ovate-lanceolate, oblique, shining above.

HABITAT.—United States.

DESCRIPTION OF DRUG.—Northern prickly-ash (*X. americanum*), as found in commerce, is in curved or quilled pieces about 1 mm. $\frac{1}{25}$ in.)

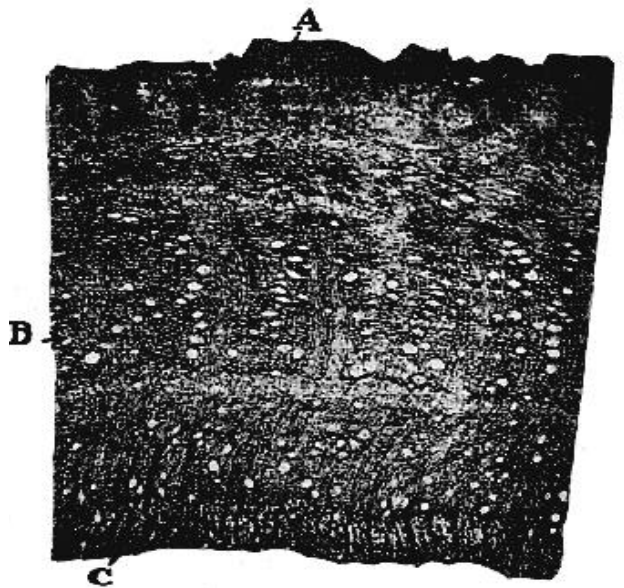


FIG. 143.—Xanthoxylum—Cross-section of bark. (15 diam.) A, Cork. B, Resin cells. C, Medullary ray. (Photomicrograph.)

thick; the outer surface is of a brownish-gray color, longitudinally furrowed and **showing a few yellowish-gray patches of foliaceous lichens, also numerous black dots** and a few straight spines. Inner surface is light brown or yellowish; fracture uneven, short; inodorous; taste bitter, pungent, and acrid. Southern prickly-ash (*F. clava-herculis*) is somewhat thicker and has conical corky projections, with a few spines rising from corky bases. Inner surface free from acicular crystals.

Powder.—Characteristic elements: See Part iv, Chap. 1, B.

CONSTITUENTS.—An acrid green oil, a colorless crystalline resin, sugar, ash 11 to 12 per cent., tannin (small quantity), and a bitter principle which is turned brown by H_2SO_4

ACTION AND USES.—Alterative, sialagogue, stimulant, and tonic, its action being similar to that of guaiac and mezereum. The bark chewed is a popular remedy for toothache, giving rise to the synonym, toothachetree. The fluidextract is frequently combined with such alteratives as stillingia, lappa, etc. The berries are used in compound syrup of stillingia (see National Formulary). Dose: 15 to 45 gr. (1 to 3 Gm.).

OFFICIAL PREPARATION.

Fluidextractum Xanthoxyli Dose: 30 to 60 drops (2 to 4 mils)

271. **XANTHOXYLI FRUCTUS**, N.F.—PRICKLY-ASH FRUIT. Consists of brownish-red capsules about 4 to 5 mm. ($\frac{1}{5}$ to $\frac{1}{4}$ in.) in diameter, sessile on the thin receptacle (*X. clava-herculis*), or borne on short stalks (*X. americanum*); the two valves open when ripe and expose the one or two shining, more or less wrinkled, black seeds; odor aromatic; taste very pungent and somewhat bitter. Stimulant, tonic, and alterative; used in fluidextract of stillingia, N.F. Dose: 15 to 30 gr. (1 to 2 Gm.).

272. **ANGUSTURA**.—CUSPARIA BARK. The bark of **Galipe'a cuspa'ri** St. Hillaire. *Habitat*: Northern South America. Found in the market in flattish, quilled, or channeled pieces about 3 mm. ($\frac{1}{8}$ in.) thick, and not longer than 150 mm. (6 in.), but usually shorter; externally it is covered with a yellowish-gray, corky layer, which is marked by shallow longitudinal fissures, and in most cases easily removed by the nail; inner surface light cinnamon-brown, often with adhering strips of wood; internally reddish-brown, showing white points due to deposits of calcium oxalate. **The tissue of the bark is loaded with oil cells.** Odor musty, due to volatile oil; taste bitter and nauseous. Besides volatile oil and resin, the bark contains a bitter principle, **angusturin, and four alkaloids**, the most important of which is **cusparine**. Used as an aromatic bitter. Dose: 8 to 30 gr. (0.5 to 2 Gm.).

273. **PTELIA TRIFOLIATA** Linné.—WATER ASH. Shrub growing in the United States east of the Mississippi. (Root-bark.) It contains berberine. Used as a tonic and antiperiodic, "its mild, non-irritating properties rendering it especially valuable in low fevers attended with gastro-intestinal irritation; this soothing influence causes it to be retained when other tonics would be rejected." Dose of fluidextract: 15 to 30 drops (1 to 2 Mils).

274. **BUCHU**.—BUCHU

SHORT BUCHU

The dried leaves of **Barosma Betulina** (Thunberg) Bartling and Wendland, known commercially as short buchu, or of **Barosma Serratifolia** (Curtis), Willdenow, known commercially as long buchu, with which may be mixed not more than 10 per cent. of the stems of the plants or other foreign matter.

BOTANICAL CHARACTERISTICS.—Shrubby plant. The characteristics common to the buchuus are opposite *leaves*, small, simple, coriaceous, dotted with pellucid glands. *Flower* pink (*betulina*), white (*crenulata*), solitary on axillary or terminal peduncles. *Fruit* composed of five follicles, adherent at the axis and dehiscent at the summit.



FIG. 144.—*Barosma betulina*—Branch and flower.



FIG 145.—*Barosma crenulata*—Flowering branch.

HABITAT.—Southern Africa, Cape of Good Hope.

DESCRIPTION OF DRUG.—About 15 mm. long, varying between oval and obovate, yellowish-green, apex obtuse, margin crenate or serrate with a gland at the base of each tooth, base more or less wedge-shaped; coriaceous, both surfaces beset with numerous slight projections; odor strong and characteristic; taste somewhat mint-like, pungent and

bitterish. *B. serratifolia* (very narrow, linear-lanceolate) con. stitute the "long buchu" of commerce. The long buchu (off. in U.S.P. 1890) contains less of the volatile oil. Transverse sections show a subcuticular layer of thickened cells, rich in mucilage, and containing sphaero-crystals. Both kinds usually require careful garbling, as they are often mixed with branchlets, fragments of capsules, and with leaves of allied species. The long buchu is sometimes mixed with the leaves of *Empleurum serrulatum*, but these are still narrower, often longer, and terminate in an acute point, without an oil duct.

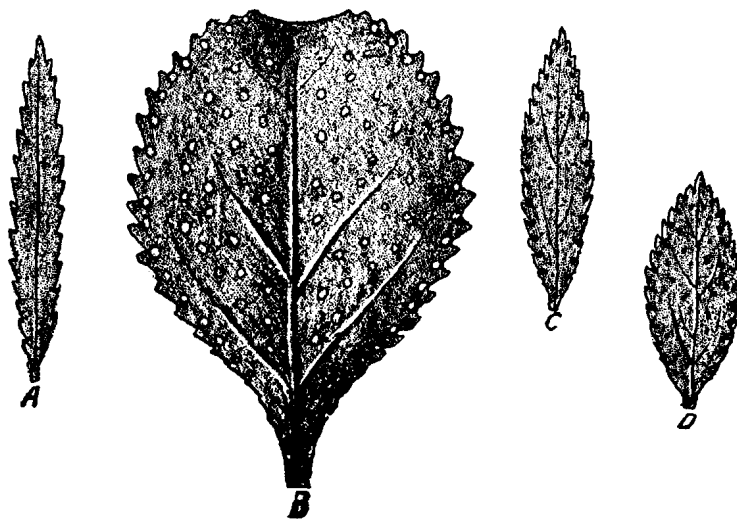


FIG. 146.—Buchu Leaves and Adulterant. A, Leaf of *Empleurum serrulatum*. B, Leaf of *Barosma betulina* (enlarged). C, Leaf of *Barosma serratifolia*. D, Leaf of *Barosma crenulata*.

Powder.—Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—**Volatile oil** is contained in large circular cells just beneath the epidermis of the under surface of the leaf; the short buchu yields the greater per cent. (1 to 1.56 per cent.). On exposure to cold it separates out barosma camphor, which existed in the oil dissolved in a hydrocarbon. The upper surface of the leaves swells up in water, due to a layer of mucilage cells just beneath the surface. The bitter principle is **rutin**; **resin** is also present.

ACTION AND USES.—A mild diuretic in disorders of the urinogenital organs, its action depending upon the volatile oil. In Cape Colony the leaves are employed as a stimulant and stomachic. Dose: 15 to 45 gr. (1 to 3 Gm.).

OFFICIAL PREPARATION.

Fluidextractum Buchu,

Dose: 15 to 60 drops (1 to 4 mils) .

275. PILOCARPUS.—PILOCARPUS

JABORANDI

The leaflets of **Pilocar'pus jaboran'di** Holmes or of **Pilocarpus microphyllus** Stapf. Yielding when assayed by U.S.P. process not less than 0.6 per cent. of alkaloids.

BOTANICAL CHARACTERISTICS.—A shrub 4 to 5 feet high. *Leaflets* 1 to 4 pairs, petiolate. *Flowers* in long racemes. *Ovary* with 5 carpels. *Seeds* black, angular.

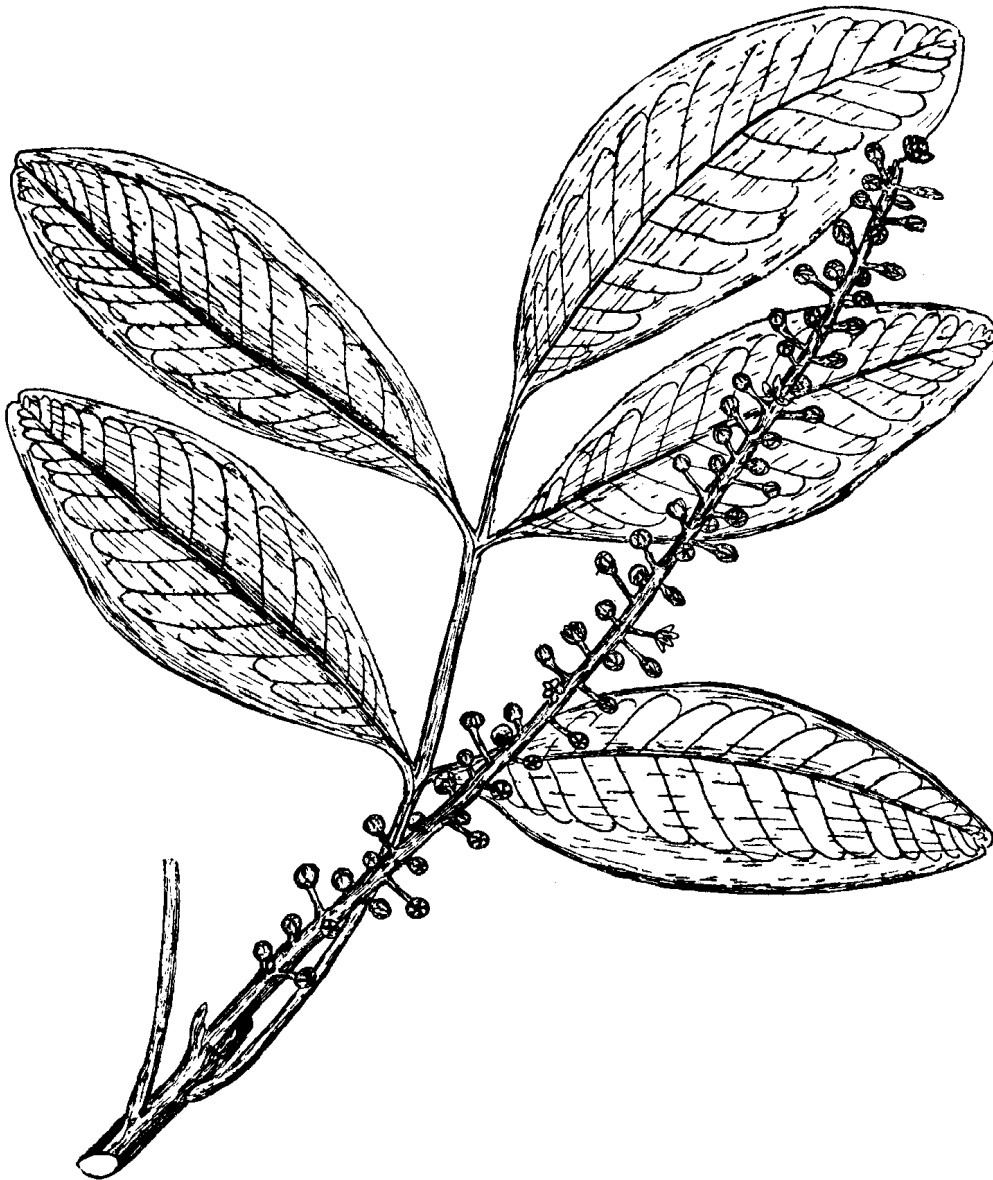


FIG. 147.—*Pilocarpus selloanus*—Branch from flowering top.—(After Kohler.)

SOURCE, VARIETIES, AND ADULTERATIONS.—The name Jaborandi is a generic one, applied in South America to several plants possessing diaphoretic properties. The shrub, *Pilocarpus jaborandi*, grows in Brazil in the neighborhood of Pernambuco, known commercially as Pernambuco Jaborandi. *P. microphyllus* (which yields a large percentage of alkaloid), differs from this in absence of oil from their tissues, by their reticulated venation, etc., is known commercially as Maranham jaborandi. It has been adulterated with species of *Piper*, which are not pellucid-punctate, with *Laurus nobilis*, etc.

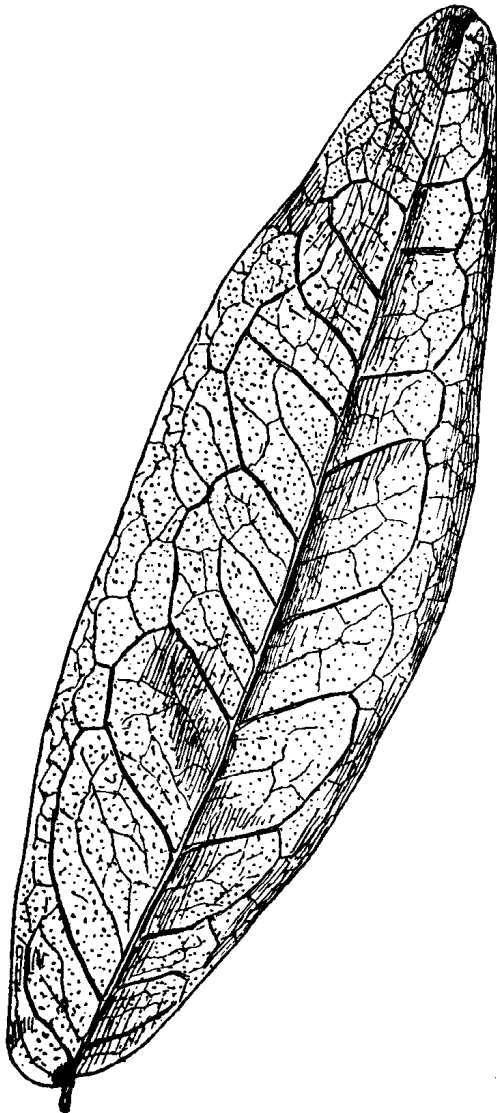


FIG. 148.—Leaf of Jaborandi as it appears in the market.

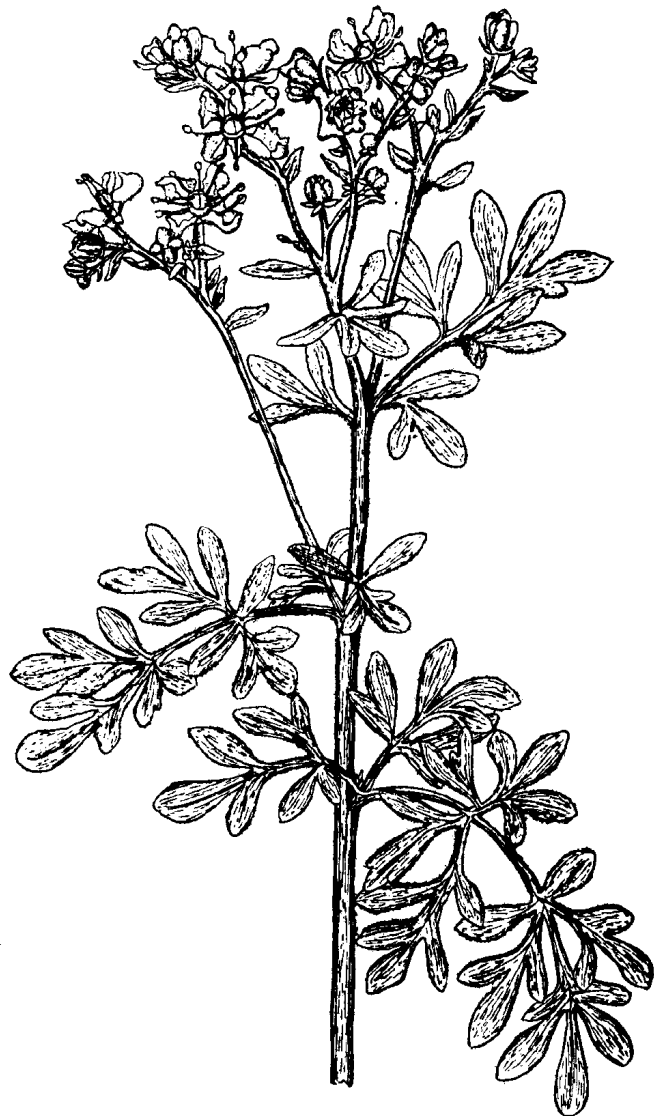


FIG. 149.—*Ruta graveolens*.—Portion of plant.

DESCRIPTION OF DRUG.—Leaves nearly sessile, pinnate, with a terminal leaflet; the leaflets, which come into market separate, are **ovate-oblong, entire**, about 100 mm. (4 in.) long, and 50 mm. (2 in.) broad; short-petiolate; uneven at the base; **slightly revolute at margin**, near which the **anastomosing veins form one or two distinct wavy lines; coriaceous**; dull green, finely marked with small, transparent dots or oil-cells, plainly visible when held up to the light; texture coriaceous, brittle; when bruised a peculiar, rather unpleasant odor is emitted; this odor is predominant in the fluidextract. Taste disagreeable, slightly pungent, and bitter. The leaflets of *P. microphyllus* (Maranham jaborandi) are smaller (2-5 to 4 cm. in length), usually ovate in outline, deeply emarginate at apex. **Alkaloidal content (chiefly Pilocarpine) of best leaf ranges from 0.5 to 1 per cent.**

Powder.—Yellowish-brown. Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—A **volatile oil**, and two alkaloids, **pilocarpine** ($C_{11}H_{17}N_2O_2$), deliquescent, crystalline, inodorous, and slightly bitter, and **jaborine**, chemically isomeric with, but directly antagonistic to, the first named in physiological action. Pilocarpine is the most active, and yields jaborine and pilocarpidine ($C_{10}H_{14}N_2O_2$) when heated with HCl; its salts are readily soluble in water; their action is similar to that of nicotine. **Jaborine** ($C_{22}H_{32}N_4O_4$) **is yellow**, amorphous, and **resembles atropine in action**; its presence in the commercial pilocarpine explains the different effects following the use of the latter when improperly made. It is therefore very necessary, in using pilocarpine or any of its preparations, to obtain them free from jaborine.

Preparation of Pilocarpine.—To an aqueous solution of acidulated alcoholic extract add alkali and shake with chloroform. From the chloroformic solution the alkaloid is separated by shaking with acidulated (HCl) water, filter, and allow it to crystallize.

ACTION AND USES.—Powerfully diaphoretic and sialagogue by stimulating the nerves supplying the glands and involuntary muscular fiber; cardiac depressant. The most important effects of pilocarpine are due to the stimulation of certain nerve terminations. It stimulates the peripheral endings of all the autonomous nerves. The most important effect of the ingestion of a therapeutic dose of pilocarpine is an increase in the secretory activity of nearly all the glands of the body, especially of the salivary and sweat-glands. Dose: of drug 5 to 60 gr. (0.3 to 4 Gm.). Pilocarpine is used as a myotic in ophthalmic practice. It has acquired

some reputation in the treatment of diphtheria and croup; frequently administered hypodermically; poisonous. Dose of pilocarpinæ hydrochloridum, $\frac{1}{8}$ to $\frac{1}{12}$ gr. (0.008 to 0.005 Gm.). Ash, not exceeding 7 per cent.

OFFICIAL PREPARATION.

Fluidextractum Pilocarpi Dose: 5 to 60 drops (0.3 to 4 mils).

276. **RUTA.**—RUE. The leaves of **Ru'ta graveo'lens** Linné. *Habitat:* Mediterranean region; cultivated. The whole plant is active, but the leaves are the portion generally employed. They are ternate, the leaflets being obovate-oblong, yellowish-green, thickly dotted with minute, transparent oil-vesicles; odor strong, disagreeable, increased by rubbing; taste bitter, hot, and acrid.

Their medicinal value depends chiefly upon the volatile oil, but there is also present a peculiar coloring matter, rutinic acid, found also in other plants, and an acrid principle, the activity of which is diminished in the dried leaves; the fresh leaves will inflame or even blister the hands if much handled.

ACTION AND USES.—Emmenagogue, vermifuge, and diaphoretic. Dose: 5 to 20 gr. (0.3 to 1.3 Gm.) in infusion. The Romans used rue as a condiment, as the Germans still do.

OLEUM RUTÆ.—A yellowish-green volatile oil, powerfully irritant; used as a uterine stimulant, emmenagogue, etc. Dose: 2 to 5 drops (0.13 to 0.3 mil).

277. **BELA.**—BAEL FRUIT. BENGAL QUINCE. From **Æ'gle marme'los** Correa. *Habitat:* Himalaya Mountains; cultivated in India, where it is employed and considered as a valuable remedy in dysentery and diarrhoea, relieving without causing constipation. Dose: I to 2 dr. (4 to 8 Gm.). It is collected when half ripe and dried; usually enters commerce in segments having a smooth, grayish rind, and a hard, reddish, gummy pulp; whitish internally and divided into cells, each of which contains four or five woolly seeds; taste mucilaginous, slightly bitter; nearly inodorous.

AURANTIEÆ.-SUB-ORDER OF RUTACEÆ.-The Orange Family

The trees and shrubs which compose this sub-order of Rutaceæ are distinguished from others of the order merely by the character of the fruit. In the Aurantieæ the fruit is an indehiscent, juicy, berry-like fruit, botanically known as hesperidium (lemon, orange, and lime), having a leathery rind, containing numerous oil-glands. The capsular fruit of the rueworts proper is usually dehiscent. The leaves and fruit of both sub-orders abound in minute receptacles of volatile oil. These attain their maximum development in the rind of the orange, lemon, etc. (see Figs. 150 151, 152).

The Official and Unofficial Products of the Aurantieæ

I. *The Products of the Orange.*

A. Official.

The Peel, 278.

The Oil, 279.

Oleum Aurantii Florum, 281 a.

B. Unofficial.

The Leaf, 280.

The Flower, 281.

II. *The Products of the Lemon.*

A. Official.

*The Juice, 282.

The Rind, 283.

The Oil, 284.

Oil of Bergamot, 285.

B. Unofficial.

White Zapote, 286.

THE ORANGE PRODUCTS

SOURCE.—Universally cultivated in India and widely in tropical regions. The *sweet orange* was introduced from China by the Portuguese. It has been much improved by cultivation. There are now some fifty varieties in different parts of the globe, these taking the name of the places where cultivated, the sweetest coming from Havana, Florida, and California. *Bitter oranges* were introduced into Europe from India by the Arabians and were used medicinally from very early times, the bitter fruit being usually termed the Seville or Bigarade orange.

278. AURANTII AMARI CORTEX.—THE RIND. BITTER ORANGE PEEL, the dried rind of the unripe fruit of *Citrus vulgaris* Risso. Ash, not to exceed 7 per cent.

AURANTII DULCIS CORTEX.—SWEET ORANGE PEEL, the undried outer rind of the ripe fruit of *Citrus Aurantium* Linné. The orange tree is cultivated in the south of Europe, in the Azores, and in the United States-Southern States and California. It is said to be one of great longevity; thus, a tree in Versailles, known as the "Grand Bourbon," planted in 1421, is still in existence (Mueller).

DESCRIPTION OF DRUG.—*Bitter*: In narrow, thin bands or in quarters, epidermis brownish-yellow color, outer layer with numerous oil reservoirs, inner layer spongy, light yellowish-brown; odor fragrant; taste aromatic, bitter. The Curacao orange peel is obtained from a variety of the orange cultivated in the island of Curacao. *Sweet*: Outer surface orange-yellow with numerous oil reservoirs, odor highly fragrant, taste pungently aromatic.

Powder.—Microscopical elements of: See Part iv, Chap. I, B.



FIG. 150.—*Citrus Aurantium*—Branch.

CONSTITUENTS.—Volatile oil (contained in vesicles of the epidermis), hesperidin, ash, and a white principle which turns black with ferric salts.

ACTION AND USES.—Tonic, carminative, and stomachic; a valuable addition to preparations of the bitter tonics like gentian. Dose: 15 to 30 gr. (1 to 2 Gm.).

OFFICIAL PREPARATIONS.

Bitter Orange Peel.

Fluidextractum Aurantii Amari,..... Dose: 15 to 60 $\text{m}\ddot{\text{r}}$ (1 to 4 mils).

Tinctura Aurantii Amari (20 per cent.),... 1 to 2 fl. dr. (4 to 8 mils).

Tinctura Cinchonæ Composita (8 per cent.),... 8.0 mils to 2 fl. dr.

Tinctura Gentianæ Composita (4 per cent.),... 4.0 mils. to 1 fl. dr.

Sweet Orange Peel.

Syrupus Aurantii (5 per cent. of Tinct.),... $\frac{1}{4}$ to 1 fl. oz. (8 to 30 mils).

Tinctura Aurantii Dulcis (50 per cent.),... Flavoring.

279. **OLEUM AURANTII**—THE OIL. Obtained from the fresh peel of either the bitter or sweet orange. A pale yellow liquid, having a characteristic aromatic odor. Optical rotation should not be more than 95' to the right in a 100 mm. tube, and at a temperature of about 25°C. (77°F.). It contains some hesperidin, and an aldehyde geranial.

Oil of Petit-grain is obtained from the small, fragrant, immature oranges (berries about the size of a cherry). Recently, however, the leaves and shoots have been used for this purpose.

Manufacture.—The oils of the fruit of the Aurantieæ are manufactured by subjecting the outer rind to expression, distillation, or, preferably, to the écuelle process. This instrument (the écuelle) is described in most works on pharmacy.

OFFICIAL PREPARATIONS.

Spiritus Aurantii Compositus (contains 25 per cent. oil and the oils of lemon, coriander, and anise).

Elixir Aromaticum (1.2 per cent.),



FIG. 151.—*Citrus vulgaris*—Flowering branch.

280. **AURANTII FOLIA.**—THE LEAF. From **Cit'rusvulgar'is** Risso. Oval, from 50 to 100 Mm- (2 to 4 in.) long, on a broadly-winged petiole, pellucidunctate; odor aromatic; taste bitter. It is the principal source of *essence de petit-grain*, used to adulterate Oleum Neroli. Stimulant and tonic.

281. **AURANTII FLORES.**—THE: FLOWER. ORANGE FLOWERS. The flowers **Cit'rusvulgar'is** and **C. Aurantium**, collected before they are expanded, solely for the volatile oil, which is then most fragrant. Generally used while fresh, in which state they may be preserved for some time by mixing with half their weight of common salt. They are about 12 mm, ($\frac{1}{2}$ in.) long, with small, cup-shaped calyx and white, rather fleshy petals. Occasionally used as a stimulant and antispasmodic, but principally for preparing orange-flower water and the volatile oil.

281 a. **OLEUM AURANTII FLORUM, U.S. VI—OLEUM NEROLI.** A thin, yellowish, or brownish-yellow volatile oil, very fragrant. Used as a flavor and as a perfume. Neroli is the predominant odor in Farina Cologne.



FIG. 152.—*Citrus limonum*—Branch.

THE LEMON PRODUCTS

282. **LIMONIS SUCCUS—THE JUICE.**—LEMON JUICE (Succus Citri, N. F.). The freshly expressed juice of the ripe fruit of **Citrus medica** Linné (**C. limonum** Risso, U.S.P. 1900). A slightly turbid, yellowish liquid having the odor of lemon, due to the presence of some of the volatile oil from the rind; taste acid, often slightly bitter. It contains about 7 per cent. of free citric acid, also phosphoric and malic acids. Refrigerant and antiscorbutic; used in the form of lemonade, or in effervescing draughts. Dose: 1 fl. oz. (30 mils) .

Lemon juice should contain from 7 to 9 per cent. of citric acid. It should be free from added preservatives; preserved by sterilization. For tests see U.S.P. VIII. Lemon juice contains from 0.5 to 1 percent. of gum and sugar.

283. **LIMONIS CORTEX—THE RIND.**—LEMON PEEL. The undried outer rind of the ripe fruit of **Citrus medica** Linné (**C. limonum**. Risso, U.S.P. IX), removed by grating. The fruit comes from the Mediterranean and tropical regions (see Orange). The outer surface is of a light yellow color and ruggedly glandular from the oil-cells; odor fragrant; taste aromatic and bitterish.

Microscopically, the rind of the lemon resembles that of the orange.

Powder.—Microscopical elements of: See Part iv, Chap. I, B.

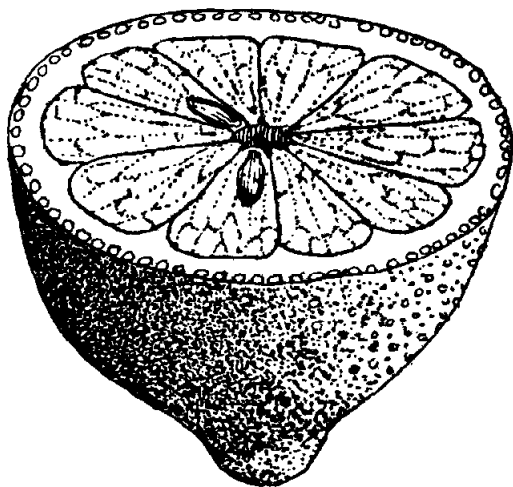


FIG. 153.—Cross-section of Lemon fruit.

CONSTITUENTS.—A pale yellow volatile oil (sp. gr. 0.87) consisting mainly of hydrocarbons, citrene ($C_{10}H_{16}$), cymene ($C_{10}H_{14}$), also citral ($C_{10}H_{16}O$), and a compound ether. Hesperidin ($C_{22}H_{26}O_{12}$), a bitter principle, produces with ferric salts a black color.

Used as a flavoring agent.

OFFICIAL PREPARATION.

Tinctura Limonis Corticis (50 per cent.).

284.—**OLEUM LIMONIS.**—OIL OF LEMON PEEL, OR RIND. A volatile oil obtained by expression from

the fresh lemon peel. It is a pale yellow, limpid liquid, having a lemon taste and a fragrant odor. It should be protected from light in well-stoppered bottles. Oil of citral, used in perfumery, is obtained from *Citrus medica* Risso, a large oblong fruit with rough surface-known in England as the citron.

Oil of lemon consists of two isomeric oils, chiefly citrene or limonine, $C_{10}H_{16}$, with citral (an aldehyde) and a crystalline product which fuses at 143° to $144^{\circ}C.$ (289° to $291^{\circ}F.$), colored yellow by H_2SO_4 , and green by HNO_3 . Used principally as a flavor assayed by the official process not less than 4 per cent. of the aldehydes from oil of lemon calculated as citral.

ADULTERATION OF THE OIL OF LEMON.—It is adulterated with the volatile oil of other fruits of the genus *Citrus*. These are difficult to detect, odor and taste must be chiefly relied upon.

OFFICIAL PREPARATIONS.

Spiritus Aurantii Compositus (5 per cent.).

Spiritus Amonniae Aromaticus Dose: 30 drops (2 Mils).

285. OLEUM BERGAMOTTÆ.—OIL OF BERGAMOT. A volatile oil obtained by expression from the rind of the fresh fruit of *Citrus bergamia* Risso et Poiteau, the fruit being collected in November or December, still greenish, unripe, but full grown. By some, the bergamot orange is supposed to be an established hybrid—a product of cultivation. A greenish or greenish-yellow, thin liquid, having a peculiar, very fragrant odor, and an aromatic, bitter taste. The color is due to chlorophyll. It is distinguished from the oils of orange and lemon by forming a clear solution with solutions of potassium. This oil, so valuable in perfumery, was official in the U.S.P. of 1890, but was dropped from the list in 1900.

CONSTITUENTS.—By fractional distillation there comes over as the first fraction at 60° to 65° about 40 per cent. of the oil. This has a lemon odor and consists of almost pure **limonine**. The second fraction (10 per cent.), distilling at 77° to 82° , consists principally of dipentene, $C_{10}H_{16}$. The third fraction of about 25 per cent., distilling between 87° and 91° , consists of linalool, $C_{10}H_{18}O$. The fourth fraction, 90° to 105° (approximately 20 per cent.), having the pronounced bergamot odor, consists of **linalool (linalyl) acetate**, $C_{10}H_{17}OC_2H_3O$. It is to this that the **peculiar odor of bergamot is probably due**.

286. WHITE ZAPOTE.—The seeds of *Casimiroa edulis*, growing in Mexico. Used as a hypnotic in the hospitals of the City of Mexico. Recently introduced in United States. Dose of fl'ext.: $\frac{1}{2}$ to 9 drops (0.1 to 0.6 mils).

SIMARUBACEAE

Shrubs and trees with scentless foliage; almost confined to the tropics. Leaves generally compound and alternate. The bitter bark and wood are employed in medicine.

287. QUASSIA

QUASSIA



FIG. 154.—*Picrasma excelsa*—Branch.

The wood of **Picrasma excelsa** (Swartz) Planchon, known commercially as **Jamaica Queen**, or of **Quassia amara** Linné (**Surinam Quassia**).

BOTANICAL CHARACTERISTICS.—A tree resembling the common ash, attaining a height of 50 or 60, even 100, feet. *Leaves* pinnate, with an odd leaflet; leaflets opposite, 4 to 8 pairs. *Flowers* small, pale yellowish-green, in loose panicles, polygamous. *Fruit* drupaceous, globose, glossy, black.

HABITAT.—Jamaica and other West India islands.

DESCRIPTION OF DRUG.—Imported in dense, **tough billets**, often 300 mm. (12 in.) thick, freed from the thick, tough bark. The yellowish-white or white **raspings or chips** are usually employed in pharmacy. The tissue consists mostly of prosenchyma, associated with long woodfibers with tapering ends, and ducts which, on transverse sections of the wood, appear as pores; inodorous; taste intensely bitter. **Quassia tonic drinking cups** are made from the wood on a turning lathe; water poured into them acquires a bitterness, in a few minutes, of which the wood seems inexhaustible.

Quas'sia amar'a Linné, Surinam Quassia, comes in much thinner billets, and has a thin, brittle bark, it seldom reaches our market. It may be distinguished from the *Picrasma excelsa* (Jamaica quassia) by the fact that the medullary rays in the former consist of single rows of cells, while those of the latter consist of three rows each. The cells composing the rays in the *Q. amara* are of equal size, and their radial walls appear wavy in tangential section; whereas the corresponding cells in *P. excelsa* are of variable size and exhibit regular walls in tangential section. The true source of Quassia is said, by some authorities, to be a *simaruba*.

Powder.—Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—*Picrasma excelsa* contains a bitter neutral principle, picrasmin, *Quas'sia amar'a*, an analogous principle, quassin, both soluble in water, alcohol, and chloroform. The principles can easily be obtained from the precipitated tannate by mixing it with lead carbonate, drying, and extracting with alcohol. They crystallize from alcoholic solution in needles; purified by recrystallization. Quassia **contains no tannin**, and therefore can be prescribed with salts of iron.

Preparation of Quassin.—Neutralize infusion with NaOH; add tannin to precipitate the neutral principle; heat with lead oxide or lime to decompose precipitate, and

dissolve out with alcohol. White, opaque, very bitter. Soluble in hot alcohol, chloroform; slowly in water.

Preparation of Picrasmin.—Precipitate tannate with lead acetate, the former obtained by precipitating the neutral infusion with tannin. In needles; very soluble in hot alcohol, chloroform, acetic acid, but sparingly in water.

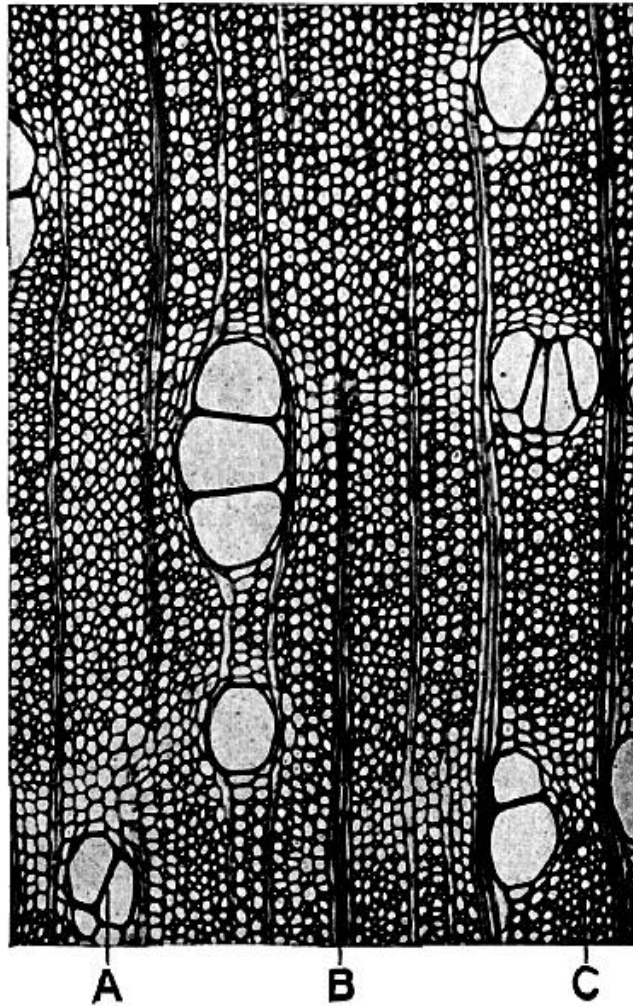


FIG. 155.—Quassia—Cross-section of wood. (65 diam.) A, Water tube. B, Medullary ray. C, Wood fibers. (Photomicrograph.)

ACTION AND USES.—A valuable simple bitter tonic. Dose: 15 to 60 gr. (1 to 4 Gm.). It is poisonous to insects, a strong infusion being often used as a parasiticide on animals.

OFFICIAL PREPARATION.

Tinctura Quassiae (20 percent.)

Dose: 30 to 60 drops (2 to 4 mils).

288. **QUASSIÆ CORTEX.**—QUASSIA BARK. The bark of **Picraea'na excel'sa** Lindley. In flat or curved pieces 5 mm. ($\frac{1}{5}$ in.) or more thick. The outer surface is of a dark gray color and longitudinally furrowed; inner surface yellowish-white and smooth; inodorous; very bitter. The bark of *Surinam Quassia* is much thinner. These barks have the same constituents and are used for the same purposes as the wood—as tonics.

289. **SIMARUBA.**—The root-bark of **Simaru'ba officina'lis** De Candolle. *Habitat:* Northern South America and West Indies. In curved or quilled pieces about 50 to 100 mm. (2 to 4 in.) long, and 3 mm. ($\frac{1}{8}$ in.) thick; it is of a yellowish-white color, generally deprived of the yellowish or brownish periderm; inner surface light brown, finely striate; bast coarsely fibrous, tough, flexible, the fibers easily separable; inodorous; very bitter. It contains probably quassin or picrasmin, some resin, and a trace of volatile oil. Tonic, used in dysentery and chronic diarrhea. Dose: 8 to 30 gr. (0.5 to 2 Gm.), in infusion or decoction.

290. **CEDRON.**—CEDRON SEED. From **Sima'ba ce'dron** Planch, a South American tree. These seeds are used by the natives as a remedy for the bite of poisonous serpents and insects. Cerebral sedative, antispasmodic, and antiperiodic; poisonous. Dose of fluidextract: 1 to 8 drops (0.065 to 0.5 mil).

291. **AILANTHUS.**—TREE OF HEAVEN. CHINESE SUMAC. The bark of **Ailanth'us glandulo'sa** Des Fontaines, a common shade tree. The powder is of a greenish-yellow color, and has a strong, narcotic, nauseating odor. A powerful nervedepressant and antispasmodic, used in asthma, hiccough, twitching of the muscles, epilepsy, etc. When chewed, it produces a general sense of uneasiness, weakness, dazzling, cold sweats, shivering, nausea, etc., similar to that produced by tobacco. These effects depend upon a volatile oil, which is so powerful that persons preparing the extract are often thus affected by the vapor. Dose: 15 to 30 gr. (1 to 2 Gm.).

292. **CASCARA AMARGA.**—HONDURAS BARK. From undetermined species of **Picram'naea**.—A valuable alterative, claimed to be almost a specific in syphilitic affections; it contains an alkaloid, picramnine. The use of tobacco and alcohol is said to counteract its action. Dose: 30 to 60 gr. (2 to 4 Gm.).

293. **CHAPARRO AMARGOSO.**—**Castela Nicholsoni** Hook. AMARGOSA. Bark of root. West Indies and along the Rio Grande in Mexico and Texas. *Preparation:* Fluidextract. *Properties:* Tonic, antiperiodic, astringent. *Uses:* Considered a specific for diarrhea. Dose: 30 to 60 minims. In pieces about ten inches long by one in width and a quarter in thickness. Outer portion composed of a corky layer $\frac{1}{24}$ inch thick and ash-gray in color. Inner side of a dirty yellowish color-, slightly striated. Fracture brittle but fibrous. Slightly aromatic. Very bitter.

BURSERACEÆ

Tropical trees and shrubs abounding in resinous and oily secretions. Drugs of the order are: *Myrrha* (294); *Olibanum* (295); *Bdellium* (296), and *Elemi* (297).

294. MYRRHA.—MYRRH

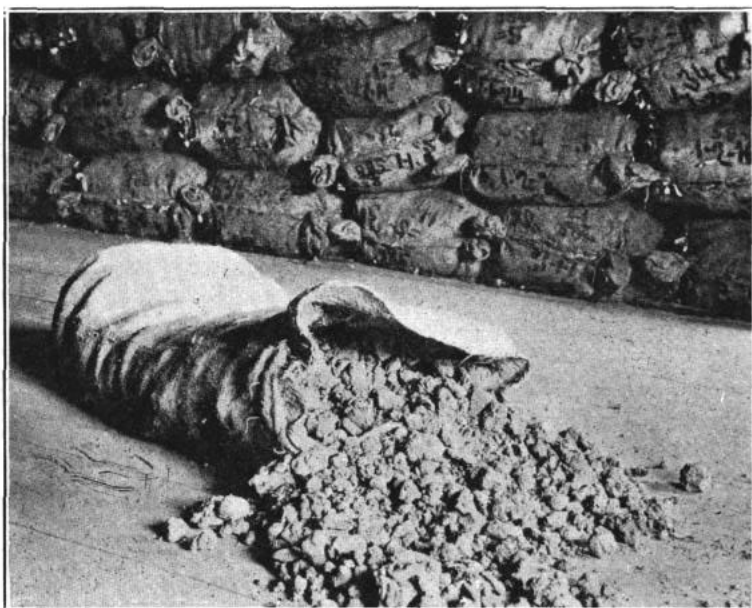
MYRRH

A gum-resin obtained from one or more species of **Commiph'ora myrrha** Engler and other species.

BOTANICAL CHARACTERISTICS.—A shrub forming the chief underwood of the Arabian and African forests along the shores of the Red Sea. Squamose, spinescent branches, with pale, ash-gray, odorous bark; *leaves* ternate; *flowers* solitary, greenish; *fruit* drupaceous, with the persistent calyx attached.

SOURCE.—Myrrh is now imported from the East Indies, where it is brought from Arabia and the northeastern coast of Africa. It is usually imported in chests containing from one hundred to two hundred pounds. The terms Turkish and Indian myrrh are now obsolete. Up to recent times most of the myrrh came from India but now it chiefly comes direct from Aden.

DESCRIPTION OF DRUG.—Irregular masses of agglutinated tears, varying from small grains up to pieces about the size of an egg, or



Bags of Myrrh sorts in the Cutler Street Drug Warehouse
(*Chemist and Druggist*).

sometimes much larger; of a reddish-yellow to a reddish-brown color, dusty, opaque, waxy, and unctuous. Freshly broken, the shining surface often shows characteristic white marks or streaks. Odor pleasant, balsamic; taste bitter, aromatic. This description applies to the best *Turkey*-official myrrh. The *India* variety comes in darker pieces, more opaque, less odorous, and abounding in impurities. *Bdellium*

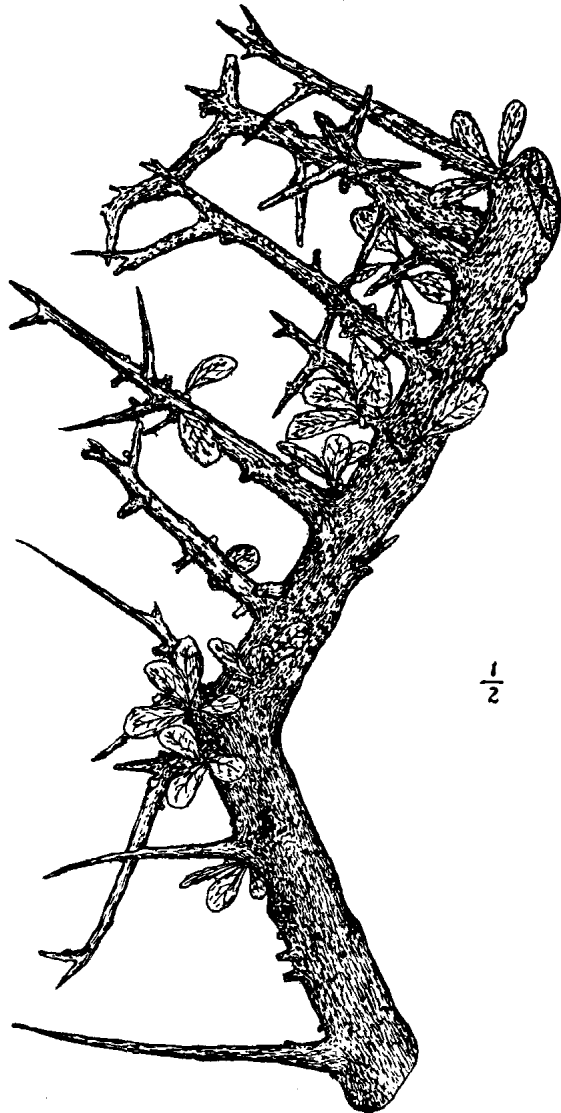


FIG. 156.—*Commiphora myrrha*—Branch.

and other gummy or resinous substances are often mixed with it. *False myrrh* is the name sometimes given to these other gummy and resinous substances. As it is difficult to detect adulteration when it is in the powdered form, it is best purchased in mass. The best variety yields a brownish-yellow tincture, which acquires a purple tint upon the addition of nitric acid. A tincture which does not show this color reaction betrays an impure article, which should be rejected.

Powder.—Microscopical elements of: See Part iv, Chap. I, B.

CONSTITUENTS.—A **volatile oil**, myrrhol (3 to 4 per cent.); a bitter principle; a **resin**, 35 per cent., and **gum**, 60 per cent., forming with water a yellowish or brownish emulsion, which deposits a sediment upon standing. Recent investigations of Tschirch and others, have cleared up many obscure points regarding the chemistry of the resins in such drugs as myrrh. An excellent classification of the resins is found in a volume entitled "Pharmacopœdia," by White

and Humphrey, London (PP. 400, 403) and in Allen's "Commercial Organic Analysis," (pp. 1-103, vol. iv, 4th edition). Myrrh of good quality should contain not more than 70 per cent. of matter insoluble in alcohol. Ash, not more than 8.5 per cent.

ACTION AND USES.—A stomachic, carminative, and emmenagogue. Used mostly in mouth-washes. Dose: 2.5 to 15 gr. (0.15 to 1 Gm.), in pills and emulsion.

OFFICIAL PREPARATIONS.

Tinctura Myrrhæ (20 per cent.) Dose: 10 to 60 drops (0.6 to 4 mils).
Pilulæ Rhei Compositæ.

295. **OLIBANUM**.—FRANKINCENSE. A gum-resin exuding from incisions into the bark of **Boswel'liacarte'rii** Birdwood. *Habitat*: Eastern Africa and Southern Arabia. In tears of various shapes, generally rounded; yellowish or pale brown, thickly covered with a white dust; fracture dull, waxy, pale yellowish or reddish; softens when chewed; odor agreeably aromatic, stronger on heating; taste terebinthinate, somewhat bitter, but not unpleasant. Contains a volatile oil, a gum resembling gum arabic, and a resin, forming with water a pure white emulsion. Rarely used medicinally; mostly used for fragrant fumigations and pastilles, and as an altar incense.

296. **BDELLIUM**.—A gum-resin obtained from **Commi'phora mu'kul** Hooker and from **C. africana** Engler. *Habitat*: (1) East India; (2) Western Africa. (1) Dusty pieces breaking with a dark brown, conchoidal fracture; translucent in thin sections; (2) irregular, dusty tears, breaking with a yellowish to brown-red, waxy, angular fracture. Contains resin, volatile oil, and gum. Odor and taste resemble myrrh. Used for the same purposes.

297. **ELEMI**.—MANILA ELEMI. An oleoresin exuding from incisions in **Cana'rium commu'ne** (?) Linné. *Habitat*: Philippine Islands. A soft, unctuous substance, colorless when pure, becoming firmer and yellow with age; often contaminated with carbonaceous matter, which renders it grayish or blackish. It has a strong, pleasant odor, like lemon and fennel; taste bitter, disagreeable, and pungent. Contains volatile oil, resin, elemic acid, and breidin, a crystalline principle, soluble in water. Used in plasters and ointments as a stimulant and irritant.

MELIACEÆ

Tropical trees, rarely undershrubs, with mostly pinnately compound leaves. The order contains many plants which have acrid, bitter, and astringent properties. None official.

298. **MAREGAMIA ALATA**.—GOANESE IPECAC. (Root.) *Habitat*: Western India. Expectorant and emetic. Dose: 1 to 3 gr. (0.065 to 0.2 Gm.); as an emetic, 5 to 10 gr. (0.3 to 0.6 Gm.).

299. **COCILLANA**, N.F.—The bark of an undetermined species of **Guarea**, a large Bolivian tree. Expectorant and emetic properties similar to ipecac. Dose of fluidextract: 10 to 30 drops (0.6 to 2 mls). A popular compound expectorant, syrupy, preparation furnishes a much used remedial agent.

300. **AZEDARACH**.—MARGOSA BARK. The root-bark of **Me'lia azed'arach** Linné. *Habitat*: China and India; cultivated in Southern United States. Fibrous pieces about 5 mm. ($\frac{1}{5}$ in.) thick, and 50 to 75 mm. (2 to 3 in.) wide. The outer surface is reddish-brown, with irregular, blackish, longitudinal ridges. The inner surface is yellowish-white to brown, and striated longitudinally; fracture fibrous; inodorous; taste sweetish, acrid, and bitter. If collected from old roots, the bark must be freed from the corky layer. The active principle is a yellowish-white resin. Azedarach was once extensively used in the Southern States as an anthelmintic. Dose: 15 to 60 gr. (1 to 4 Gm.), in decoction.

POLYGALEÆ.—Milkwort Family

Plants often with milky juice in roots, low herbs in temperature regions, with leaves mostly simple, entire, dotted, exstipulate. Flowers irregular; sepals 5, the two inner large, petaloid, petals 3, the anterior one larger. Properties: generally bitter (polygala), acrid (senega), or astringent (krameria).

Synopsis of Drugs from the Polygaleæ

A. *Roots.*

KRAMERIA, 301.
SENEGA, 302.

B. *Herb.*

Polygala, 303.

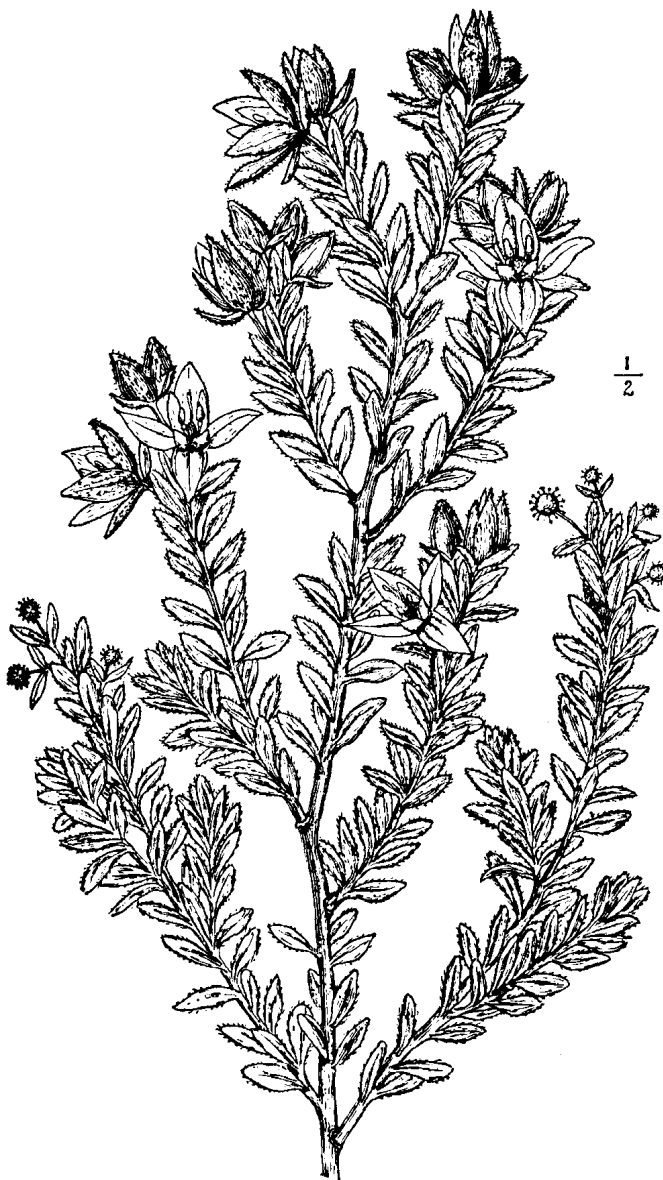


FIG. 157.—*Krameria triandra*—Flowering branch.

301. KRAMERIA, N.F.—KRAMERIA

RHATANY

The dried root of **Krame'riatrian'dra** Ruiz et Pavon, and of **Krame'riaixi'na** Linné and other undetermined species of *Krameria*. (Fam. transferred to *Krameriaceæ* U.S.P. 1900.)

BOTANICAL CHARACTERISTICS.—A low, woody shrub, with grayish leaves and red flowers. The *flowers* are solitary in the axils of the upper leaves, shortstalked. The *fruit* is globular, leathery, indehiscent, about the size of a pea, and covered with reddish-brown, hooked prickles.

SOURCE.—*Krameria triandra* (Red rhatany) is a native of Peru, the commercial supply being obtained from the southern provinces; abundant about the cities of Huanuco and Lima; shipped from Paytu. *Krameria ixina* (Savanilla or New Granada rhatany) is yielded by several varieties, as *K. tomentosa*, St. Hil., an extremely wooly form growing in Colombia, British Guiana, and Northern Brazil; shipped from Carthagena, Santa Marta, etc. Para rhatany, described by Berg, is said to be from *K. argentea*; grayish-brown color.

DESCRIPTION OF DRUG.—From 10 to 30 mm. ($\frac{2}{5}$ to $1\frac{1}{5}$ in.) thick, knotty, and with several thick heads above, and branches below, from which emanate cylindrical

roots about 6 to 12 mm. ($\frac{1}{4}$ to $\frac{1}{2}$ in.) thick and from 100 to 400 mm. (4 to 16 in.) long. In commerce the more **woody pieces, with short stumpy branches**, constitute the largest proportion; the bark is tough and fibrous, **dark reddish-brown**, scaly, rugged, and about 1 to 2 mm. ($\frac{1}{25}$ to $\frac{1}{12}$ in.) thick; the wood is hard and compact, light reddish-brown in color, and when cut with a knife, presents a shining surface, marked with concentric circles and fine medullary rays. Inodorous; taste **very astringent**, the bark more so than the wood. *Krameria ixina* (Savanilla rhatany) is more slender and less knotty, dull purplish-brown, with smooth, closely adhering bark. The roots are less flexuous and less tapering than the Peruvian rhatany and are usually separate, not usually exceeding 12 cm. in thickness, externally purplish-brown or

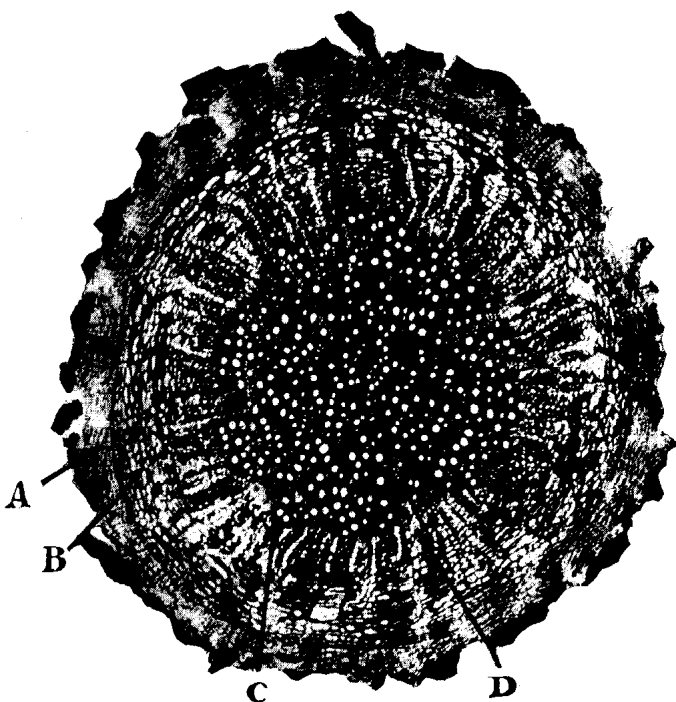


FIG. 158.—*Krameria triandra*—Cross-section of root. (18 diam.) A, Cork. B, Thin-walled parenchyma of cortex. C, Xylem. D, Medullary ray. (Photomicrograph.)

chocolate-colored and marked with numerous fissures, the fracture less tough than that of Peruvian rhatany, the bark and wood darker. The bark is more astringent than that of Peruvian rhatany. The yield of aqueous extract should not be less than 9 per cent. The yield of ash should not exceed 5 per cent.

Powder.—Deep red. Characteristic elements: Parenchyma cells of cortex with reddish-brown coloring-matter; starch grains, 20 to 30 μ in diam., 1 to 4 compound; calcium oxalate in prisms and pyramids; sclerenchyma with few short, thick-walled bast fibers. In Savanilla variety the sclerenchymatous fibers, the parenchyma, bast, and ducts, are larger.

CONSTITUENTS.—**Kramero-tannic acid** (20 per cent.), rhatanin, and rhataniced (a coloring matter). The tannic acid in a state of purity is perfectly colorless, but accompanying it is phlobaphene, an extractive which gives its solutions a reddish-brown color. Gives a dark green precipitate with ferric salts, a flesh-colored precipitate, with gelatin, and none with tartar emetic. **Extracts of krameria should be made with cold water**, the solution being evaporated at a low temperature. Boiling water extracts apothem, the presence of which is a detriment to the astringent principle.

ACTION and USES.—A powerful astringent, with some tonic properties. Dose: 5 to 30 gr. (0.3 to 2 Gm.).

302. SENECA.—SENEGA

SENEKA. SENEKA SNAKEROOT

The dried root of **Polyg'ala sen'ega** Linné.

BOTANICAL CHARACTERISTICS.—*Stems* several, from a thick and hard, knotty root-stock; *leaves* lanceolate, with rough margins; *calyx* with 3 *sepals*, small, greenish, and 2 larger (called wings), colored; *flowers* white, in a solitary, close spike.

SOURCE.—Almost all parts of the United States east of the Rocky Mountains. It is collected for market in Kentucky and in the states west and southwest of it, and in Wisconsin, and in immense quantities in northern Minnesota. This latter variety is known as northern senega. It is, as a rule, a larger root than the southern; the anatomical and structural differences between the two roots are probably very slight. *Polygala alba*, Nutt., inhabits Western Texas and Western Kansas, but this variety of senega is not systematically collected for the market as are the roots of Minnesota and Kentucky.



FIG. 159.—*Polygala senega*—Plant and rhizome.

DESCRIPTION OF DRUG.—A contorted root, about 100 mm. (4 in.) long, with a **knotty crown bearing numerous remnants of scaly leaves**. The main root is from 5 to 10 mm. ($\frac{1}{5}$ to $\frac{2}{5}$ in.) thick, fleshy, but void of starch. It varies in color from a light yellow to a dark brown externally; much-branched, the branches spreading, tortuous, longitudinally wrinkled, annulate near upper end; **bark thickish**, inclosing a porous, yellowish wood, but easily separable from it; it

consists of three layers, the inner one excessively **developed on one side, forming a prominent cord or keel on drying**, fracture short when dry. Odor faint, sometimes wintergreen-like; taste sweetish, afterward acrid and nauseating. The liquid preparations of it have a characteristic nauseous odor.

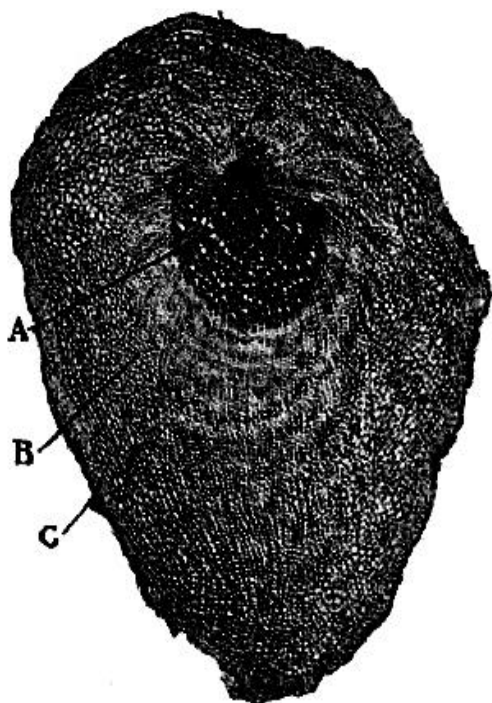


FIG. 160.—Senega—Cross-section of Root. (21 diam.) A, Xylem. B, Parenchyma of cortex. C, Cork. (Photomicrograph.)

Powder.—Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—The acrid principles to which its medicinal action is entirely due, are **polygalic acid**, $C_{19}H_{30}O_{10}$, and **senegin**, $C_{17}H_{26}O_{10}$ —two homologues. The distinction between polygalic acid and senegin is mainly one of solubility in alcohol (the former more soluble). Lead acetate precipitates polygalic acid, but does not precipitate senegin. The root also contains a fixed oil, and a small quantity of volatile oil, which is a mixture of valerianic ether and methyl salicylate, resin, malic acid, and sugar. Liquid preparations of senega are apt to become gelatinous, which is ascribed to the presence of pectin compounds; but is very likely, at least in part, due to sapogenin, generated under the influence of acids or other compounds; the jelly is rendered soluble again on the addition of an alkali. The above proximate principles are similar to the saponins. Ash, not exceeding 5 per cent.

ACTION AND USES.—A valuable stimulating expectorant, for which it is generally used; also diuretic, and in large doses emetic and cathartic. it affects the heart like digitalis. Dose: 10 to 30 gr. (0.6 to 2 Gm.).

OFFICIAL PREPARATIONS.

Fluidextractum Senegæ Dose: 10 to 30 drops (0.6 to 2 mils).

Syrupus Senegæ (20 percent. of fl'ext.), Dose: 30 to 60 drops (2 to 4 mils).

Syrupus Scillæ Compositus (Fl'ext.

senega 8 per cent., Fl'ext. squill 8 per

cent., Tartar emetic, 0.2 per cent.), 10 to 60 drops (0.6 to 4 mils).

303. POLYGALA RUBELLA Willdenow.-BITTER POLYGALA. A North American herb, used for its tonic properties. The bitter principle is easily extracted by water and alcohol.

EUPHORBIACEÆ.-Spurge Family

Herbs, shrubs, or trees, usually with an acrid, milky juice, which in some cases yields rubber. A volatile oil is found in the bark of a few species, and a fatty oil is found abundantly in the seeds of other plants, as *tiglium* and *ricinus*.

Synopsis of Drugs from the Euphorbiaceæ

- | | | |
|---|--|---|
| <p>A. <i>Roots.</i>
 STILLINGIA, 304.
 Euphorbia, 305.
 Euphorbia Corollata,
 305 a.
 Euphorbia Ipecacu-
 anha, 305 b.</p> | <p>C. <i>Gum-resins.</i>
 Euphorbium, 306.
 D. <i>Concrete Juices.</i>
 Alveloz Milk, 307.
 ELASTICA, 309.
 E. <i>Resin.</i>
 Lacca, 310.</p> | <p>G. <i>Seeds.</i>
 Ricinus, 312.
 Tiglium, 313.
 Curcas, 314.
 H. <i>Fixed Oils.</i>
 OLEUM RICINI,
 312 a.
 OLEUM TIGLI,
 313 a.</p> |
| <p>B. <i>Herbs.</i>
 *Euphorbia Pilulifera,
 305 c.
 Mercurialis, 308.</p> | <p>F. <i>Bark.</i>
 *Cascarilla, 311.</p> | <p>I. <i>Glands.</i>
 Kamala, 315.</p> |

304. STILLINGIA.—STILLINGIA

QUEEN'S ROOT. QUEEN'S DELIGHT

The dried root of **Stillin'gia sylvatica** Linné.

BOTANICAL CHARACTERISTICS.—Stem herbaceous, 1 to 3 feet high. *Leaves* alternate, nearly sessile, oblong-lanceolate, finely serrate. *Flowers* monoecious; in a terminal spike (the fertile flowers at the base), with saucer-shaped glands at the base of each; *stamens* 2 or 3; *style* 1; *stigmas* 3. *Capsule* 3-celled, 3-lobed, 3-seeded.

HABITAT.—United States, from Virginia to Florida, in sandy soil.

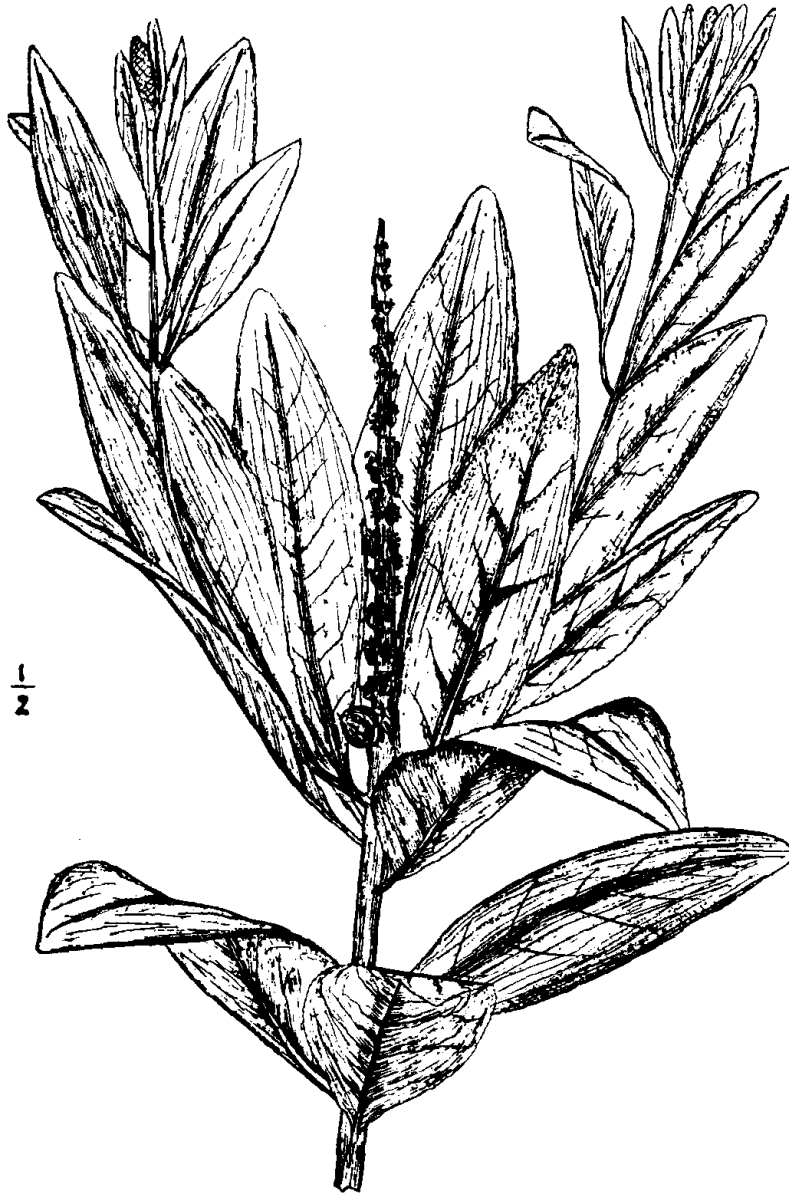


FIG. 161.—*Stillingia sylvatica*—Branch.

DESCRIPTION OF DRUG.—A subcylindrical root, 300 mm, (1 ft.) long, 25 to 50 mm. (1 to 2 in.) or more thick, slightly tapering and sparingly branched; compact; fracture fibrous; odor distinct, peculiar, stronger and disagreeable when fresh; taste bitterish and pungent, persistently acrid.

The color of the exterior surface varies considerably, due, probably, to the varied character of the soils in which the plants grow. Roughly speaking, the roots would thus be classified into light and dark stillingias. By the accidental removal of their outer bark the pinkish

inner bark is exposed. Transversely the woody cortex is seen to occupy about one-half of the diameter of the root. Around this is disposed the thick bark containing numerous bast fibers separately imbedded in the parenchyma. The cambium line is composed of distinctly marked flat cells. Woody center radiate, through which numerous tracheids, arranged in four or five radiating rows that are quite regular in their disposition.

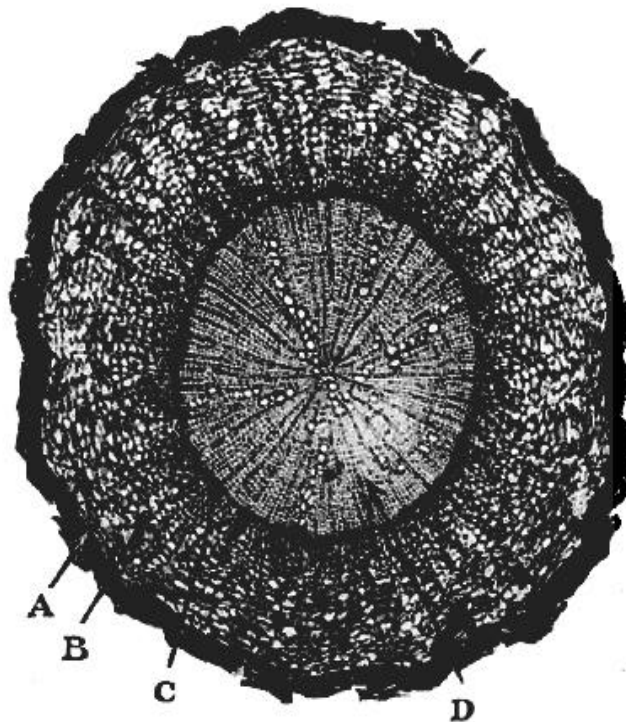


FIG. 162.—*Stillingia*—Cross-section of root. (17 diam.) A, Cork. B, Parenchyma of cortex. C, Medullary ray. D, Xylem. (Photomicrograph.)

Powder.—Characteristic elements: See Part iv, Chap. I, B.

CONSTITUENTS.—The active principle has not yet been determined; it is probably a volatile principle, as old roots are nearly inert. An acrid resin (sylvacrol, soluble in alcohol and chloroform, insoluble in benzene), volatile oil, fixed oil, resin, starch, tannin, and gum have been separated. The so-called oil of *stillingia*, as found in the market, is intended to be the ethereal extract, but sometimes possesses very little of the persistent acrimony of the root. Ash, not to exceed 5 per cent.

ACTION AND USES.—An efficient **alterative** and antisyphilitic, usually given in combination, often with sarsaparilla, but more generally in the compound syrup of *stillingia*. Dose: 15 to 30 gr. (1 to 2 Gm.).

OFFICIAL PREPARATION.

Fluidextractum Stillingiæ Dose: 15 to 20 drops (1 to 2 Mils).

305. **EUPHORBIA**.—There are a number of species of this genus yielding medicinal products:

305a. **EUPHORBIA COROLLATA** Linné.—LARGE FLOWERING SPURGE. (Root.) Long, branched; externally purplish-black, wrinkled; internally whitish or yellowish. The medical virtues reside in the very thick, internally whitish bark, which constitutes about two-thirds of the whole root. Inodorous; taste sweetish, somewhat bitter and acrid. Emetic in doses of 10 to 20 gr. (0.6 to 1.3 Gm.); diaphoretic, expectorant, and cathartic in smaller doses.

305b. **EUPHORBIA IPECACUANHA**.—IPECACUANHA SPURGE. (Root.) Has medical properties similar to the above. It is of a light brown color externally, with a thick bark inclosing a yellowish or whitish wood. The action of these two drugs is due to a resinous matter. Both are indigenous.

305c. **EUPHORBIA PILULIFERA**, N.F. Linné.—A common herb along the roadsides in Australia, where it enjoys a great reputation for the prompt and complete relief it gives in asthma and pectoral complaints generally. Dose: 15 to 60 gr. (1 to 4 Gm.).

306. **EUPHORBIIUM**.—EUPHORBIIUM. A gum-resin exuding from one or more undetermined species of **Euphorbia**, ascribed to some leafless, cactus-like plants of Egypt, Arabia, and the East Indies. It occurs in dull brownishyellow or reddish, rounded pieces of the size of a pea or larger, often pierced with, or inclosing, the spines around which it has hardened on the stem of the plant; almost inodorous, the powder sternutatory; taste mild at first, but afterward intensely acrid and burning. Only used externally, mostly in veterinary practice as a vesicant.

307. **ALVELOZ MILK**.—The milky juice of a Brazilian plant, **Euphorbia heterodoxa** Müller. It has an action resembling that of papain, and is used in eating out cancerous and other ulcers.

308. **MERCURIALIS ANNUA** Linné.—MERCURY WEED. A European herb, employed from the most ancient times as a purgative and emmenagogue.

309. **ELASTICA**.—INDIA-RUBBER (U.S.P. VIII)

CAOUTCHOUC

The prepared milk-juice of **Hevea Braziliensis** Mueller and other species, known in commerce as Para rubber. Large trees containing a milky juice which, on hardening, forms india-rubber. **Ficus elastica**, producing the greatest quantity, has its seeds germinate in the forks of the tree, giving off aerial roots which descend to the ground and form a great many trunks.

HABITAT.—South America and India, the finest quality coming from Brazil.

DESCRIPTION.—Large, flat pieces, or molded into various shapes—balls, hollow, bottle-shaped pieces, etc. When the juice first hardens it is yellowish-brown externally and yellowish-white within, but in the processes of molding and drying it acquires a smoky, blackish appearance; very elastic; odor peculiar. Insoluble in water and alcohol, but soluble in chloroform, carbon bisulphide, and benzin. The common adulterants are the carbonates of zinc and lead; when pure or nearly pure, india-rubber should float in water.

CONSTITUENTS.—The elastic principle has been termed caoutchoucine; it, or a similar principle, is contained in a great number of milky-juiced plants.

USES.—On account of its insolubility it has no therapeutic application, but is extensively used in the arts. Employed in some of the pharmaceutical plasters, e.g., Emp. Elasticum. U.S. IX.

310. **LACCA**.—LAC. GUM-LAC. A resinous exudation from punctures, made by insects, in the bark of several East Indian trees, and also in plants growing in Arizona and other Western States. The twigs, with their deep reddish-brown incrustations, are called **stick-lac**. **Seed-lac** consists of the small, irregular fragments broken off from the twigs. **Lump-lac** is made by melting the stick-lac, and, after it has hardened, breaking the brown, translucent mass into lumps. **Shell-lac** or gum-shellac, the most common form, is prepared by spreading the melted lac out in thin layers, which, on drying, form thin, brittle sheets, glossy, more or less transparent, varying from amber to dark brown in color; in packing, these sheets are broken into fragments, in which form shellac is commonly met with in market; odorless and tasteless. Lac contains several resins, laccin (a peculiar principle insoluble in alcohol), and a coloring matter varying in quantity in the different forms; this coloring matter, “lac dye,” is equal to cochineal dyes; it is soluble in water, being obtained from the washings in making the different forms of lac. Lac is not used medicinally, but is extensively employed in the arts for making varnishes and sealing-wax.

311. **CASCARILLA**, N.F.-CASCARILLA BARK. The bark of **Cro'ton elute'ria** Bennet. Small broken quills having a grayish fissured cork, more or less covered with white lichen patches, but often partially or wholly removed, showing the dull brown inner bark; inner surface smooth; bast fibers few; fracture short, resinous; odor feeble, stronger when rubbed; when ignited, it emits a strongly aromatic odor, somewhat resembling musk, but weaker and more agreeable; taste warm, aromatic, very bitter. Copalchi bark (see also *Aspidosperma*, 353) has a cascarilla-like odor, and melambo bark, from *Croton Melambo*, Venezuela, and other species of *Croton*, are similar to cascarilla. *Constituents*: **Volatile oil** (1.5 to 3 per cent.); **cascarillin** (a bitter crystalline principle), tannin, fat, resin, etc. Aromatic, stimulant, and tonic. Once used as a febrifuge as a substitute for cinebona. Dose: 15 to 30 gr. (1 to 2 Gm.).



FIG. 163.—*Croton eluteria*—Branch.

312. **RICINUS**.—CASTOR-OIL SEED. The seeds of **Rici'nus commu'nis** Linné (Palma Christi), a herbaceous plant about 4 to 6 feet in height, native to India, but cultivated in tropical and warm temperature countries; stems hollow, purplish-red; leaves large, palmately 9-divided, on long petioles, with glands at the apex of the petiole; flowers monoecious, in terminal panicles, the lower ones male, the upper female; male flowers-stamens numerous; female flowers-style 1, stigma 3, colored

red; capsule covered with prickles, 3-celled, each cell containing one seed.

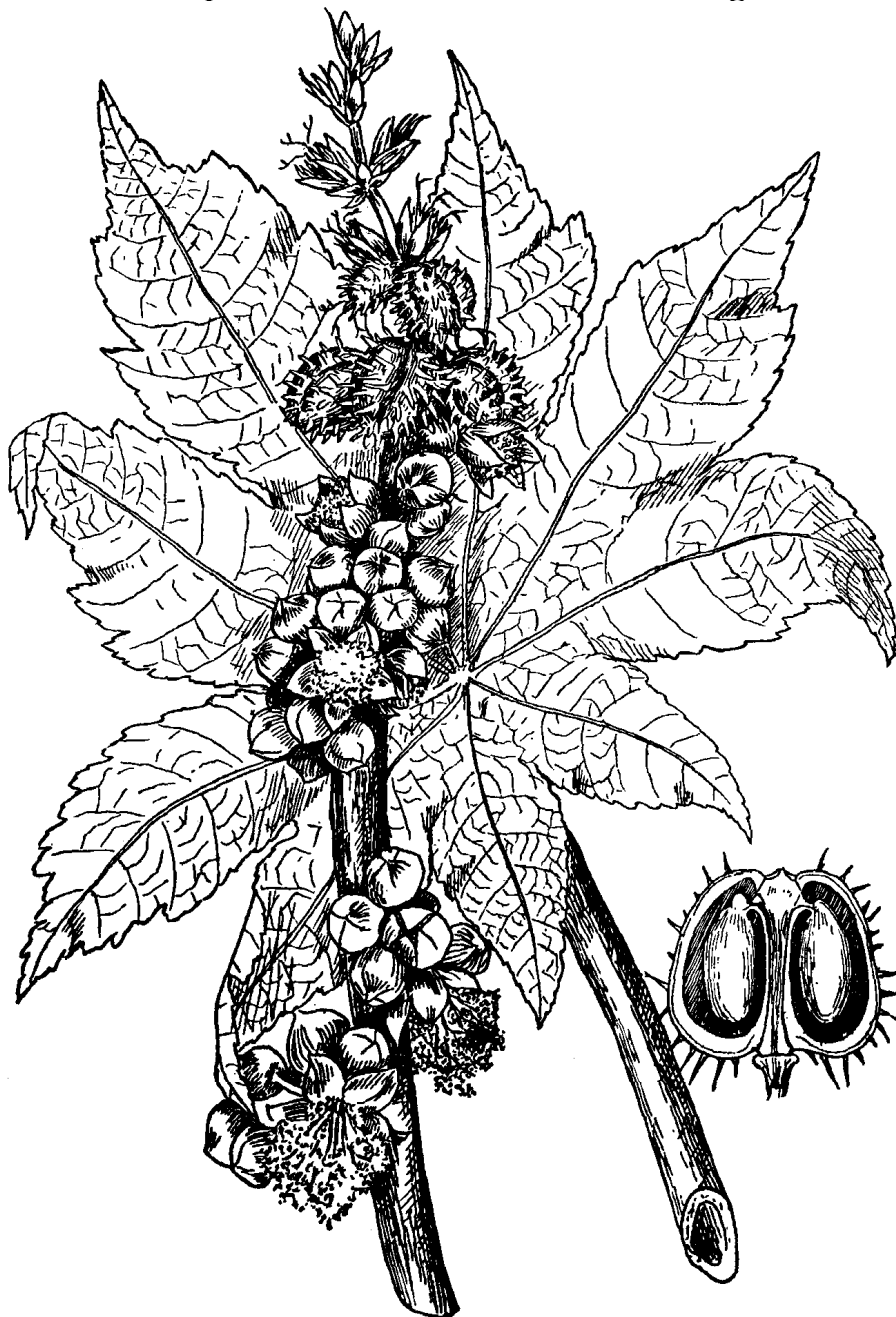


FIG. 164.—*Ricinus communis*—Flowering stem, leaf, and section of fruit.

The seeds are about the **size of a bean**, oval-oblong, flattened on one side; at one end is a yellowish caruncle from which runs an obscure, longitudinal ridge (raphé) to the opposite end; externally smooth, of a **glossy grayish color, mottled with reddish-brown** from the removal, in places, of the thin, white pellicle investing the black, brittle testa. Embryo and albumen very oily; cotyledons broad and veined. Inodorous; taste sweetish, then acrid. They contain a **fixed oil**, 45 to 50 per cent, (*Oleum Ricini*), and a poisonous principle, ricin, which is left behind in the extraction of the oil, some cases of poisoning have occurred from the ingestion of the whole seeds, symptoms are

violent gastroenteritis and collapse. They are more active, weight for weight, than the oil.

312a. **OLEUM RICINI.**—CASTOR OIL. The commercial fixed oil is extracted in several ways, the finest product being yielded by the process known as cold expression. It is a thick, viscid, transparent liquid with a feeble odor, and a mild, somewhat acrid and nauseous taste, soluble in its own weight of strong alcohol. On standing, it becomes thicker, and deposits a white, crystalline substance. Ricinolein (the glyceride of ricinoleic acid) constitutes the bulk of castor oil, with small quantities of palmitin, stearin, myristin and an acrid principle. A mild and efficient **cathartic**. Dose: $\frac{1}{4}$ to 2 fl. oz. (8 to 60 mils). Formerly employed in making flexible collodion, 3 per cent.

ADMINISTRATION.—Various methods of administration to hide the nauseating taste have been devised. The three-layer method in which the oil is suspended between two layers of flavored watery or alcoholic liquid, is the favorite. For this purpose compound tincture of cardamon, spirit of peppermint, whisky, orange juice, lemon juice, lemonade or beer may be used. “The layers should not be stirred together.” The favorite drug store method is to place some syrup of sarsaparilla in a glass and cause it to foam by adding carbonated water from the soda fountain or by a little tartaric acid and sodium carbonate. Then the oil is poured in without allowing any to get on the edge of the tumbler. “The mixture must not be stirred.” The oil floats between some of the syrup below and foam above, and the whole is drunk without stopping. The oil is not tasted at all. The principle of these methods is to have the mouth and tongue moistened with a pleasant flavored liquid (the top layer), upon which the oil will readily slip down. For infants and children, an emulsion made with acacia and flavored syrup may be employed.—Bastedo.

313. **TIGLIUM.**—CROTON SEED. The seed of **Cro'tontig'lium** Linné, a small tree indigenous to China, but extensively cultivated in India. The fruit is a smooth capsule about the size of a large hazelnut, 3-celled, each containing a single seed. **The seeds** are from 12 to 15 mm. ($\frac{1}{2}$ to $\frac{3}{5}$ in.) long, oval-oblong, resembling castor-oil seeds in shape but somewhat larger, and **quadrangular**, and with the caruncle usually absent; the testa is soft, dull yellowish-brown, generally partially, but occasionally wholly, rubbed off from the black tegmen by friction, giving the seeds a **mottled** or **nearly black** appearance; albumen and embryo yellowish-brown; odor feeble; taste acrid. It yields about 50 to 60 per cent. of an **acrid fixed oil**.



FIG. 165.—*Croton tiglium*—Flowering branch; flower (enlarged); seed, entire and in section (enlarged).

313a. **OLEUM TIGLII.**—CROTON OIL. A rather viscid, pale yellowish to brown fixed oil, with a peculiar, faint odor, and an exceedingly hot, acrid taste, continuing in the mouth for several hours. It consists of the glycerides of lauric, myristic, palmitic, stearic, formic, acetic, crotonic, $C_4H_6O_2$, isobutyric, isovalerianic, and tiglinic, $C_5H_8O_2$, acids. Saponification value 200 to 215, iodine value 104 to 110. The vesicating properties are due to a croton resin. Purgative principle is insoluble in alcohol. **Drastic purgative**, capable of causing death in excessive

doses. Dose: $\frac{1}{2}$ to 2 drops (0.0324 to 0.13 mil), in emulsion. Applied externally in liniment, it is a powerful rubefacient.

314. **CURCAS**.—PURGING NUTS. The seeds of **Cur'cas pur'gans** Adanson. *Habitat*: Brazil, West Indies, and Africa. They resemble croton seeds, but have a dull black, fissured surface and are somewhat milder in action. The purgative principle is ricinoleic acid; they also contain about 40 per cent. of an acrid, colorless fixed oil.

315. **KAMALA**.—ROTTLERA. The glands and hairs from the capsule of **Mallo'tus philippinen'sis** Mueller Arg. Official U.S.P. 1890. A brick-red, mobile, finely granular powder, almost odorless and tasteless, with a gritty feeling between the teeth; excessive grittiness, however, indicates a probable adulteration with earthy matter, which may be detected by floating it in water. It is inflammable, flashing up like gunpowder, with a red flame. Under the microscope the powder is seen to consist of depressed globular, transparent sacs, containing numerous red, hood-shaped vesicles, and mixed with colorless hairs. Almost insoluble in water; soluble in alcohol, imparting a deep red color to the solution, from which water throws down a resinous precipitate. *Flemingia rhodocarpa* Baker or Warrus, a leguminous plant indigenous to Eastern Africa, has been employed as substitute. The powder is coarser than kamala, is deep purple, in a water-bath becomes black, and has a slight odor. The glands are cylindrical or subconical. Constituents: Resins (supposed to be the active principle) and resinous coloring matters, one of which has been isolated and termed **rottlerin**, $C_{22}H_{20}O_6$. Vermifuge. Dose: 1 to 2 dr. (4 to 8 Gm.).

Preparation of Rottlerin.—Obtained by exhausting with ether or carbon disulphide, evaporating and crystallizing; occurs in yellowish needles; soluble in hot alcohol, ether, benzene, or carbon disulphide; changes on exposure.

ANACARDIACEÆ.—Cashew Family

Trees or shrubs with gummy, milky or resinous juice, often poisonous. *Leaves* usually compound. *Fruit* drupaceous, not infrequently having a strong turpentine odor and taste. The *seeds* of many species yield an abundance of bland oil. Drugs from the order: *Rhus Toxicodendron*, 316; *Rhus Glabra*, 317; *Rhus aromatica*, 318; *Mastiche*, 319; *Terebinthina Chia*, 320; *Anacardium*, 321; *Semecarpus*, 322.

316. **RHUS TOXICODENDRON**.—POISON IVY. POISON OAK. The fresh leaves of **Rhus rad'icans** Linné. Off. U.S.P. 1890. The leaves are trifoliolate, the terminal leaflet ovate, stalked, the lateral ones sessile, obliquely ovate. These leaflets are about 100 mm. (4 in.) in length, with margins entire, or coarsely toothed or indented; odorless; taste bitter, acrid, and astringent. The dried leaves are brittle and papery, of a pale green color. *Constituents*: The fresh leaves abound in an acrid, milky juice, which blackens on exposure to the air, and in contact with the skin causes inflammation and swelling. The acidity is due to what was formerly termed toxicodendric acid, the vapor of which was said to be the cause of vesicular eruptions, but this principle has been found to be, by Pfaff and Balch, an oil, which was given the name, "toxicodendrol." It is said by some authorities (Bessey) that it is volatile. A. B.

Stevens shows the principle to be a resin, soluble in a mixture of ether and alcohol, which solvent removes completely the poison from the parts affected. Bessey has shown by test upon himself that, to sensitive persons, the poison may be communicated without handling the plant, and concludes that the principle is volatile. They also contain tannin producing greenish precipitates with iron salts, wax, fixed oil, resin, etc.

Preparation of Toxicodendric Acid.—To bruised leaves add $\text{Ca}(\text{OH})_2$; macerate with water; express; add H_2SO_4 ; distil. The condensed vapor is a very acrid liquid (see above), which causes the characteristic vesicular eruption of ivypoisson.

Local irritant and rubefacient. Used in treatment of eczema, but is no longer in vogue. Dose: 1 to 5 gr. (0.065 to 0.3 Gm.).

317. RHUS GLABRA, N.F.—RHUS GLABRA

SUMAC

The dried fruit of **Rhus gla'bra** Linné.

DESCRIPTION OF DRUG.—Berries (drupes) about 3 Mm. (1/8 in.) in diameter, densely **covered with a dark-red down**. The sarcocarp (the outer portion of a stone fruit) is composed of two layers, the outer being crimson, and the inner whitish; putamen (stone) flattish, ovoid, smooth. Inodorous; taste acidulous and astringent.

Powder.—Dark reddish-brown. Characteristic elements: Thick-walled cells of testa, porous; many celled trichomes deep red in color; seldom dispensed as powder.

CONSTITUENTS.—The acidity of the fruit is due to the **acid calcium and potassium malates** present; there are also tannic and gallic acid, a red coloring-matter, etc.

ACTION AND USES.—Astringent and refrigerant. Used as a gargle in the form of decoction or fluidextract. Dose: 30 gr. (2 GM.).

OFFICIAL PREPARATION.

Fluidextractum Rhois Glabrae, (U.S.P. VIII). Dose: 1 to 2 fl. dr. (4 to 8 mils).

318. **RHUS AROMATICA** Aiton (Var. *Trilobata* Gray).—SWEET SUMACH. An indigenous bush, with leaves smaller than those of *R glabra*, and unpleasantly scented. (Root-bark.) It acts as an excitant to the unstriped muscular fiber, particularly of the bladder, and is therefore an efficient remedy in incontinence of urine. Dose: 5 to 30 gr. (0.3 to 2 Gm.).



FIG. 166.—*Pistacia lentiscus*—Branch.

319. MASTICHE, N.F.

MASTIC

A concrete resinous exudation from **Pista'cia lentis'cus** Linné. A shrub about 12 feet high. *Fruita* small, roundish drupe, brownish-red, produced chiefly in the island of Scio.

DESCRIPTION OF DRUG.—A handsome-appearing resin, globular, somewhat elongated, **yellowish, translucent tears** about the **size of a pea**, brittle, and dusty from powder derived from attrition; **plastic when chewed**; odor balsamic; taste slight turpentine-like and faintly bitter. Soluble in ether and nearly so in alcohol.

CONSTITUENTS.—Volatile oil 1 to 2 per cent., and two resins, mastichic acid (alpha-resin), soluble in alcohol, and masticin (beta-resin), insoluble in alcohol, but soluble in ether.

ACTION AND USES.—Mild stimulant, but rarely used internally. Dose: 30 gr. (2 Gm.). Used as a filling for carious teeth, and for making paints, varnishes, etc., and formerly official in **Pilulæ Aloes et Mastiches**.

320. **TEREBINTHINA CHIA**.—CHIAN TURPENTINE. An oleoresin from **Pista'ciaterebin'thus** Linné, a tree growing on the island of Selo. Incisions are made and the exuding juice is allowed to fall upon smooth stones. It is a greenish-yellow, pellucid, syrupy liquid, hardening to a transparent mass when exposed by the evaporation of its volatile oil; odor fennel-like; taste bitterish. It is used for destroying cancerous growths in which it is claimed to be very efficient. Dose: 5 to 20 gr. (0.3 to 1.3 Gm.), in emulsion.

321. **ANACARDIUM**.—CASHEW NUT. The fruit of **Anacar'dium occidenta'le** Linné. *Habitat*: North America. Kidney-shaped, about 25 mm. (1 in.) long, invested with a grayish-brown, finely punctate pericarp containing cardol (a reddish-yellow fixed oil, very active and poisonous). The seed is white and consists principally of a bland fixed oil. Vermifuge and escharotic.

322. **SEMECARPUS**.—ORIENTAL CASHEW NUT. The fruit of **Semecar'pus anacar'dium** Linné, growing in Eastern India, a heart-shaped, somewhat flattened nut, about 20 mm. ($\frac{4}{5}$ in.) long, invested with a blackish-brown pericarp containing a brown, acrid, vesicating oil. Used as a local irritant.

ILICINEÆ.-Holly Family

Trees and shrubs indigenous to tropical and temperate climates. Leaves coriaceous, evergreen.

323. **ILEX OPACA** Aiton.—HOLLY. (Leaves.) Petiolate, about 50 mm. (2 in.) long, leathery, smooth; inodorous; taste mucilaginous, bitter, and astringent. They contain a bitter principle, ilicin, and tannin. Demulcent, tonic, and emetic. Dose: 15 to 30 gr. (1 to 2 Gm.).

324. **ILEX PARAGUAYENSIS** Lambert.—PARAGUAY TEA. (Leaves.) *Habitat*: Brazil and Argentine Republic. Lance-oblong, about 50, mm. (2 in.) long, on a short petiole; surface smooth; margin few-toothed. The maté of the market is a coarse, dark powder, slightly roasted, with a tea-like odor and a bitter, astringent taste. Contains caffeine, giving it properties differing only slightly from tea, for which it is used as a substitute by the natives.

325. **PRINOS**.—BLACK ALDER. WINTERBERRY. The bark of **I'lex verticilla'ta** Gray. *Habitat*: North America, in swampy thickets. Thin, yellowishgreen fragments,

usually deprived of the grayish or brownish periderm, which, when present, is marked with whitish patches and black lines and dots; inodorous; taste bitter and slightly astringent. It contains tannin, wax, sugar, resin, starch, chlorophyll, and a yellow, amorphous, bitter principle. Used as a tonic, antiperiodic, and astringent. Dose: 15 to 60 gr. (1 to 4 Gm.).

CELASTRINACEÆ.-Staff-tree Family

Small trees and shrubs, sometimes climbing. *Leaves* alternate, rarely opposite, often coriaceous. A peculiarity of the *flowers* is that the perigynous stamens are inserted on the disk which fills the bottom of the calyx and sometimes covers the ovary. *Fruit* a capsule, an indehiscent drupe, or a samara. *Seeds* furnished with a pulpy, colored, cupular aril.

326. EUONYMUS, N.F.—EUONYMUS

WAHOO

The dried bark of the root of ***Euonymus atropurpureus*** Jacquin.

BOTANICAL CHARACTERISTICS.—Tall, ornamental shrub, 6 to 14 feet high; *leaves* petiolate, oval-oblong; *flowers* dark purple, in fours; *Pods* smooth, deeply lobed; *seeds* inclosed in a red aril. Ornamental in autumn from its copious crimson fruit, drooping in long peduncles.

DESCRIPTION OF DRUG.—In quilled or curved pieces about 2 mm. ($\frac{1}{12}$ in.) thick. The **periderm is of an ash-gray color, covered with blackish patches or ridges**, and removable in scales from the **whitish or yellowish-brown inner bark**; fracture, smooth and short. It contains a hygroscopic tissue, which readily absorbs moisture, thus becoming less brittle; odor distinct; taste sweetish, bitter and somewhat acrid. It is sometimes mixed with branches and pieces of the wood.

Powder.—Light brown. Characteristic elements: Sclerenchyma consisting of long, thin-walled bast fibers; ducts and wood fibers sometimes present; spherical starch grains and rosette-shaped calcium oxalate crystals also present.

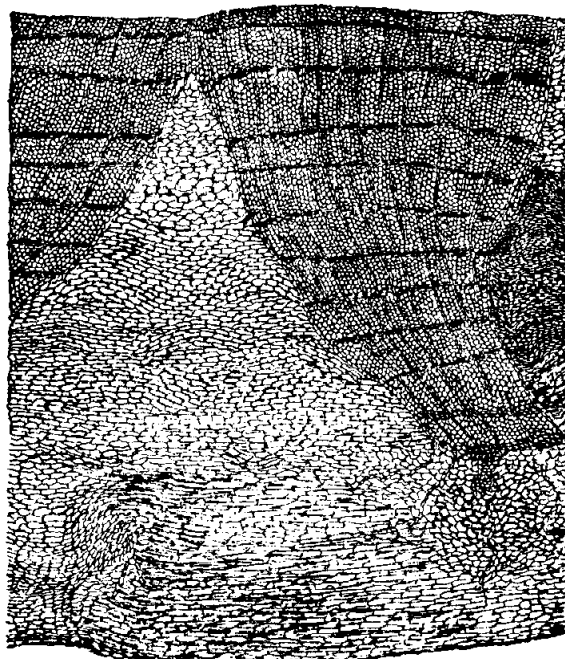


FIG. 167.—Cross-section of Wahoo bark. Magnified 15 diam.

CONSTITUENTS.—Its chief constituent of therapeutic value, **euonymin**, is bitter, amorphous, and precipitated from its solution by phosphomolybdic acid and lead subacetate. This product is not to be confounded with a resinoid of the same name (see below). The bark also contains atropurpurin, asparagin, euonic acid, fixed oil, and albumen.

Preparation of Euonymin.—Add chloroform to a dilute alcoholic tincture and shake; separate chloroformic solution and evaporate; treat residue with ether, then alcohol, and lead acetate; add H₂S to precipitate lead; finally evaporate. Soluble in ether, alcohol, and water. The eclectic resinoid, by this name, is a dried precipitate, resulting when concentrated alcoholic tincture is added to water.

ACTION AND USES—A cholagogue cathartic in doses of 0.8 to 30 gr. (0.5 to 2 Gm.); also tonic and laxative.

OFFICIAL PREPARATIONS.

Extractum Euonymi (From Fl'ext.), Dose: 1 to 5 gr. (0.065 to 0.3 Gm.).

Fluidextractum Euonymi 1/2 to 2 fl.dr. (2 to 8 mils).

327. **CELASTRUS SCANDENS** Linné.—CLIMBING STAFF-TREE. FALSE BITTER-SWEET. *Habitat:* North America. (Root-bark.) Alterative, diaphoretic, diuretic, and emetic; has been used in chronic affections of the liver. Dose of fluidextract: 1 to 2 fl. dr. (4 to 8 mils).

328. **ACER RUBRUM** Linné (Aceraceæ).—RED OR SWAMP MAPLE. The bark of this indigenous maple was the favorite remedy of the Indians for sore eyes; it is a mild astringent.

SAPINDACEÆ.—Soapberry Family

Trees or shrubs, rarely herbs. Stem with watery juice, erect or climbing. The members of the order are called soapworts because of the *fruit of many species containing a saponaceous principle*. The flowers are unsymmetrical, racemed, or paniced, the pedicels often changed into tendrils. The order furnishes a variety of dissimilar products, as will be seen in *Guarana*, 329; *Æsculus glabra*, 330; *Æsculus hippocastanum*, 331; *Acer rubrum*, 328; and *Macassar Oil*, 332.

329. GUARANA

GUARANA

A dried paste consisting chiefly of the crushed or pounded seeds of **Paullin'ia cupan'a** Kunth, yielding, by the official process, 4 per cent. of caffeine.

BOTANICAL CHARACTERISTICS.—A climbing shrub with alternate, imparipinnate leaves on long stalks, with five oblong-oval, irregularly sinuate-dentate leaflets 5 to 6 in. long and 2 to 3 in. broad, contracted into a shortly attenuated blunt point. *Flowers* in axillary spicate panicles. *Fruit* ovoid or pyriform, about the size of a

grape, with a short, strong beak, and six longitudinal. ribs. *Pericarp* thin, leathery, hairy inside, inclosing lenticular, thorny seeds resembling small horse-chestnuts, and each invested with an easily removed, flesh-colored aril.



Paullinia Cupana: a, leafy branch with flowers; b, branch with ripe fruit, $\frac{1}{2}$ nat. size; also male and hermaphrodite flowers, pistil, stamens, and fruit, enlarged.

HABITAT.—Brazil.

DESCRIPTION OF DRUG.—In **cylinders**, **cakes**, or **balls** of a dark reddish-brown color, not infrequently met with in the form of a **light reddish-brown** powder. In preparing the cylinders, etc., above referred to, the seeds deprived of arilode (papery shell) of the plant are first roasted, then ground, kneaded with water in a heated mortar into a pasty and pliable dough, made into forms, and dried. The forms thus made break with an uneven fracture, black-mottled from fragments of seeds. The drug has a peculiar characteristic chocolate-like odor and a bitter, astringent taste afterward sweetish. Guarana constitutes the

habitual beverage of thousands of people in the Amazon valley.

Powder.—Characteristics: See Part iv, Chap. 1, B.

CONSTITUENTS.—Tannic acid, not precipitated by tartar emetic or copper, gum, albumin, starch, a trace of volatile oil, saponin, a greenish fixed oil, and **guaranine**, an alkaloid identical with caffeine or theine. Of this it contains a much larger percentage as compared with other caffeine-yielding drugs. For example, good black tea gives an average yield of 2.13 per cent.; coffee, 1 per cent.; Paraguay tea (324), 1.2 per cent., and guarana, 4.5 per cent.

Preparation of Guaranine.—Treat the powder with boiling water. Evaporate the decoction on a water-bath to dryness, and exhaust the residue with chloroform. Distil off chloroform, treat residue with boiling water, filter, and evaporate the liquid to obtain caffeine (guaranine). Tea and kola can be treated in the same way for their active constituents.

ACTION AND USES.—Stimulant, especially beneficial in nervous headache, and used like tea, coffee, and other drugs containing caffeine-like principles. Dose: 15 to 60 gr. (1 to 4 Gm.).

OFFICIAL PREPARATION.

Fluidextractum Guaranae Dose: 15 to 60 drops (1 to 4 mils).

330. **ÆSCULUS GLABRA** Willdenow.—OHIO BUCKEYE. (Bark.) It has an especial action on the portal circulation and the liver, and promotes the biliary secretions. Dose of fluidextract: 3 to 5 drops (0.2 to 0.3 mil).

331. **ÆSCULUS HIPPOCASTANUM** Linné.—HORSE-CHESTNUT. (Bark and Fruit.) *Habitat:* Asia; cultivated as an ornamental tree in Europe and North America. The bark contains a bitter glucosid, esculin, isomeric with quinovin in cinchona bark, for which it is used as a substitute in Europe. It is tonic, astringent, antiperiodic, narcotic, and antiseptic. The nuts have a similar action, but in addition are antispasmodic, used chiefly in neuralgic affections. The administration of the fluidextract has been recently recommended as a palliative in hæmorrhoids. Dose of bark: 1/2 to 2 dr. (2 to 8 Gm.); of the nuts: 5 to 15 gr. (0.3 to 1 Gm.), generally in fluidextract.

Preparation of Esculin.—Precipitate a decoction of the bark with lead acetate, treat the filtrate with H₂S, evaporate and recrystallize.

332. **MACASSAR OIL.**—A fixed oil expressed from the seeds of **Schlerche'ra triju'ga** Willdenow, a small East Indian tree which is also a source of lac. This oil has a great reputation in its native country as a stimulating application to promote the growth of the hair, and also as a remedy in skin diseases, especially eczema.