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A MANUAL
OF
ORGANIC MATERIA MEDICA.

BEING A
GUIDE TO MATERIA MEDICA OF THE VEGETABLE
AND ANIMAL KINGDOMS,
FOR THE
USE OF STUDENTS, DRUGGISTS, PHARMACISTS,
AND PHYSICIANS.

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WITH MANY ILLUSTRATIONS ON WOOD.



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P R E F A C E.

WHEN, in 1867, the author was called to the Chair of Materia Medica in the Philadelphia College of Pharmacy, he seriously felt the need of a suitable text-book which could be used in connection with his lectures, and he made preparations for the publication of such a work at an early date, but the accomplishment of his purpose has been delayed from time to time. To elaborate a system of classification which should be readily comprehended and easily applied by those for whom it was intended was by no means an easy task, and the author found occasion, almost every year, either to remodel that previously selected, or to make what in his opinion seemed to be desirable improvements. The publication of the National Dispensatory in a measure supplied the want, at least as far as a work of reference is concerned, but, owing to its lexical arrangement, it is not well adapted for systematic instruction. Its publication, however, rendered desirable a modi-

fication of the original plan for a treatise on *materia medica*, and, so modified, it is now presented in a concise form, giving what may be considered the *essential* physical, histological, and chemical characters of the organic drugs, so as to render the work also a useful and reliable guide in business transactions.

Regarding the classification adopted, the author is conscious of its imperfections, but he believes it to be convenient and capable of practical application. In reference to the scope of the work, his aim has been to embrace all the drugs recognized by the United States and British Pharmacopœias, together with important old but now unofficinal drugs, and others of which the use has been recently revived or suggested, and which seem to deserve attention. Many other drugs, more particularly those which are indigenous, are more or less employed in different localities, and, in the opinion of many, may seem perhaps to be deserving of notice.

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INTRODUCTION.

IN arranging the vast mass of material within our reach for the study of *Materia Medica* several methods may be followed.

1. An alphabetical arrangement, while it affords us all the advantages due to facility of references, lacks the essential requisites of a *systematic* investigation of the subject.

2. The classification usually adopted in works intended for the use of Medical Students and Physicians is based upon a similarity in the action of drugs on the animal economy ; and it presents obvious conveniences for the purpose.

3. Another method of classification is founded upon the chemical relation of substances which have a definite composition, and upon the botanical and zoological origin of organic drugs. This method has been followed by Pereira, by Guibourt, and by Royle, and is employed in the "*Pharmacographia*" and in other valuable and instructive works. Its chief advantage, as far as Vegetable *Materia Medica* is

concerned, is due to the close chemical and physiological relations of the different parts of the same species, and in many instances of the different plants belonging to the same natural order.

4. But the primary object of Pharmacognosy or *Materia Medica*, as more especially adapted to the needs of the Pharmacist and the Druggist, is to enable us to recognize drugs, to determine their quality, to detect their adulteration, and to distinguish the characteristic elements of those which are closely allied. Organic drugs which resemble one another in physical and structural properties are thus naturally brought together; and the special properties of each are made the more prominent by comparison. Classifications based on these considerations have been elaborated by Berg, Schleiden, Flückiger, Wigand, and others, and for more than a quarter of a century such a system has formed the basis of instruction in *Materia Medica* in the Philadelphia College of Pharmacy. We have found it useful and instructive, and, with such modifications as we have thought desirable, we have adopted it in this work.

The medical properties and doses of the various drugs are briefly presented simply as matters of important information; but it is not the design of this treatise to give instruction in their therapeutical application.

The development of the different organs of plants and of the histological changes incident to their growth, and the botanical relations of the different natural orders and species of medicinal plants, are subjects which are foreign to the scope of our work. Their consideration is appropriate to a separate course as an introduction to the study of *Materia Medica* proper. The preparation of a suitable text-book is contemplated. Meanwhile, Gray's "Structural and Systematic Botany" and Bentley's "Manual of Botany" will prove excellent books of reference and study for those who desire information which it is not the object of this treatise to furnish on Vegetable Anatomy, Organography, and Systematic Botany.

A MANUAL OF MATERIA MEDICA.

PART I. ANIMAL DRUGS.

THEY consist either wholly or in part of cellular tissue, except a few which are free from it. On being heated, they give off vapors having a peculiar animal empyreumatic odor, resembling the odor of burning horn or urine.

1. ANIMALS.

CANTHARIS.—CANTHARIDES.

Spanish flies.

Cantharis (Lytta, *Fabr.*) *vesicatoria*, *De Geer*.

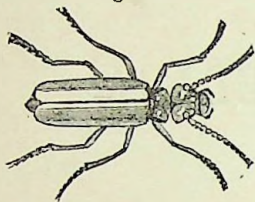
Class, Insecta; *order*, Coleoptera.

Habitat.—Southern and central Europe, mainly upon oleaceæ and caprifoliaceæ.

Collection.—By shaking the trees or shrubs, or beating the branches in the morning, and killing the insects with hot water or oil of turpentine.

Description.—About 25 millimeters (1 inch) long, and 6 millimeters ($\frac{1}{4}$ inch) broad, with filiform, in the upper part, black antennæ, and ample membranous, brownish, transparent wings, otherwise of a copper-green color, shining, of a strong and disagreeable odor. They yield a grayish-brown powder, containing green, shining particles.

Fig. 1.



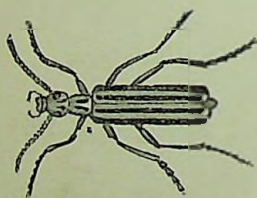
Cantharis vesicatoria.

Cantharides should be preserved in well-closed vessels with the addition of a little camphor or oil of turpentine.

Constituents.—Cantharidin, $C_{10}H_{12}O_4$ (colorless scales or prisms, soluble in alcohol, ether, chloroform, fats, volatile oils, glacial acetic acid, also in water; sublimable), also fat, various extractives, salts, etc.

Valuation.—The powder is exhausted with chloroform or acetic ether, the solution evaporated, fat and coloring matter removed by carbon bisulphide; yield 0.4–0.5 per cent. cantharidin. It is with difficulty obtained in crystals from old cantharides; these may be treated with potassa and then with hydrochloric acid, or mixed with magnesia and water, dried, acidulated, deprived of oil by petroleum benzine, and exhausted with chloroform, etc.

Fig. 2.



Cantharis vittata.

Other species.—Cantharis (Epicauta, Fabr.) vittata, Latr., potato fly, indigenous to the United States; wing-cases black, each with a yellow

margin and a yellow stripe along the middle; contains, when fresh, 1.3 per cent. cantharidin.

Mylabris cichorii, *Fabr.*, and *M. phalerata*, *Pall.*

Chinese blistering flies. Indigenous to southern and eastern Asia; black, wing-cases with two bands and at the base with two spots; bands and spots orange-yellow; contain 1.0–1.2 per cent. cantharidin.

Properties.—Diuretic, aphrodisiac, acrid poison; externally, rubefacient, vesicant.

Dose, 0.01 to 0.07 gram (gr. $\frac{1}{6}$ –gr. $\frac{1}{8}$), mostly in form of tincture.

Fig. 3.

*Mylabris cichorii*.

COCCUS.—COCHINEAL.

Coccionella.

• *Coccus cacti*, *Lin.*

Class, Insecta; *order*, Hemiptera.

Habitat.—Mexico and Central America, upon *Opuntia cochinillifera*, *Mill.*, and other species.

Collection.—Cultivated; the wingless females, after fecundation, increase in size; they are brushed off from the plants and killed by hot water, or upon heated sheet-iron.

Description.—About 5 millimeters ($\frac{1}{5}$ inch) long, oblong, angular, flat or concave beneath, and with 6 short legs, convex above, annulate and wrinkled, purplish-black or gray, yielding a dark red powder, odor faint, taste slightly bitter.

Fig. 4.



Coccus cacti. — Female insect, natural size; a, before, and b, c, after impregnation, dry, and soaked in water.

Adulteration.—The silvery-gray cochineal with carbonate or sulphate of barium and lead; the black cochineal with graphites or ivory black; on maceration in water the powders are separated.

Valuation.—Exhausting with boiling distilled water, and decolorizing the cold decoction with potassium permanganate, preferably in the presence of a little indigo-carmin.

Constituents.—Carminic acid, $C_{17}H_{18}O_{10}$ (purple, amorphous, very soluble in water and alcohol, precipitated purple by earths, yields, with dilute acids, sugar and carmine red, $C_{11}H_{12}O_7$), fat, mucilage, salts.

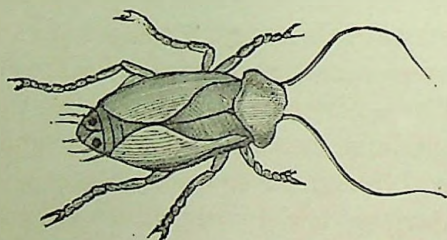
Properties.—Stimulant, antispasmodic, diuretic, chiefly used for its coloring-matter. *Dose*, 0.06 to 1.0 gram (gr. j-xv).

BLATTA.—COCKROACH.

Blatta (*Periplaneta*) *orientalis*, *Lin.* *Class*, Insecta; *order*, Orthoptera.

Habitat.—Asia, now found in most parts of the world, in kitchens and damp, warm rooms.

Fig. 5.



Blatta orientalis.

Description.—About 25 millimeters (1 inch) long, oblong, flat; reddish-brown or black-brown; antennæ

long, filiform; head hidden beneath the prothorax; wings in the male long, in the female very short; odor very disagreeable.

Constituents.—Fetid oil, extractive, antihydropin (crystallizable, not diuretic).

Properties.—Diuretic. *Dose*, 0.3 to 0.6 gram (gr. v-x), in powder or tincture.

Other species of blatta resemble the above in odor and perhaps in properties. *B. gigantea* of the West Indies is about 5 centimeters (2 inches) long. *B. Americana* of North America is 25 to 30 millimeters (1 to 1½ inch) long. *B. Germanica* of Central Europe is 10 to 12 millimeters (about ½ inch) long.

HIRUDO.—LEECH.

1. *Sanguisuga medicinalis*, *Savigny*; and 2. *San. officinalis*, *Sav.* *Class*, Vermes; *order*, Annulata; *sub-order*, Apoda; *family*, Hirudinea.

Habitat.—1. Central and Northern Europe (Swedish or German leech); 2. Southern Europe (Hungarian leech); in fresh-water ponds.

Description.—Body 7 to 15 centimeters (3 to 6 inches) long, smooth, soft, round, somewhat flattened, narrowed towards both ends, composed of 90 to 100 rings; posterior end terminated by a broad disk, anterior end by a narrower disk, in the centre with the mouth, containing 3 jaws each with a double row of teeth; back olive-green or blackish-green, with 6 longitudinal stripes dotted with black; belly yellowish-green or olive-green—No. 1 with numerous black spots, No. 2 with a black line on each side, unspotted. No. 1 draws readily about its own weight of blood;

No. 2 draws more, and a larger amount of blood will flow after the animal has fallen.

Preservation.—In clean river water in a shady place, free from noxious vapors; temperature 10° to 20° C. (50° to 68° F.); the bottom covered or the greater part of the vessel filled with pebbles, turf, moss, some charcoal.

Leeches gorged with blood should be kept by themselves, and not used for six months or more; they may be made to disgorge the blood by placing them for a short time in a solution of table salt.

Uses.—For local depletion.

2. EGGS.

OVUM.—EGG.

Origin.—*Gallus banckiva*, var. *domesticus*, *Temminck*, s. *Phasianus gallus*, *Lin.* Class, Aves; order, Gallinæ.

Habitat.—Java and CochinChina, domesticated.

The egg consists of the shell and lining membrane about 10 per cent., albumen 60, and yolk 30 per cent.

1. *Testa ovi*, *Egg-shell.*—Composed of 90–97 calcium carbonate, 1–5.7 calcium and magnesium phosphates, and 2–4.7 organic matter.

2. *Albumen ovi*, *White of egg.*—Weight 20 to 26 grams (3v–vjss). Contains 82–88 per cent. water and 12–18 per cent. solid constituents, mostly albumen, traces of fat, sugar, and extractive, and about 0.65 ash, of which 42 per cent. is KCl and 9 NaCl, the re-

mainder being carbonates, phosphates, and sulphates of alkalies, calcium, magnesium, and iron.

3. *Vitellus ovi*, *Yolk*, *Yelk*.—Contains 48–55 water, 16 vitellin (a proteid related to casein, mixed with albumin), 30 fat, 1.5 inorganic salts (chlorides, sulphates, and phosphates of potassium, sodium, calcium, and magnesium), 0.42 cholesterin; also coloring matter, lactic acid, sugar.

Properties and Uses.—Egg-shell is antacid. White of egg is nutritious, and used for the clarification of liquids and as an antidote to metallic poisons. Yelk is nutritious, and used for emulsionizing oils and as a dressing for burns, etc.

3. ANASTOMOSING FIBROUS TISSUE.

SPONGIA.—SPONGE.

Origin.—*Spongia officinalis*, *Lin.* *Class*, Poriphera; *order*, Ceratospongiæ.

Habitat.—In the sea attached to rocks.

Collection.—By diving and cutting, or the inferior kinds by tearing from the rocks with a forked instrument. The gelatinous animal matter is removed by exposure and washing.

Description.—A framework consisting of long, elastic, ramifying, and anastomosing fibres, and traversed by numerous smaller or larger cavities and pores; yellowish, brownish, or brown; soluble in potassa solution with evolution of ammonia; charred

by heating, giving off empyreumatic ammoniacal vapors.

The best kind is the soft cup-shaped Turkey sponge, imported from the Red Sea and Mediterranean Sea. The coarser sheeps'-wool, Bahama, Florida, and Nassau sponges are obtained from the West Indies.

Constituents.—Spongin (soluble in cuprammonium solutions), various salts.

Uses.—For cleaning, absorbing liquids, dilating cavities (sponge-tents); for preparing *burned sponge*, *spongia usta*; by heat in covered vessels; yield 30–35 per cent.; contains about 40 per cent. of charcoal, the remainder silica and salts, among them potassium and sodium iodide and bromide, each 0.5–1.0 per cent., calcium carbonate 28 per cent.

4. MEMBRANOUS TISSUE AND GELATINS.

ICHTHYOCOLLA.—ISINGLASS.

Colla piscium. Russian isinglass.

Origin.—*Acipenser huso*, *Lin.* (belugo); *Ac. Güldenstädtii*, *Br. et Ratz.* (osseter); *Ac. ruthenus*, *Lin.* (sterlet); *Ac. stellatus*, *Pall.* (sewruqa). *Class*, Pisces; *order*, Sturiones.

Habitat.—Caspian and Black Seas and tributary rivers.

Preparation.—The swimming bladder is cut, washed, and dried.

Description.—In separate sheets (leaf isinglass), several sheets folded together (book isinglass), or rolled and folded into various forms (staple isinglass), of horny or pearly appearance, whitish, or yellowish, semi-transparent, iridescent, inodorous, insipid; almost completely soluble in boiling water and in boiling diluted alcohol. The solution in 24 parts of hot water forms, on cooling, a transparent jelly.

Other kinds.—American isinglass. The sounds of *Gadus merluccius*, *Lin.* (hake), dried in thin sheets or ribbons.

Purse or pipe isinglass. Fish sounds dried without being cut open.

Constituents.—Gelatin (glutin) with 2 (the inferior kinds sometimes 30) per cent. of membrane and salts.

Properties.—Emollient, nutritive, externally as a protective.

GELATINA.—GELATIN.

Preparation.—Bone cartilage, skins, tendons, and ligaments are boiled in water until dissolved, and the resulting jelly is dried in the air.

Properties.—Thin, transparent sheets, or porous and opaque layers, or shreds; the solution in hot water is colorless and inodorous. Inferior kinds of gelatin are called glue. Its solution is not precipitated by dilute acids, alum, lead acetate, and ferric chloride; it is precipitated by tannin.

Composition.—Glutin contains about 50 per cent. C, 18 N, 6.5 H, 25 O, and 0.5 S. *Chondrin* resembles gelatin, and is obtained from the cartilages of the ribs and other non-ossifying cartilages; its solution is pre-

precipitated by tannin and by the reagents mentioned above.

Properties.—Emollient, nutritive, externally as a protective.

5. SECRETIONS AND EXCRETIONS.

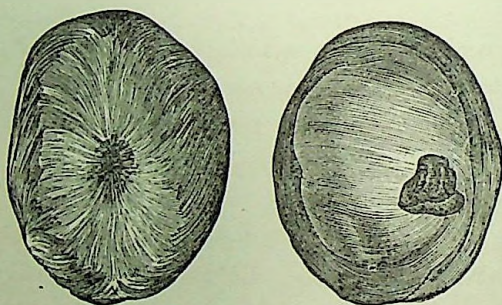
a. Friable, not Fusible.

MOSCHUS.—MUSK.

Origin.—From the preputial follicles of the male animal, *Moschus moschiferus*, *Lin.* *Class*, Mammalia; *order*, Ruminantia.

Habitat.—Central Asia.

Fig. 6.



Lower surface.

Chinese musk-sac.

Upper surface.

Description.—Irregular crummy, somewhat unctuous grains, dark reddish-brown, of a peculiar penetrating and persistent odor and bitterish taste. It is contained in oval or roundish sacs about 5 centimeters

(2 inches) in diameter; on one side invested with a smoothish membrane, on the other side covered with stiff, appressed, grayish hairs concentrically arranged around two orifices near the centre; in the muscular coat with a portion of the thin penis. Strong alcohol dissolves about one-tenth the weight of musk; the tincture is light brownish-yellow, and on the addition of water becomes slightly turbid. Water dissolves about one-half the weight of musk, the solution being deep brown, faintly acid, and strongly odorous. The secretion, freed from skin and hairs, on ignition, gives off a somewhat urine-like odor, and leaves 6 to 8 per cent. of a gray ash.

Varieties.—Chinese, Thibet or Tonquin musk is the best variety. Siberian or Russian musk is sometimes scarcely inferior, but often in flat oval sacs with thin and light hairs, the secretion compact and less aromatic (Cabardine musk). Bucharian and Assam musk is in small sacs, often with portions of the hide adhering.

Constituents.—Ammonia, an acid, cholesterin, fat, wax, gelatinous and albuminous principles. The odorous principle has not been isolated.

Properties.—Diffusible stimulant, aphrodisiac, anti-spasmodic. *Dose*, 0.3 to 0.6 gram (gr. v-x), in powder, pills or enema.

Substitutions and Adulterations.—Artificial musk bags, having none of the characters described, or the secretion partly replaced by dried blood, resin, lead, and other substances.

CASTOREUM.—CASTOR.

Origin.—From the preputial follicles of both the male and female animals Castor fiber, *Linn.* *Class*, Mammalia; *order*, Rodentia.

Habitat.—Northern hemisphere, between 33° and 68° north latitude.

Description.—Follicles in pairs, each about 75 millimeters (3 inches) long, club-shaped, or narrow pyriform, wrinkled, brown or blackish; the inner coat iridescent, glandular, and much folded; the contents brown, hard, friable, of a peculiar odor, and of a bitter, rather acrid and nauseous taste. Alcohol dissolves about one-half of the weight of castor, the tincture being of a brown color. The decoction with water has a light brownish-yellow color, becomes turbid on cooling, and acquires a dark color with ferric chloride.

Varieties.—American or Canadian Castor. Weight of follicles between 30 and 125 grams (1 and 4 oz.); the membranes adhering firmly, the contents often rather glossy. Russian or Siberian castor. Subglobular or roundish pyriform; weight, 75 to 250 grams (2½ to 8 oz.); the outer membranes rather readily separable; the contents dull brown, of a more agreeable odor.

Constituents.—Volatile oil, containing carbolic acid 1 to 2 per cent., bitter resinous substance 14 to 58 per cent., castorin (colorless fusible needles), salicin, cholesterolin, etc.; ash about 3.5 per cent.

Adulterations.—The secretion of castor sacs from diseased animals, is sometimes of a brownish gray color, and may contain over 50 per cent. of calcium

carbonate. Adulterations with earthy matters, resin, blood, etc., are rare.

Properties.—Stimulant, antispasmodic, emmenagogue. *Dose*, 0.3 to 1 or 2 grams (gr. v-xv-xxx).

b. Fusible or Soft.

AMBRA GRISEA.—AMBERGRIS.

Origin.—Found floating on the sea; a morbid excretion in the intestines of *Physeter macrocephalus*, *Lin.* *Class*, Mammalia; *order*, Cetacea.

Habitat.—Indian and Southern Pacific Oceans.

Description.—Fusible in hot water; in the cold friable, gray or brown-gray, streaked and dotted; sp. grav., .91; of a peculiar fragrance, nearly tasteless; soluble in ether, volatile oils, and hot alcohol; insoluble in potassa solution.

Constituents.—Ambrein, 85 per cent. (white, tasteless, fusible needles); balsamic extractive, etc.

Tests.—Heated upon platinum foil, no acrid vapors are evolved, and only a small residue is left.

Properties.—Stimulant, antispasmodic. *Dose*, 0.3 to 1 gram (gr. v-xv); mostly used in perfumery.

HYRACEUM.—HYRACEUM.

Origin.—From the klipdas, *Hyrax capensis*, *Cuvier*. *Class*, Mammalia; *order*, Hyracoidea.

Habitat.—Southern Africa.

Description.—Black brown, tough and plastic, partly soluble in water, less soluble in alcohol and ether,

when warmed of a castor-like odor; taste, bitter nauseous. It has been regarded as the dried urine, by others as the feces of the animal.

Constituents.—Volatile oil, resin, fat, various acids and salts.

Properties.—Stimulant, antispasmodic. *Dose*, 0.3 to 1.0 gram (gr. v–xv).

CIVETTA.—CIVET.

Zibethum.

Origin.—From glands in a pouch between the anus and genitals of the male and female animals. 1. *Viverra zibetha*, *Schreb.*, and 2. *Viv. civetta*, *Schreb.*

Class, Mammalia; *order*, Carnivora.

Habitat.—1. Southern Asia, and 2, Africa.

Description.—Unctuous, fresh yellowish, afterwards brown, fusible; almost insoluble in water, soluble in hot absolute alcohol, partly soluble in ether; odor strong, resembling musk; taste, bitterish acrid, nauseous.

Constituents.—Volatile oil, fat, resinous and coloring matters, salts.

Properties.—Stimulant, antispasmodic. *Dose*, 0.3 to 1.0 gram (gr. v–xv).

c. Liquid.

LAC.—MILK.

Lac vaccinum.

Origin.—From the mammary glands of the cow, *Bos taurus*, *Lin.* *Class*, Mammalia; *order*, Ruminantia.

Habitat.—Domesticated.

Description.—White, opaque, sp. grav. 1.030; odor slight; taste, bland and sweet.

Constituents.—Water 87, solids 13, consisting of albumenoids 4.1, fat 4.0, milk sugar 4.2, and salts, chiefly phosphates with some chlorides, 0.7. The fat is emulsified by the albumenoids (casein and lactoprotein).

Derivatives.—Cremor lactis, cream. The fat rising to the surface on standing, containing some albumenoids and serum.

Skim milk. The white liquid from which the cream has been removed, containing the albumenoids, sugar, and salts; taste bland.

Buttermilk, Lac ebutyratum. The opaque liquid separated in churning the cream; contains the albumenoids, sugar, and salts; of a slight acidulous taste.

Butter, Butyrum; see Fats.

Milk sugar, Saccharum lactis; see Sugars.

Whey, Serum lactis. The opalescent liquid separated from milk after removing the albumenoids and fat, either by rennet (serum lactis dulce) or by acids or acid salts (ser. lact. acidum, aluminatum, tamarindatum, etc.). It contains the sugar and salts, also the acid or salt added.

Properties.—Nutritious.

FEL BOVINUM.—OX GALL.

Fel tauri.

Origin.—From the gall-bladder of the ox, Bos taurus, Lin. *Class*, Mammalia; *order*, Ruminantia.

Habitat.—Domesticated.

Description.—A viscid liquid, greenish or brownish-green; sp. grav. 1.02; neutral or faintly alkaline; odor peculiar; taste sweetish, very bitter and nauseous; produces with sugar and strong sulphuric acid a deep red and purple color (Pettenkofer's test).

Constituents.—Water about 90 per cent., solids 10 per cent., consisting of mucilage (precipitated by 2 volumes of alcohol), bilirubin (cholepyrrhin) $C_{16}H_{13}N_2O_3$, and other coloring matters, cholesterin $C_{26}H_{44}O$ and salts, among them the sodium salts of two bitter acids, glycocholic (cholic) and taurocholic (choleic) acid; both acids give Pettenkofer's reaction, and, on being boiled with alkalies, yield cholic (cholalic) acid and, the former, glycocol; the latter, taurin.

Derivatives.—Purified by straining, and precipitation by alcohol, then evaporated (fel tauri purificatum s. depuratum).

Properties.—Tonic, laxative. *Dose* (of inspissated bile), 0.3 to 1 or even 4 grams (gr. v-xv-3j).

6. CALCAREOUS SKELETONS AND CONCRETIONS.

Almost wholly soluble, with effervescence, in hydrochloric acid.

CORALLIUM.—CORAL.

Origin.—1. *Oculina virginea*, Lam.; and 2. *Corallium rubrum*, Lam. *Class*, Polypiphera.

Habitat.—Mediterranean and Atlantic Ocean.

Description.—Hard, cylindrical, branching pieces, with a more or less uneven, porous, and striate surface and a radiating interior, frequently hollow, inodorous, tasteless, white (from No. 1) or red (from No. 2).

Constituents.—Animal matter 7.75, calcium carbonate 83.25, magnesium carbonate 3.50, ferric oxide 4.25 (in red coral).

Properties.—Antacid. *Dose*, 0.3 to 2.0 grams (gr. v-xxx). Used in tooth powders.

OS SEPIÆ.—CUTTLEFISH BONE.

Origin.—The calcareous bone of *Sepia officinalis*, *Lin.* *Class*, Cephalopoda; *order*, Decapoda.

Habitat.—Mediterranean and Atlantic Ocean.

Description.—White, oval, oblong, 10 centimeters (4 inches) or more in length, flattened; both sides convex; outer surface smoothish, hard; the remainder porous and friable, inodorous; taste, earthy, somewhat saline.

Constituents.—Animal matter, 10–15 per cent.; the remainder calcium carbonate, with little sodium chloride and traces of calcium phosphate and magnesia.

Properties.—Antacid, mostly used in tooth powders.

TESTA.—OYSTERSHELL.

Conchæ, s. testa ostreæ.

Origin.—The bivalved shell of *Ostrea edulis*, *Lin.* *Class*, Accphala (Conchifera); *order*, Lamellibranchia.

Habitat.—Coast of the Atlantic and Indian Oceans.

Description.—Irregular roundish, oblong or obovate; hinge toothless; valves composed of imbricate foliaceous layers, externally rough, inner surface smooth, glossy, and white.

Constituents.—Animal matter 0.5–4.5 per cent., the remainder calcium carbonate, with a small proportion of calcium phosphate and sulphate, magnesia, alumina, ferric oxide, and silica.

Properties.—Antacid. *Dose*, 0.3 to 2.0 grams (gr. v–xxx).

TESTA OVI.—EGGSHELL.

(See page 30.)

CALCULI CANCRORUM.—CRABS' STONES.

Lapides, s. lapilli, s. oculi cancrorum, crabs' eyes.

Origin.—Concretions in the stomach of *Astacus fluviatilis*, *Fabric.*, s. *Cancer astacus*, *Lin.* *Class*, Crustacea; *order*, Decapoda.

Habitat.—Northern temperate zone, in rivers.

Description.—Circular, 3 to 10 millimeters ($\frac{1}{8}$ to $\frac{3}{8}$ inch) in diameter; plano-convex; the upper side with a concentric groove; white, hard; in boiling water rose-red; on treatment with hydrochloric acid, leaving a cartilaginous plano-convex mass; inodorous, tasteless.

Constituents.—Animal matter, 12–15 per cent.; cal-

cium carbonate, 63; calcium phosphate, 17; the remainder, magnesium phosphate and sodium salts.

Properties.—Antacid. *Dose*, 0.3 to 2 grams (gr. v-xxx).

Substitutions.—Factitious crabs' stones, treated with hydrochloric acid, leave little or no residue.

PART II.

CELLULAR VEGETABLE DRUGS.

THESE consist of plants and parts of plants—all being composed of one or more kinds of cells.

1. ROOTS.—RADICES.

A root is the descending axis of a plant, and resembles the ascending axis or stem, but is destitute of leaves, and consequently does not branch by the formation of axillary buds. The pith found in the stem of dicotyledons usually descends only a short distance into the main or tap root, and the epidermis of even young roots becomes uneven and obliterated by the formation of cork; with these exceptions, the tissues of the root and their arrangement resemble those of the stem. Roots are destitute, or nearly so, of chlorophyll.

Annual roots, separated from the other portions of the plant, are not employed in medicine; the officinal roots derived from biennial or perennial herbs emanate from a short crown (base of stem) bearing leaf scars and producing buds, the crown being several- or many-headed in perennial roots; the roots of shrubs and trees are destitute of such a crown. In the monocotyledons the tap root is commonly not

developed, but in its place appear a number of adventitious roots (rootlets) of about equal thickness and length, and usually not branched, though frequently beset with fibres. Adventitious roots are also met with in dicotyledons, and emanate, as in the monocotyledons, from the base or other parts of the stem, or from the rhizome. But the dicotyledonous roots which are medicinally employed consist generally of the main or tap root and its branches—in some cases of the latter alone. The branches at their base are often but little thinner than the main root from which they emanate, and, like the latter, are tapering towards the tip.

Histology.—The rootlets of monocotyledons consist of a circle of parenchyma, which is followed by the nucleus sheath, formed of one or sometimes two rows of thick-walled cells, and inclosing an irregular circular layer, containing a few or numerous small fibro-vascular bundles, which are never arranged in wedge-shaped rays; the centre of the rootlets is often occupied by parenchyma tissue, similar in character to that of the outer layer.

The roots of dicotyledons consist of bark, the outer layer of which is cork, followed by parenchyma and an inner layer of bast tissue, traversed by more or less distinct medullary rays. A cambium layer containing the newly forming cells and indicated in the dried root as a dark line, separates the bark from the wood, the bundles of which are wedge-shaped and separated from one another by medullary rays. The central pith is wanting, except in the upper part and occasionally for some distance in the main root; in the latter case it becomes considerably thinner towards the tip.

Classification.

Sect. 1. Monocotyledonous Roots (Rootlets).

Orange-brown ; outer layer mealy or horn-like ;
taste acrid.

Sarsaparilla.

Pale brownish ; outer layer spongy ; taste pun-
gently aromatic.

Vetiveria.

Sect. 2. Dicotyledonous Roots (Tap roots and branches).

I. Fleshy roots : wood either soft or wood bundles
thin, with broad medullary rays.

1. Free from starch and inulin.

Taste acrid ; externally keeled ; wood not
cylindrical.

Senega.

red-brown ; wood yellowish, not radiate.

Saponaria.

light brownish-gray ; wood whitish, radi-
ate.

Saponaria
levantica.

Taste bitter ; wood bundles thin ; inner bark
radiate ; yellowish-brown.

Gentiana.

pale orange-brown.

Frasera.

Taste mucilaginous ; externally brown-black.

Symphytum.

2. Free from starch, but containing inulin.

Taste bitter ; laticiferous vessels in bark
forming concentric circles.

Taraxacum.

laticiferous vessels in bark in radiating
lines.

Cichorium.

Taste acrid, burning ; resin cells forming
concentric circles in bark and medullary
rays.

Pyrethrum.

resin cells in bark only (root thin).

Pyrethrum
German.

Taste aromatic ; resin cells numerous, scat-
tered ; wood bundles small.

Inula.

Taste mucilaginous and bitter ; neither resin
cells nor milk vessels ; wood and bark
radiate.

Lappa.

3. Containing starch.

a. With laticiferous vessels in bark.

Cork orange-brown ; bark thin ; laticiferous
vessels few.

Asclepias
tuberosa.

Light brown ; subcylindrical ; bark thick ; wood porous, yellowish.	Apocynum cannabinum.
Pale yellowish-brown ; subcylindrical ; internally white.	Euphorbia ipecacuanha.
Cork blackish ; internally whitish.	Euphorbia corollata.

b. With radiating rows of resin cells in bark.

Root stock short, divided into numerous long rootlets ; resin cells large.	Angelica.
Root simple, with several stout branches ; resin cells small.	Angelica triquinata.
Root simple, with several long branches ; resin cells small.	Levisticum.
Root nearly simple ; (brown cork removed) whitish ; wood white.	Laserpitium.
Root nearly simple ; brown-yellow ; wood yellow, porous, in branching rays.	Pimpinella.
Root nearly simple ; brownish-yellow ; resin cells in numerous approximate rows.	Petroselinum.
In sections ; tough ; resin cells in irregular rows ; wood bundles irregularly matted.	Sumbul.

c. Resin cells not radiating.

Tuberous, napiform ; resin cells in broad and narrow concentric circles.	Jalapa (see Tubers).
Root forked below ; yellowish ; resin cells in bark in concentric circles.	Panax.
Root large, somewhat branched ; gray-brown ; internally pinkish ; resin cells scattered.	Stillingia.
Root large, nearly simple ; brown-gray ; internally whitish ; resin cells scattered.	Ipomœa pandurata.

d. Neither resin cells nor laticiferous vessels.

Taste acrid ; grayish ; wood wedges short, numerous, in several circles.	Phytolacca.
Taste acrid and bitter ; (gray-brown cork removed) whitish, with numerous fine crystal cells ; wood yellow, porous.	Belladonna.
Taste mucilaginous, insipid ; (brown cork removed) white, with loose bast fibres.	Althæa.

Taste slight; bark scaly, friable, dark purple.	Alkanna.
Taste mucilaginous and bitter:	
In sections; grayish, with pale yellow; wood bundles in distant circles.	Calumba.
Fusiform, yellowish-brown; medullary rays reddish.	Rumex.
Fusiform, brown-red; medullary rays red.	Rhaponticum.
Sections; marbled by interrupted and interwoven red medullary rays; radiate near cambium.	Rheum.

II. Woody roots: wood firm and medullary rays narrow.

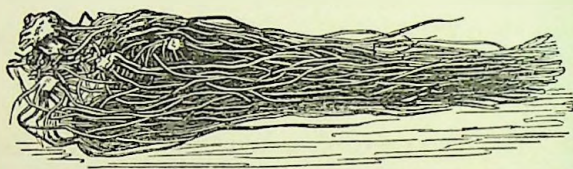
Taste sweet; color tawny-yellow internally.	Glycyrrhiza.
Taste bitter, nauseating; bark annulate.	Ipecacuanha.
bark wrinkled, contains milk vessels.	Apocynum androsæmifolium.
Taste bitter, aromatic; wood yellowish-white (see Rhizomes).	Gelsemium.
Taste spicy; wood pale reddish-brown.	Sassafras (see Woods).
Taste bitter; wood in irregularly concentric circles; pale brown.	Pareira.
wood tough, yellow; bark foliaceous, loose, yellow.	Berberis.
bark firm, yellow.	Berberis aquifolium (see Rhizomes).
Taste astringent; reddish-brown; wood wedges narrow, yellowish.	Statice.
rust-brown or purplish-brown; wood brownish.	Krameria.

SARSAPARILLA.—SARSAPARILLA.

Origin.—*Smilax officinalis*, *H. B. K.*, *S. syphilitica*, *H. B. K.*, *S. medica*, *Schlech.* *Natural order*, Smilacææ.

Habitat.—Tropical America from Mexico to Brazil.

Fig. 7.

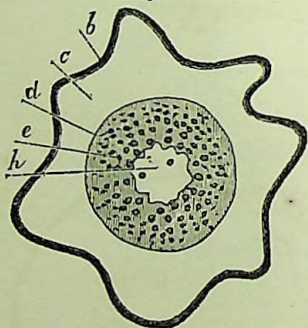


Mexican sarsaparilla.

Description.—Very long, cylindrical, about 5 millimeters ($\frac{1}{8}$ inch) thick, longitudinally wrinkled, grayish-brown or orange-brown externally, white and mealy or somewhat horny internally, within the nucleus

sheath numerous scattered wood bundles, forming a circular zone around a central layer of parenchyma (pith); nearly inodorous; taste mucilaginous, bitterish, acrid. The thick woody knotty rhizome, if present, should be removed.

Fig. 8.



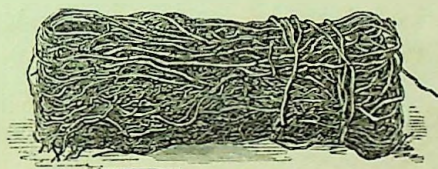
Mexican sarsaparilla.—Transverse section.

Varieties.—*a.* Non-mealy sarsaparillas. The parenchyma cells contain mostly a pasty mass, more rarely starch granules.

1. *Mexican sarsaparilla*. The long roots folded back over the rhizome, to which portions of the stem are often attached. Roots deeply wrinkled, with some fibres, brown-gray from adhering earth; woody and medullary zones nearly equal in width, and about half as broad as the cortical layer; nucleus sheath with the cells radially elongated, the inner cell-walls thickest. In the market as *Vera Cruz* and *Tampico sarsaparilla*.

2. *Jamaica sarsaparilla*. In loose bundles with and without the rhizome; resembles the preceding, but has more fibres attached (*bearded sarsaparilla*), and surface usually more of a red tint and less deeply

Fig. 9.



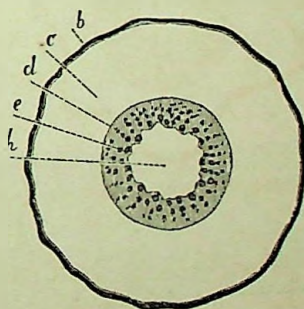
Jamaica sarsaparilla.

wrinkled; medullary and cortical layers broader than the woody zone. Caracas sarsaparilla is probably derived from the same plant.

b. *Mealy sarsaparillas*. The parenchyma cells contain starch granules, or occasionally a pasty mass.

3. *Honduras sarsaparilla*. In subcylindrical bundles,

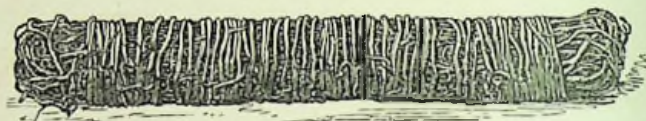
Fig. 10.



Caracas sarsaparilla.—Transverse section.

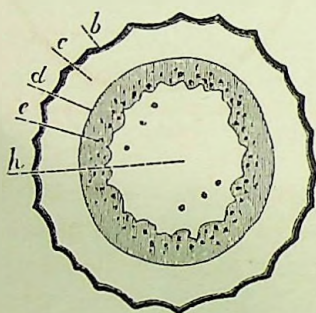
tied with a root and rounded at the ends by the roots being folded back. Roots rather finely wrinkled,

Fig. 11.



Honduras sarsaparilla.

Fig. 12.

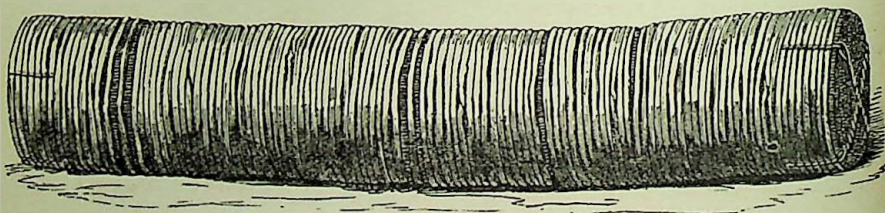


Honduras sarsaparilla.—Transverse section.

with few fibres, brown or gray-brown from adhering earth. Cortical and medullary layers nearly alike in thickness, and about twice broader than the woody zone; cells of the nucleus sheath nearly square, with large apertures, and the cell walls evenly thickened.

4. *Rio Negro sarsaparilla* (also called *Para* and *Lisbon sarsaparilla*). In large cylindrical rolls, neatly tied with the stem of a climbing plant, and evenly cut off at both ends. Roots

Fig. 13.



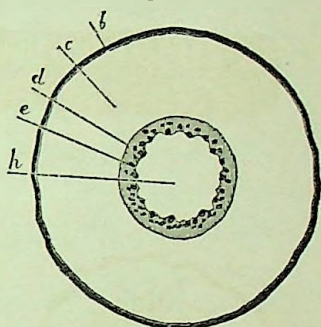
Rio Negro or Para sarsaparilla.

finely wrinkled, dark brown or blackish-brown from adhering earth; cortical layer thick; woody zone narrow, medullary layer as broad as the cortical layer, or broader; cells of the nucleus sheath somewhat radially elongated, the inner cell walls thickest, the aperture small.

Constituents.—Parillin (smilacin, parillic acid), trace of volatile oil, starch, resin, coloring matter. Parillin is soluble in hot water and alcohol, insoluble in ether, has an acrid taste, is a glucoside, and closely resembles saponin. When quite pure it crystallizes in scales; boiled with dilute acids it is split into sugar and parigenin, crystallizing in scales from alcohol.

Medical properties.—Regarded as an alterative. *Dose* 2 to 8 grams (3ss–3ij).

Fig. 14.



Rio Negro sarsaparilla.—Transverse section.

VETIVERIA.—VETIVERT.

Radix Ivarancusæ.

Origin.—*Andropogon muricatus*, Retz. *Natural order*, Graminaceæ.

Habitat.—East India.

Description.—Rootlets emanating from a short thin rhizome, light yellowish-brown, somewhat wavy, about 15 to 20 centimeters (6 to 8 inches) long, about

1 millimeter ($\frac{1}{25}$ inch) thick, tough, aromatic, balsamic. The bark has large air passages, and a number of resin cells.

Constituents.—Volatile oil and resin.

Medical properties.—Tonic, stimulant; almost exclusively used in perfumery for sachet powders, etc.

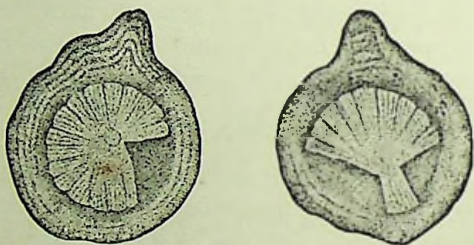
SENEGA.—SENEKA.

Origin.—*Polygala senega*, Lin. *Natural order*, Polygalaceæ.

Habitat.—United States.

Description.—About 10 centimeters (4 inches) long, with a very knotty crown, and spreading tortuous branches, keeled when dry, fleshy and round after having been soaked in water; externally, yellowish-

Fig. 15.



Senega.

Transverse sections, magnified 3 diam.

gray or brownish-yellow; bark thick, whitish within, sweetish, afterwards acrid, inclosing an irregular porous, yellowish, tasteless wood; odor slight, but unpleasant.

Constituents.—Polygalic acid (senegin), 5 per cent. fixed oil (containing virginic acid), pectin, coloring

matter. Polygalic acid resembles saponin, dissolves in water and diluted alcohol, and is nearly insoluble in absolute alcohol.

Substitution.—The root of *Pol. Boykinii*, *Nuttall*, closely resembles senega, but is destitute of the keel, and has a cylindrical wood. A northern variety of *Polygala senega* is likewise occasionally destitute of the keel, and has a cylindrical wood; it is frequently thick and large, often light colored, contains about 3 per cent. of polygalic acid, and yields a light-colored infusion and tincture.

Properties.—Expectorant, emetic, somewhat diuretic. *Dose*, 0.2 to 1.5 grams (3 to 22 grains).

SAPONARIA.—SOAPWORT.

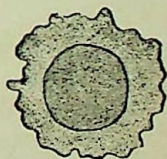
Origin.—The root of *Saponaria officinalis*, *Lin.*
Natural order, Caryophyllaceæ.

Habitat.—Central and Southern Europe, naturalized in North America.

Description.—About 25 centimeters (10 inches) long, 2 to 4 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) or more in thickness, nearly cylindrical, longitudinally wrinkled, rust-brown, internally whitish with a rather thick bark containing numerous small white crystal cells, and a pale yellow medullium, with indistinct medullary rays; inodorous; taste sweetish, somewhat bitter, persistently acrid.

Old woody roots and the long thin runners are rarely collected.

Fig. 16.



Saponaria.
Transv. sec. 3 diam.

Constituents.—Saponin, mucilage, a little resin. Saponin, $C_{32}H_{54}O_{18}$, is a white powder, sternutatory, soluble in hot water and alcohol, the aqueous solution foaming like soap-water; by acids it is split into sugar and crystallizable *sapogenin*, which is sparingly soluble in water.

Properties.—Alterative, resembling sarsaparilla.

SAPONARIA LEVANTICA.—LEVANT SOAPROOT.

Origin.—The root of *Gypsophila struthium*, *Lin.*
Natural order, Caryophyllaceæ.

Habitat.—Basin of the Mediterranean.

Description.—Simple, 25 to 40 centimeters (10 to 16 inches) long, 2 to 5 centimeters ($\frac{3}{4}$ to 2 inches) thick, somewhat fusiform, with longitudinal wrinkles and transverse ridges; light brownish-gray, internally whitish, with a thickish bark and a whitish medullium containing numerous medullary rays, and rather narrow wood wedges; inodorous; taste sweetish, persistently acrid.

Constituents and Properties.—Similar to the preceding; mostly used in washing silk and other fabrics.

GENTIANA.—GENTIAN.

Radix gentianæ rubræ.

Origin.—*Gentiana lutea*, *Lin.*; also *G. purpurea*, *Lin.*; *G. pannonica*, *Lin.*; *G. punctata*, *Lin.* *Natural order*, Gentianaceæ.

Habitat.—Mountains of Central and Southern Europe.

Description.—In nearly cylindrical pieces or longitudinal slices, about 25 millimeters (1 inch) thick, the upper portion closely annulate, the lower portion longitudinally wrinkled; externally deep yellowish-

Fig. 17.



Gentian.—Transverso section, magnified 3 diam.

brown, internally lighter; somewhat flexible and tough when damp; rather brittle when dry; fracture uneven; the bark rather thick, by a blackish cambium line separated from the somewhat spongy medullium; odor peculiar, faint, more prominent when moistened; taste sweetish, persistently bitter.

The root of *G. purpurea* is shorter, thinner, and darker; that of *G. pannonica* is scarcely annulate, shorter and darker; that of *G. punctata* little annulate, lighter, otherwise like the officinal root; they have the same properties.

Constituents.—Gentiopierin, gentisic acid (gentisin), pectin, fixed oil. Gentiopierin is an amorphous or crystalline glucoside, freely soluble in water and alcohol. Gentisic acid, $C_{14}H_{10}O_5$, crystallizes in yellow tasteless needles, is soluble in alcohol and ether, and colors ferric salts dark brown; and a dark green color is produced by a principle which is precipitated by water from the alcoholic tincture.

Properties.—Tonic. *Dose*, 0.3 to 2.0 grams (gr. v-xxx).

The *American gentian root*, collected from *Gentiana puberula*, *Mich.*, *G. saponaria*, *Lin.*, and *G. Andrewsii*, *Griseb.*, consists of a scarcely annulated head about 12 millimeters ($\frac{1}{2}$ inch) long and 3 millimeters ($\frac{1}{8}$ inch) thick, and numerous nearly simple, light brown-yellow, wrinkled rootlets about 6 centimeters ($2\frac{1}{2}$ inches) or more long, and having a thick whitish bark and thin medullium; odor and taste like that of gentian.

FRASERA.—AMERICAN COLUMBO.

The root of *Frasera Walteri*, *Michaux.* *Natural order*, Gentianaceæ.

Habitat.—United States in the Alleghanies and westward.

Description.—Mostly in longitudinal slices, about 25 millimeters (1 inch) thick, the upper portion annulate, the lower portion longitudinally wrinkled, externally pale orange-brown, internally light yellowish-brown; the bark thick, overlapping on the edges, by a brown cambium line separated from the rather spongy medullium; odor gentian-like, more prominent when moistened; taste sweetish and bitter.

Constituents.—The same as gentian, but apparently less gentiopierin. The yellow crystalline principle is probably different from gentisic acid.

Properties.—Tonic. *Dose*, 1 to 2 grams (gr. xv-xxx). The recent root is said to be emetic and purgative.

SYMPHYTUM.—COMFREY.

The root of *Symphytum officinale*, *Lin.* *Natural order*, Boraginaceæ.

Habitat.—Europe, cultivated and spontaneous in the United States.

Description.—About 15 centimeters (6 inches) long, 1 to 2 centimeters ($\frac{2}{3}$ to $\frac{4}{5}$ inch) thick, deeply wrinkled, brown-black, internally somewhat horny, whitish, or when old gray, with a thickish bark, narrow wood wedges, broad medullary rays, and, in the upper part, a thin pith; inodorous, taste sweetish, mucilaginous, and faintly astringent.

Constituents.—Mucilage, sugar, a little tannin, few starch granules, and a small quantity of asparagin.

Properties.—Demulcent, somewhat astringent.
Dose, 8 to 15 grams (3ij–iv) per day.

TARAXACUM.—DANDELION.

Origin.—*Taraxacum dens-leonis*, *Desf.*, s. *T. officinale*, *Wiggers*, s. *Leontodon taraxacum*, *Lin.* *Natural order*, Compositæ.

Habitat.—Grassy places and roadsides in Europe, naturalized in North America.

Nearly cylindrical, about 30 centimeters (12 inches) long, above about 25 millimeters (1 inch) thick, crowned with several short thickish heads, somewhat branched, dark brown, longitudinally wrinkled, when dry breaking with a short fracture, showing a yellowish porous wood, surrounded by a thick white bark, containing numerous milk-vessels arranged in concentric circles; inodorous, bitter. It should be free from the root of *Cichorium intybus*, *Lin.*, which closely resem-

Fig. 18.



Transverse section of
taraxacum root.

bles it, but is usually paler, and has the milk-vessels in radiating lines. Dandelion should be gathered in the autumn.

Constituents.—Early in spring dandelion contains uncrystallizable sugar, which disappears during the summer; in autumn it contains about 24 per cent. of inulin; pectin is also present. The milk-juice contains the crystalline bitter principle taraxacin, resin, a glutinous body, and taraxacerin $C_8H_{10}O$, the latter when in alcoholic solution having an acrid taste. Taraxacin is soluble in water and alcohol.

Properties.—Deobstruent, tonic in hepatic disorders, on continued use deranging digestion. *Dose*, 2 to 8 grams (3ss-ij).

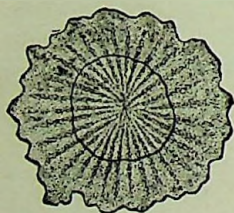
CICHORIUM.—CHICORY, SUCCORY.

Origin.—*Cichorium intybus*, *Lin.* *Natural order*, Compositæ.

Habitat.—Roadsides in Europe, naturalized in North America, cultivated in Europe.

Description.—Chicory bears a close resemblance to dandelion; but the root of wild plants is usually lighter in color and more woody, and has a relatively thinner bark. It, like the more fleshy and darker cultivated root, is readily distinguished by the radiating arrangement of the laticiferous vessels in the bark.

Fig. 19.



Cichorium, transverse section.

Constituents.—Bitter principle, inulin, pectin, sugar.

Properties.—Deobstruent, tonic, in overdoses deranging digestion. *Dose*, 1–4 grams (gr. xv to 3j). The roasted root is used for adulterating coffee.

PYRETHRUM.—PELLITORY.

Radix pyrethri romani. Roman pellitory.

Origin.—Anacyclus pyrethrum, *De Candolle*. *Natural order*, Compositæ.

Habitat.—Basin of the Mediterranean.

Description.—Somewhat fusiform, nearly simple, 5 to 10 centimeters (2 to 4 inches) long, about 12 milli-

Fig. 20.



Pyrethrum.—Transverse section, magnified 3 diam.

meters ($\frac{1}{2}$ inch) thick, annulate above, wrinkled below, externally dark gray-brown, internally brownish-white, fracture short; bark rather thick, containing two circles of shining resin cells, and surrounding the slender wood bundles and medullary rays, the latter with about four circles of shining resin cells, inodorous, pungent, and very acrid.

Constituents.—Acrid brown resin and acrid fixed oils, one brown and soluble in potassa, the other yel-

low, and insoluble in potassa, inulin, trace of tannin, mucilage.

Properties.—Irritant, rubefacient, sialagogue. *Dose*, as a masticatory 2.0 to 4.0 grams (3ss-j).

PYRETHRUM GERMANICUM.—GERMAN PELLITORY.

Radix pyrethri germanici.

Origin.—*Anacyclus officinarum*, Hayne. *Natural order*, Compositæ.

Habitat.—Central Europe, cultivated in Thuringia, Germany.

Description.—Nearly simple, about 25 millimetres (1 inch) long, about 3 millimeters ($\frac{1}{8}$ inch) thick, almost filiform towards the tip, finely wrinkled, brown-gray, brittle, internally brownish, with a rather thick bark, containing a circle of distinct resin cells; odor slight; taste acrid, burning. In commerce it is usually found with the thin stem, which should be separated.

Fig. 21.



Pyrethrum germanicum.
—Transverse section, magnified 3 diam.

Constituents.—Acrid resin, fixed oil, inulin, bitter principle.

Properties.—Like Roman pellitory.

INULA.—ELECAMPANE.

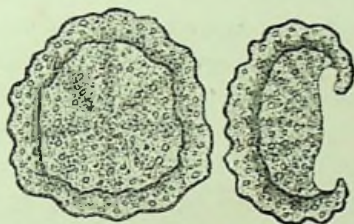
Radix inulæ s. enulæ.

Origin.—*Inula helenium*, Lin. *Natural order*, Compositæ.

Habitat.—Central and southern Europe, spontaneous in the United States; cultivated.

Description.—Branches of the root 15 to 30 centimeters (6 to 12 inches) long, and 2 to 2.5 centimeters ($\frac{3}{4}$ to 1 inch) in diameter; in commerce nearly always in transverse concave slices or longitudinal sections with overlapping bark, externally wrinkled and

Fig. 22.



Inula.—Transverse section, natural size.

brown, flexible in damp weather, when dry, breaking with a short fracture, internally grayish, fleshy, slightly radiate and dotted with numerous shining yellowish-brown resin cells; odor peculiar, aromatic; taste bitterish, camphoraceous, aromatic.

Constituents.—Acrid resin, helenin, inulin, bitter extractive, wax, etc.; odor and camphoraceous taste are due to the volatile oil, alantol (inulol) $C_{10}H_{15}O$; alantic (inulic) anhydrid, $C_{15}H_{20}O_2$, is in needles and has a faint odor and taste; helenin, C_6H_8O , is insipid.

Properties.—Stimulant, diaphoretic, diuretic, expectorant, externally rubefacient. *Dose*, 2 to 8 grams (3ss-ij) in infusion.

LAPPA.—BURDOCK.

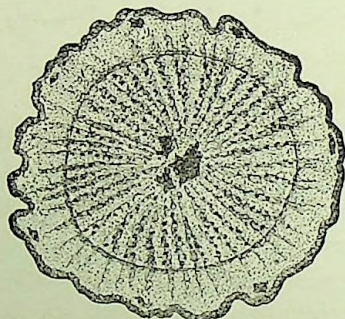
Radix bardanæ s. lappæ.

Origin.—*Lappa officinalis*, *Allioni*. *Natural order*, Compositæ.

Habitat.—Europe and northern Asia, naturalized in North America in waste places.

Description.—Nearly simple, fusiform, 30 centimeters (12 inches) or more long, about 25 millimeters (1 inch) thick, fleshy, longitudinally wrinkled, crowned with a tuft of whitish, soft, hairy leaf-stalks; gray-

Fig. 23.



Lappa.—Transverse section, magnified 2 diam.

brown, internally paler; bark rather thick, the inner part and the soft wood radially striate, the parenchyma often with cavities lined with snow-white remains of tissue; odor feeble, unpleasant; taste mucilaginous, sweetish, and somewhat bitter.

Constituents.—Mucilage, sugar, inulin, bitter extractive, little tannin.

Properties.—Diaphoretic, diuretic, alterative. *Dose*, 2 to 8 grams (3ss-ij) in decoction.

ASCLEPIAS TUBEROSA.—PLEURISY ROOT.

Origin.—*Asclepias tuberosa*, *Lin.* *Natural order*, Asclepiadaceæ.

Habitat.—United States near the Atlantic coast.

Description.—Root large and fusiform, dried in longitudinal transverse sections from 2 to 15 centimeters ($\frac{3}{4}$ to 6 inches) long, and about 20 millimeters ($\frac{3}{4}$ inch) or more in thickness, the head knotty, and slightly but distinctly annulate, the remainder longitudinally wrinkled; externally orange-brown, internally whitish; fracture uneven, tough; bark thin, in two distinct layers, the inner one whitish; wood yellowish, with large white medullary rays; inodorous; taste bitterish and somewhat acrid. When long kept, pleurisy root acquires a gray color.

Constituents.—Principle possessing the taste of the root; soluble in alcohol, ether, and somewhat in water; precipitated by tannin; two resins, tannin, mucilage, starch, etc.

Properties.—Sudorific, expectorant, carminative, anodyne. *Dose*, 1 to 4 grams (gr. xv-3j).

APOCYNUM CANNABINUM.—INDIAN HEMP.

Origin.—*Apocynum cannabinum*, *Lin.* *Natural order*, Apocynaceæ.

Habitat.—United States, on the border of thickets and in grassy places.

Description.—Long cylindrical, branched, about 6 millimeters ($\frac{1}{4}$ inch) thick, pale brown, longitudinally

wrinkled, somewhat fissured; fracture short; bark rather thick, white internally; wood pale yellow, porous and spongy; inodorous, bitter. It is often sold in place of *Apocynum androsæmifolium*.

Constituents.—Tannin, resin, bitter extractive, starch, etc.

Properties.—Emetic, cathartic, expectorant, diuretic, antiperiodic. *Dose*, as an antiperiodic and diuretic, 0.3 gram (gr. iv-v); as an emetic, 1 to 2 grams (gr. xv-3ss).

EUPHORBIA IPECACUANHA.—IPECACUANHA SPURGE.

American ipecac.

Origin.—*Euphorbia ipecacuanha*, *Lin.* *Natural order*, Euphorbiaceæ.

Habitat.—United States, in sandy soil, not far from the Atlantic coast.

Description.—Several, or many-headed, branches of the head short or sometimes 5 centimeters (2 inches) long, somewhat knotty and marked with stem scars; root more than 30 centimeters (12 inches) long, about 1 centimeter ($\frac{2}{3}$ inch) thick, nearly cylindrical, somewhat branched, light brown, wrinkled, fracture short; bark rather thick, white internally; wood yellowish, spongy, inodorous, sweetish, somewhat bitter, slightly acid.

Constituents.—Probably a glucoside, resins, euphorbon, starch, etc.

Properties.—Diaphoretic, cathartic, emetic. *Dose*, 0.3, 0.6, 1.3 gram (gr. v, gr. x, 3j).

EUPHORBIA COROLLATA.—LARGE-FLOWERING
SPURGE.

Origin.—*Euphorbia corollata*, *Lin.* *Natural order*, Euphorbiaceæ.

Habitat.—United States, in meadows; most abundant in the Southern States and west of the Alleghenies.

Description.—Many-headed: branches of the head usually short and stumpy; root 20 centimeters (8 inches) and more long, branched, subcylindrical or elongated-conical, from 5 to 25 millimeters ($\frac{1}{2}$ to 1 inch) thick, externally blackish-brown or brown-black, wrinkled and somewhat fissured, fracture short, or, in old roots, somewhat fibrous; bark rather thick, white internally; wood yellowish, soft; inodorous, sweetish, somewhat bitter, and slightly acrid.

Constituents.—Resin, mucilage, sugar, starch, etc.; probably similar to preceding.

Properties and Doses.—Diaphoretic (0.3 gm.=gr. v), cathartic (0.6 gm.=gr. x), emetic (1.3 gm.=gr. xx).

ANGELICA.—ANGELICA.

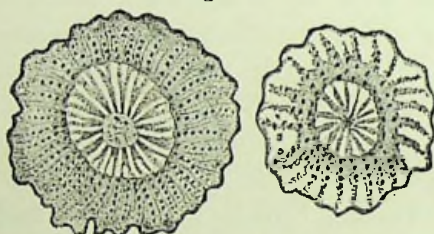
Origin.—*Archangelica officinalis*, *Hoffmann.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Central and Northern Europe; cultivated; collected in the spring of the second year.

Description.—Main root 5 to 10 centimeters (2 to 4 inches) long, 2.5 to 5 centimeters (1 to 2 inches) thick, crowned with remnants of leaf-bases, annulate; be-

low divided into numerous nearly simple cylindrical wrinkled branches, which are 2 to 6 millimeters ($1\frac{1}{2}$ to $\frac{1}{4}$ inch) thick, and 20 to 30 centimeters (8 to 12 inches) long; grayish-brown; fracture short. Main root with a rather thick bark, irregular curved yellowish porous wood-wedges, and a whitish pith; branches with the spongy whitish bark rather thicker than the yellowish soft wood; bark with radiating lines of large resin cells. Aromatic, sweetish, pungent, and bitter.

Fig. 24.



Angelica.—Transverse section of root-stock and rootlet, magnified 3 diam.

Constituents.— $\frac{1}{2}$ per cent. volatile oil, resin, valeric acid, angelic acid, $C_5H_8O_2$ (volatile, crystalline, fusible at $45^\circ C.=113^\circ F.$, aromatic), angelicin (crystalline, pungent), sugar, bitter principle, starch, tannin.

Properties.—Carminative, stimulant, tonic, diaphoretic, in large doses emetic. *Dose*, 0.6 to 2.0 grams (gr. x- $\overline{3}$ ss), in powder or infusion.

ANGELICA ATROPURPUREA.—AMERICAN ANGELICA.

Origin.—*Archangelica* (*Angelica*, *Lin.*) *atropurpurea*, *Hoffm.*, s. *Angelica triquinata*, *Mich.* *Natural order*, Umbelliferae, Orthospermae.

Habitat.—Northern and Western United States, south to Pennsylvania.

Description.—About 10 to 15 centimeters ($\frac{1}{2}$ to 6 inches) long and 18 millimeters ($\frac{3}{4}$ inch) thick, branched, deeply wrinkled, brown-gray, internally whitish, fracture short, with a thick resinous-dotted bark, and soft radiating wood, aromatic, sweetish, pungent and bitter.

Constituents.—Volatile oil, volatile acid, resin, starch.

Properties and Dose.—Similar to preceding.

LEVISTICUM.—LOVAGE.

Origin.—*Levisticum officinale*, Koch, s. *Ligusticum levisticum*, Lin. *Natural order*, Umbelliferæ, Orthospermæ.

Habitat.—Southern Europe; cultivated in Germany.

Description.—Main root nearly 10 centimeters ($\frac{1}{2}$ in.) long and 4 centimeters ($1\frac{3}{5}$ inch) thick, several-headed, annulate; below divided into a few nearly simple, subcylindrical, and deeply wrinkled branches, which are about 20 centimeters (8 inches) long and 2 to 6 millimeters ($1\frac{1}{2}$ to $\frac{1}{4}$ inch) thick; brown or reddish-brown; fracture short, spongy. Main root with a rather thick bark, and yellowish porous wood, which is radiate near the bark, and in irregular meshes towards the centre; branches with the bark rather thicker than the porous

Fig. 25.



Levisticum. — Transverse section, magnified 3 diam.

yellowish wood; the bark with numerous narrow bast rays, and small resin cells, in radiating lines; aromatic, sweetish, pungent, and bitter.

Constituents.—Volatile oil, bitter extractive, resins, sugar, starch, mucilage.

Properties.—Carminative, stimulant, diuretic, emmenagogue. *Dose*, 0.6 to 2.0 grams (gr. x-3ss), in infusion.

LASERPITIUM.—WHITE GENTIAN.

Radix gentianæ albæ.

Origin.—*Laserpitium latifolium*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Central Europe.

Description.—Several-headed, somewhat conical, annulate above, branched below, and deeply wrinkled; the brown corky layer removed; grayish-white; fracture short, white; bark thick, with numerous orange-colored resin cells; wood finely porous; aromatic, bitter.

Constituents.—Volatile oil, bitter principle, mucilage, starch.

Properties.—Tonic, stimulant. *Dose*, 1 to 4 grams (gr. xv-3j).

PIMPINELLA.—PIMPERNEL.

Origin.—*Pimpinella saxifraga*, *Lin.*, and *P. magna*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Central Europe, in dry and mountainous localities.

Description.—Several-headed, branches of the head terminated by the hollow stem-base; fusiform, 20 to 30 centimeters (8 to 12 inches) long, annulate above, longitudinally wrinkled below; yellowish-brown or brown-yellow; fracture short, internally whitish; bark thick, radiate, with yellow resin cells; wood yellowish, porous, radiate; aromatic, sweetish, pungent.

Constituents.—Volatile oil, acrid resin, sugar, starch.

Properties.—Stimulant, tonic, sialagogue. *Dose*, 0.5 to 2.0 grams (gr. viij-3ss).

Fig. 26.



Pimpinella.—Transverse section, magnified 3 diam.

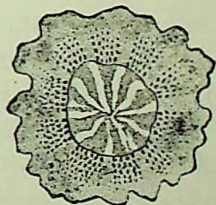
PETROSELINUM.—PARSLEY.

Origin.—*Petroselinum sativum*, *Hoffmann*, s. *Apium petroselinum*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Southern Europe; extensively cultivated.

Description.—Somewhat conical, about 15 centimeters (6 inches) long, and about 12 millimeters ($\frac{1}{2}$ inch) thick; light brown-yellow; annulate above, wrinkled below, with transverse ridges; fracture short; bark thick, and, like the medullary rays, white and resinous dotted; wood light yellow, porous; faintly aromatic, sweetish.

Fig. 27.



Petroselinum. Transverse section, magnified 3 diam.

Constituents.—Volatile oil, mucilage, sugar, starch.

Properties.—Carminative, diuretic, nephritic, discutient. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion.

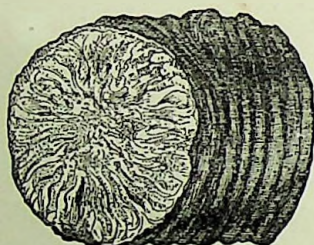
SUMBUL.—SUMBUL.

Origin.—*Ferula sumbul*, *Hooker fil.*; s. *Euryangium sumbul*, *Kauffmann*. *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Central and northeastern Asia.

Description.—In transverse segments varying considerably in diameter and thickness, light, spongy, annulate or longitudinally wrinkled; bark thin, brown, more or less bristly-fibrous; the interior whitish, with numerous brown-yellow resin dots and irregular easily separated fibres; odor strong, musk-like; taste bitter and balsamic.

Fig. 28.



Sumbul section.

False Sumbul of India—

Ammoniacum root, sometimes flavored with sumbul; firmer, denser, and of a yellow or reddish tint.

Constituents.—Volatile oil, $\frac{1}{3}$ per cent., bluish; soft resin, 9 per cent., of musk odor; angelic acid, valeric acid, bitter extractive, sugar, starch; on dry distillation yields umbelliferon.

Properties.—Stimulant, tonic, nervine. *Dose*, 0.5 to 2.0 grams (gr. viij to 3ss) in powder, tincture, or fluid extract.

PANAX.—GINSENG.

Origin.—*Aralia quinquefolia*, Gray, s. *Panax quinquefolium*, Lin. *Natural order*, Araliaceæ.

Habitat.—North America, south to the mountains of Georgia and Tennessee; in rich woods.

Description.—Fusiform, 50 to 75 millimeters (2 to 3 inches) long, annulate above, divided below into 2 or 3 equal branches, wrinkled longitudinally; externally, pale brownish-yellow; fracture short, mealy, white, with a thick bark containing numerous reddish resin cells; wood wedges narrow yellowish; medullary rays broad; sweetish, slightly aromatic.

Constituents.—Panaquilon, sweet, amorphous, soluble in water and alcohol, insoluble in sodium sulphate solution, precipitated by tannin; resin, mucilage, starch.

Properties.—Demulcent, slightly stimulant. *Dose*, 1 to 8 grams (gr. xv–5ij).

STILLINGIA.—STILLINGIA, QUEEN'S DELIGHT.

Origin.—*Stillingia sylvatica*, Lin. *Natural order*, Euphorbiaceæ.

Habitat.—Southern United States, in sandy soil.

Description.—Subcylindrical, about 30 centimeters (12 inches) long, nearly 5 centimeters (2 inches) thick, little branched, compact, wrinkled, tough, gray-brown, breaking with a fibrous fracture, showing a thick bark and porous wood, the inner bark and medullary rays pinkish, with numerous yellowish-brown resin cells; odor peculiar, unpleasant; taste bitter, acrid, pungent.

Constituents.—Pungent resin, fixed oil, starch.

Properties.—Alterative, antivenereal, in large doses emetic. *Dose*, 1 to 2 grams (gr. xv–3ss).

IPOMŒA PANDURATA.—WILD JALAP, MANROOT.

Origin.—*Ipomœa pandurata*, Meyer. *Natural order*, Convolvulaceæ.

Habitat.—United States, in sandy fields.

Description.—Large, conical, above abruptly contracted and about 1 centimeter ($\frac{2}{5}$ inch) thick; in longitudinal or transverse slices, with overlapping bark, wrinkled and brownish-gray externally, whitish internally; bark thin, with a zone of resin cells, wood wedges numerous and narrow, in the medullary rays scattered resin cells; odor slight; taste sweetish, bitter, somewhat acrid.

Constituents.—Resin 1–2 per cent., sugar, gum, coloring matter, starch. The resin is a glucoside, soluble in alcohol, ether, chloroform, and alkalies, the latter solution being precipitated by acids.

Properties.—Diuretic, cathartic. *Dose*, 1.0 to 4.0 grams (gr. xv–3j).

PHYTOLACCÆ RADIX.—POKEROOT.

Origin.—*Phytolacca decandra*, Lin. *Natural order*, Phytolaccaceæ.

Habitat.—North America in waste places; naturalized in southern Europe and the West Indies.

Description.—Large, conical, branched, and fleshy; mostly in transverse or longitudinal slices, wrinkled, grayish, hard; fracture fibrous, the wood bundles in several distinct concentric circles; inodorous; sweetish, acrid.

Constituents.—Resin, starch, tannin, mucilage, etc.

Properties.—Alterative, anodyne, resolvent, emetic.

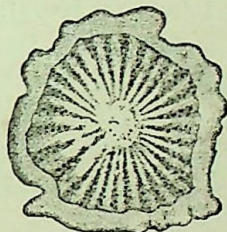
Dose, 0.3 to 2 grams (gr. v–5ss) in powder, decoction, or extract.

Fig. 29.



Phytolacca.—Transverse section,
natural size.

Fig. 30.



Belladonna.—Transverse section,
magnified 2 diam.

BELLADONNÆ RADIX.—BELLADONNA ROOT.

Origin.—*Atropa belladonna*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Central and southern Europe; in woods.

Description.—In cylindrical, somewhat tapering, longitudinally wrinkled pieces, 12 to 25 millimeters ($\frac{1}{2}$ to 1 inch) or more thick, externally brownish-gray, internally whitish, nearly inodorous, of a sweetish afterwards bitterish and strongly acrid taste, and breaking with a nearly smooth and mealy fracture; bark rather thin, wood bundles yellowish, with distinct medullary rays.

Roots which are tough, woody, and break with a splintery fracture should be rejected.

Constituents.—Atropia, 0.2–0.6 per cent., belladonna, starch; atropia, $C_{17}H_{23}NO_3$, white crystalline, soluble in ether, chloroform, alcohol, also in water; yields tropic acid and tropina.

Atropia is found chiefly in the bark; hence woody roots should be rejected; it is present in largest quantity about the time of flowering.

Properties.—Diuretic, dilating the pupil, narcotic.

Dose, 0.06 gram (gr. j).

ALTHÆA.—MARSHMALLOW.

Origin.—*Althæa officinalis*, *Lin.* *Natural order*, Malvaceæ.

Habitat.—Europe; naturalized in the eastern United States; in salt marshes; cultivated in Europe.

Description.—Deprived of the brown corky layer; cylindrical or conical, longitudinally wrinkled pieces, from seven to fifteen centimeters (3 to 6 inches) long, and above 1 centimeter ($\frac{3}{8}$ inch) in diameter; externally white, mealy, somewhat hairy from detached slender bast fibres, and marked with circular scars of the rootlets;

Fig. 31.



Althæa.—Transverse section, magnified 2 diameters.

fracture short and granular, whitish, showing a thickish bark and a fleshy or mealy very faintly radiating centre. Odor faint, peculiar; taste sweetish, mucilaginous.

Marshmallow should not be coated with lime.

Young uncoated belladonna root resembles marshmallow; but is externally not fibrous, and has yellowish wood wedges.

Constituents.—Asparagin, mucilage, sugar, starch.

Properties.—Demulcent. *Dose*, 2 to 8 grams (3ss-ij) in infusion or syrup.

ALKANNA.—ALKANET.

Origin.—Alkanna (*Anchusa*, *Lin.*) *tinctoria*, *Tausch*.
Natural order, Boraginaceæ.

Habitat.—Western Asia and southeastern Europe.

Description.—Fusiform, about 10 centimeters (4 inches) long, and 1 centimeter ($\frac{2}{5}$ inch) thick, with a crown of feltlike leaf bases; deeply wrinkled; bark dark purple, foliaceous, friable, easily separated from the twisted yellowish wood, which is cleft by purple friable medullary rays; nearly inodorous and tasteless; does not tinge the water red.

Constituents.—Alkannin, little starch. Alkannin is of resinous appearance, dark purplish-red, soluble in ether, alcohol, fats, and certain volatile oils, with a red color; in alkalies blue.

Uses.—For coloring tinctures and pomades.

CALUMBA.—COLOMBO.

Origin.—*Jateorrhiza calumba*, *Miers*. *Natural order*, Menispermaceæ.

Habitat.—Eastern Africa, cultivated in some East Indian islands.

Description.—Nearly circular disks, 3 to 6 centimeters ($1\frac{1}{5}$ to $2\frac{2}{5}$ inch) in diameter, yellowish-gray, depressed in the centre, with two or three interrupted circles of projecting wood bundles, distinctly radiate in the outer portion; fracture short, mealy; odor slight; taste mucilaginous, slightly aromatic, persistently bitter.

Fig. 32.



Calumba.—Transverse section, natural size.

Constituents.—Columbin (white, crystalline, slightly soluble in water), berberina (yellow, crystalline), columbic acid (colorless, nearly insoluble in cold water), starch, mucilage.

Properties.—Tonic. *Dose*, 0.5 to 2 or 4 grams (gr. viij-3ss-j), in infusion, tincture, extract.

RUMEX.—YELLOW DOCK.

Radix lapathi.

Origin.—*Rumex crispus*, *Lin.*, and other species of *Rumex*. *Natural order*, Polygonaceæ.

Habitat.—Europe, naturalized in North America; in grassy places and along roadsides.

Description.—Fusiform, 10 to 20 centimeters (4 to

8 inches) long, 1 to 2 centimeters ($\frac{2}{5}$ to $\frac{1}{2}$ inch) thick, annulate above, deeply longitudinally wrinkled below; externally brown or reddish-brown, internally dingy brownish-yellow; fracture short, showing a thickish bark of about $\frac{1}{8}$ diameter, and a porous fleshy or somewhat horny medullium; inner bark and wood with fine reddish medullary rays; nearly inodorous, taste bitter and astringent; on mastication the saliva is tinged yellowish.

Constituents.—Tannin, mucilage, starch, chrysophanic acid (rubicin, lapathin), calcium oxalate.

Properties.—Astringent, tonic, alterative, in larger doses laxative. *Dose*, 1 to 4 grams (gr. xv–3j).

RHAPONTICUM.—RHAPONTIC ROOT. CRIMEAN RHUBARB.

Origin.—*Rheum rhaponticum*, *Lin.* *Natural order*, Polygonaceæ.

Habitat.—Western Asia, cultivated in some parts of Europe.

Description.—Fusiform, about 10 centimeters (4 inches) long, and 2 centimeters ($\frac{1}{2}$ inch) thick, somewhat annulate above, deeply wrinkled; partly deprived of the orange-red cork; fracture short, internally whitish, with straight interrupted red medullary rays, and a rather thick bark; odor and taste resembling rhubarb, more mucilaginous, and less gritty; the saliva, on mastication, tinged yellow.

Fig. 33.



Rhaponticum.—Transverse section, magnified 3 diam.

Constituents.—Like rhubarb, but astringency predominating.

Properties.—Astringent, laxative. *Dose*, 1 to 3 grams (gr. xv–xlv).

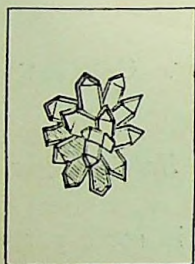
RHEUM.—RHUBARB.

Origin.—*Rheum officinale*, *Baillon*, and probably other species of *Rheum*. *Natural order*, Polygonaceæ.

Habitat.—Western and Central China.

Description.—Cylindrical, conical, or flattish segments, deprived of the dark-brown corky layer, smoothish or somewhat wrinkled, externally marked with white elongated meshes, containing a white rather spongy tissue, and a number of short red-brown or brown-yellow striæ; compact, hard, fracture uneven; internally white, with numerous red irregularly curved and interrupted medullary rays, which are radially parallel only near

Fig. 34.



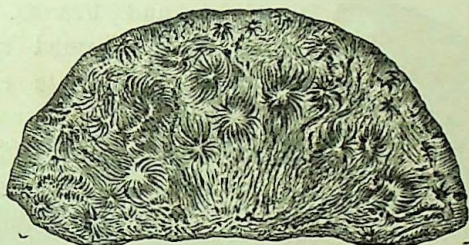
Oxalate of calcium
crystals in rhubarb.

the cambium line; of a peculiar aromatic odor, gritty between the teeth from tufts of crystals of calcium oxalate; taste bitter, somewhat astringent; the saliva is tinged orange-yellow. Near the cambium line are a few stellate spots, or sometimes a larger number arranged in a loose circle; they indicate the internal origin of the rootlets, and are formed by short, red, somewhat wavy medullary rays radiating from a common centre.

Varieties.—1. *Russian Rhubarb* came from Chinese

Tartary by way of Siberia (Kiachta) to St. Petersburg, and consisted of carefully selected pieces, which were trimmed after drying to beneath the cambium line, and marked with a conical hole, penetrating beyond the middle. It is no longer an article of commerce.

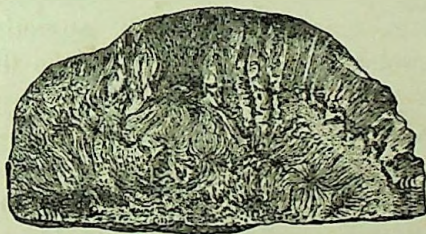
Fig. 35.



Russian rhubarb.—Transverse section.

2. *Chinese Rhubarb*, also called *East India Rhubarb*, is exported from Canton and other Chinese ports, frequently by way of India. The inner bark is always

Fig. 36.



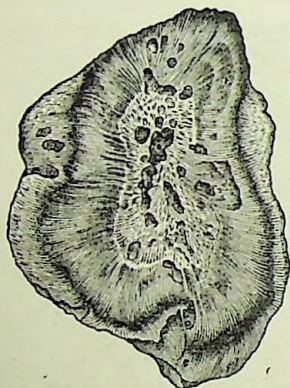
Chinese rhubarb.—Transverse section.

present, small patches of the rough corky layer are occasionally adhering, and fragments of twine on which the root was dried are not unfrequently ob-

served. Its color is less bright, and its odor somewhat less aromatic than that of Russian rhubarb. This variety is the officinal rhubarb.

3. *European Rhubarb*. From *Rheum palmatum*, *rhaponticum*, *compactum*, *undulatum*, *Emodi*, and

Fig. 37.



European rhubarb.—Transverse section.

other species, cultivated in Moravia (Austria), England, and France. Frequently trimmed so as to resemble Chinese rhubarb, but the surface entirely or nearly destitute of white meshes, and the medullary rays interrupted and nearly parallel. The color is paler, the odor weaker, and the taste more mucilaginous and less gritty than in Chinese rhubarb. It is sometimes used in veterinary practice.

Constituents. — Chrysophan, chrysophanic acid, erythroretin, emodin, phæoretin, aporetin, starch, tannin, crystals of calcium oxalate; the first-named principles yield with alkalis a deep-red or brown-red color. *Chrysophan*, $C_{16}H_{18}O_8$, is orange-yellow, bitter, soluble in alcohol and water, yields with dilute acids sugar and *chrysophanic acid*, $C_{13}H_{10}O_4$; this is orange-yellow, crystalline, freely soluble in benzol, chloroform, volatile and fixed oils, less soluble in alcohol and ether, nearly insoluble in cold water. *Erythroretin* is yellow, tasteless, readily soluble in alcohol, less so in ether. *Emodin*, is orange-colored,

insoluble in benzol. *Phæoretin* is yellowish-brown, soluble in alcohol, insoluble in ether, chloroform, and water. *Aporetin* is blackish, resinous, sparingly soluble in simple solvents. *Rheotannic acid*, $C_{22}H_{22}O_{14}$, is yellowish, soluble in water and alcohol, yields with dilute acids sugar and *rheumic acid*, $C_{20}H_{16}O_9$, which is sparingly soluble in cold water.

Properties.—Tonic, astringent, aperient, purgative.
Dose, 0.3 to 1.6 gram (gr. v-xxv).

GLYCYRRHIZA.—LICORICE ROOT.

Radix liquiritiæ.—Liquorice Root.

Origin.—*Glycyrrhiza glabra*, *Lin.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Southern Europe; cultivated.

Description.—Long cylindrical pieces, from 5 to 25 millimeters ($\frac{1}{2}$ to 1 inch) thick, longitudinally wrinkled, externally grayish-brown, warty; internally tawny-yellow; pliable, tough; fracture coarsely fibrous; bark rather thick, with firm bast fibres; wood porous, but dense, in narrow wedges; medullary rays linear; nearly inodorous; taste sweet, somewhat acrid.

The under-ground stem, which is often present, has the same appearance, but contains a thin pith.

Varieties.—1. *Spanish, Italian, and Turkish licorice root*. The kind described, exported from the countries named.

2. *Russian licorice root*. From *Glycyrrhiza echinata*, *Lin.*, or *Gl. glandulifera*, *W. K.* It is mostly thicker than the preceding, is deprived of the corky

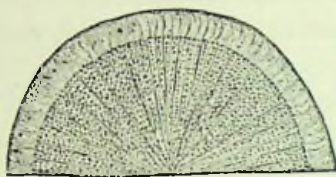
layer, externally bright tawny-yellow, smooth, the wood-wedges softer and paler, the cells larger, and the tissue often cleft.

Fig. 38.



Glycyrrhiza glabra.—Transverse section.

Fig. 39.



Glycyrrhiza echinata.—Transverse section.

Constituents.—Glycyrrhizin about 6 per cent. (probably in combination with ammonia), sugar, asparagin, starch, resin. Glycyrrhizin, $C_{16}H_{24}O_6$, is a glucoside, splitting into glucose and bitter glycyrretin.

Properties.—Demulcent, expectorant. *Dose*, 1 to 4 grams (gr. xv-3j).

APOCYNUM ANDROSÆMIFOLIUM.— DOG'S-BANE.

Origin.—*Apocynum androsæmifolium*, *Lin.* *Natural order*, Apocynaceæ.

Habitat.—North America, chiefly northward.

Description.—Long cylindrical, branched, about 6 millimeters ($\frac{1}{4}$ inch) or less thick; bark pale brownish, wrinkled, transversely fissured, thickish, unpleasantly bitter, easily separable from the tough, white, porous, and tasteless wood.

It should not be confounded with the root of

Apocynum cannabinum, *Lin.*, which has a relatively thicker bark and soft, fragile, porous wood.

Constituents.—Bitter principle, resin, caoutchouc, starch, etc.

Properties.—Diuretic, sudorific, emetic, cathartic.

Dose, 0.3 to 1.6 gram (gr. v-xxv).

IPECACUANHA.—IPECACUANHA.

Origin.—*Cephaelis ipecacuanha*, *A. Richard*. *Natural order*, Rubiaceæ, Coffeæ.

Habitat.—Brazil to Bolivia and New Granada, in damp forests.

Description.—About 10 centimeters (4 inches) long and 4 millimeters ($\frac{1}{8}$ inch) thick; mostly simple, contorted, dull gray-brown or blackish, finely wrinkled, closely irregularly annulated, and often transversely fissured; bark thick, brittle, brownish, somewhat waxy, easily separated from the thin, whitish, tough, ligneous portion; odor slight, nauseous; taste bitterish, acrid, nauseating.

Varieties.—According to the tint of the corky layer, *gray*, *red*, and *black* ipecac, all being derived from the same species.

Substitutions.—The following are used in Brazil, besides other roots, like ipecacuanha, and are occasionally met with in Europe, but rarely seen in the United States:—

Striated ipecacuanha.—From *Psychotria emetica*, *Lin.* *Natural order*, Rubiaceæ. Longitudinally wrinkled, with distant transverse fissures; dark purplish-brown; bark thick.

Undulated ipecacuanha.—From *Richardsonia scabra*, *St. Hil.* *Natural order*, Rubiaceæ. Undulate, slightly wrinkled, annulate and transversely fissured, gray; bark mealy; wood nearly the thickness of the bark.

Fig. 40.



Ipecacuanha.

Fig. 41.



Striated ipecacuanha.

Fig. 42.



Undulated ipecacuanha.

White ipecacuanha.—From *Ionidium ipecacuanha*, *Vent.* *Natural order*, Violaceæ. Somewhat branched, not annulate, longitudinally wrinkled, whitish or pale brownish-yellow; wood porous, rather thick, yellowish.

Constituents.—Emetia about 1 per cent., ipecacuanhic acid, resin, pectin, starch, sugar. Emetia, $C_{22}H_{40}N_2O_5$, white powder, soluble in alcohol and chloroform, slightly soluble in cold water, ether, and fixed oils; colored bright yellow or orange by solution of chlorinated lime.

Properties.—Expectorant, nauseant, emetic. *Dose*, 0.06, 0.3 to 1 or 2 grains (gr. j, gr. v, gr. xv-xxx).

PAREIRA.—PAREIRA BRAVA.

Origin. — Chondodendron tomentosum, *Ruiz et Pavon.* *Natural order*, Menispermaceæ.

Habitat.—Brazil.

Description. — Subcylindrical, somewhat tortuous pieces, about 10 or 15 centimeters (4 or 6 inches) long, varying in thickness between 2 and 10 centimeters ($\frac{3}{4}$ and 4 inches); externally dark brown-gray, with transverse ridges and fissures and longitudinal furrows; internally pale brown, the fresh cut of a waxy lustre; bark thin; wood porous, in two or more, somewhat irregularly concentric circles, and with distinct medullary rays; inodorous, bitter.

Pieces having a bright yellow color, or with a grayish, hard, nearly tasteless wood, should be rejected.

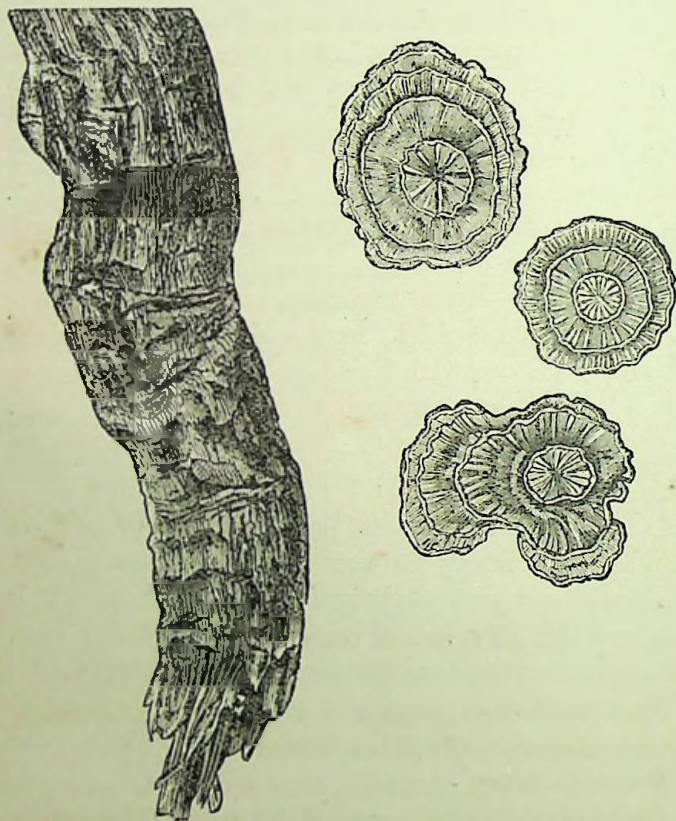
Admixtures and Substitutions.—Pareira brava is not unfrequently mixed with sections of the *stem*, which has a rather thicker bark, when young, dotted with black warts, nearly regular zones of wood-wedges, and a central pith; taste bitterish; otherwise resembles the root.

False Pareira brava.—*a.* Wood hard, very excentric, in separate circles and sections of circles, grayish, the fresh cut not waxy; bark thin, slightly bitter. Origin unknown.

b. Wood hard, pale brown, nearly concentric, separate circles; bark thin, nearly tasteless; otherwise resembling the preceding. Origin unknown.

c. Bark blackish; wood whitish, amylaceous, tasteless; derived from *Abuta rufescens*, Aublet.

Fig. 43.



Pareira brava.—Portion of a root, and transverse sections of the same.

d. Wood hard, very excentric, in separate circles and sections of circles, bright yellow like the thin bark; bitter. It contains berberina, and is probably derived from a species of *Abuta*. Habitat, Brazil.

Constituents.—Pelosina, identical with beberina and buxina.

Properties.—Diuretic, tonic. *Dose*, 2 to 4 grams (3ss-j).

BERBERIS.—BARBERRY.

Radix berberidis.

Origin.—*Berberis vulgaris*, *Lin.* *Natural order*, Berberidaceæ.

Habitat.—Europe and Western Asia; naturalized in North America.

Description.—Much branched, sometimes 5 centimeters (2 inches) thick, hard and tough, brownish, internally yellow, with a thin, rather loose bark, and thick, light yellow wood; inodorous, bitter.

Constituents.—Berberina (see Hydrastis), vinetina (berbina or oxyacanthin; see Barberry bark).

Properties.—Tonic. *Dose*, 2.0 to 4.0 grams (3ss-j), in decoction, etc.

STATICE.—MARSH ROSEMARY.

Origin.—*Statice limonium*, *Lin.*, var. *Caroliniana*, *Gray.* *Natural order*, Plumbaginaceæ.

Habitat.—North America, near the coast.

Description.—Several-headed, 30 to 60 centimeters (12 to 24 inches) long, 25 millimeters (1 inch) or more thick, annulate above, branched and wrinkled below, compact, tough, purplish-brown externally, lighter internally, with a rather thick bark and narrow, yellowish wood-wedges; inodorous, strongly astringent, and slightly bitter.

Constituents.—Tannin 14–18 per cent., mucilage, sugar, etc.

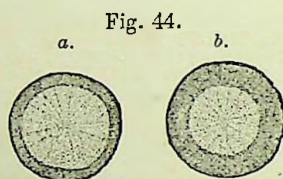
Properties.—Astringent. *Dose*, 0.5 to 2 grams (gr. viij–xxx).

KRAMERIA.—RHATANY.

Origin.—1. *Krameria triandra*, Ruiz et Pavon, and 2. *Krameria tomentosa*, St. Hilaire. *Natural order*, Polygalaceæ, Kramerieæ.

Habitat.—1. Peru and Bolivia; 2. New Granada.

Description.—About 25 millimeters (1 inch) thick, knotty and several-headed above, branched below,



Transverse section of—*a*. Peruvian, *b*. Savanilla rhatany root.

the branches thinner and long; bark smooth or scaly, deep rust-brown, about 2 millimeters ($\frac{1}{12}$ inch) thick, very astringent, inodorous; wood pale brownish, tough, with fine medullary rays, nearly tasteless; bark of branches about $\frac{1}{8}$ or $\frac{1}{6}$ the diameter.

The root of *Krameria tomentosa* (*Savanilla rhatany*) is less knotty, more slender, and has a dark brown-purplish, somewhat scaly bark, about 3 millimeters ($\frac{1}{8}$ inch) thick; bark of branches about $\frac{1}{5}$ to $\frac{1}{4}$ the diameter.

Varieties.—1. *Peruvian or Payta rhatany*, and, 2. *Savanilla rhatany*. Described above.

3. *Para or Brazilian rhatany*.—Resembles the preceding; but is more blackish, less of a purple tint, very flexible; bark transversely fissured.

4. *Texan rhatany*.—From *Kr. secundiflora*, *D. C.* Thin; externally blackish-brown, scaly; bark of branches about $\frac{1}{3}$ the diameter; not found in commerce.

Constituents.—Kramero-tannic acid about 20 per cent., rhatanin red, starch.

Properties.—Astringent. *Dose*, 0.5 to 2 grams (gr. viij-3ss), in powder (rarely), syrup, tincture, extract.

2. RHIZOMES.—RHIZOMATA.

Rhizomes are stems remaining wholly or partly under ground, and are mainly distinguished from roots by the presence of scaly leaves or of sheathing leaf-bases or their scars, whereby they, or at least their younger portion, acquire a more or less annulated appearance. Rhizomes grow mostly in a horizontal or oblique direction, and bear on the upper side the scars of overground stems and leaf-sheaths, while the rootlets are mainly on the lower side. Few of the officinal rhizomes have a perpendicular growth, are on all sides uniformly surrounded by rootlets, and on the lower end are more or less truncate. Branches, if present, emanate from the axils of leaf-scars.

Histology.—The rhizomes of cryptogamous plants (ferns) consist of parenchyma, in which a few, more or less, laterally elongated, not wedge-shaped, wood-bundles are arranged in a loose circle.

The rhizomes of monocotyledons consist of a circle

of parenchyma, followed by a circular row of thick-walled cells, the nucleus sheath, and inclosing a cylinder of parenchyma in which wood-bundles are irregularly scattered, sometimes being most abundant near the nucleus sheath; in some cases wood-bundles are also observed in the outer layer which may be likened to the bark.

The rhizomes of dicotyledons have usually the epidermis replaced by a layer of cork; the bark consists of an outer and an inner layer, the latter being the liber, and is separated by a thin layer of cambium from the wood, which is circularly arranged in more or less distinctly wedge-shaped masses, and these alternate with medullary rays and inclose a circular pith.

Classification.

Sect. 1. Cryptogamous Rhizomes.

Rhizome densely covered with stipes, and between these with brown silky chaff.

Filix mas.

Sect. 2. Monocotyledonous Rhizomes.

Collected without rootlets.

Aromatic and pungent.

Peeled or unpeeled, flattish, lobed, with numerous oil-cells.

Zingiber.

Usually in disks, light reddish or brown-gray, with oil-cells.

Zedoaria.

Cylindrical, annulate, branched, reddish-brown; internally whitish, with oil-cells.

Galanga.

Globular-pyriform, or more frequently cylindrical, gray; internally orange-yellow, horny.

Curcuma.

Aromatic and bitter, flattish-cylindrical, on the lower side with scars of rootlets in wavy and branched lines.

Calamus.

Odor of violets, bitterish, white, consisting of flattened club-shaped joints.

Iris florentina.

- Taste acrid ; brown, consisting of cylindrical joints, which are flattened above. Iris versicolor.
- Taste sweet ; thin, straw-yellow ; internally whitish, spongy, hollow in centre. Triticum repens.
- Taste bitterish, acrid ; thin, brown-gray, under the epidermis a circle of large air-tubes. Carex arenaria
- Taste bitterish ; thick, tuberos, tuberculated, reddish-brown ; internally whitish-brown dotted. Smilax China.
- Taste acrid, tingling ; obconical, brown, surrounded by scars of rootlets ; internally whitish, with short curved wood-bundles. Veratrum album.
- Collected with rootlets.
- Taste acrid, tingling ; obconical, brown, surrounded by shrivelled, lighter-colored, simple rootlets ; internally whitish, with short curved wood-bundles. Veratrum viride.
- Resembling the preceding, but of larger dimensions, dark gray, and, when rubbed, of a disagreeable odor. Dracontium.
- Taste bitterish, slightly acrid ; long, sub-cylindrical ; on upper side with cup-shaped stem-scars, on lower side with numerous long somewhat wavy rootlets. Cypripedium.

Sect. 3. Dicotyledonous Rhizomes.

Collected with few or no rootlets.

Short, leaf-scars approximate.

- Acrid ; cylindrical, deep brown-red ; internally white, with numerous red resin-cells. Sanguinaria.
- Astringent ; cylindrical, brown ; internally reddish ; bark thin ; wood-wedges small ; medullary rays broad. Geranium.
- Astringent ; irregularly conical, pitted, brown ; internally reddish ; bark thick ; wood-wedges small ; medullary rays broad. Tormentilla.
- Astringent ; S-shaped, flattish, red-brown ; internally reddish ; bark thick : wood-wedges small, numerous ; medullary rays narrow. Bistorta.

Long horizontal, leaf-scars mostly distant.

Somewhat bitter and acrid; composed of joints, terminated by a broad cup-shaped scar on upper side, and a tuft of rootlets underneath.

Podophyllum.

Cylindrical, somewhat tuberculate, with laticiferous vessels.

*Asclepias
cornuti.*

Somewhat aromatic, sweetish; cylindrical, annulate above.

*Aralia
nudicaulis.*

Collected with rootlets.

Rhizomes short, upright or mostly oblique, often knotty.

Aromatic, more or less pungent.

Upright, subglobular, or obconical; internally brownish, waxy, with small wood-wedges.

Valeriana.

Cylindrical, oblique, or horizontal; wood circle narrow; in bark of rhizome and rootlets, near the wood, a circle of resin-cells.

Arnica.

Thin cylindrical, oblique, with projecting stem-scars on upper side and numerous rootlets beneath; wood somewhat excentric.

Serpentaria.

Thin cylindrical, with deeply cup-shaped stem-scars on upper side and numerous rootlets beneath; wood excentric.

Spigelia.

Slightly aromatic, bitter, and astringent.

Subcylindrical, oblique, with fragile rootlets; wood soft; pith brown-gray.

Geum rivale.

Subcylindrical or obconical, with numerous fragile rootlets; wood rather hard; pith reddish; odor clove-like.

Geum urbanum.

Not aromatic; bitter or somewhat acrid; wood (except in *Hydrastis*) prominent, hard.

Subglobular; wood white; rootlets numerous, brittle; pale brown.

*Asclepias
incarnata.*

Obconical or oblique and short jointed; yellowish-gray; internally bright yellow.

Hydrastis.

- Irregular, tuberculate, blackish-brown, waxy; wood-bundles rather distant; wood of rootlets somewhat hexagonal. *Helleborus niger*.
- Like preceding, somewhat smaller; wood-bundles approximate in about four distant groups; wood of rootlets with four short rays. *Helleborus viridis*.
- Stout, branches ascending, black-brown, hard; wood-wedges approximate; wood of rootlets with four long rays. *Cimicifuga*.
- Like preceding, but considerably smaller. *Actæa alba*.
- Stout, knotty-cylindrical, gray-brown, hard; scars concave; medullary rays fine. *Triosteum*.
- Knotty, red-brown; rootlets more or less annulate; resinous dotted in the bark. *Gillenia*.
- Elongated, mostly not knotty.
- Aromatic; knotty from prominent stem-scars; roots long. *Aralia racemosa*.
- Aromatic, pungent; quadrangular or two-edged, thin, gray-brown; bark thick; wood-wedges small; pith large. *Asarum*.
- Bitter, slightly acrid; flattened, branched, black-brown; bark thin; wood thick, tough; pith brownish. *Leptandra*.
- Bitter; cylindrical, pale yellowish-brown; internally bright yellow; wood tough; pith small. *Xanthorrhiza*.
- Bitter; often knotty; yellowish-brown; tough. *Berberis aquifolium*.
- Aromatic, bitter; cylindrical, light brown; internally white; bark thin; wood hard; pith small. *Gelsemium*.
- Sweet; cylindrical, brownish; internally tawny-yellow; bark rather thick; wood large-porous. *Glycyrrhiza* (see Roots).

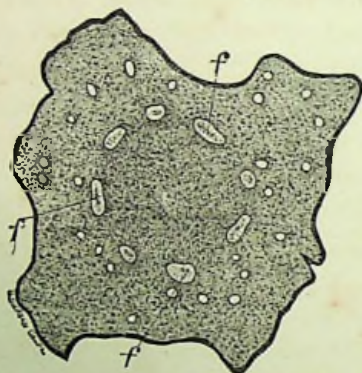
FILIX MAS.—MALE FERN.

Origin.—1. *Aspidium filix mas*, Swartz, and 2. *Aspidium marginale*, Willdenow. *Natural order*, Filices.

Habitat.—1. Canada, Rocky Mountains, Northern Asia, and Europe. 2. United States.

Description.—From 7 to 15 centimeters (3 to 6 inches) long, 15 to 25 millimeters ($\frac{3}{8}$ to 1 inch) thick,

Fig. 45.



Filix mas.—Transverse section, magnified 3 diam. *f*. Fibro-vascular bundles.

and, together with the closely imbricated stipe remnants, 50 or 65 millimeters (2–2½ inches) in diameter, and densely covered with brown, glossy, transparent, and soft chaffy scales; externally of a dark brown color; internally pale green, rather spongy; the vascular bundles about 10 (*A. filix mas*) or 6 in number (*A. marginale*), arranged in an interrupted circle; odor slight, disagreeable; taste sweetish, bitter, somewhat astringent, nauseous.

When used, the chaff, together with the dead portions of the rhizome and stipes, must be removed, and only such portions as have retained their green color must be employed.

Constituents.—Fixed oil 6–7 per cent., filitanic acid, filixred, chlorophyll, and filicic acid, $C_{14}H_{18}O_5$; the latter crystalline, soluble in fixed and volatile oils, less soluble in ether and alcohol, insoluble in water; yields, with fusing potassa, butyric acid and phloroglucin. The constituents named are contained in *Oleoresina filicis*.

Properties.—Tæniifuge. *Dose*, 2 to 8 grams (3ss–ij), or the oleoresin, 0.3 to 1.0 gram (gr. v–xv).

Allied drug. — *Aspidium athamanticum*, Kunze, pauna-pauna, uncomocomo, from Southern Africa; thicker and firmer; internally brownish, with black resin-dots and broader wood-bundles.

Substitutions.—The rhizomes of other indigenous ferns are mostly thinner, the stipes rarely closely imbricate, and usually free from, or with very little, chaff.

ZINGIBER.—GINGER.

Origin.—*Zingiber officinale*, Roscoe. *Natural order*, Zingiberaceæ.

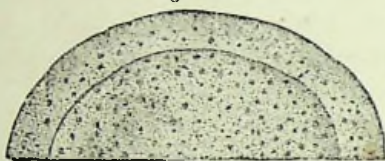
Habitat.—India; cultivated in the tropics.

Description.—Flatish, about 15 millimeters ($\frac{3}{8}$ inch) broad, on one side lobed or clavately branched, deprived of the epidermal layer, pale buff-colored, striate, breaking with a mealy rather fibrous fracture, showing numerous small scattered resin-cells and fibro-vascular bundles, the latter mainly within the nucleus

sheath; agreeable aromatic, of a pungent and warm taste.

Varieties.—Coated and uncoated ginger: the latter deprived of the epidermal layer; the former sometimes distinguished as *black* ginger—a designation more properly restricted to the rhizome, which, before dry-

Fig. 46.



Zingiber.—Transverse section, magnified
3 diam.

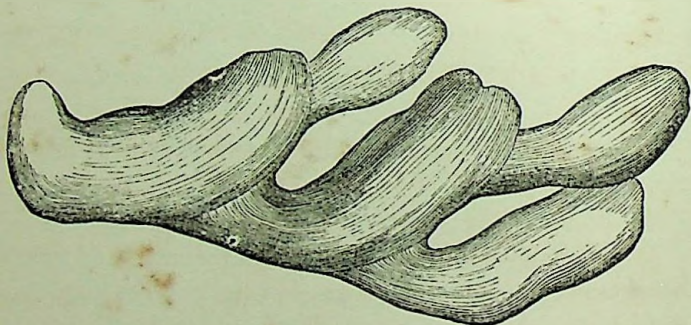
Fig. 47.



Ginger starch-granules.
—Magnified 250 diam.

ing, has been steeped in boiling water, and, when dry, breaks with a horny, blackish, somewhat diaphanous fracture. The commercial varieties are designated from the country of production.

Fig. 48.



Jamaica ginger.

1. *Jamaica ginger.*—The kind described above; sometimes the rhizome has been steeped in milk of

lime, and is covered with a white powder of calcium carbonate.

2. *African ginger*.—Coated with a light brown or gray-brown tissue, rhizome shorter, the lobes broadly linear or oblong.

3. *Chinese ginger*.—Coated, rhizome shorter, the lobes stumpy.

4. *East India ginger*.—Coated on the edges, the flat sides deprived of the epidermal layer.

5. *Green ginger*.—The lobed branches recently dug and sent to market without drying.

6. *Preserved ginger*.—Fresh ginger steeped in hot syrup; it is soft, brown-yellow, translucent.

Constituents.—Volatile oil, resin (to which the hot taste is due), starch, mucilage, etc.

Properties.—Carminative, stimulant, sternutatory, rubefacient, anodyne. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in powder or tincture.

Fig. 49.



East India ginger.

ZEDOARIA.—ZEDOARY.

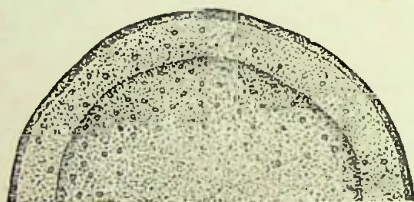
Origin.—*Curcuma zedoaria*, *Roscoe*. *Natural order*, Zingiberaceæ.

Habitat.—India.

Description.—Circular disks of a tuber, 1 to 4 centimeters ($\frac{2}{3}$ to $1\frac{1}{3}$ inch) in diameter, orange-brown; internally pale reddish-gray-brown, with numerous

brown-yellow resin-cells, and lighter colored wood-bundles, the latter most numerous within the nucleus sheath, which separates the central portion from a much thinner outer layer; fracture short, somewhat mealy, and slightly horny; odor and taste ginger-like.

Fig. 50.



Zedaira.—Transverse section, magnified 3 diam.

Constituents.—Volatile oil, resin (to which the pungent taste is due), starch, mucilage, etc.

Properties and Dose.—Like ginger.

GALANGA.—GALANGAL.

Origin.—*Alpinia officinarum*, Hance. *Natural order*, Zingiberaceæ.

Habitat.—China.

Fig. 51.

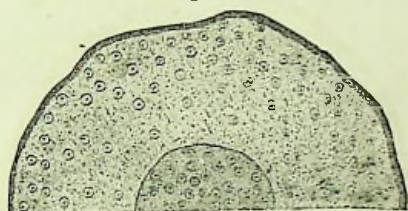


Galanga.

Description.—Cylindrical, branched, about 5 centimeters (2 inches) long and 15 millimeters ($\frac{3}{8}$ inch)

thick, annulate by distant leaf-sheaths, rust-brown; fracture short, somewhat fibrous; internally brownish-white, with numerous brown-yellow resin-cells and brownish wood-bundles, which are scattered in the outer layer and approximate in the equally thick central portion; odor and taste ginger-like.

Fig. 52.



Galanga.—Transverse section, magnified 3 diam.

The *larger galangal* from *Alpinia galanga*, Swartz (India), which is of larger dimensions and of a more red color, is now not an article of commerce.

Constituents.—Volatile oil, resin (to which the pungent taste is due), starch, mucilage, etc.

Properties and Dose.—Like ginger.

CURCUMA.—TURMERIC.

Origin.—*Curcuma longa*, Lin. *Natural order*, Zingiberaceæ.

Habitat.—Southern Asia; cultivated.

Description.—Oval or oblong, nearly 5 centimeters (2 inches) long and about one-half as thick (round turmeric); or cylindrical branches about 1 centimeter ($\frac{2}{3}$ inch) thick (long turmeric); sometimes cut longitudinally or transversely; externally yellowish-gray,

somewhat annulate; internally orange-yellow or brown-yellow, with a dark circular line (nucleus sheath); fracture flattish, glossy; odor slight ginger-like; taste warm, aromatic, and bitterish; powder deep yellow, turning brown-red by alkalies.

Fig. 53.



Round turmeric.

Fig. 54.



Long turmeric.

Fig. 55.



Curcuma.—Transverse section, magnified 3 diam.

Varieties. 1. *Chinese turmeric*.—Central rhizomes and branches.

2. *Bengal turmeric*.—Slender branches, reddish.

3. *Madras turmeric*.—Thick branches and transverse sections of central rhizomes.

4. *Java turmeric*.—Rather small central rhizomes and branches, usually cut transversely and longitudinally.

5. *Cochinchina turmeric*.—Sections of large diameter, rough externally.

Constituents.—Volatile oil, a little pungent resin, curcumin, starch, mucilage, etc.

Curcumin, $C_{10}H_{10}O_3$, is orange-yellow, resinous, in-

soluble in water, soluble in alcohol and ether; also with a red-brown color in alkalies; red-brown by boracic acid.

Properties.—Stimulant, tonic; used for coloring ointments and tinctures, and for the detection of alkalies and borates.

CALAMUS.—CALAMUS.

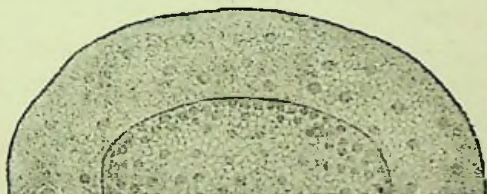
Sweet flag.

Origin.—*Acorus calamus*, *Lin.* *Natural order*, Araceæ.

Habitat.—Europe and North America, on the banks of streams and ponds.

Description.—In sections of various length, sub-cylindrical, about 2 centimeters ($\frac{1}{2}$ inch) broad; peeled, on the lower surface marked with the circular scars of the rootlets in wavy lines, longitudinally wrinkled,

Fig. 56.



Calamus.—Transverse section, magnified 3 diam.

pinkish-white externally, whitish internally, of a spongy texture, breaking with a short corky fracture, showing numerous oil-cells, air-tubes, and scattered wood-bundles, the latter crowded within the subcir-

cular nucleus sheath. It has an aromatic odor and a strongly bitter taste.

Constituents.—Volatile oil $\frac{1}{4}$ –1 per cent., bitter principle (acorin), resin, starch, mucilage. Acorin is brown-yellow, soft, soluble in water, alcohol, and ether, precipitated by tannin, and is probably a glucoside.

Properties.—Stimulant, carminative, tonic. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in powder, infusion, and tincture.

IRIS FLORENTINA.—FLORENTINE ORRIS.

Origin.—*Iris florentina*, *Lin.*, *I. pallida*, *Lin.*, and *I. germanica*, *Lin.*, chiefly the last two species. *Natural order*, Iridaceæ.

Habitat.—Northern Italy; cultivated.

Description.—Horizontal, flattened, consisting of joints, 5 to 10 centimeters (2 to 4 inches) long,

Fig. 57.



Iris florentina.—Transverse section.

broadest near the upper extremity, and terminated by a circular scar; peeled, of a whitish color; on the upper side with small fibro-vascular bundles in transverse lines; on the lower side with numerous circular brownish scars; fracture short, somewhat mealy;

nucleus sheath prominent in lower half; wood-bundles scattered, crowded within the nucleus sheath; odor violet-like; taste mealy, bitterish, and slightly acrid.

Long, rather slender joints are selected for the use of teething infants, trimmed smoothly and frequently whitened by chalk or magnesia.

Constituents.—Volatile oil, resin, fat, starch, mucilage, bitter extractive. *Oil of orris*, distilled by means of superheated steam, is solid at ordinary temperatures, has an agreeable violet odor, and consists chiefly of myristic acid mixed with a little volatile oil.

Properties.—Errhine, diuretic, in fresh state irritant; used chiefly in dentifrices and perfumery.

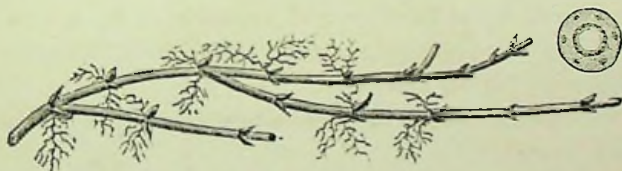
TRITICUM REPENS.—COUCHGRASS.

Radix graminis.—Quitchgrass, Quickens.

Origin.—*Triticum repens*, *Lin.* *Natural order*, Graminaceæ.

Habitat.—Europe and North America.

Fig. 58.



Triticum repens.—Rhizome and transverse section, magnified 3 diam.

Description.—Very long and creeping, cut in sections, about 1 centimeter ($\frac{2}{5}$ inch) long, about 2 millimeters ($\frac{1}{12}$ inch) thick, smooth, straw-yellow, hollow

in the centre; woody zone narrow, yellowish; in the cortical zone about six small wood-bundles; inodorous, sweet.

It should be gathered in the spring and deprived of the rootlets.

Constituents.—Glucose, fruit-sugar, a third sugar, and triticin, which resembles inulin.

Properties.—Diuretic, aperient. *Dose*, 2.0 to 8.0 grams (℥ss-ij), in decoction and as extract.

CAREX ARENARIA.—RED SEDGE.

Radix sarsaparillæ germanicæ, *Radix graminis rubræ*.

Origin. — *Carex arenaria*, *Lin.* *Natural order*, Cyperaceæ.

Habitat.—Central and Northern Europe, near the coast.

Description.—Horizontal, long, internodes 1 to 3 centimeters ($\frac{2}{3}$ to $1\frac{1}{2}$ inch) long, angularly furrowed, brown-gray, the nodes fringed with leaf-sheaths and marked with scars and remnants of rootlets; internally with a large centre containing numerous approximate wood-bundles, and surrounded by a circle of large air-passages; nearly inodorous, sweetish, somewhat bitter, and acrid.

Constituents.—Acrid and bitter principle, sugar, resin, starch.

Properties.—Alterative; used similar to sarsaparilla.

Substitutions.—The rhizomes of many other species of *Carex* are destitute of the large air-passages, and in many the wood-bundles in the central portion are surrounded by broad layers of parenchyma.

SMILAX CHINA.—CHINA ROOT.

Origin. — Smilax China, *Lin.* *Natural order,* Smilacææ.

Habitat.—China, Japan.

Description.—Irregularly tuberous, about 10 or 15 centimeters (4 or 6 inches) long and 3 to 5 centimeters (1½ to 2 inches) thick, tuberculate by short branches, reddish-brown; internally whitish, mealy, with numerous small brown resin-cells, and near the centre with many scattered wood-bundles; inodorous, insipid, afterwards bitterish, and slightly acrid.

Substitutions.—Smilax pseudochina, *Lin.*, Central and Southern North America. Smaller, less tuberculate, rather spongy, and with few resin-cells.

The tubers of Smilax glauca, *Walt.*, are yellowish or pale brownish, spongy, and destitute of resin-cells.

Constituents.—Smilacin, resin, starch, a little tannin.

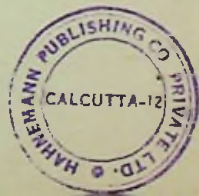
Properties.—Alterative; used similar to sarsaparilla.

VERATRUM ALBUM.—WHITE VERATRUM.

Origin.—Veratrum album, *Lin.* *Natural order,* Melanthacææ.

Habitat.—Europe, in mountainous regions.

Description. — Obconical, mostly simple, 5 centimeters (2 inches) or more long, about 2 centimeters (¾ inch) thick, blackish-gray externally, and with numerous scars from the detached rootlets; internally whitish, with a brownish wavy nucleus sheath, surrounding the thick inner layer with numerous small



irregularly curved and scattered wood-bundles—a few wood-bundles also outside of the nucleus sheath; inodorous, bitter, very acrid, sternutatory.

Fig. 59.



Veratrum.—Longitudinal section.

Fig. 60.



Veratrum.—Transverso section.

Constituents.—Jervia, $C_{30}H_{46}N_2O_3$ or $C_{26}H_{37}NO_3$ (not sternutatory, insoluble in water and ether; colored yellow and green by H_2SO_4 ; the nitrate, sulphate, and hydrochlorate sparingly soluble in water); pseudojervia, $C_{20}H_{31}NO_7$ (sulphate soluble in water), rubijervia, $C_{26}H_{43}NO_2$ (insoluble in ether; red by H_2SO_4), veratralbia, $C_{28}H_{43}NO_5$ (uncrystallizable, sternutatory, soluble in ether, etc., perhaps identical with veratroidia), veratria(?), jervic acid, resin.

Properties.—Emetic, cathartic, errhine, poisonous. *Dose*, 0.06 to 0.12 gram (gr. j-ij), in powder, mostly externally as ointment in itch, and mixed with an inert powder as snuff.

VERATRUM VIRIDE.—AMERICAN VERATRUM.

Origin.—*Veratrum viride*, *Aiton*. *Natural order*, Melanthaceæ.

Habitat.—North America, in rich woods.

Description.—Closely resembles white veratrum, but is invested on all sides with numerous, shrivelled, light yellowish-brown rootlets, about 10 centimeters (4 inches) long, and about 2 millimeters ($\frac{1}{12}$ inch) thick.

The plant is probably identical with *Verat. album*, var. *Lobelianum*, *Bernh.*, of Europe.

Constituents.—*Jervia*, veratroidia, $C_{24}H_{27}NO_7$ (ster-nutatory, soluble in ether), rubijervia, pseudojervia, veratria(?), resin.

Properties.—Emetic, diaphoretic, sedative, errhine.

Dose, 0.06 to 0.12 gram (gr. j-ij), in powder, or preferably in tincture and fluid extract.

DRACONTIUM.—SKUNK CABBAGE.

Origin.—*Dracontium foetidum*, *Lin.*, s. *Symplocarpus foetidus*, *Salisbury*. *Natural order*, Araceæ.

Habitat.—North America, in moist grounds.

Description.—Obconical, truncate above and below, 7 to 10 centimeters (3 to 4 inches) long, and about 5 centimeters (2 inches) in diameter, the upper half beset with numerous long shrivelled rootlets; gray-brown externally; internally whitish, with numerous short bent wood-bundles, which are crowded within the somewhat wavy nucleus sheath. When triturated, it emits a disagreeable odor; taste acrid, biting.

Constituents.—Fat, resin, sugar, gum, starch; the acrid principle, which appears to be altered by heat, has not been isolated.

Fig. 61.



Dracontium.—Section through upper part, natural size.

Properties.—Emetic, diuretic, antispasmodic, stimulant. *Dose*, 0.3 to 1.0 gram (gr. v-xv), in recent powder or infusion.

IRIS VERSICOLOR.—BLUE FLAG.

Origin.—*Iris versicolor*, *Lin.* *Natural order*, Iridaceæ.

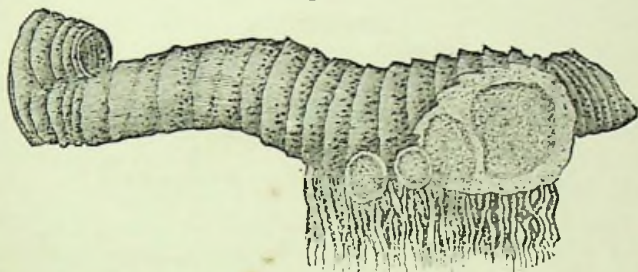
Habitat.—North America, in swampy localities.

Description.—Rhizome horizontal, consisting of joints, 5 to 10 centimeters (2 to 4 inches) long, cylindrical in the lower half, flattish, and about 2 centimeters ($\frac{1}{3}$ inch) broad near the upper extremity, and terminated by a circular scar, annulated from the leaf-sheaths, gray-brown; rootlets long, simple, crowded near the broad end; odor slight; taste acrid, nauseous.

Allied drugs.—*Iris virginica*, *Lin.*, Boston iris, and *I. verna*, *Lin.*, dwarf iris of the United States. The joints of the rhizome are about 25 millimeters (1 inch)

long, and about 1 centimeter ($\frac{3}{8}$ inch) broad, brownish-gray; otherwise resembling the above.

Fig. 62.



Iris versicolor.—Joint of rhizome and section of branches.

Constituents.—Acrid resin, fat, sugar, gum, tannin, possibly an alkaloid.

Properties.—Alterative, diuretic, purgative, emetic.

Dose, 0.3 to 1.0 gram (gr. v–xv), in powder, or the oleoresin, 0.06 to 0.12 gram (gr. j–ij).

CYPRIPEDIUM.—CYPRIPEDIUM.

American Valerian.

Origin.—*Cypripedium pubescens*, Willdenow, and *Cypr. parviflorum*, Salisbury. *Natural order*, Orchidaceæ.

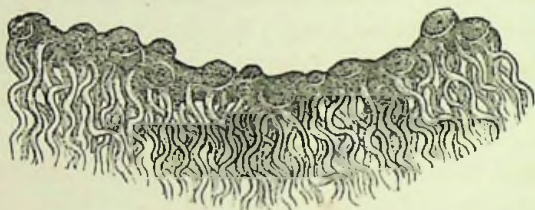
Habitat.—North America, in swampy places.

Description.—Horizontal, bent, 10 centimeters (4 inches) or less long, about 3 millimeters ($\frac{1}{8}$ inch) thick; on the upper side with numerous circular cup-shaped scars; closely covered below with simple

wiry rootlets, varying from 10 to 50 centimeters (4 to 20 inches) in length; brittle; dark brown or light orange-brown; fracture short, white; odor faint, but heavy; taste sweetish, bitter, and somewhat pungent.

Fig. 63.

Portion of rhizome and rootlets, natural size.



Cypripedium pubescens.



Cypripedium parviflorum.

Cypripedium parviflorum yields the shorter rhizome with orange-brown rootlets.

Constituents.—Volatile oil (trace), volatile acid, resins, tannin, starch.

Properties.—Diaphoretic, stimulant, antispasmodic.
Dose, 0.5 to 1.0 gram (gr. viij–xv), in powder, infusion, or extract.

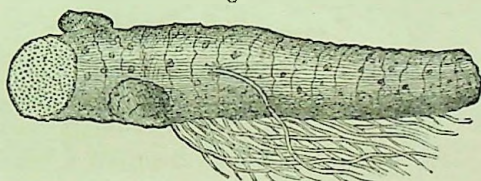
SANGUINARIA.—BLOODROOT.

Origin.—*Sanguinaria Canadensis*, *Lin.* *Natural order*, *Papaveraceæ*.

Habitat.—North America, in rich woods.

Description.—Horizontal, cylindrical, about 5 centimeters (2 inches) long, 1 centimeter ($\frac{2}{5}$ inch) thick, somewhat branched, faintly annulate, wrinkled, reddish-brown; fracture short, somewhat waxy, whitish, with numerous small red resin-cells, or of a nearly uniform brownish-red color; bark thin; odor slight; taste bitter and acrid.

Fig. 64.



Sanguinaria.—Rhizome with transverse section.

It should be collected in autumn.

Constituents.—*Sanguinarina*, $C_{19}H_{17}NO_4$, citric and malic acids, resins, starch. *Sanguinarina* is colorless, soluble in alcohol and ether, and yields bright red salts having an acrid taste. A second alkaloid is one of a yellow color, giving with sulphuric acid a deep purple color, which is deepened by a little potassium bichromate.

Properties.—Alterative, tonic, stimulant, emetic, sternutatory. *Dose*, 0.2, 0.5, 1.0 to 4.0 grams (gr. iij, viij, xv–3j), in powder or tincture.

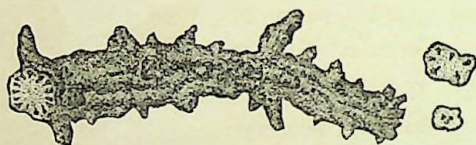
GERANIUM.—GERANIUM. CRANESBILL.

Origin.—*Geranium maculatum*, *Lin.* *Natural order*, Geraniaceæ.

Habitat.—North America, in woods and thickets.

Description.—Horizontal, cylindrical, 5 to 7 centimeters (2 to 3 inches) long, 12 millimeters ($\frac{1}{2}$ inch) or less thick, tuberculated, longitudinally wrinkled, dark brown; fracture short, pale red-brown; bark thin;

Fig. 65.



Geranium maculatum.—Rhizome and transverse section of rhizome and rootlets, natural size.

wood-wedges yellowish, small, forming a circle near the cambium line; medullary rays broad; central pith large; rootlets thin, fragile; inodorous; taste astringent.

Constituents.—Tannin 13–17 per cent., red coloring matter, starch, pectin, sugar.

Properties.—Tonic, astringent. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv).

TORMENTILLA.—TORMENTIL.

Origin.—*Tormentilla erecta*, *Lin.*, s. *Potentilla tormentilla*, *Silthorp.* *Natural order*, Rosaceæ, Roseæ.

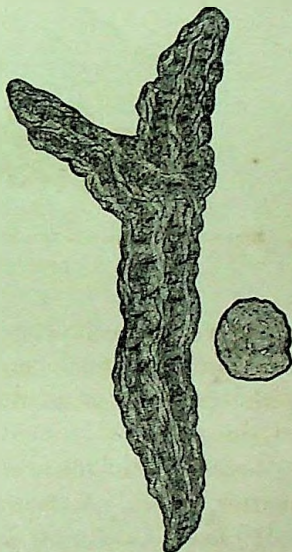
Habitat.—Europe, in open woodlands.

Description.—Conical, oblong, or nearly cylindrical, occasionally branched, about 5 centimeters (2 inches) long, and 15 millimeters ($\frac{3}{8}$ inch) thick, with irregular rounded elevations and ridges, depressed stem-scars, and minute scars of the filiform brittle rootlets; brown or reddish-brown; fracture smooth, slightly fibrous; internally light brownish-red; bark thick; wood-wedges small, distant, in one or in two distant circles, inclosing a pith about equal in thickness to that of the bark; inodorous, astringent.

Constituents.—Tannin (25 per cent.), red coloring matter (tormentil red), kinovic acid, starch, mucilage.

Properties.—Tonic; astringent. *Dose*, 0.6 to 2.0 grams (gr. x-xxx), in powder or decoction.

Fig. 66.



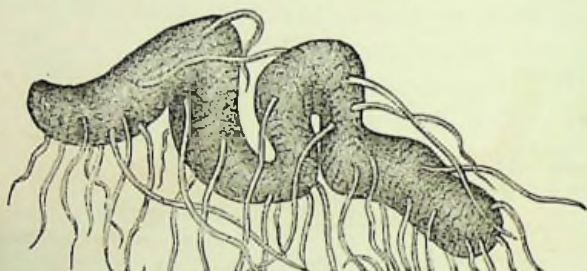
Tormentilla.—Rhizome and transverse section.

BISTORTA.—BISTORT.

Origin.—*Polygonum bistorta*, *Lin.* *Natural order*, Polygonaceæ.

Habitat.—Europe, Northern Asia, Canada, and Northwestern United States, in swampy meadows.

Fig. 67.



Bistorta.—Natural size.

Description.—Depressed, S-shaped, about 5 centimeters (2 inches) long, and 15 millimeters ($\frac{3}{8}$ inch) broad, flattened or channelled and transversely striate on the upper side, convex and with depressed thin root-scars on the lower side, dark red-brown; fracture smooth, scarcely fibrous; internally light brownish-red; bark thick; wood-wedges small, numerous, approximate, inclosing a large pith; inodorous, astringent.

Constituents.—Tannin (20 per cent.), red coloring matter, starch.

Properties.—Tonic, astringent. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder or decoction.

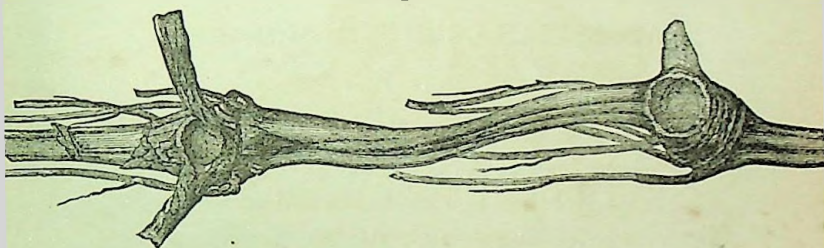
PODOPHYLLUM.—MAYAPPLE.

Origin. — *Podophyllum peltatum*, *Lin.* *Natural order*, Berberidaceæ.

Habitat. — North America, in rich woods and thickets.

Description.—Horizontal, about 5 millimeters ($\frac{1}{5}$ inch) thick, nearly cylindrical, consisting of joints

Fig. 68.



Podophyllum.—Natural size.

about 5 centimeters (2 inches) long, somewhat enlarged at the end, which has a circular scar on the upper side, a tuft of about ten nearly simple fragile rootlets on the lower side, and is sometimes branched laterally; smooth or somewhat wrinkled, orange-brown; internally white and mealy, with a circle of small wood-bundles; pith large; inodorous; taste sweetish, somewhat bitter, and acid.

Constituents.—Resin 4–5 per cent., starch, sugar. The resin is partly neutral, partly acid (podophyllinic acid); both portions are partly soluble in ether; the acid yields yellow compounds with alkalies and earths.

Podwissotzki announced the presence of podophyllotoxin (white, crystallizable, bitter, faintly acid, sparingly soluble in water), pieropodophyllin (crystalline, bitter, insoluble in water), podophyllinic acid (inactive); yellow crystals, perhaps identical with quercetin; green oil, and crystalline fatty acid.

Properties. — Alterative, cholagogue, cathartic.
Dose, 0.3 to 1.0 gram (gr. v-xv), in powder or extract; the resin 0.03 to 0.06 gram (gr. ss-j).

ASCLEPIAS CORNUTI.—MILKWEED.

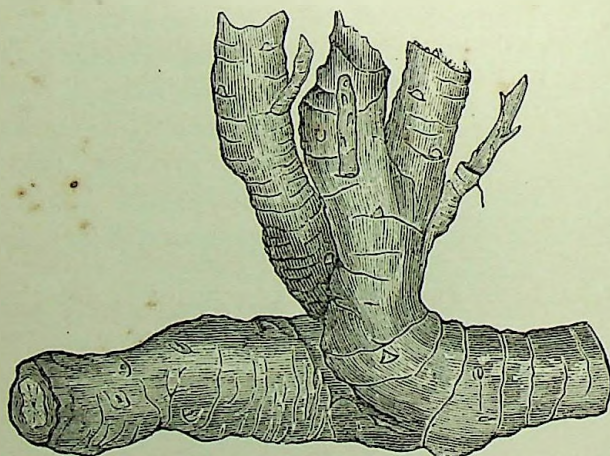
Silkweed.

Origin.—*Asclepias cornuti*, *Decaisne*, s. *A. syriaca*, *Lin.* *Natural order*, *Asclepiadaceæ*.

Habitat.—North America, fields and waste places.

Description.—Horizontal, 0.5 to 2 meters (1½-6

Fig. 69.



Asclepias cornuti.—Portion of rhizome.

ARALIA NUDICAULIS—FALSE SARSAPARILLA. 119

feet) long, cut, 6 to 12 millimeters ($\frac{1}{4}$ – $\frac{1}{2}$ inch) thick, cylindrical, nearly simple, finely wrinkled, somewhat knotty, gray-brown, tough; fracture short or splintery, white; bark rather thick, with laticiferous vessels; wood-wedges yellowish, porous, narrow; nearly inodorous; taste bitterish, nauseous.

Constituents.—Bitter principle, asclepion (tasteless), caoutchouc, resin, tannin, starch, sugar, fat.

Properties.—Diuretic, diaphoretic, alterative, emetic. *Dose*, 0.5 to 3.0 grams (gr. viij–xlv), in powder, infusion, or extract.

ARALIA NUDICAULIS.—FALSE SARSAPARILLA.

Origin.—*Aralia nudicaulis*, *Lin.* *Natural order*, Araliaceæ.

Habitat.—North America, in rocky woodlands.

Description.—Horizontal, 30 centimeters (12 inches) or more long, about 6 millimeters ($\frac{1}{4}$ inch) thick, wrinkled, annulate above, stem-scars cup-shaped; rootlets few; bark light gray-brown, exfoliating; internally white, with a yellowish wood and spongy pith; fracture short; odor slightly aromatic; taste mawkish.

Constituents.—Probably a little volatile oil, resin, starch, sugar, etc.

Properties.—Stimulant, diaphoretic, alterative. *Dose*, 2.0 to 4.0 grams (5ss–j), in infusion or decoction.

VALERIANA.—VALERIAN.

Origin.—*Valeriana officinalis*, *Lin.* *Natural order*, Valerianaceæ.

Habitat.—Europe and Northern Asia, naturalized in New England, in moist and dry localities; cultivated.

Description.—Rhizome upright, subglobular or obconical, from 2 to 4 centimeters ($\frac{1}{3}$ to $1\frac{1}{2}$ inch) long, truncate at both ends, yellowish-brown or brown; internally whitish or pale brownish, with a narrow

Fig. 70.



Valeriana.—Longitudinal and transverse section.

circle of white wood under the thin bark. Rootlets numerous, slender, brittle, brown, with a thick bark and slender ligneous cord. Odor peculiar, becoming stronger and unpleasant on keeping; taste camphoraceous and bitter.

Collected from dry localities, the rhizome is small, and has few light brown rootlets; from moist localities, it is larger, has numerous, larger, and darker rootlets, and contains less volatile oil.

Constituents.—Volatile oil $\frac{1}{2}$ –2 per cent.; valerianic, formic, and acetic acids, tannin, resin, starch, mucilage. The volatile oil has the density 0.94, and consists of the alcohol borneol, $C_{10}H_{18}O$, its ether, $(C_{10}H_{17})_2O$, and its compound ethers of formic, acetic, and valerianic acids; these acids are liberated by the gradual decomposition of the compound ethers.

Properties. — Stimulant, anodyne, antispasmodic, nervine. *Dose*, 1.0 to 6.0 grams (gr. xv– $\overline{3}$ jss), in infusion, tincture, or fluid extract. The volatile oil, 0.06 to 0.20 gram (gr. j–iij).

ARNICÆ RADIX.—ARNICA ROOT.

Origin. — Arnica montana, *Lin.* *Natural order*, Compositæ.

Habitat.—Europe, Northern Asia, Northwestern America, in mountainous localities.

Fig. 71.



Arnica.—Transverse section of rhizome, natural size, and magnified 10 diam.

Description.—Horizontal or oblique, about 5 centimeters (2 inches) long and 3 millimeters ($\frac{1}{8}$ inch) thick, brown, rough from remnants of leaves and stem-bases; internally whitish, with a large spongy pith and a circle of broad and short wood-wedges,

surrounded in the bark by a circle of resin-cells. Radicles lighter brown, fragile, with a thick bark containing a circle of resin-cells. Odor slightly aromatic; taste aromatic, pungent, bitter.

Constituents.—Volatile oil $\frac{1}{2}$ per cent., acrid and tasteless resins, arnicin, capronic and caprylic acids, inulin 10 per cent., tannin, mucilage.

Properties.—Irritant, stimulant, diuretic, vulnerary. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in powder or infusion.

SERPENTARIA.—SERPENTARIA.

Origin.—1. *Aristolochia serpentaria*, *Lin.*, and 2. *Aristolochia reticulata*, *Nuttall*. *Natural order*, Aristolochiaceæ.

Habitat.—United States, in hilly woods. No. 1, east of the Mississippi; No. 2, in the Southwestern States.

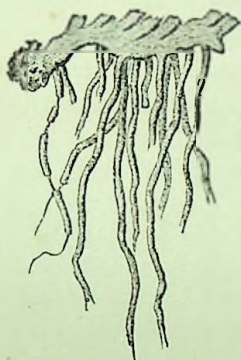
Description. — Rhizome about 25 millimeters (1 inch) long, thin, bent, on the upper side with approximate short stem-remnants, on the lower side with numerous thin branching rootlets about 10 centimeters (4 inches) long; dull yellowish-brown; internally whitish, the wood-rays of the rhizome longest on the lower side; odor aromatic, camphoraceous; taste warm, bitterish, and camphoraceous.

The rootlets of *Ar. reticulata* (Red River or Texas snakeroot) are coarser, longer, and less interlaced than those of *Ar. serpentaria* (Virginia snakeroot).

Constituents.—Volatile oil $\frac{1}{2}$ per cent., bitter principle, soluble in alcohol and water; little tannin, starch, sugar, albumen.

Properties.—Stimulant, diaphoretic, tonic. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in powder, infusion, tincture, or fluid extract.

Fig. 72.
Serpentaria.



Rhizome with rootlets.



Transverse section of rhizome.

Admixtures.—The subterraneous parts of *Panax*, *Cypripedium*, *Hydrastis*, and others are readily distinguished; *Spigelia* has no projecting stem-remnants, and in the wood no medullary rays.

SPIGELIA.—SPIGELIA. PINKROOT.

Origin.—*Spigelia Marilandica*, *Lin.* *Natural order*, Loganiaceæ.

Habitat.—United States, in rich woods.

Description.—Rhizome horizontal, 5 centimeters (2 inches) or more long, about 3 millimeters ($\frac{1}{8}$ inch) thick, bent, purplish-brown, somewhat branched, on the upper side with cup-shaped scars, on the lower

side with numerous thin, brittle, lighter colored rootlets about 10 centimeters (4 inches) long; fracture smooth; wood-circle whitish, thickest on lower side, scarcely radiate; pith usually dark colored; somewhat aromatic, sweetish, and bitter.

It should not be confounded with the underground portion of *Phlox carolina*, *Lin.* (like *Spigelia* known as Carolina pink), the rootlets of which are brownish-yellow, rather coarse, straight, and contain a straw-colored wood underneath a readily removable bark.

Constituents.—Little volatile oil, tasteless resin, bitter principle, tannin, wax, etc.

Properties.—Anthelmintic, toxic, dilates the pupil.
Dose, 1.0 to 4.0 grams (gr. xv–5j).

GEUM RIVALE.—WATER AVENS.

Origin.—*Geum rivale*, *Lin.* *Natural order*, Rosaceæ, Dryadeæ.

Habitat.—North America (south to Pennsylvania), Northern Asia, Northern and Central Europe.

Description.—Horizontal or oblique, about 5 to 7 centimeters (2 to 3 inches) long and 6 millimeters ($\frac{1}{4}$ inch) thick, tuberculate and scaly above, wrinkled; fracture short, waxy, reddish or brownish, with a thin bark, small and distant whitish wood-wedges, and a large pith. Radicles wrinkled, with a thick bark. Odor faintly aromatic; taste astringent, bitterish.

Constituents.—Little volatile oil, tannin, bitter principle, etc.

Properties.—Astringent, tonic. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in powder or decoction.

GEUM URBANUM.—AVENS.

Radix caryophyllatæ.

Origin. — *Geum urbanum*, *Lin.* *Natural order*, Rosaceæ, Dryadeæ.

Habitat.—Europe, in shady places.

Description.—Upright or oblique, 3 to 5 centimeters (1 to 2 inches) long, obconical, thinner and abrupt below, tuberculate and scaly, dark brown, hard; upon transverse section, waxy, purplish-brown; bark thin; wood-circle yellowish, narrow; pith large. Radicles light brown, with a thickish bark. Odor aromatic, clove-like; taste astringent, somewhat aromatic, and bitter.

Constituents.—Little volatile oil, tannin 30 per cent., bitter principle, resin, etc.

Properties.—Astringent, tonic. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in powder or decoction.

ASCLEPIAS INCARNATA.—SWAMP MILKWEED.

Flesh-colored *Asclepias*.

Origin.—*Asclepias incarnata*, *Lin.* *Natural order*, Asclepiadaceæ.

Habitat.—North America, wet grounds.

Description.—Upright or oblique, about 3 centimeters ($\frac{1}{2}$ inch) long, irregularly globular or oblong, knotty, yellowish-brown, hard, with a thin bark and tough whitish wood. Rootlets 10 centimeters ($\frac{1}{2}$ inches) or more long, light brown, with a thick white bark. Inodorous; taste sweetish, acrid, and bitter.

Constituents.—Volatile oil a trace, two acrid resins, alkaloid, pectin, starch, sugar, etc.; ash 8.25 per cent.

Properties.—Alterative, emetic, cathartic. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in decoction.

HYDRASTIS.—HYDRASTIS. GOLDEN SEAL.

Origin.—*Hydrastis canadensis*, *Lin.* *Natural order*, Ranunculaceæ.

Habitat.—North America, east of the Mississippi, in woodlands.

Description.—Obconical, upright, or oblique, about 4 centimeters ($1\frac{1}{2}$ inch) long and 6 millimeters ($\frac{1}{4}$ inch) thick, with short branches, somewhat annulate, and longitudinally wrinkled; externally yellowish-gray; fracture short, waxy, bright reddish-yellow,

Fig. 73.



Hydrastis.—Rhizome with transverse section.

with a thickish bark, about 10 narrow wood-wedges, broad medullary rays, and large pith. Rootlets thin, brittle, with a thick yellow bark and subquadrangular woody centre. Odor slight; taste bitter.

Constituents.—Berberina, $C_{20}H_{17}NO_4$, 3–4 per cent. hydrastia, $C_{22}H_{23}NO_6$, xanthopuccina, starch, sugar,

etc. Berberina dissolves in alcohol, slightly in benzol and cold water, and is insoluble in ether and petroleum benzin; its salts are bright yellow, and sparingly soluble in acidulated water; the hot alcoholic solution yields with iodine not in excess dark green lustrous scales. Xanthopuccina resembles berberina, but yields with iodine brown scales. Hydrastia is soluble in alcohol, ether, chloroform, and benzol, and yields white bitter salts.

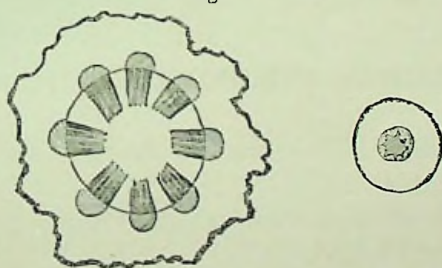
Properties.—Tonic, deobstruent, alterative. *Dose*, 0.3 to 3.0 grams (gr. v-xlv), in decoction or fluid extract.

HELLEBORUS.—BLACK HELLEBORE.

Origin.—*Helleborus niger*, *Lin.* *Natural order*, Ranunculaceæ.

Habitat.—Central and Southern Europe.

Fig. 74.



Helleborus niger.—Transverse section of rhizome and root, magnified 3 diam.

Description.—Upright, irregular, knotty, about 5 centimeters (2 inches) long and 1 centimeter ($\frac{2}{3}$ inch) thick, with curved, somewhat annulate branches;

externally brown-black; internally grayish, with a thick bark, a circle of about 8 wood-wedges, broad medullary rays, and a large pith. Rootlets long, brown-black, very brittle, with a thick bark and a hexagonal wood-centre. Odor slight; taste sweetish, bitterish, and acrid.

Constituents.—Helleborin, $C_{36}H_{42}O_6$, and helleborein, $C_{26}H_{44}O_{15}$, both poisonous; resin, fat, starch, no tannin. Helleborein predominates, is precipitated by tannin, soluble in water, also in alcohol, not in ether; yields with acids sugar and inert helleboretin. Helleborin is scarcely soluble in ether and cold water, and with acids yields sugar and helleboresin.

Properties. — Diuretic, emmenagogue, cathartic. *Dose*, 0.3 to 1.3 grams (gr. v-xx), in powder, tincture, or extract.

Admixtures.—*Actæa alba*, *Lin.* The rhizome with rootlets has the dimensions of black hellebore, but closely resembles black snakeroot in structure, and contains tannin.

HELLEBORUS VIRIDIS.—GREEN HELLEBORE.

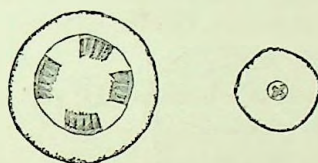
Origin.—*Helleborus viridis*, *Lin.* *Natural order*, Ranunculacææ.

Habitat.—Southern and Central Europe; naturalized on Long Island.

Description.—Like the preceding, but of smaller dimensions; the narrow wood-wedges of the rhizome forming three or four groups, separated by broad medullary rays; the woody cord with 4 (3-5) obtuse rays.

Constituents.—Like black hellebore, but helleborin in larger proportion.

Fig. 75.



Helleborus viridis.—Transverse section of rhizome and root, magnified 3 diam.

Properties and Dose.—Like the preceding; considered more active.

CIMICIFUGA.—BLACK SNAKEROOT.

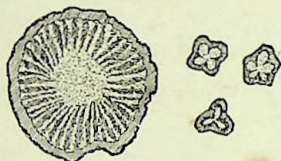
Origin.—*Cimicifuga racemosa*, *Elliott*. *Natural order*, Ranunculaceæ.

Habitat.—North America, in rich woodlands.

Description.—Horizontal, 5 to 15 centimeters (2–6 inches) long, about 2 centimeters ($\frac{1}{3}$ inch) thick, hard, with numerous stout, upright or curved branches, terminated by a cup-shaped scar, and with numerous wiry, brittle, obtusely quadrangular rootlets, about 2 millimeters ($\frac{1}{12}$ inch) thick; brownish-black, nearly inodorous, and of a bitter and acrid taste. Rhizome and branches have a smoothish fracture, with a large pith, surrounded by numerous sub-linear whitish wood rays, and a thin, firm bark. The rootlets break with a short fracture, and contain a thick bark and a ligneous cord branching into about four broad rays.

Constituents.—Crystalline principle, not precipitated by lead acetate, soluble in chloroform and alcohol, the solution intensely acrid; resin, tannin, starch, gum.

Fig. 76.



Cimicifuga.—Transverse section through a branch of the rhizome and through rootlets, natural size.

Properties.—Alterative, emmenagogue, sedative. *Dose*, 0.3 to 2.0 grams (gr. v-xxx) in powder, decoction, or fluid extract.

TRIOSTEUM.—FEVERROOT, BASTARD IPECAC.

Origin.—*Triosteum perfoliatum*, *Lin.* *Natural order*, Caprifoliaceæ.

Habitat.—United States, in woodlands.

Description.—Horizontal, 15 centimeters (6 inches) or more long, about 15 millimeters ($\frac{3}{8}$ inch) thick, knotty-cylindrical, with broad cup-shaped stem-scars, yellowish-brown, bark thin, wood hard, whitish, with fine medullary rays. Rootlets long, about 5 millimeters ($\frac{1}{5}$ inch) thick, with a thick wrinkled bark. Inodorous; taste bitter, somewhat nauseous.

Constituents.—No analysis.

Properties.—Purgative emetic. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx).

GILLENIA.—GILLENIA. AMERICAN IPECAC.

Origin.—1. *Gillenia stipulacea*, *Nuttall*, and 2, *Gillenia trifoliata*, *Moench*. *Natural order*, Rosaceæ, Spirææ.

Habitat.—United States: No. 1, Western and Southern States; No. 2, east of the Alleghanies.

Fig. 77.



G. stipulacea.

Fig. 78.



G. trifoliata.

Rootlets, natural size.

Description. — Horizontal, very knotty, much branched, 10 to 25 millimeters ($\frac{2}{5}$ –1 inch) thick, with a thin bark, and numerous tortuous or undulated, annulate and somewhat transversely fissured rootlets having a thick irregular bark, which is brittle, com-

posed of two reddish layers and marked with numerous minute resinous dots; wood tough, whitish, with fine medullary rays, and in the rhizome with a thin pith; nearly inodorous, taste bitter.

The rhizome of *Gillenia trifoliata* is smaller and less knotty; the rootlets smoother and less distinctly annulate.

Constituents.—Gillenin, resin, tannin, starch, etc. Gillenin is a whitish powder, bitter, neutral, soluble in water, alcohol, and ether, and colored blood-red by nitric acid.

Properties.—Mild emetic. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx).

ARALIA RACEMOSA.—AMERICAN SPIKENARD.

Origin.—*Aralia racemosa*, *Lin.* *Natural order*, Araliaceæ.

Habitat.—North America, in rich woods.

Description.—Oblique, 10 or 15 centimeters (4 or 6 inches) long, with prominent concave stem-scars about 3 centimeters ($1\frac{1}{2}$ inch) broad, pale brown, internally whitish. Roots numerous, long, about 25 millimeters (1 inch) thick at the base, little branched, wrinkled, pale brown, breaking with a short fracture, internally whitish; of a peculiar aromatic odor and taste.

Constituents.—Probably volatile oil, resin, starch, sugar, etc.

Properties.—Stimulant, diaphoretic, alterative, expectorant. *Dose*, 2.0 to 4.0 grams (3ss-j) in infusion.

ASARUM.—WILD GINGER.

Origin.—Asarum Canadense, *Lin.* *Natural order,* Aristolochiaceæ.

Description.—Horizontal, 10 centimeters ($\frac{4}{5}$ inches) or more long, and 3 millimeters ($\frac{1}{8}$ inch) thick, irregular quadrangular or almost two-edged, finely wrinkled, grayish or purplish-brown, internally whitish, with about 12 small wood-wedges and a large pith; rootlets thin, nearly simple, on the rather distant nodes; aromatic, pungent, and bitterish.

Constituents.—Volatile oil 1.5–3–5 per cent., resin, coloring matter (asarin), starch, mucilage, sugar, possibly an alkaloid. The volatile oil is of spec. grav. 0.94–0.95, very aromatic, and consists of asarene $C_{10}H_{16}$, a neutral body $C_{12}H_{18}O_2$, asarol $C_{10}H_{13}O$, and the acetic and probably also the valerianic ether of asarol.

Properties.—Carminative, stimulant, diaphoretic. *Dose,* 2.0 grams (3ss) in infusion.

Allied Drug.—Asarum europæum, *Lin.* Asarabacca. The rhizome is 1 or 2 millimeters ($\frac{1}{25}$ — $\frac{1}{12}$ inch) thick, nearly quadrangular, and is emetic, cathartic, and employed as an emetic.

LEPTANDRA.—LEPTANDRA. CULVER'S PHYSIC.

Origin.—Leptandra Virginica, *Nuttall.* *Natural order,* Scrophulariaceæ.

Habitat.—North America, in low grounds.

Description.—Horizontal, 10 to 15 centimeters ($\frac{4}{5}$ to 6 inches) long, about 10 millimeters ($\frac{3}{8}$ inch) thick,

somewhat flattened, bent, and branched, deep blackish-brown, on upper side with cup-shaped scars, hard, of a woody fracture, with a thin blackish bark, a hard, yellowish wood, and a large purplish-brown, about six-rayed pith; rootlets thin, wrinkled, very fragile; inodorous; taste bitter and feebly acid.

Fig. 79.



Leptandra.—Transverse sections of rhizomes and rootlets, natural size.

Constituents.—Leptandrin, resin 6 per cent., saponin, tannin, mannit, gum, and possibly a volatile alkaloid. Leptandrin is crystalline, bitter, soluble in water, alcohol and ether, not precipitated by lead subacetate. Leptandrin of the eclectics is essentially the alcoholic extract.

Properties.—Alterative, cholagogue, cathartic.
Dosê, 1.0 to 4.0 grams (gr. xv- ʒj) in powder and extract.

XANTHORRHIZA.—YELLOW ROOT.

Origin.—*Xanthorrhiza apiifolia*, *L'Heritier*. *Natural order*, *Ranunculaceæ*.

Habitat.—Southern and Central United States.

Description.—Horizontal, 0.5 to 1 meter (20 to 40 inches) long, 1 centimeter ($\frac{2}{5}$ inch) thick, bent, much branched, sparingly beset with brittle fibres, externally light yellowish-brown; bark thin, internally deep

yellow, covering a bright yellow tough wood, with a thin pith; inodorous, bitter.

Constituents.—Berberina (see page 127).

Properties.—Tonic. *Dose*, 2.0 to 4.0 grams (5ss-j) in powder or infusion.

BERBERIS AQUIFOLIUM.—OREGON GRAPE.

Origin.—*Berberis aquifolium*, Pursh; *B. nervosa*, Pursh; and *B. repens*, Lindley. *Natural order*, Berberidaceæ.

Habitat.—From Colorado westward.

Description.—In more or less knotty and tough pieces, varying from 3 to 25 or 50 millimeters ($\frac{1}{8}$ to 1 or 2 inches) in thickness, with a thin yellowish-brown, internally bright yellow bark, and a yellow hard wood with fine medullary rays, the rhizome with a thin pith; inodorous and bitter. The rhizome and roots of *B. repens* and *B. nervosa* rarely exceed 3 millimeters ($\frac{1}{8}$ inch) in diameter.

Constituents.—Berberina (see page 127), possibly a second alkaloid, sugar, gum, etc.

Properties.—Tonic, alterative. *Dose*, 0.5 to 2.0 grams (gr. viij-3ss) in decoction or fluid extract.

GELSEMIUM.—GELSEMIUM. YELLOW JASMINE.

Origin.—*Gelsemium sempervirens*, Aiton. *Natural order*, Loganiaceæ.

Habitat.—Southern United States. The creeping rhizome and rootlets are collected.

Description.—Cylindrical, long or cut in sections, occasionally 3 centimeters ($1\frac{1}{2}$ inch) thick, the roots much thinner; externally light brown-yellow with purplish-brown longitudinal lines; tough, fracture splintery; bark thin, with silky bast fibres, closely adhering to the pale yellowish porous wood, having fine medullary rays and, in the rhizome, a thin pith; odor aromatic, heavy; taste bitter, of the wood slightly so.

Fig. 80.



Gelsemium. — Transverse section.

Constituents.—Volatile oil, gelseminia $C_{11}H_{19}NO_2$, gelseminic acid (æsculin), resin, starch; gelseminia is amorphous, bitter, soluble in ether and alcohol, slightly soluble in water.

Properties. — Nervine, antispasmodic, sedative.
Dose, 0.2 to 0.6 gram (gr. iij-x) in powder, tincture, or fluid extract.

3. TUBERS AND BULBS.—TUBERA ET BULBI.

Tubers are enlarged, more or less fleshy subterraneous stems or branches, or dilated bases of stems, which are not invested with leaves. They consist of either one internode or of several, and hence may develop either a terminal or several lateral buds. The dilated fleshy tuberous base of an annual stem is often designated as a *corm*.

Bulbs are buds with a permanently short, fleshy axis, which is invested with fleshy leaves, called

scales, the external layers of the latter usually decaying and becoming dry and papyraceous. The scaly bulb has the leaves rather narrow, thick, and overlapping; in the *tunicated* bulb the leaves are broad, cover the axis completely, or nearly so, and thus form concentric layers. If several small bulbs surround a common axis, and the whole is again invested with fleshy or dry leaves, the compound bulb is produced. Bulbous plants are monocotyledons.

Histology.—The arrangement of the tissue in the tubers corresponds with that of the rhizome, while the scales of the bulbs have, like the leaves proper, more or less delicate fibro-vascular tissue (veins) imbedded in loose and fleshy parenchyma.

Classification.

TUBERS.—Sect. 1. Of Dicotyledons.

With resin cells in circles.	Jalapa.
Without resin cells; turnip-shaped, very acrid.	Aconitum.
subglobose, yellowish, bitterish.	Corydalis.

Sect. 2. Of Monocotyledons.

Ovate with a lateral groove; usually in reniform sections, bitter.	Colchicum.
Depressed globose, above with a zone of rootlets or their scars; acrid.	Arum.
Ovate or roundish; horny; mucilaginous.	Salep.

BULBS, all tunicated.

Single; globular ovate; mostly in sections of the scales; mucilaginous, bitter, acrid.	Scilla.
Compound; mucilaginous, pungent, acrid.	Allium.

JALAPA.—JALAP.

Origin.—*Exogonium purga*, *Bentham*. *Natural order*, *Convolvulaceæ*.

Habitat.—Eastern Mexico.

Description.—Napiform, pyriform or oblong, varying in size, the larger ones incised, more or less wrinkled, dark-brown, with lighter-colored warts and short transverse ridges, hard, compact, internally pale grayish-brown, with numerous concentric circles composed of small resin cells; fracture resinous, not fibrous; odor slightly smoky and sweetish; taste sweetish and acrid.

Fig. 81.



Jalapa.—Transverse section.

10 grams of jalap, exhausted by alcohol, the tincture concentrated and poured into water, should yield a precipitate of resin which, after washing with water and drying, should weigh not less than 1.2 gram (or 12 grains for 100 grains of jalap), and should be only slightly soluble in ether.

Constituents.—Starch, gum, sugar, etc., resin 12 to 18 or 22 per cent.; about $\frac{1}{10}$ of the resin is soluble in ether, also in alkalies, and reprecipitated by acids; the remainder is the glucoside convolvulin $C_{62}H_{100}O_{32}$, which is soluble in alkalies and converted into convolvulic acid, soluble in water.

False Jalaps.—Tampico jalap, from *Ipomoea similans*, *Hanb*. Irregular, globular or elongated, deeply wrinkled, without transverse ridges or scars, yields

10 to 15 per cent. resin (tampicin), almost wholly soluble in ether.

Fusiform (male or light) jalap, jalap stalks; from *Ipomœa orizabensis*, *Pelletan*. Spindle-shaped, but mostly divided longitudinally and transversely, in sections or rectangular irregular pieces; the transverse section distinctly radiate from thick porous wood bundles. The resin, jalapin, is completely soluble in ether.

Mechoacanna root, from *Convolvulus mechoacan*, *Vand.*, and perhaps from other plants; in sections, light, whitish, mealy, contains little resin.

Properties.—Diuretic, hydragogue cathartic. *Dose*, 0.5 to 2.0 grams (gr. viij-3ss).

ACONITI RADIX.—ACONITE ROOT.

Origin.—*Aconitum napellus*, *Lin.* *Natural order*, Ranunculaceæ.

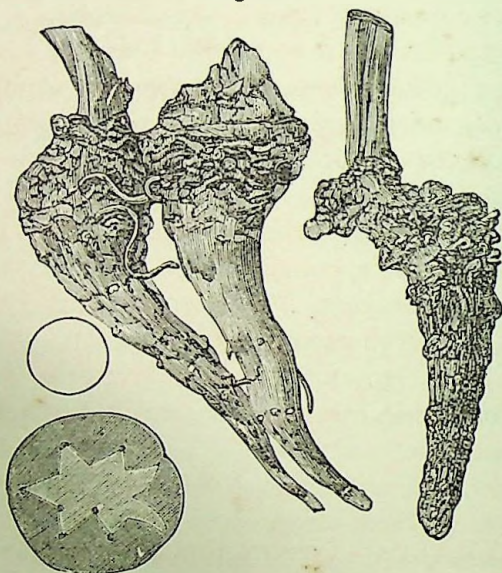
Habitat.—Mountainous districts of Europe, Asia, and western North America.

Characters.—About 18 millimeters ($\frac{3}{4}$ inch) thick at the crown, conically contracted below, about 5 centimeters (2 inches) long, with scars or fragments of radicles, dark-brown externally, whitish or brownish internally, with a rather thick bark, inclosing a star-shaped, about 7-rayed pith; odor none; taste sweetish, soon acrid, producing a sensation of tingling.

Constituents.—Resin, fat, sugar, aconitic acid, $\text{H}_3\text{C}_8\text{H}_3\text{O}_9$, and about 0.07 per cent. of alkaloids, consisting of aconitia, $\text{C}_{33}\text{H}_{43}\text{NO}_{12}$, pseudaconitia, $\text{C}_{36}\text{H}_{49}\text{NO}_{11}$, aconina, $\text{C}_{26}\text{H}_{39}\text{NO}_{11}$, pseudaconina,

$C_{27}H_{41}NO_8$, pieraconitia, $C_{31}H_{45}NO_{10}$. These alkaloids and one or two amorphous bases are contained in commercial aconitia. By heating in sealed tubes aconitia is decomposed into benzoic acid and aconina, and pseudaconitia into dimethyl-protocatechuic acid and pseudaconina.

Fig. 82.



Aconitum napellus.—Tubers and transverse section.

Properties.—Anodyne, sedative, poisonous. *Dose*, 0.06 to 0.12 gram (gr. j–ij) in tincture.

Other Aconite Roots.—*Aconitum cammarum*, *Jacq.*, Europe. Globular-ovate, about 15 millimeters ($\frac{3}{8}$ inch) long, the rays of the pith about five in number, rather short and rounded.

Aconitum Stœrckianum, *Reichenb.*, Europe. Slender conical, the pith roundish pentagonal.

Aconitum ferox, *Wallich*. Bikh or bish, Indian

aconite. From 5 to 10 centimeters (2 to 4 inches) long, and 25 millimeters (1 inch) or more in diameter above, conical, brown, internally whitish, mealy or horny, intensely acrid. The roots of *Ac. uncinatum*, *Lin.*; *Ac. luridum*, *Hook. f. et Thoms.*, and perhaps others are said to be collected with it. The constituents are similar to those of *Ac. napellus*, but pseudaconitia predominates among the alkaloids.

Japanese and Chinese aconite obtained from different unknown species. The tubers are napiform or elongated, the pith circular, elliptic, or more or less five- to seven-rayed; very poisonous; contains japonitia, $C_{66}H_{88}N_2O_{21}$.

Aconitum heterophyllum, *Wallich*, India. Conical or fusiform, bitter, not acrid.

Aconitum anthora, *Lin.*, Europe; long, fusiform; pith thin, with short and longer rays.

Aconitum lycoctonum, *Lin.*, Europe; oblique, several headed rhizome with elongated conical rootlets, bitter.

CORYDALIS.—TURKEY CORN, SQUIRREL CORN.

Origin.—*Dicentra canadensis*, *DeC.*, s. *Corydalis canadensis*, *Goldie*. *Natural order*, Fumariaceæ.

Habitat.—Canada and mountains of United States, south to Kentucky.

Description.—Depressed globose, about 6 millimeters ($\frac{1}{4}$ inch) thick, with a scar on each of the depressed sides, tawny-yellow, internally whitish or yellowish, horny or rather mealy, inodorous, bitter.

The rhizome of *Dicentra eximia*, *DeC.*, s. *Corydalis formosa*, *Pursh*, is scaly.

Constituents.—Acrid and tasteless resin, starch, mucilage, fumaric acid and corydalia, which is very bitter in solution.

Properties.—Tonic, diuretic, alterative. *Dose*, 0.6 to 2.0 grams (gr. x-xxx), in powder or extract.

COLCHICI RADIX.—COLCHICUM ROOT.

Origin.—*Colchicum autumnale*, *Lin.* *Natural order*, Melanthaceæ.

Habitat.—Southern and central Europe.

Description.—About 25 millimeters (1 inch) long, ovoid, flattish and with a groove on one side; externally brownish and wrinkled; internally white and solid; often in transverse slices, reniform in shape, with numerous scattered wood bundles, and breaking with a short mealy fracture, inodorous, taste sweetish, bitter, and acrid.

Fig. 83.



Tuber of Colchicum.

Fig. 84.



Colchicum.—Transverse section.

Colchicum root breaking with a horny or very dark-colored fracture should be rejected.

Constituents.—Starch, gum, sugar, resin, fat, colchicia. (See *Colchici Semen*.)

Properties.—Cathartic, emetic, sedative; in gout and rheumatism. *Dose*, 0.1 to 0.5 gram (gr. iss-vij) in powder, wine, fluid extract, or extract.

ARUM.—INDIAN TURNIP. DRAGON ROOT.

Origin.—*Arisæma* (*Arum*, *Lin.*) *triphyllum*, *Torrey*. *Natural order*, *Araceæ*.

Habitat.—North America, in rich woods.

Description.—Depressed globular, 2 to 5 centimeters ($\frac{4}{5}$ to 2 inches) broad, above with a zone of numerous simple rootlets, externally brown-gray, internally white, mealy, with scattered wood bundles; inodorous, taste burning acrid.

Constituents.—Starch, mucilage, sugar, fat, a volatile acrid principle, soluble in ether.

European dragon-root, from *Arum maculatum*, *Lin.* Oval or oblong, with radicles on the lower side, in commerce often peeled, and in white mealy sections of an acrid taste.

Properties.—Stimulant, diaphoretic, expectorant, irritant. *Dose*, 0.5 to 1.0 gram (gr. viij-xv), in powder, mixed with honey, externally in ointment.

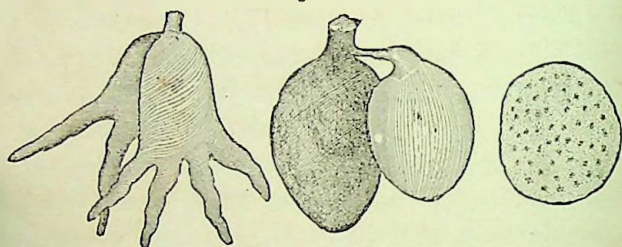
SALEP.—SALEP.

Origin.—*Orchis mascula*, *Lin.*, *O. morio*, *Lin.*, and other species of *Orchis*. *Natural order*, *Orchidaceæ*.

Habitat.—Central and Southern Europe, in rich woods.

Description.—Oblong or ovate, 25 millimeters (1 inch) or less long, deprived of the epidermal layer, and scalded, brown-yellow, hard, translucent, internally horny; inodorous, taste insipid. The tissue contains scattered wood-bundles, parenchyma with starch, and large cells containing mucilage. The powder is pale grayish-yellow.

Fig. 85.



Salep.—Tubers and transverse section.

The tubers of *Orchis latifolia*, *Lin.*, *O. maculata*, *Lin.*, and others, closely resemble the preceding, but below are palmately divided (*radix palmæ Christi*).

Constituents.—Starch 27, mucilage 48, sugar, proteids, and ash about 2 per cent. One part of powdered salep with 50 of boiling water yields, after cooling, a jelly.

Properties.—Demulcent, nutritive.

SCILLA.—SQUILL.

Origin.—*Urginea scilla*, *Steinheil*, s. *Scilla maritima*, *Lin.* Natural order, Liliaceæ.

Habitat.—Basin of the Mediterranean near the sea.

Description.—Broadly ovate or pear-shaped, 10 to 15 centimeters (4–6 inches) in diameter; in commerce usually the fleshy scales, rejecting the insipid inner ones; narrow segments about 5 centimeters (2 inches) long, slightly translucent, yellowish-white or reddish, brittle and pulverizable when dry, flexible on exposure; inodorous, mucilaginous, bitter and acrid.

Constituents.—Mucilage, sugar, crystals of calcium oxalate; the active principles are scillipicrin (hygroscopic, bitter, very soluble in water, acts upon the heart), scillitoxin (bitter, burning taste, soluble in alcohol, acts upon the heart), and scillin (soluble in alcohol and boiling ether, produces numbness, vomiting, etc.) [Merck.] Jarmersted's scillain is a glucoside, soluble in alcohol, poisonous.

Properties.—Expectorant, diuretic, cathartic, emetic, irritant. *Dose*, 0.03 to 0.3 or 0.6 gram (gr. ss–v–x), in powder, vinegar, syrup, or tincture.

Fig. 86.



Scilla.—Bulb.

ALLIUM.—GARLIC.

Origin.—*Allium sativum*, Lin. *Natural order*, Liliaceæ.

Habitat.—Asia and Southern Europe, cultivated.

Description.—Bulb subglobular, compound, consisting of about eight compressed wedge-shaped bulblets,

which are arranged in a circle around the base of the stem and covered by several dry membranaceous scales. It has a pungent, disagreeable odor, and a warm, acrid taste. It should be preserved in a dry place, and used only in the fresh state.

Hybrids of the above species with *Allium porrum*, *Lin.*, and perhaps with other species of *Allium* are frequently met with.

Constituents.—Mucilage 35 per cent., albumen, volatile oil $\frac{1}{4}$ per cent., consisting of oxide and sulphides of allyl (C_3H_5).

Properties.—Stimulant, diuretic, expectorant, anthelmintic, irritant.

Dose.—2.0 to 4.0 grams (3ss-j), as expressed juice or syrup.

4. TWIGS AND WOODS.—STIPITES ET LIGNA.

The twigs are the overground stems and branches of perennial herbaceous or suffruticose plants, deprived of leaves, flowers, and fruit; they consist of a woody column, inclosing a pith and covered by a green bark. The twigs of one plant only are now officinal.

The medicinal woods are derived from dicotyledonous trees, and as used in pharmacy have the bark removed.

Histology.—The woods consist principally of prosenchyma, the elongated wood-fibres with tapering ends and thickened cell-walls, associated with ducts, which, upon the transverse section, appear as pores. With the exception of the annular and spiral ducts near the

medullary sheaths, the ducts are dotted. The wood of Coniferæ is destitute of ducts, and the wood-fibres, on their lateral walls, are marked with disks. The wood incloses a pith composed of parenchyma, and is radially dissected by medullary rays, which, upon transverse section, appear as fine lines, separating the narrow wood wedges, upon radial section as broader bands, and upon tangential section as short vertical striæ, which are narrowed at both ends. The medullary rays consist of parenchyma-cells, somewhat elongated in the radial direction, forming either a single row, or broader rows of two or more cells, and vertically a layer of six or more cells. Parenchyma is also found in some woods accompanying the ducts; its cells are vertically elongated and it is designated as wood parenchyma. The wood-cells formed in the spring are larger, those formed towards the close of the season are much thinner; the annual layers or circles of wood are thus plainly indicated by the abrupt transition from the growth of one year to that of the next. In woods from tropical countries the annual layers are less distinctly marked, and often cannot be recognized. The inner layer of wood, from deposits upon its cell-walls, is harder, denser, and frequently of a darker color than the outer layer; the former is called the heartwood or duramen, the latter is the sapwood, or alburnum.

The structural characters of the dicotyledonous woods depend upon the vertical course of the wood-fibres, the width and thickness of the medullary rays, the size and distribution of the ducts, the presence or absence of the wood-parenchyma, etc.

Classification.

Twigs ; nodes alternate ; taste bitter-sweet.	Dulcamara.
Woods, containing ducts.	
Annual layers distinct.	
Pale reddish-brown ; soft ; aromatic.	Sassafras.
Annual layers indistinct, or with irregular circles of wood-parenchyma.	
Whitish, very bitter.	Quassia.
Greenish-brown, heavy, taste somewhat acrid.	Guaiacum.
Dark-red, ducts large ; nearly tasteless, not coloring water.	Santalum rubrum.
Dark-red, ducts fine ; astringent and sweetish, tinging water red.	Hæmatoxylon.
Yellowish or whitish, ducts fine ; on rubbing aromatic.	Santalum album.

DULCAMARA.—BITTERSWEET.

Origin.—*Solanum dulcamara*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Europe and Asia ; naturalized in North America.

Description.—Cylindrical, somewhat angular ; longitudinally striate, more or less warty ; usually hollow in the centre ; about 6 millimeters ($\frac{1}{4}$ inch) or less thick, cut into short sections ; the thin bark is externally pale greenish or light greenish-brown, marked with alternate leaf scars, and internally green ; the greenish or yellowish wood forms one or two concentric rings. Odor slight ; taste bitter, afterwards sweet.

Fig. 87.



Dulcamara. — Transverse section. Magnified 3 diameters.

Constituents.—Resin, gum, wax,

an amorphous alkaloid and the glucoside dulcamarin, $C_{22}H_{34}O_{10}$, which is soluble in water and alcohol; yields frothing solutions, and has a bitter and sweet taste.

Properties.—Deobstruent, alterative, resolvent, anodyne. *Dose*, 4 to 8 grams (3j-ij), in decoction, fluid extract, or extract.

SASSAFRAS LIGNUM (RADIX).—SASSAFRAS
WOOD (ROOT).

Origin.—Sassafras officinale, Nees. *Natural order*, Lauraceæ.

Habitat.—North America, woods.

Description.—In branching billets or logs, partly covered with bark, or in chips; pale brownish or reddish, coarse-grained, soft, with narrow medullary rays and large ducts; odor and taste aromatic.

Constituents.—Volatile oil.

Properties and Uses.—Like sassafras bark.

QUASSIA.—QUASSIA.

Origin.—Simaruba (Quassia, Swartz) excelsa, De Cand. *Natural order*, Simarubaceæ.

Habitat.—Jamaica.

Description.—Various sized billets, dense, tough, of medium hardness, porous, with a thick tough bark, a minute pith, narrow medullary rays, and irregular circles of wood parenchyma; in the shops usually in raspings or chips; yellowish-white, inodorous, intensely bitter.

Surinam quassia, from *Quassia amara*, *Lin.*, is in much thinner billets, has a thin brittle bark, smaller ducts, and narrower medullary rays, of only one cell in width.

Constituents.—Mucilage, pectin, resin, quassin, $C_{10}H_{12}O_3$; the latter is soluble in alcohol and water, is precipitated by tannin, and is very bitter.

Properties.—Tonic, febrifuge. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in infusion, tincture, or extract.

GUAIACI LIGNUM.—GUAIACUM WOOD.

Origin.—*Guaiacum officinale*, *Lin.* *Natural order*, Zygophyllaceæ.

Habitat.—West India and Northern South America.

Description.—In billets and logs, with a yellowish alburnum; heavy, hard, brown or greenish-brown, resinous upon the transverse section, marked with irregular concentric circles; splitting irregularly from wavy wood-tissue; medullary rays narrow; ducts large, not numerous; when heated emitting a balsamic odor; taste slightly acid.

Used in the form of raspings, which should be greenish-brown, contain few particles of a whitish color, and on the addition of nitric acid, acquire a dark blue-green color.

Constituents.—Resin 20 to 25 per cent. (see *Guaiaci resina*); extractive, soluble in water, 3 to 4 per cent.

Properties.—Diaphoretic, alterative. *Dose*, 2.0 to 8.0 grams (5ss–ij), in decoction.

SANTALUM RUBRUM.—RED SAUNDERS.

Origin.—*Pterocarpus santalinus*, *Lin.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Madras, cultivated.

Description.—In billets deprived of the light-colored sapwood, heavy, hard; splitting coarsely splintery; externally dark red-brown; the fresh transverse section deep red, marked with lighter red irregular concentric circles of wood parenchyma; medullary rays fine, ducts large, nearly uniformly distributed; inodorous and nearly tasteless; on maceration in water, does not color it. Used in the form of chips or of an irregular powder, of a deep brown-red or purplish-red color.

Constituents.—Santalic acid, $C_{15}H_{14}O_5$, or $C_{14}H_{12}O_5$, red needles, soluble in ether with a yellow, and in alkalies with a violet color. Santal, $C_8H_6O_3$, and pterocarpin, $C_{17}H_{16}O_5$, are colorless, insoluble in water; the solution of the former in alkalies turning red and green.

Used for coloring tinctures.

HÆMATOXYLON.—LOGWOOD.

Origin.—*Hæmatoxyton Campechianum*, *Lin.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Central America, naturalized in the West Indies.

Description.—In logs; heavy, hard, splitting irregularly, externally purplish-black, internally brown-

red, marked with irregular concentric circles of wood parenchyma, medullary rays narrow; ducts thin, but distinct; odor faint agreeable; taste sweetish, astringent; colors the saliva dark pink. Used in the form of small chips or coarse powder of a dark brown-red color, often with a greenish lustre.

Constituents.—Hæmatoxylin, $C_{16}H_{14}O_6$, colorless, sweet, soluble in water and alcohol, turning red in sunlight, purplish by alkalis. Also tannin, fat, resin.

Properties.—Astringent, tonic. *Dose*, 2.0 to 4.0 grams (3ss-j) in decoction or extract.

SANTALUM ALBUM.—SANDALWOOD.

Origin.—1. *Santalum album*, *Lin.*; 2. *S. yasi*, *Seemann*, and other species. *Natural order*, Santalaceæ.

Habitat.—1. India; 2. Fijee Islands; other species in Australia, the Sandwich Islands, etc.

Description.—In billets, or logs, splitting readily, heavy, hard, yellowish, brownish or whitish, marked with darker circles; medullary rays very narrow; ducts thin; odor when rubbed aromatic, somewhat musk-like; taste aromatic.

Constituents.—Resin, tannin, volatile oil 1-4 per cent.; the latter is yellow, thick; sp. grav. .96; readily soluble in alcohol while fresh, strongly aromatic, but varying somewhat with its origin.

Properties.—The volatile oil stimulant, sudorific, used in gonorrhœa in doses of 0.5 to 1.0 or 1.5 gram (gr. viij-xv-xxij); also in perfumery; the wood for fancy articles.

5. BARKS.—CORTICES.

Barks constitute the outer layer of dicotyledonous stems and roots, separated from the wood by the cambium layer, and are collected mostly from the trunk or stem and its larger branches, in a few cases from the root. The outer surface of the bark is not unfrequently beset with larger or smaller patches of lichens; the inner surface, immediately after the removal of the bark from the wood, is mostly whitish or light colored and smooth, but darkens more or less on drying, and often becomes rough or ridged in consequence of the unequal shrinkage of different parts of the tissue.

Histology.—The bark consists originally of two layers, the outer bark wholly composed of parenchyma, containing chlorophyll; and the inner bark, bast or liber, which is composed of vertically elongated bast parenchyma, and of bast prosenchyma or liber fibres, and this tissue is radially dissected by medullary rays, formed of radially elongated parenchyma. The epidermis is present only in very young barks; its place is soon taken by the primary cork, which is frequently present in wart-like projections, or in longitudinal or transverse ridges, and is composed of tangentially flattened cells. The secondary cork, composed of similar cells, penetrates in layers or bands into the outer or inner bark, and the exterior tissue cracks off in layers or falls away by decay. The tissues which may be present in barks are, 1, the epiphloeum or exophloeum, formed by the primary cork; 2, the mesophloeum, primary or outer bark,

also sometimes called middle bark; or these two layers may have been thrown off, so that the external layer is formed by 3, the rhytidoma, or secondary cork; 4, the endophlœum or liber. The term periderm is often used to designate the external corky layer, whether it be epiphlœum or rhytidoma, but is by some authors confined to the latter. The parenchyma of some barks contains cells in which volatile oil, resin, mucilage, or crystals are found; and others in which the cell-walls become considerably thickened and indurated, producing the gritty cells or stone cells or sclerenchyma.

Aside from the natural color of the tissue, the appearance of the outer surface of the medicinal barks depends upon the presence or absence of lichens, epiphlœum, mesophlœum and rhytidoma, and the appearance of the inner surface upon the degree of shrinkage in drying of the medullary rays and bast parenchyma. The breadth of the medullary rays on the one hand, and the radial or lateral arrangement of the bast cells on the other hand, cause the radial, lateral (tangential) or checkered markings upon the transverse section of the inner bark.

Classification.

Sect. 1. Taste bitter and astringent.

Bast cells with a minute cavity, single, in short radial lines or small groups.	Cinchona.
Bast indistinctly tangentially striate; cork removed; fracture granular.	Nectandra.
Bast radially striate, pale red; periderm brown.	Cornus florida.
Bast radially striate, cinnamon-colored; periderm brown-gray; bark thin.	Cornus circinnata.

- Bast radially striate, pale-brown; periderm purplish-brown; bark thin. *Cornus sericea.*
- Bast radially striate, whitish; periderm purplish-brown. *Liriodendron.*
- Bast radially striate, whitish; periderm gray, or brownish. *Magnolia.*
- Bast radially striate, yellowish; periderm grayish, dotted. *Prinos.*
- Bast radially striate, rust-brown; periderm green-brown. *Prunus virginiana.*
- Bast layers tangential, checkered, yellow, exfoliating. *Berberis.*
- Bast layers tangential, checkered, pale cinnamon-colored. *Salix.*
- Bast indistinctly striate, whitish; periderm purplish or grayish-brown. *Viburnum.*
- Sect. 2. Taste astringent.*
- Bast checkered, pale brown; inner surface ridged; saliva not tinged. *Quercus alba.*
- Bast checkered, pale brown; inner surface ridged; saliva tinged yellow. *Quercus nigra.*
- Bast tangentially striate; periderm blackish; inner surface smooth, brownish; tough. *Rubus.*
- Bast scarcely striate, yellowish; inner surface smooth; fracture short. *Granatum.*
- Sect. 3. Taste bitter, not aromatic.*
- Bast radially striate, pale brownish; bark tough. *Simaruba.*
- Bast radially striate, whitish; periderm blackish; bark tough. *Quassia excelsa.*
- Bast radially striate, whitish; periderm gray; bark brittle. *Quassia amara.*
- Bast scarcely striate, brownish-yellow; periderm dark gray. *Frangula.*
- Bast scarcely striate, yellowish; periderm gray and whitish. *Rhamnus Purshiana.*
- Bast checkered, brown and white; cork removed; inner surface striate. *Juglans.*

Bast tangentially striate, yellowish ; cork rust-brown, tasteless.

Azedarach.

Sect. 4. Taste acrid or pungent.

Slender prickles in transverse rows.

Aralia spinosa.

Brown-gray, inner surface whitish ; fracture short ; spines brown, two-edged.

Xanthoxylum
fraxineum.

Brown-gray, inner surface whitish ; fracture short ; spines brown, stout, upon a thick, corky base.

Xanthoxylum
carolinianum.

Bast tangentially striate, tough, whitish ; periderm greenish, glossy.

Mezereum.

Bast tangentially striate, tough, whitish ; periderm reddish ; taste slightly acrid.

Gossypium.

Bast tangentially striate, tough, with yellow dots ; cinnamon brown ; aromatic pungent.

Coto.

Bast tangentially striate, whitish ; periderm gray and blackish, scaly ; taste slightly acrid and bitter.

Euonymus.

Bast checkered, white or whitish ; cork removed ; sternutatory.

Quillaia.

Sect. 5. Mucilaginous.

Bast checkered, whitish or brownish ; cork removed.

Ulmus.

Sect. 6. Aromatic (some also bitter) with oil or resin cells.

Astringent : compound quills ; papery ; outer surface lightest.

Cinnamomum.

Astringent ; curved or quilled ; both surfaces cinnamon-brown.

Cinnamomum
cassia.

Astringent : flattish fragments, rust-brown ; fracture corky.

Sassafras.

Bitterish, pungent ; periderm whitish and reddish, with white scars ; bast white.

Canella.

Bitterish, pungent ; periderm brown, with dark-brown scars ; bast brown.

Cinnamoden-
dron.

- Bitterish, pungent; periderm whitish or brown;
 inner surface ridged; contains tannin. -Wintera.
- Very bitter; reddish brown; in outer bark
 white striæ. Angustura.
- Very bitter; periderm white, fissured; inner
 surface brown. Cascarilla.

CINCHONA.—CINCHONA, PERUVIAN BARK.

Origin.—Between 30 and 36 species of cinchona are usually recognized, of which number about one-half furnish commercial cinchona bark. O. Kuntze regards most of these as hybrids or as varieties, and recognizes only four typical species. Those recognized by the pharmacopœias are mentioned below.

Natural order, Rubiaceæ, Cinchonæ.

Habitat.—South America, commencing at 19° or 22° S. lat., on the eastern slope of the central chain of the Andes, northward to 2° S. lat., where a second belt commences on the eastern slope of the western chain; thence spreading northward into New Granada to 10° N. lat. The valuable species grow at an altitude of 1600 to 2400 meters (5300 to 8000 feet), Cinch. succirubra at 700 meters (2300 feet). Other species of little or no value are found up to 3500 meters (11,600 feet), and down to 100 meters (330 feet). The climate where the best species grow has a mean temperature of 12° to 13° C. (55° F.), and is damp and foggy throughout the greater part of the year.

Cinchonas are now extensively cultivated in Java, India (Neilgherry and Himalaya Mountains), Jamaica (Blue Mountains), and other countries; to a limited extent also in South America.

Structural Characteristics.—The bast fibres are rather short, obtusely pointed, unbranched, have very much thickened cell-walls and a minute cavity, and are

Fig. 88.



Cinchona calisaya.—Transverse section, magnified 40 diameters.

quite brittle. They are imbedded in the bast parenchyma, either singly, or in short radial lines, composed

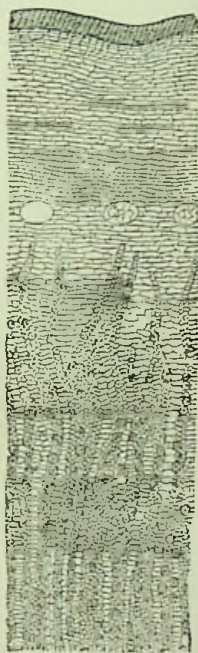
of one or two rows, or in irregular groups of 2, 3, or sometimes 6 or 8 cells. The bast rays contain also

Fig. 89.



Cinchona micrantha.—Transverse section, magnified 40 diameters.

Fig. 90.



Cinchona succirubra.—Transverse section, magnified 30 diameters.

incomplete fibres or staff cells, which are elongated and thick-walled. The primary bark of some species

contains elongated unbranched laticiferous ducts (vessels, lacunæ), thick-walled resin-cells and crystal-cells, the last two being also occasionally found in the medullary rays. The formation of secondary cork bands, penetrating deeply into the interior, causes the absence of these ducts and resin-cells in the older trunk bark of some species.

Classification of the Important Cinchona Barks.

1. Bast fibres single, sometimes in groups of 2 or rarely more, medium sized.
 - C. calisaya*. Laticiferous ducts in young bark ; no resin-cells ; old bark with prominent secondary cork ; medullary rays narrow.
 - C. glandulifera*. Laticiferous ducts in 1 or 2 rows ; resin-cells few ; bast rays narrow ; medullary rays large-celled.
2. Bast fibres single, or oftener in groups, not in distinct radial lines.
 - C. micrantha*. No laticiferous ducts ; resin-cells few or none ; bast fibres medium ; medullary rays narrow.
 - C. purpurea*. Laticiferous ducts in 1 or 2 rows ; resin-cells numerous ; bast fibres thin, with some incomplete fibres ; medullary rays broadly wedge-shaped at end.
 - C. pubescens*. Laticiferous ducts in 1 row ; resin-cells numerous ; bast fibres large, variable, with incomplete fibres ; medullary rays broad.
3. Bast fibres in interrupted, single, or double radial lines.
 - C. succirubra*. Laticiferous ducts in 1 row, in old bark often filled with cells ; bast and medullary rays narrow ; bast fibres medium.
 - C. officinalis*. Laticiferous ducts thin, soon obliterated ; resin-cells none ; bast fibres medium ; medullary rays narrow.
 - C. pitayensis*. Laticiferous ducts none ; resin-cells few or none ; bast fibres thin ; medullary rays mostly narrow, wedge-shaped at end.
 - C. cordifolia*. Laticiferous ducts none ; resin-cells few ; bast fibres small, with some incomplete fibres ; medullary rays large-celled.

- C. lancifolia*. Laticiferous ducts none; resin-cells many; bast fibres medium, with some incomplete fibres; medullary rays large-celled.
- C. nitida*. Laticiferous ducts none; resin-cells few or none; bast fibres mostly thin, but many thick or medium; medullary rays narrow.
- C. Peruviana*. Laticiferous ducts (in 1 row) and resin-cells small; bast fibres small, many incompletely filled.
4. Bast fibres in nearly uninterrupted radial lines.
- C. scrobiculata*. Laticiferous ducts in 1 or 2 rows; resin-cells and bast fibres numerous; medullary rays large-celled.

Official Cinchonas.

CINCHONA FLAVA.—YELLOW CINCHONA, CALISAYA BARK.

The bark of the trunk of *Cinchona calisaya*, Weddell.

Habitat.—Northeastern Bolivia and Southeastern Peru. Altitude 1500–1800 meters (5000–6000 feet).

Description.—In flat pieces, varying in length and width, and from 4 to 10 millimeters ($\frac{1}{6}$ to $\frac{3}{8}$ inch) in thickness; almost completely deprived of the brown corky layer; compact; of a tawny-yellow color; outer surface marked with shallow conchoidal depressions (digital furrows) and intervening, rather sharp ridges; inner surface closely and finely striate; transverse fracture showing numerous, very short, and rigid, glistening fibres, which are radially arranged, and rarely in small groups. Powder light cinnamon-brown, slightly aromatic, and persistently bitter.

Calisaya bark should not be confounded with other cinchona barks of a similar color, but having the bast

fibres in bundles or radial rows, and breaking with a splintery or coarsely fibrous fracture (*Cinch. scrobiculata* and *C. lancifolia*).

Fig. 91.



Cinch. calisaya, showing digital furrow and short fibrous fracture.

Fig. 92.



Cinch. scrobiculata.

CINCHONA PALLIDA.—PALE CINCHONA, LOXA BARK, CROWN BARK.

The bark of the branches of *Cinchona officinalis*, *Hooker*.

Habitat.—Ecuador, chiefly in the neighborhood of Loxa.

Description.—About 2 millimeters ($\frac{1}{12}$ inch) thick; in single or double quills from 3 to 20 millimeters ($\frac{1}{8}$ to $\frac{3}{4}$ inch) in diameter; outer surface brown or

gray, transversely fissured, and longitudinally wrinkled or nearly smooth; inner surface pale yellowish-brown or reddish-brown, finely striated; fracture slightly fibrous in the inner layer; powder pale brown, slightly odorous, astringent, and bitter.

Commercial Loxa bark is frequently mixed with the bark of one or several other species of Cinchona.

CINCHONA RUBRA.—RED CINCHONA.

The bark of the trunk of *Cinchona succirubra*, *Pavon*.

Habitat.—Ecuador, west of Chimborazo. Altitude 700–1500 meters (2300–5000 feet).

Description.—In flat or incurved pieces, varying in length and width, and from 3 to 12 millimeters ($\frac{1}{8}$ to $\frac{1}{2}$ inch) thick; compact; of a deep brown-red color; outer surface covered with numerous tuberous warts and ridges, or longitudinally and somewhat transversely fissured; inner surface rather coarsely striate; transverse fracture short-fibrous, the bast fibres in interrupted radial lines; powder deep brown-red, slightly odorous, astringent, and bitter.

Red cinchona should not be confounded with other Cinchona barks having an orange-red color and breaking with a coarse splintery fracture. Thin, quilled, red cinchona of a light red-brown color should be rejected.

Unofficial Cinchona Barks.

Pitaya bark, from *C. pitayensis*, Wed. Periderm smooth, ochre-colored, with circular scars; liber red-

dish cinnamon-brown; fracture short splintery; powder bright brown-yellow.

Cusco bark, from *C. pubescens*, Vahl. Periderm pale brown-yellow, warty, sometimes whitish; liber cinnamon-colored, with a coarse splintery fracture.

Carthagera bark, from *C. lancifolia*, Mutis, and *C. cordifolia*, Mut. Quills and half-quills; periderm whitish, ochre-colored or yellowish-brown, soft; inner surface cinnamon-brown, with orange or reddish tint; inner fracture fibrous.

Lima or Huanuco bark, from *C. Peruviana*, Howard, *C. nitida*, Ruiz et Pavon, *C. micrantha*, R. & P., and other species. Quills and half-quills, varying according to the origin.

Huamalies bark, from *C. micrantha*, R. & P., *C. glandulifera*, R. & P., *C. purpurea*, R. & P., and other species. Quills and half-quills, varying according to origin.

Jaen bark or false Loxa bark, from *C. Humboldtiana*, Lamb. Inferior.

Cinchona Pahudiana, Howard, formerly cultivated in Java. Bark of handsome appearance, but inferior.

Spurious Cinchona barks.—From different species of *Ladenbergia*, *Exostemma*, *Nauclea*, etc. The liber layer is more or less distinctly radially striate or checkered, and contains bast fibres with large cavity, variously arranged. Occasionally a bast fibre like those of the cinchonas is observed.

Constituents.—Kinic (quinic) acid, $C_7H_{12}O_6$ (5 to 7 per cent., yields kinone, $C_6H_4O_2$, with sulphuric acid and manganese binoxide); kinovic (quinovic) acid,

$C_{24}H_{38}O_4$ (tasteless); kinovin (quinovin), $C_{30}H_{48}O_8$ (bitter; yields kinovic acid and mannitan); cinchotannic acid (usually 2 to 4 per cent.); cinchona red (derivative of the preceding); volatile oil (minute quantity), gum, sugar, wax, ash (2–3 per cent.). The most important constituents are the following five alkaloids: quinia and quinidia (conquinamina), $C_{20}H_{24}N_2O_2$; cinchonia and cinchonidia, $C_{19}H_{22}N_2O$ (older formula, $C_{20}H_{24}N_2O$); quinamina, $C_{19}H_{24}N_2O_2$. Their properties are as follows:—

Alkaloids.	Rotation.	Soluble in parts of				Cl. KCrO. and NH_3 .
		Water.	Alcohol.	Ether.	Cl and NH_3 .	
Quinia	left	480	30	21	green	dark red
Quinidia	right	1500	45	30	green	dark red
Cinchonia	right	3800	140	400	not gr.	not red
Cinchonidia	left	2580	20	76	not gr.	not red
Quinamina	right	trace	100	32	not gr.	not red

A large number of allied alkaloids have been obtained, some of which are known to be produced under the influence of heat or of reagents:—

Isomeric with quinia are quinidia and quinicia.

Isomeric with quinamina are conquinamina, quinamidia, quinamicia.

Isomeric with cinchonia are cinchonidia, cinchonicia, homocinchonia, homocinchonidia, homocinchonicia, and apoquinamina.

In the preparation of the cinchona alkaloids a mother-liquor is obtained yielding a brown amorphous alkaloid known as chinoidin (quinoidin), which is usually a mixture of dicinchonicia, $C_{33}H_{44}N_4O_3$ ($= 2C_{19}H_{22}N_2O$), and diconquinia, $C_{30}H_{43}N_4O_3$ ($= 2C_{20}H_{24}N_2O_2 - H_2O$); the latter gives with chlorine water and ammonia the green thalleioquin color.

Other alkaloids obtained from varieties of cinchona barks are—paricina, $C_{16}H_{13}N_2O$; paytina, $C_{21}H_{24}N_2O$; cusconina and aricina, $C_{23}H_{26}N_2O_4$.

Grahe's test. Cinchona barks containing cinchona alkaloids yield on dry distillation in a test-tube a purple-colored tar.

Properties.—Astringent, tonic, antiperiodic, febrifuge. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in powder, fluid extract, extract, or the salts of the alkaloids.

NECTANDRA.—BEBEERU. GREENHEART BARK.

Origin.—Nectandra Rodiaei, Schomburgk. *Natural order*, Lauraceæ.

Habitat.—Guiana.

Description.—Flat pieces, 6 millimeters ($\frac{1}{4}$ inch) or less thick; outer surface gray-brown, with numerous depressions; inner surface cinnamon-colored, coarsely striate; fracture granular from the numerous stone-cells, in the liber somewhat tangentially striate; inodorous; taste astringent and bitter.

Constituents.—Bebirina, $C_{13}H_{21}NO_3$, identical with buxina and pelosina, white, soluble in ether; sipirina, red brown, amorphous, insoluble in ether.

Properties.—Tonic, febrifuge, antiperiodic. *Dose*, 2.0 to 4.0 grams (3ss–j), mostly the alkaloid, 0.06 to 0.6 gram (gr. j–x).

CORNUS.—DOGWOOD.

Origin.—*Cornus florida*, *Lin.* *Natural order*, Cornaceæ.

Habitat.—North America, in woods.

Description.—The bark of the root is collected and is deprived of the furrowed brown-gray corky layer; in curved pieces of various sizes, about 3 millimeters ($\frac{1}{8}$ inch) thick; outer and inner surface pale reddish or light reddish-brown, striate; transverse and longitudinal fracture short, whitish, with brown-yellow striæ; inodorous; astringent and bitter.

Constituents.—Cornin (cornic acid, silky needles, bitter, soluble in water and alcohol), tannin (3 per cent.), resin, gum, etc.

Properties.—Astringent, tonic, febrifuge. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in decoction and fluid extract.

The bark of *Cornus circinata*, *L'Her.*, or round-leaved dogwood, is thin, quilled, or curved; outer surface greenish or brownish-gray, with suberous warts or longitudinal lines; inner surface cinnamon-brown.

The bark of *Cornus sericea*, *L'Her.*, or swamp dogwood, is quilled, thin; outer surface purplish-brown or purplish-gray, with few suberous warts; inner surface cinnamon-brown.

These barks agree with that of *Cornus florida* in taste, constituents, and properties.

LIRIODENDRON.—TULIP-TREE BARK.

Origin.—*Liriodendron tulipifera*, *Lin.* *Natural order*, Magnoliaceæ.

Habitat.—United States, in woodlands.

Description.—The bark of the branches is collected. Quills or curved pieces, about 2 millimeters ($\frac{1}{12}$ inch) thick; outer surface purplish-brown or blackish-gray, with thin, often cleft ridges forming elongated meshes; internally whitish, smooth; transverse fracture short, somewhat fibrous in the inner layer; nearly inodorous; taste somewhat astringent, pungent, and bitter. The bark of old wood deprived of the corky layer is whitish, fibrous, and less pungent.

Constituents.—Tannin, resin, gum, liriodendrin. The latter is in white, pungent, fusible needles or yellowish globules, soluble in alcohol and ether.

Properties.—Tonic, febrifuge, vermifuge. *Dose*, 4.0 to 8.0 grams (5j-ij), in infusion or fluid extract.

MAGNOLIA.—MAGNOLIA.

Origin.—*Magnolia glauca*, *Lin.*, *M. acuminata*, *Lin.*, and *M. tripetala*, *Lin.* *Natural order*, Magnoliaceæ.

Habitat.—Middle and Southern United States.

Description.—Thin quills or curved pieces; periderm orange-brown, glossy, or light gray, with scattered warts, somewhat fissured; inner surface whitish or brownish, smooth; fracture in inner layer somewhat fibrous; inodorous; taste somewhat astringent, pungent, and bitter. The bark of old wood deprived

of the corky layer is whitish or pale brownish, fibrous, and less pungent.

Constituents.—Tannin, soft pungent resin, magnolin. The latter is crystalline, of an irritating taste, insoluble in water, soluble in most simple solvents and in alkalies. The identity of the crystalline principles in the bark and fruit of the different species has not been demonstrated.

Properties.—Diaphoretic, tonic, febrifuge. *Dose*, 2.0 to 4.0 grams (3ss-j), in decoction.

PRUNUS VIRGINIANA.—WILD CHERRY BARK.

Origin.—The bark of *Prunus* (*Cerasus*, *DeCand.*) *serotina*, *Ehrhart*. *Natural order*, Rosaceæ, Amygdaleæ.

Habitat.—North America, in woods.

Description.—Curved pieces or irregular fragments, 2 millimeters ($\frac{1}{12}$ inch) or more thick; outer surface greenish-brown or yellowish-brown, smooth, and somewhat glossy; if collected from old wood deprived of the corky layer, the outer surface rust-brown and uneven; inner surface somewhat striate, cinnamon-brown; brittle; fracture granular, radially striate; after maceration in water, of a distinct bitter almond odor; taste astringent, aromatic, and bitter.

It should be collected in autumn. The bark of the small branches is to be rejected.

Constituents.—Tannin, gallic acid(?), bitter principle, resin, starch, amygdalin, emulsin. The reaction in water of the two last-named principles generates hydrocyanic acid and oil of bitter almonds. Collected

in October, the bark yields 0.144 per cent. HCy, contains a large percentage of tannin, and yields a dark-colored infusion. The bitter principle has not been completely isolated.

Properties.—Tonic, sedative, pectoral. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion, syrup, or fluid extract.

PRINOS.—BLACK ALDER.

Origin.—*Prinos verticillatus*, *Lin.*, s. *Ilex verticillata*, *Gray*. *Natural order*, Aquifoliaceæ.

Habitat.—North America, in swampy thickets.

Description.—Thin slender fragments, about 1 millimeter ($\frac{1}{25}$ inch) thick, fragile; outer surface brownish ash-colored, with whitish patches and blackish dots and lines, the corky layer easily separating from the green tissue; inner surface pale greenish or yellowish; fracture short, tangentially striate; nearly inodorous, bitter, slightly astringent.

Constituents.—Tannin, wax, fat, resin, chlorophyll, albumen, sugar, gum, starch, amorphous bitter principle, which is precipitated by subacetate of lead.

Properties.—Astringent, tonic, alterative, febrifuge. *Dose*, 2.0 to 4.0 grams (3ss-j), in decoction or fluid extract.

BERBERIS.—BARBERRY BARK.

Cortex radiceis berberidis.

Origin.—*Berberis vulgaris*, *Lin.* *Natural order*, Berberidaceæ.

Habitat.—Europe and Western Asia; naturalized in North America.

Description.—Thin fragments; periderm yellowish-gray, soft; inner surface smooth, orange-yellow; fracture short, bright yellow; separable in laminæ; inodorous; taste bitter, not astringent, tinging the saliva yellow.

Constituents.—Little tannin (green with ferric salts), wax, fat, resin, albumen, gum, starch, berberina $1\frac{1}{2}$ per cent. (see Hydrastis), berbina or oxyacanthine or vinetina—a bitter white alkaloid soluble in alcohol, ether, and chloroform.

Properties.—Tonic, febrifuge, in large doses laxative. *Dose*, 0.2 to 0.6 gram (gr. iij-x), in powder or decoction.

SALIX.—WILLOW.

Origin.—*Salix alba*, *Lin.*, and other species of *Salix*. *Natural order*, Salicaceæ.

Habitat.—Europe, naturalized in North America; cultivated.

Description.—Collected from branches several years old. Fragments or quills, 1 or 2 millimeters ($\frac{1}{25}$ or $\frac{1}{12}$ inch) thick, smooth; outer surface somewhat glossy, brownish or yellowish, more or less finely warty, under the corky layer green; inner surface brownish-white, smooth, the liber separating in thin layers; inodorous, bitter, and astringent.

Fig. 93.



Salix.—Transverse section, magnified 15 diam.

Constituents.—Tannin, salicin, $C_{13}H_{18}O_7$, white bitter scales or needles, insoluble in ether, blood-red by sulphuric acid, by dilute acids split into sugar and saligenin, $C_7H_8O_2$ (solution blue by ferric chloride), or saliretin, $C_{14}H_{14}O_3$. The white or crack willows appear to contain more tannin, the purple willows more salicin. Salicin has also been found in the leaves and flowers of several species of willow.

Properties.—Tonic, astringent, vermifuge, febrifuge. *Dose*, 1.0 to 4.0 grams (gr. xv–3j) or more. Salicin as a tonic or febrifuge in doses of 0.2 to 1.0 gram (gr. iij–xv).

VIBURNUM.—VIBURNUM, BLACK HAW.

Origin.—*Viburnum prunifolium*, *Lin.* *Natural order*, Caprifoliaceæ.

Habitat.—United States, in thickets.

Description.—The bark of the stem is in thin pieces or quills, glossy purplish-brown, with scattered warts and minute black dots; collected from old wood grayish-brown, the thin corky layer easily removed from the green layer; inner surface whitish, smooth; fracture short, inodorous, somewhat astringent, bitter. The root bark is reddish-brown, internally cinnamon-colored, very bitter.

Constituents.—Valerianic acid, brown, bitter resin, greenish-yellow bitter principle, tannin, sugar, oxalates, citrates, malates, and ash 8–9 per cent.

Properties.—Diuretic, tonic, nervine; used in threatened abortion. *Dose*, 2.0 to 4.0 grams (3ss–j), in infusion or fluid extract.

QUERCUS ALBA.—WHITE OAK BARK.

Origin.—*Quercus alba*, *Lin.* *Natural order*, Cupuliferæ.

Habitat.—North America, in woods.

Description.—Nearly flat pieces, deprived of the corky layer, about 6 millimeters ($\frac{1}{4}$ inch) thick, pale brown, inner surface with short, sharp longitudinal ridges; tough; fracture coarsely fibrous, odor faint tan-like, taste strongly astringent; in the shops usually in an irregular fibrous powder, which does not tinge the saliva yellow.

Constituents.—Tannin, 6–11 per cent. (blue with ferric salts), red-brown coloring matter, pectin, resin, etc. Young oak bark is richer in tannin than bark from old wood. Querceto-tannic acid is $C_{23}H_{24}O_{12}$ and $C_{28}H_{28}O_{14}$, the latter being readily soluble in water. Oak red is $C_{28}H_{22}O_{11}$.

Properties.—Astringent. *Dose*, 1.0 to 4.0 grams (gr. xv–3j); mostly used externally.

QUERCUS TINCTORIA.—BLACK OAK BARK.

Origin.—*Quercus coccinea* var. *tinctoria*, *Gray.* *Natural order*, Cupuliferæ.

Habitat.—North America, in woods.

Description.—Flattish pieces, deprived of the corky layer, about 5 millimeters ($\frac{1}{5}$ inch) thick, reddish-brown, inner surface somewhat ridged; compact but rather brittle; fracture coarsely fibrous; odor faint tan-like; taste strongly astringent and somewhat bit-

ter, imparting a brownish-yellow color to the saliva. Usually kept in an irregular fibrous powder.

In the Southern States the barks of *Quercus nigra*, *Lin.* (black jack), and of *Qu. falcata*, *Mich.* (Spanish oak), are frequently used as black oak bark; they are of a much coarser texture and of a deep reddish-brown color.

Constituents.—Tannin (blue with ferric salt), red-brown coloring matter, pectin, quercitrin, $C_{33}H_{30}O_{17}$. The latter is yellow, crystalline, nearly tasteless; nearly insoluble in cold water; colored dark green by ferric salts, and with dilute acids yields isodulcit, $C_6H_{14}O_6$, and yellow quercetin, $C_{27}H_{18}O_{12}$.

Properties and Uses.—Like the preceding.

RUBUS.—BLACKBERRY BARK.

Origin.—*Rubus villosus*, *Aiton*; *Rubus canadensis*, *Lin.*, and *Rubus trivialis*, *Michaux.* *Natural order*, Rosaceæ, Dryadeæ.

Habitat.—North America, in fields and thickets, the last-named species is confined to the Southern States.

Description.—The bark of the root is collected. Thin, tough, flexible bands, outer surface blackish or blackish-gray, inner surface pale brownish, sometimes with strips of whitish, tasteless wood adhering, inodorous, strongly astringent, somewhat bitter.

Constituents.—Tannin. No analysis.

Properties.—Astringent, tonic. *Dose*, 2.0 to 8.0 grams (3ss-ij), in decoction, syrup, or fluid extract.

GRANATI RADICIS CORTEX.—BARK OF
POMEGRANATE ROOT.

Origin.—*Punica granatum*, *Lin.* *Natural order*,
Granataceæ.

Habitat.—India and Southwestern Asia; cultivated
and naturalized in subtropical countries.

Description.—The bark of the root is collected. In
thin quills or fragments, 5 to 10 centimeters (2 to 4
inches) long, little over 1 mil-
limeter ($\frac{1}{25}$ inch) thick; outer
surface brown or brown-gray,
somewhat warty or longi-
tudinally and reticulately
ridged; inner surface smooth,
finely striate, grayish-yel-
low; fracture short, granular,
brownish-yellow, indistinctly radiate; inodorous, as-
tringent, scarcely bitter.

The bark of the stem is similar, externally more
gray, with broader suberous warts, the fracture
greenish-yellow, and the bast layer more distinctly
radiate; it is said to be fully equal to the root bark.

Constituents.—Punico-tannic acid, $C_{20}H_{16}O_{13}$, mannit,
sugar, gum, pectin, and pelletierina, a colorless oily
aromatic alkaloid, soluble in water.

Properties.—Anthelmintic, tænisfuge. *Dose*, 8.0 to
16.0 grams (3ij-iv), in decoction.

Fig. 94.



Granati cortex.—Transverse sec-
tion, magnified 10 diam.

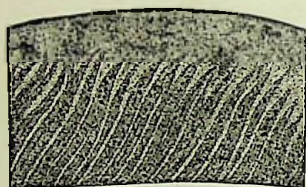
SIMARUBA.—SIMARUBA.

Origin.—1. *Simaruba officinalis*, *D. C.*; and 2. *S. medicinalis*, *Endl.* *Natural order*, Simarubaceæ.

Habitat.—1. Guiana to Northern Brazil. 2. West Indies.

Description.—The bark of the root is usually collected. Flattish, curved or quilled pieces, often 0.5 to 1.0 meter (20–40 inches)

Fig. 95.



Simaruba.—Transverse section,
magnified 3 diam.

long, and 3 millimeters ($\frac{1}{8}$ inch) thick; periderm yellowish or brownish, often partly or wholly removed; then gray-brown; inner surface light brown, striate; bast coarsely fibrous, tough, flexible, difficult to break; bast rays wavy and oblique;

inodorous; taste very bitter. No. 2 is light yellowish-brown, the inner surface finely striate.

Constituents.—Probably quassin, some resin, trace of volatile oil, etc.

Properties.—Tonic, febrifuge. *Dose*, 0.5 to 2.0 grams (gr. viij–xxx), in infusion or decoction.

QUASSIÆ CORTEX.—QUASSIA BARK.

Origin.—*Simaruba* (*Quassia*, *Swartz*) *excelsa*, *D. C.* *Natural order*, Simarubaceæ.

Habitat.—Jamaica.

Description.—Flat or curved pieces, about 5 milli-

meters ($\frac{1}{5}$ inch) and more thick; outer surface black-gray, longitudinally furrowed and verrucose; inner surface whitish, smooth; bast rays somewhat wavy; fracture in inner layer tough; inodorous, taste very bitter.

The bark of *Quassia amara*, *Lin.*, or Surinam quassia, is about 1 millimeter ($\frac{1}{25}$ inch) thick; externally gray, smoothish; inner surface whitish, smooth; very brittle; fracture smooth.

Constituents.—Quassin, trace of volatile oil, etc.

Properties.—Tonic, febrifuge. *Dose*, 0.5 to 2.0 grams (gr. viij—xxx), in infusion.

FRANGULA.—FRANGULA.

Origin.—*Rhamnus frangula*, *Lin.* *Natural order*, Rhamnaceæ.

Habitat.—Europe and Northern Asia.

Description.—Quilled, about 1 millimeter ($\frac{1}{25}$ inch) thick; outer surface gray-brown or blackish-brown,

Fig. 96.



Rhamnus frangula.—Transverse section, magnified 15 diameters.

with numerous small whitish transversely elongated suberous warts; inner surface smooth, pale brownish-yellow; fracture in the outer layer short, of a purplish tint; in the inner layer fibrous and pale yellow; nearly inodorous; taste sweetish and bitter. It should

not be used sooner than a year after it has been collected.

Constituents. — Frangulin or rhamnoxanthin, $C_{20}H_{20}O_{10}$ (yellow, tasteless, sublimable, purple by alkalis), emodin, bitter principle, resin, tannin, ash 5-6 per cent.

Properties. — When fresh, emetic; when old, tonic, purgative, diuretic. *Dose*, 2.0 to 8.0 grams (3ss-ij), in decoction.

RHAMNUS PURSHIANA.—CASCARA SAGRADA, CHITTEM BARK.

Origin. — Rhamnus Purshiana, *D. C.* *Natural order*, Rhamnaceæ.

Habitat. — Rocky Mountains and westward to the Pacific coast.

Description. — Curved or quilled, 1 or 2 millimeters ($\frac{1}{25}$ — $\frac{1}{12}$ inch) thick; periderm gray and whitish, underneath brown or reddish-brown; inner surface yellowish, smooth; fracture short, yellowish; inodorous; taste bitterish.

Constituents. — Tannin, white sublimable principle, and three resins, of which one is colored brown by potassa, another purple by the same reagent, and the third red-brown by sulphuric acid.

Properties. — Tonic, febrifuge, purgative. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in decoction, tincture, or fluid extract.

JUGLANS.—BUTTERNUT.

Origin.—*Juglans cinerea*, *Lin.* *Natural order*, Juglandaceæ.

Habitat.—North America.

Description.—The inner bark of the root is collected in autumn. Flat or curved pieces, 3 to 6 millimeters ($\frac{1}{8}$ to $\frac{1}{4}$ inch) thick, outer surface nearly free from soft cork, deep brown; inner surface smooth and striate; transverse fracture short, delicately checkered, whitish and brown; odor feeble; taste bitter, somewhat acrid.

Constituents.—Nucin (juglandic acid, juglone), $C_{36}H_{12}O_{10}$ (orange-yellow needles, volatile, acrid, purple by alkalies), fixed oil 14 per cent., trace of volatile oil and tannin.

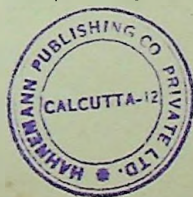
Properties.—Cathartic, tonic. *Dose*, 4.0 to 8.0 grams (3j-ij), in infusion or extract.

AZEDARACH.—AZEDARACH.

Origin.—*Melia azedarach*, *Lin.* *Natural order*, Meliaceæ.

Habitat.—China and India, cultivated in the Southern United States.

Description.—The bark of the root is collected. Curved pieces or quills of variable size and thickness, outer surface red-brown, with irregular blackish longitudinal ridges; inner surface whitish or brownish, longitudinally striate; fracture more or less fibrous; upon transverse section tangentially striate, with yel-



lowish bast fibres; inodorous, sweetish, afterwards bitter and nauseous.

If collected from old roots, the bark must be freed from the thick rust-brown, nearly tasteless corky layer.

Constituents.—Bitter yellowish-white resin, soluble in alcohol, ether, and chloroform; no tannin.

Properties.—Anthelmintic, emetic, poisonous. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in decoction.

XANTHOXYLUM.—PRICKLY ASH.

Origin.—*Xanthoxylum fraxineum*, Willdenow (Northern prickly ash), and *X. carolinianum*, Lambert (Southern prickly ash). *Natural order*, Rutaceæ.

Habitat.—North America.

Description.—Northern prickly ash is in curved or quilled fragments, about 1 millimeter ($\frac{1}{25}$ inch) thick, outer surface brown-gray with whitish patches and minute black dots, faintly furrowed, with some brown, glossy, straight, two-edged spines, linear at the base, and about 6 millimeters long; inner surface whitish, smooth; fracture short, non-fibrous, green in the outer and yellowish in the inner layer; inodorous, bitterish, very pungent. Southern prickly ash resembles this, but is nearly 2 millimeters ($\frac{1}{12}$ inch) thick, and is marked by many conical corky projections, sometimes 2 centimeters ($\frac{4}{5}$ inch) high, and by stout brown spines, rising from a corky base.

Prickly ash should not be confounded with the bark of *Aralia spinosa*, which is nearly smooth externally and beset with slender prickles in transverse rows.

Constituents.—Acrid green oil, resin (crystalline, white, tasteless), soft resin (acrid), bitter principle (probably an alkaloid), little tannin, sugar, ash 12 per cent.

Properties.—Sialagogue, stimulant, alterative, emmenagogue. *Dose*, 0.5 to 1.0 gram (gr. viij–xv), in powder or tincture; larger doses in decoction.

MEZEREUM.—MEZEREON.

Origin.—*Daphne mezereum*, *Lin.*, and of other species of *Daphne*. *Natural order*, Thymelacæ.

Habitat.—Europe, in mountainous regions.

Description.—Long, thin bands, folded or rolled into disks; outer surface yellowish or brown-yellow, with

Fig. 97.



Mezereum.—Transverse section, magnified 15 diameters.

transverse scars and minute blackish dots, underneath of a light greenish color; inner surface whitish, silky; bast in transverse layers, very tough, inodorous, very acrid.

Constituents.—Soft acrid resin and oil; daphnin, $C_{31}H_{34}O_{19}$ (bitter glucoside, blue by ferric salts).

Properties.—Sialagogue, stimulant, diuretic, alterative; externally vesicant. *Dose*, 0.1 to 0.4 gram (gr. jss–vj), mostly combined with other drugs.

GOSSYPHII RADICIS CORTEX.—BARK OF COTTON
Root.

Origin.—Gossypium herbaceum, *Lin.*, and other species of Gossypium. *Natural order*, Malvaceæ.

Habitat.—Subtropical Asia and Africa, cultivated in the United States.

Description.—The bark of the root is collected. Thin, flexible bands or quilled pieces; outer surface brownish-yellow, with slight longitudinal ridges or meshes, small black circular dots or short transverse lines, and, from the abrasion of the thin cork, with dull brownish-orange patches; inner surface whitish, of a silky lustre, finely striate; bast fibres long, tough, separable in papery layers; inodorous; taste very slightly acrid and faintly astringent.

Constituents.—Fresh a chromogene, becoming a red resin; yellow resin, fixed oil, little tannin, sugar, starch, etc.

Properties.—Emmenagogue, oxytocic. *Dose*, 2.0 to 4.0 grams (3ss-j), in decoction or fluid extract.

COTO.—COTO BARK.

Origin.—Unknown, probably from *natural order* Lauraceæ or Terebinthaceæ.

Habitat.—Bolivia.

Description.—Flat or curved, deprived of cork, about 6 to 12 millimeters ($\frac{1}{4}$ – $\frac{1}{2}$ inch) thick; outer surface cinnamon-brown, smooth; inner surface darker brown; fracture granular in the outer layer, tenacious

and fibrous in the inner layer, with numerous yellow stone-cells and bast fibres; odor aromatic; cinnamon-like; taste pungent, slightly bitter.

Another coto (paracoto) bark is usually about 12 to 18 millimeters ($\frac{1}{2}$ – $\frac{3}{4}$ inch) thick; sometimes with whitish fissured cork; odor fainter, nutmeg-like.

Constituents.—Cotoin, $C_{22}H_{18}O_6$ (pale yellow, very acrid) in coto bark. Paracotoin, $C_{19}H_{12}O_6$ (pale yellow, tasteless); leucotin, $C_{34}H_{32}O_{10}$; oxyleucotin, $C_{34}H_{32}O_{12}$; dibenzoylhydro-cotoin, $C_{32}H_{32}O_8$; and hydro-cotoin, $C_{15}H_{14}O_4$, in paracoto bark. Both barks contain volatile oil and piperoxylic acid, $C_8H_6O_4$; no tannin.

Properties.—Useful in diarrhoea. *Dose*, 0.3 to 0.6 gram (gr. v–x) in powder or tincture. *Dose* of cotoin 0.05 to 0.10 gram ($\frac{1}{4}$ – $1\frac{1}{2}$ gr.), of paracotoin 0.1 to 0.2 gram (gr. jss–iij).

EUONYMUS.—WAHOO.

Origin.—Euonymus atropurpureus, *Jacquin*. *Natural order*, Celastraceæ.

Habitat.—Northern and Middle United States, in shady woods.

Description.—Quilled or curved pieces, about 2 millimeters ($\frac{1}{12}$ inch) thick; outer surface ash-gray with blackish patches, detached in thin and small scales; inner surface whitish or slightly tawny, smooth; fracture smooth, whitish, the inner layers tangentially striate; nearly inodorous; taste sweetish, somewhat bitter, and acrid.

Constituents.—Euonymin (very bitter), resins, euonic acid, asparagin, starch, pectin.

Properties.—Tonic, diuretic, laxative, antiperiodic.
Dose, 2.0 to 4.0 grams (ʒss-j), in decoction or fluid extract.

QUILLAIA.—QUILLAIA. SOAPBARK.

Origin.—Quillaia saponaria, *Molina*. *Natural order*, Rosaceæ, Roseæ.

Habitat.—Chili and Peru.

Description.—The bark is deprived of the brown periderm. Flat large pieces, about 5 millimeters ($\frac{1}{8}$ inch) thick, pale brownish-white, and smooth on both sides, or the outer surface with small patches of brown cork; tough; fracture splintery; transverse section checkered, with tangentially arranged pale brownish bast fibres, white bast parenchyma, and distinct white medullary rays; inodorous, very acrid, sternutatory.

Constituents.—Saponin, $C_{32}H_{54}O_{18}$ (see Saponaria), numerous crystals of calcium sulphate, little starch.

Properties.—Stimulant, diuretic, irritant, detergent.
Dose, 1.0 to 2.0 grams (gr. xv-xxx), in infusion.

ULMUS.—SLIPPERY ELM.

Origin.—Ulmus fulva, *Michaux*. *Natural order*, Urticaceæ, Ulmeæ.

Habitat.—North America, in woods.

Description.—The bark is deprived of the brown periderm. Flat pieces varying in length and width, about 3 millimeters ($\frac{1}{8}$ inch) thick, tough, pale brownish-white, the inner surface finely ridged; fracture

fibrous and mealy; the transverse section delicately checkered; odor slight, fenugreek-like; taste mucilaginous, insipid.

European Elm bark from *Ulmus campestris*, *Lin.*, and *U. effusa*, *Willd.*, is cinnamon-colored, nearly inodorous, and of a mucilaginous, bitterish, and astringent taste.

Constituents.—Mucilage; in European Elm bark also a little tannin and bitter principle.

Properties.—Demulcent, emollient. *Dose*, 8.0 grams (ʒij) or more, mostly used externally.

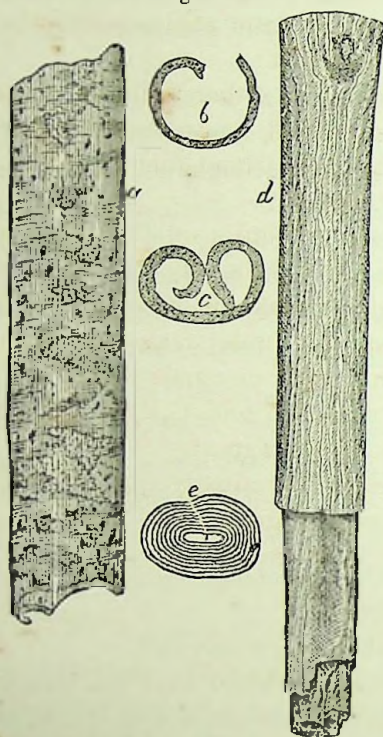
CINNAMOMUM.—CINNAMON. CEYLON CINNAMON.

Origin.—*Cinnamomum Zeylanicum*, *Nees*. *Natural order*, Lauraceæ.

Habitat.—Ceylon; cultivated.

Description.—The outer bark has been removed by scraping. In long closely-rolled quills, composed of 8 or more layers of bark of the thickness of paper; pale yellowish-brown; outer surface smooth, marked with wavy lines; inner surface scarcely striate; fracture splintery; odor fragrant; taste sweet and warmly aromatic.

Fig. 98.

Cinnamon.—*a, b, c.* From China. *d, e.* From Ceylon.

CINNAMOMUM CASSIA.—CINNAMON CASSIA.
CHINESE CINNAMON.

Origin.—*Cinnamomum cassia*, *Blume*, and other species of *Cinnamomum*. *Natural order*, *Lauraceæ*.

Habitat.—China.

Description.—Nearly deprived of the corky layer, 1 millimeter ($\frac{1}{25}$ inch) or more in thickness; yellow-

ish-brown; more or less quilled; fracture nearly smooth; odor and taste analogous to that of cinnamon, but less delicate.

Cassia lignea is either Chinese cinnamon, or a thicker, less fragrant, and more mucilaginous bark.

Saigon cinnamon from China is quilled, unscraped, sweet, and fragrant.

Constituents.—Volatile oil ($\frac{1}{2}$ to 1 or $1\frac{1}{2}$ per cent.), tannin, sugar, mannit, mucilage, ash about 5 per cent. Oil of cinnamon has the spec. grav. 1.035–1.055 or 1.065, is readily soluble in alcohol, and consists of a hydrocarbon and of cinnamic aldehyd, C_9H_8O , which oxidizes to cinnamic acid, $C_9H_8O_2$. The oil of Ceylon cinnamon is most fragrant.

Properties. — Carminative, stimulant, astringent. *Dose*, 0.5 to 2.0 grams (gr. viij–xxx), in powder, tincture, or infusion.

SASSAFRAS.—SASSAFRAS.

Origin.—Sassafras officinale, Nees. *Natural order*, Lauraceæ.

Habitat.—North America, in woods.

Description.—The bark of the root is collected and deprived of the gray corky layer; irregular fragments, bright rust-brown, soft, brittle, with a short corky fracture; strongly fragrant, sweetish, aromatic, somewhat astringent.

Constituents.—Volatile oil, tannin, sassafrid, starch, gum, resin, wax. Oil of sassafras has the spec. grav. 1.090, dissolves readily in alcohol, and yields with

nitric acid a dark-red resin—it consists of safrene, $C_{10}H_{16}$, and safrol, $C_{10}H_{10}O_2$.

Properties.—Stimulant, diaphoretic, alterative.
Dose, 2.0 to 4.0 grams (3ss-j), in infusion; mostly used as flavor.

CANELLA.—CANELLA.

Origin.—*Canella alba*, *Murray*. *Natural order*, Canellaceæ.

Habitat.—West Indies.

Description.—In quills or broken pieces about 3 millimeters ($\frac{1}{8}$ inch) thick; almost completely deprived of the gray suberous layer; external surface pale orange-brown, with transversely elongated scars; inner surface white, finely striate; fracture short, granular, white, with numerous orange-yellow resin-cells, and in the inner layer brownish; odor cinnamon-like; taste bitterish, biting.

Constituents.—Volatile oil 1 per cent. (contains eugenic acid), resin, bitter principle, mannit, mucilage, starch, albumen.

Properties.—Tonic, stimulant. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder and as an addition to tinctures.

CINNAMODENDRON.—FALSE WINTER'S BARK.

Origin.—*Cinnamodendron corticosum*, *Miers*. *Natural order*, Canellaceæ.

Habitat.—Jamaica.

Description.—Curved or quilled, about 3 millimeters ($\frac{1}{8}$ inch) thick; deprived of the dark-brown corky layer; outer surface smooth, light brown, with red-brown, roundish or transversely elongated scars; inner surface pale brown, finely striate; fracture short, granular, whitish and brownish, with numerous dark-brown resin-cells, and in the inner layer brown; odor cinnamon-like; taste bitterish, biting.

Constituents.—Probably like Canella.

Properties and Uses.—Like Canella.

WINTERA.—WINTER'S BARK.

Origin.—*Drimys Winteri, Forster*. *Natural order*, Magnoliaceæ, Winterææ.

Habitat.—Western part of South America.

Description.—Quilled or curved, 2 to 8 millimeters ($\frac{1}{12}$ to $\frac{1}{3}$ inch) thick; outer surface gray and smooth, or rust-brown, and wrinkled; inner surface brown, coarsely striate, or ridged; fracture granular, brown, with whitish stone-cells and yellow resin-cells; odor peculiar, aromatic; taste very pungent, astringent.

Constituents.—Volatile oil, tannin, pungent resin, starch.

Properties.—Tonic, stimulant, antiscorbutic. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder or tincture.

ANGUSTURA.—ANGUSTURA.

Origin.—*Galipea cusparia*, *St. Hilaire*, *Gal. officinalis*, *Hancock*. *Natural order*, Rutaceæ.

Habitat.—Northern South America.

Description.—Flat, curved, or quilled, 1 to 3 millimeters ($\frac{1}{25}$ to $\frac{1}{8}$ inch) thick; periderm ochrey-gray, friable, often partly or wholly

Fig. 99.



Angustura.—Transverse section, magnified 10 diam.

absent, and the outer surface then reddish-brown; inner surface light cinnamon-brown, smooth; fracture smooth, resinous, reddish-brown, with scattered darker oil-cells and glistening white striæ (crystals of calcium oxalate); odor aromatic; taste aromatic, very bitter.

Constituents.—Volatile oil $\frac{1}{2}$ per cent., cusparin(?), resins, gum.

Properties.—Stimulant, tonic, febrifuge. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder, infusion, or tincture.

CASCARILLA.—CASCARILLA.

Origin.—*Croton eluteria*, *Bennett*. *Natural order*, Euphorbiaceæ.

Habitat.—Bahama Islands.

Description.—In quills or curved pieces, about 2 millimeters ($\frac{1}{12}$ inch) thick, having a grayish, somewhat fissured, easily detached corky layer, the re-

maining tissue dull brown, and the inner surface smooth; fracture short, resinous, radially striate, and

Fig. 100.



Cascarilla Bark.—Transverse section, magnified 5 diam.

with scattered yellow oil-cells; when burned, emits a strong aromatic odor, taste warm and very bitter.

Constituents.—Volatile oil 1.5 per cent., cascarillin (soluble in alcohol, ether, and hot water), resin 15 per cent., little tannin, pectin, gum, starch.

Properties.—Stimulant, tonic, febrifuge, in large doses nauseating. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx), in infusion or tincture.

Allied Drugs.—Copalchi bark, from *Croton pseudochina*, Schlecht., Mexico. Large quills; periderm whitish or gray, not fissured; inner surface cinnamon-brown, smooth; fracture granular, in inner layer finely fibrous; odor and taste similar to Cascarilla.

Malambo bark, from *Croton malambo*, Karsten, Venezuela. Large quills, resembling the preceding, the thin cork fissured, and easily removed.

Other barks from different species of *Croton* are not unfrequently sold for Copalchi and Malambo bark.

6. LEAVES AND LEAFLETS.—FOLIA ET FOLIOLA.

Leaves grow laterally from the stem, and are, attached thereto either by the blade, in which case they are sessile, or they are petiolate, raised upon a foot-stalk. A leaf is called simple if it has only one blade, and compound if it has two or more distinct blades on a common leaf-stalk. The separate blades of compound leaves are termed leaflets, and, if they are articulated with the common leaf-stalk, they are, after collection and drying, usually detached from the latter, and cannot then be distinguished from simple leaves. The veins of a leaf may run parallel from the base to the apex, or from the midrib to the margin; or they may branch and divide in various ways and anastomose, forming a network. Parallel-veined leaves are met with in most monocotyledonous plants, while the dicotyledons have only netted-veined leaves, with the exception of the so-called phyllodia, which are foliaceous petioles. Deciduous leaves, which last only for a single season, are rarely leathery; but semper-virent leaves, lasting for more than one season, are generally of a leathery texture. All the officinal leaves are derived from dicotyledons.

Histology.—The petiole or foot-stalk consists of fibrovascular tissue, which, on entering the blade, branches so as to form the ribs and veins or framework of the leaf, the spaces between which are filled with parenchyma. Under the epidermis of the upper side of expanded leaves is found a layer consisting of one or two rows of vertically elongated, compacted

parenchyma cells (palisade cells). The parenchyma between this layer and the lower surface is loosely arranged, leaving irregular air-spaces between the horizontally elongated cells. The parenchyma contains the chlorophyll. On the lower surface, and in some leaves also on the upper surface, are found the stomata or breathing-pores.

Classification.

I. Margin entire.

1. Aromatic and glandular ; all coriaceous except *Thymus*.

Linear, revolute, woolly beneath, green above.

Rosmarinus.

Linear, revolute, pubescent beneath, grayish-green.

Thymus.

Broad oval, obtuse, rough on both sides.

Boldus.

Oval-oblong, retuse, uneven at base.

Pilocarpus.

Lance-oblong, acute at both ends.

Laurus.

Falcate-lanceolate, pointed, uneven at base.

Eucalyptus.

Elliptic, smooth, reticulate above.

Myrcia.

Oval-oblong, smooth, petiole winged.

Aurantium.

2. Not aromatic or glandular ; coriaceous.

Elliptic-oblong, revolute, rusty-woolly beneath, aromatic when bruised.

Ledum.

Obovate, somewhat revolute, smooth.

Uva ursi.

Roundish cordate, bristly.

Epigæa.

Elliptic, acute at both ends, smooth.

Kalmia.

3. Not aromatic or coriaceous.

Obovate, mucronulate, uneven at base, nearly smooth.

Senna (baladi).

Lance-oval, acute, uneven at base, nearly smooth.

Senna

Alexandrina.

Lanceolate, acute, uneven at base, nearly smooth.

Senna Indica.

Ovate-oblong, obtuse, uneven at base, nearly smooth.

Cassia

marilandica.

Lance-oblong, pointed, sometimes with a few teeth or three-lobed.

Sesamum.

- Obovate-oblong, acute at base, near the mid-rib with two folds. Erythroxyton.
- Ovate-oblong, acute, papery and smooth, upper side mostly brownish. Belladonna.
- Ovate-lanceolate, acute, papery, hairy, brown on both sides. Tabacum.
- II. Margin toothed or crenate.
1. Not coriaceous.
- Ovate, uneven at base, angular-toothed, papery, smooth. Stramonium.
- Ovate-oblong, gray-green, hairy, the teeth large and triangular. Hyoseyamus.
- Ovate, obtuse, crenate, beneath with white reticulations. Digitalis.
- Lanceolate, finely crenulate, beneath with brown reticulations. Matico.
- Ovate-oblong, finely crenulate, gray-green, soft hairy beneath. Salvia.
- Oval, acute at both ends, irregularly toothed, smooth. Thea.
- Oblong-lanceolate, acuminate, sinuate serrate, smooth, feather-veined. Castanea.
- Lance-oblong, with few teeth, mostly entire (see above). Sesamum.
2. Coriaceous.
- Oblanceolate, sharply serrate above, green, and smooth. Chimaphila.
- Lanceolate, serrate, on upper surface a whitish spot. Chimaphila maculata.
- Roundish oval, mucronate, with appressed teeth, smooth. Gaultheria.
- Oblong, serrate, with depressed glands near base of midrib. Laurocerasus.
- Oval, obovate, or roundish, crenate or serrate, gland in each sinus. Buchu (short).
- Linear-lanceolate, rather thin, glandular like preceding. Buchu (long).
- Elliptic-lanceolate, dentate, varnished above, white and reticulate beneath. Eriodictyon.
- III. Margin lobed ; subcoriaceous.
- Kidney-shaped, three-lobed, lobes entire. Hepatica.

Suborbicular, the divisions linear-lanceolate and furrowed above.

Aconitum.

IV. Leaves ternate.

Lateral leaflets sessile, obliquely ovate; all entire or notched.

Toxicodendron.

Leaflets sessile, obovate-oblong, slightly crenate.

Menyanthes.

V. Leaves bi- or tri-pinnate.

Pinnæ subcoriaceous, spatulate, nearly entire, pellucid-punctate.

Ruta.

Pinnæ thin, oblong-lanceolate, pointedly toothed.

Conium.

ROSMARINUS.—ROSEMARY.

Origin.—*Rosmarinus officinalis*, *Lin.*

Natural order, Labiatae.

Habitat.—Basin of Mediterranean; cultivated.

Description.—Rigid, linear, about 25 millimeters (1 inch) long, entire, revolute, dark green above, woolly and glandular beneath, pungently aromatic, somewhat camphoraceous, and bitter.

Constituents.—Volatile oil about 1 per cent., resin, tannin, bitter principle. The volatile oil is yellowish, spec. grav. 0.90, readily soluble in alcohol, contains a hydrocarbon, $C_{10}O_{16}$, and stearopten, $C_{10}H_{16}O_2$.

Properties.—Carminative, stimulant, diuretic, emmenagogue, diaphoretic.

Dose, 0.2 to 1.0 gram (gr. iij–xv), in infusion.

Fig. 101.



Rosmarinus officinalis, *Lin.* — Branch and flower.

THYMUS.—GARDEN THYME.

Origin.—*Thymus vulgaris*, *Lin.* *Natural order*, Labiatae.

Habitat.—Southern Europe; cultivated.

Description.—Linear or narrow oblong, about 5 millimeters ($\frac{1}{5}$ inch) long, revolute, grayish-green, glandular punctate on both sides, grayish pubescent beneath; aromatic; taste spicy.

Constituents.—Volatile oil about $2\frac{1}{2}$ per cent., spec. grav. .89, readily soluble in alcohol, consists of cymene, $C_{10}H_{14}$, thymene, $C_{10}H_{16}$, and thymol $C_{10}H_{14}O$; the latter melts at $44^{\circ}C.$, and liquefies in contact with camphor.

Properties.—Carminative, tonic, emmenagogue, antispasmodic. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion. Thymol externally as an antiseptic.

Fig. 102.



Boldus.—Natural size.

BOLDUS.—BOLDO.

Origin.—*Boldoa fragrans*, *R. & P.*, s. *Peumus boldus*, *Molina.* *Natural order*, Monimiaceae.

Habitat.—Chili; cultivated.

Description.—Broadly oval or oval-oblong, about 5 centimeters (2 inches) long, obtuse, rough on both sides, glossy above, hairy beneath, often reddish-brown, fragrant; taste pungent aromatic, somewhat bitter.

Constituents.—Volatile oil 2 per cent., boldina $\frac{1}{10}$ per cent., aromatic resin, tannin, etc.

Properties.—Tonic, stimulant. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion or tincture.

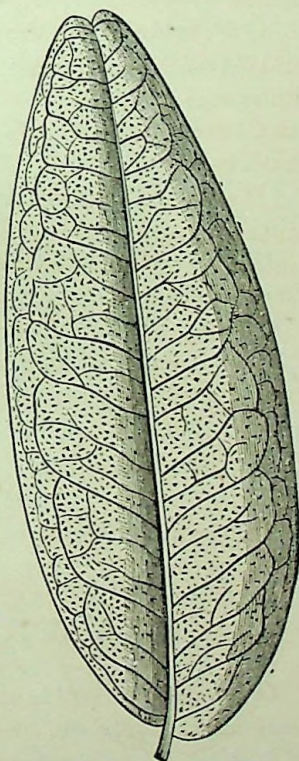
PILOCARPUS.—JABORANDI.

Origin.—*Pilocarpus penatifolius*, *Lemaire*. *Natural order*, Rutaceæ, *Xanthoxylæ*.

Habitat.—Brazil, near Pernambuco.

Description.—Leaves pinnate, with 5 to 11 leaflets, the terminal one nearly equal at base, the others short-stalked, oval or ovate-oblong, about 10 centimeters (4 inches) long, entire, and slightly revolute at the margin, near which the anastomosing veins form one or two wavy distinct lines; obtuse and emarginate; unequal at the base; coriaceous; pellucid-punctate, mostly smooth; when bruised, slightly aromatic, somewhat pungent, and bitter.

Fig. 103.



Pilocarpus.—Leaflet, natural size.

Constituents.—Volatile oil, pilocarpina, $C_{23}H_{33}N_4O_4$, $\frac{1}{4}$ – $\frac{1}{2}$ per cent., amorphous, yields crystallizable salts. The volatile oil is chiefly pilocarpene, $C_{10}H_{16}$.

Properties.—Sialogogue, diaphoretic. *Dose*, 1.0 to 2.0 grams (gr. xv–xxx), in powder or tincture; pilocarpina 0.03 gram (gr. ss).

Other Jaborandis.—*Aubletia trifolia*, *Richard*, and *Xanthoxylum elegans*, *Engler*, of the natural order Rutaceæ. *Serronia jaborandi*, *Gaud.* (contains crystalline jaborandina, $C_{10}H_{12}N_2O_3$), *Piper reticulatum*, *Lin.*, *P. nodulosum*, *Link*, *R. citrifolium*, *Lamarch*, and *Artanthe mollicoma*, *Miquel*, of the natural order Piperaceæ.

LAURUS.—LAUREL, BAY LEAVES.

Origin.—*Laurus nobilis*, *Lin.* *Natural order*, Lauraceæ.

Habitat.—Basin of Mediterranean.

Description.—Oblong or lance-oblong, 5 to 10 centimeters (2 to 4 inches) long, acute at both ends, veined beneath, pellucid-punctate, brownish; aromatic, somewhat bitter.

Constituents.—Volatile oil, tannin, bitter principle.

Properties.—Stimulant, stomachic, astringent.

EUCALYPTUS.—EUCALYPTUS:

Origin.—*Eucalyptus globulus*, *Labillardière*. *Natural order*, Myrtaceæ.

Habitat.—Australia; cultivated in subtropical countries.

Description.—The leaves are collected from rather old trees. Petiolate, lanceolately scythe-shaped, 15 to 30 centimeters (6 to 12 inches) long, rounded and oblique below, tapering above, entire, leathery, gray-green, glandular, feather-veined between the midrib and marginal veins; odor strongly balsamic; taste pungently aromatic, somewhat bitter, and astringent.

Fig. 104.



Eucalyptus globulus, Labill.—A flowering branch, an unexpanded flower, and longitudinal section of same.

The leaves of young trees are broadly oval, obtuse, cordate at base, pale bluish-green, thinner, and less aromatic.

Constituents.—Volatile oil, tannin, ceryllic alcohol, crystallizable fatty acid, crystallizable resin. The volatile oil contains cymol, $C_{10}H_{14}$, two terpenes, $C_{10}H_{16}$, and eucalyptol, $C_{10}H_{16}O$.

Properties.—Febrifuge, stimulant, astringent, antiseptic. *Dose*, 0.3 to 1.0 gram (gr. v–xv), in powder, infusion, tincture, or extract.

MYRCIA.—BAY LEAVES, WILD CLOVE LEAVES.

Origin.—*Myrcia acris*, *D. C.* *Natural order*, Myrtaceæ.

Habitat.—West Indies.

Description.—Elliptic or broadly oval, 5 to 10 centimeters (2 to 4 inches) long, obtuse, reticulate, smooth, pellucid-punctate, aromatic, and spicy.

Constituents.—Volatile oil; it contains a hydrocarbon and eugenic acid.

Properties.—Stimulant, tonic; used for preparing the volatile oil and for bay rum.

AURANTII FOLIA.—ORANGE LEAVES.

Origin.—*Citrus vulgaris*, *Risso.* *Natural order*, Aurantiaceæ.

Habitat.—Asia; cultivated in subtropical countries.

Description.—Oval- or ovate-oblong, 5 to 10 centimeters (2 to 4 inches) long, pointed, smooth, pellucid-punctate; petiole articulate, with a broad obovate or obcordate wing; aromatic, somewhat bitter.

The similar leaves of *Citrus aurantium*, *Risso*, have the petioles narrow-winged or nearly naked.

Constituents.—Volatile oil, bitter principle.

Properties.—Stimulant, tonic.

LEDUM.—LABRADOR TEA.

Origin.—*Ledum latifolium*, *Aiton*. *Natural order*, Ericaceæ.

Habitat.—Canada and Northern United States.

Description.—Elliptic oblong, about 3 centimeters ($1\frac{1}{2}$ inch) long, revolute, rounded or cordate at base, rusty woolly beneath; odor, when bruised, heavy; taste astringent, bitter, somewhat pungent.

Ledum palustre, *Lin.*, Marsh tea, grows in the northern continents; leaves linear or lance-linear, otherwise like *Ledum latifolium*.

Constituents.—Tannin, volatile oil, ericolin, resin, etc. (in *L. palustre*).

Properties.—Astringent, tonic, alterative, in large doses poisonous. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx), in infusion.

UVA URSI.—UVA URSI.

Origin.—*Arctostaphylos uva ursi*, *Sprengel*. *Natural order*, Ericaceæ.

Habitat.—Northern Hemisphere, in dry and sandy places.

Description.—Nearly sessile, obovate or oblong-spatulate, about 2 centimeters ($\frac{4}{5}$ inch) long, obtuse,

slightly revolute on the margin, smooth, glossy on the upper surface, paler and reticulate on the lower surface; odor faint hay-like; taste strongly astringent, somewhat bitter.

Fig. 105.

*Arctostaphylos uva ursi, Spreng.*

Constituents.—Tannin, 6–7 per cent., gallic acid, arbutin, ericolin, ursone (tasteless crystals). Arbutin, $C_{24}H_{32}O_{14}$, bitter needles, soluble in alcohol and hot water; in alkaline solution azure-blue with phosphomolybdic acid; yields glucose and arctuvín, or hydrokinone. Ericolin, $C_{34}H_{56}O_{21}$, yellow, bitter, soluble in water and alcohol; yields glucose and ericinol (volatile oil).

Properties.—Astringent, tonic, diuretic, nephritic.
Dose, 1.0 to 4.0 grams (gr. xv–3j), in decoction or fluid extract.

EPIGÆA.—TRAILING ARBUTUS, GRAVEL PLANT.

Origin.—*Epigæa repens*, *Lin.* *Natural order*, Ericaceæ.

Habitat.—North America, in sandy woods.

Description.—Ovate or suborbicular, cordate, about 5 centimeters (2 inches) long, reticulate, bristly; inodorous; taste astringent and bitter.

Constituents.—Tannin 3–4 per cent., acid resembling gallic acid, arbutin, ericolin, ursone.

Properties and Uses.—Like *uva ursi*.

KALMIA.—MOUNTAIN LAUREL.

Origin.—*Kalmia latifolia*, *Lin.* *Natural order*, Ericaceæ.

Habitat.—North America, damp or rocky woods.

Description.—Elliptic or lance-oval, 5 to 9 centimeters (2 to 3½ inches) long, acute at both ends, smooth and green on both sides; inodorous; taste astringent, bitter.

Constituents.—Tannin, arbutin, resin, etc.

Properties.—Astringent, reputed to be poisonous.

SENNA ALEXANDRINA.—ALEXANDRIA SENNA.

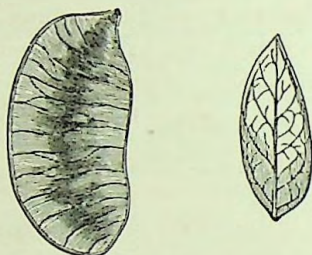
Origin.—*Cassia acutifolia*, *Delile.* *Natural order*, Leguminosæ, Cæsalpinææ.

Habitat.—Eastern and Central Africa.

Description.—Leaves pinnate, with 8 or 10 leaflets,

which are lanceolate or lance-oval, about 25 millimeters (1 inch) long, subcoriaceous, brittle, rather pointed, unequally oblique at the base, entire, grayish-green, nearly smooth; odor peculiar; taste nauseous, bitter.

Fig. 106.



Cassia acutifolia, Del.—Legume and leaflet.

It should be free from stalks and legumes, but often contains argel leaves (from *Solenostemma argel*, Hayne), which are thicker, one-veined, glaucous, and

Fig. 107.



Argel leaf.

Fig. 108.



Coriaria leaf.

Fig. 109.



Tephrosia leaflet.

even at the base. The poisonous three-nerved leaves of *Coriaria myrtifolia*, Lin., have occasionally been

mixed with senna; also the emarginate leaflets of *Tephrosia appolinea*, *D. C.*

SENNA INDICA.—INDIA SENNA.

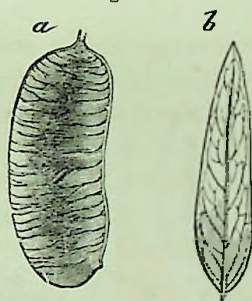
Origin. — *Cassia elongata*, *Lénaire-Lisancourt*.

Natural order, Leguminosæ, Cæsalpineæ.

Habitat.—Eastern Africa to India; cultivated.

Description.—Leaves pinnate, with 8 to 16 leaflets, which are lanceolate, nearly 5 centimeters (2 inches) long, acute, unequally oblique at the base, entire, dull green, slightly pubescent, of a peculiar odor, and a mucilaginous, bitter taste.

Fig. 110.



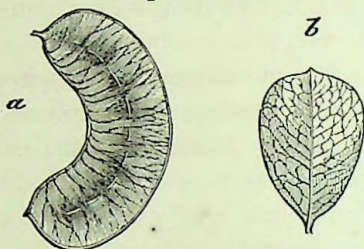
Cassia elongata, *Lém.*—*a.* Legume. *b.* Leaflet.

It should be free from stalks, discolored leaves, and other admixtures.

Varieties.—Alexandria senna sometimes consists in part of the leaflets of *Cassia obovata*, *Colladon*, known as Senna baladi or wild senna, which are obovate or obovate-oblong, mucronulate, rather longer than *C. acutifolia*, and are regarded as less efficacious.

Tripoli senna. Like Alexandria senna, leaflets more broken, free from argel leaves.

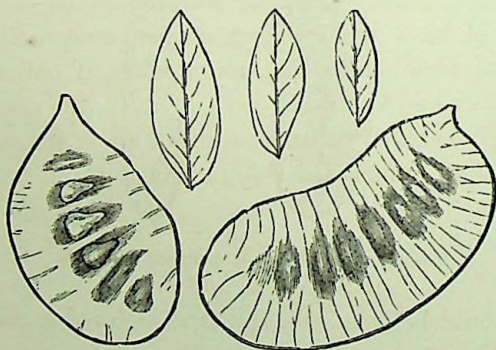
Fig. 111.



Cassia obovata, *Colladon*.—*a*. Legume. *b*. Leaflet.

Tinnevelly senna, the cleanest variety of India senna, carefully dried and unbroken; from cultivated plants.

Fig. 112.



Tripoli senna.—Leaflets and legumes.

Bombay senna, an ordinary or inferior India senna, often mixed with discolored and small leaves.

Mecca senna, like the preceding, leaflets often brown, broken, and mixed with legumes.

Constituents.—Chrysophanic acid, phæoretin, sennacrol, cathartic acid, cathartomannit, mucilage, etc. Cathartic acid is amorphous, black, nearly insoluble in water and alcohol, its alkaline and earthy salts soluble in water, and insoluble in alcohol; mineral acids split it into glucose and cathartogenic acid.

Properties.—Cathartic. *Dose*, 8.0 to 32.0 grams (3ij–3j), in infusion or fluid extract.

CASSIA MARILANDICA.—AMERICAN SENNA.

Origin.—*Cassia marilandica*, *Lin.* *Natural order*, Leguminosæ, Cæsalpineæ.

Habitat.—United States, in low grounds.

Description.—Leaves pinnate, with 12 to 18 leaflets, which are ovate-oblong or elliptic, 25 to 50 millimeters (1 to 2 inches) long, obtuse, uneven at base; odor and taste senna-like, but weaker, if collected in September and October.

Constituents.—Probably similar to senna. *Dose*, 16.0 to 50.0 grams (3ss–jss), in infusion.

SESAMUM.—BENNE.

Origin.—*Sesamum indicum*, *Lin.* *Natural order*, Pedaliacæ.

Habitat.—India; cultivated.

Description.—Petiolate, ovate-oblong or oblong-lanceolate, pointed, rounded or somewhat heart-shaped at the base, entire, sometimes with a few

teeth or two basal lobes, prominently veined, smoothish, mucilaginous. Used only in the fresh state.

Fig. 113.



Sesamum indicum, *Lin.*—*a.* Flowering branch. *b.* Section of seed.

Constituents.—Mucilage.

Properties.—Demulcent; used in infusion in dysentery, etc.

ERYTHROXYLON.—COCA.

Origin.—*Erythroxylon coca*, *Lamarch.* *Natural order*, *Erythroxylacæ.*

Habitat.—Peru, Bolivia; cultivated.

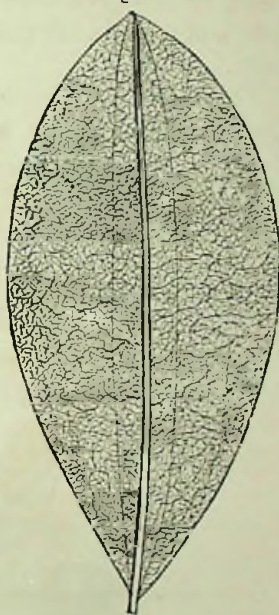
Description.—Oval or obovate-oblong, 50 to .75 millimeters (2 to 3 inches) long, short-petiolate, entire, rather obtuse or emarginate at apex, reticulate on both sides, with a prominent midrib, and on

each side of it with a curved line (fold of the blade) running from base to apex; odor slight, tea-like; taste somewhat bitter and aromatic.

Constituents. — Cocaina, hygrina (volatile, oily), cocatannic acid. Cocaina, $C_{17}H_{21}NO_4$, colorless, bitter prisms, soluble in alcohol and ether, also in water; with strong HCl yields methylalcohol, benzoic acid, and ecgonina, which is sweetish, bitter, and insoluble in alcohol.

Properties. — Stimulant, diaphoretic. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in substance, infusion, fluid extract; usually combined with an alkali.

Fig. 114.



Coca.—Lower surface, natural size.

BELLADONNÆ FOLIA.—BELLADONNA LEAVES. DEADLY NIGHTSHADE.

Origin.—*Atropa belladonna*, *Lin.* *Natural order*, Solanaceæ.

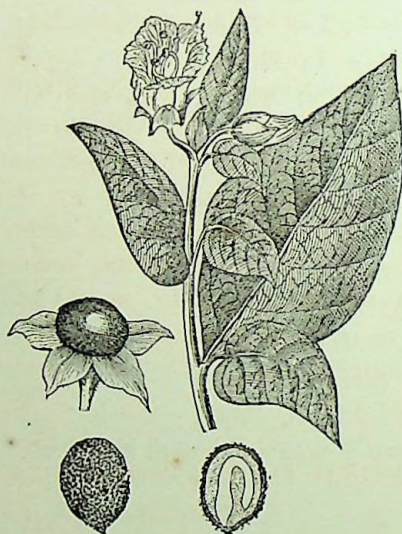
Habitat.—Europe.

Description.—Ovate-oblong or broadly ovate, 10 to 15 centimeters (4 to 6 inches) long, narrowed into a petiole, tapering at the apex, entire, smooth, thin,

upper surface brownish-green, lower surface grayish-green, of a slight odor, and of a bitterish, disagreeable taste.

Constituents.—Atropia (heavy atropia) 0.4 per cent. (see Belladonna root), mucilage, wax, albumen, asparagin(?), ash 14 per cent. The light atropia is identical with hyoseyamia.

Fig. 115.



Atropa belladonna, *Lin.*—Branch, fruit, seed, and section of seed, the last two magnified.

Properties.—Diuretic, dilating the pupil, narcotic.
Dose, 0.03 to 0.2 gram (gr. ss-ijj).

TABACUM.—TOBACCO.

Origin.—*Nicotiana tabacum*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Tropical America; cultivated.

Description.—The commercial dried leaves are used. Oval or ovate-lanceolate, sometimes 50 centimeters (20 inches) long, acute, entire, brown, friable, glandular-hairy; odor heavy, peculiar; taste nauseous, bitter, and acrid.

Constituents.—Nicotina, $C_{10}H_{14}N_2$, 2 to 8, sometimes 11 per cent.; nicotianin, resin, albumen, gum, extractive, ash 14 to 18, occasionally 27 per cent. Nicotina is colorless, becomes rapidly brown, is pungently acrid, soluble in water, alcohol, and ether.

Properties.—Diuretic, sedative, emetic, narcotic. *Dose*, 0.03 to 0.13 gram (gr. ss-ij); as emetic, 0.3 gram (gr. v), in powder, infusion, or wine; externally as sternutatory, enema, etc.

STRAMONII FOLIA.—STRAMONIUM LEAVES.
HENBANE.

Origin.—*Datura stramonium*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Asia; naturalized in most countries.

Description.—Petiolate, ovate, about 15 centimeters (6 inches) long, smooth, pointed, unequal at the base, coarsely and sinuately angular-toothed; after drying thin, brittle, and nearly inodorous; taste unpleasant, bitter, and nauseous.

Constituents.—Daturia (heavy and light) 0.02 per cent., mucilage, albumen, ash 17 per cent. Daturia closely resembles atropia, which is optically inactive, and is not precipitated by picric acid; while the

Fig. 116.



Datura stramonium, *Lin.*—Flowering branch.

former is levogyre, is precipitated by picric acid, and is physiologically twice as strong as atropia. Light daturia predominates, and is identical with hyoseyama.

Properties.—Diuretic, dilating the pupil, narcotic. *Dose*, 0.06 to 0.13 gram (gr. j-ij), in powder or extract.

HYOSCYAMI FOLIA.—HYOSCYAMUS LEAVES.
HENBANE.

Origin.—*Hyoscyamus niger*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Europe and Asia; naturalized in some parts of North America.

Fig. 117.

*Hyoscyamus niger*, *Lin.*—Flowering branch.

Description.—Ovate or ovate-oblong, sometimes 25 centimeters (10 inches) long, and 10 centimeters (4 inches) broad, sinuate-toothed, the teeth large, oblong or triangular; grayish-green, hairy; midrib promi-

ment; odor heavy narcotic; taste bitter, somewhat acrid.

Constituents.—Hyoscyamia (two alkaloids), hyoscyperin, $C_{27}H_{32}O_{14}$, mucilage, albumen. Hyoscyamia, $C_{15}H_{23}NO_3$, is crystalline, soluble in water, alcohol, and ether, and with baryta splits into hyoscinic acid and hyoscina, $C_6H_{13}N$. The second alkaloid is amorphous.

Properties.—Anodyne, hypnotic, dilates the pupil, narcotic. *Dose*, 0.13 to 0.6 gram (gr. ij-x), in powder, tincture, fluid extract, or extract.

DIGITALIS.—DIGITALIS, FOXGLOVE.

Origin.—*Digitalis purpurea*, *Lin.* *Natural order*, Scrophulariaceæ.

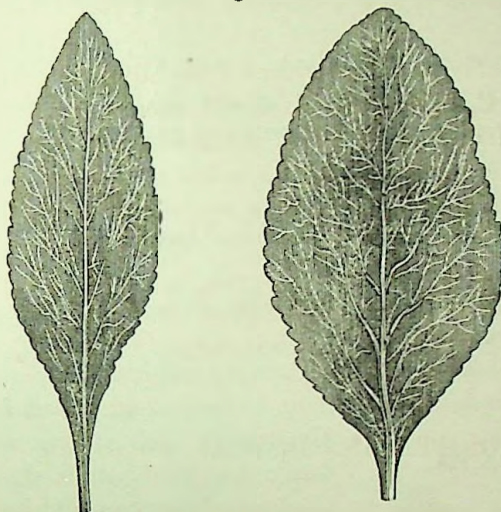
Habitat.—Europe, in sandy soil on the edges of woods.

Description.—The leaves are collected from plants of the second year's growth. Ovate-oblong, narrowed into a petiole; from 10 to 30 centimeters (4 to 12 inches) long; crenate, downy; dull green and wrinkled above; paler and whitish reticulate beneath; midrib near the base broad; odor faint, tea-like; taste bitter, nauseous.

Constituents.—Digitalin, resin, mucilage, extractive, inosit, pectin. The officinal digitalin is a mixture of several compounds, of which digitoxin is crystallizable.

Properties. — Diuretic, sedative, narcotic. *Dose*, 0.06 to 0.13 gram (gr. j-ij), in powder, infusion, tincture, or extract.

Fig. 118.



Digitalis.—Leaf of the first and of the second year's growth.

MATICO.—MATICO.

Origin.—*Artanthe elongata*, Miquel.
Natural order, Piperaceæ.

Habitat.—Tropical America.

Description. — Short-petiolate, oblong lanceolate, 10 to 15 centimeters (4 to 6 inches) long, pointed, unequally heart-shaped, very finely crenulate, tessellated above, reticulate and rough beneath, the meshes small, and the veins densely brownish-hairy; aromatic, spicy, and bitterish.

The leaves of *Artanthe adunca* are not tessellated, rough, and hairy, like true matico.

Constituents.—Volatile oil $1\frac{1}{2}$ per

Fig. 119.

Matico — $\frac{1}{2}$ nat. size.

cent., pungent resin, artanthic acid, tannin, mucilage, etc.

Properties.—Stimulant, tonic, vulnerary, styptic. *Dose*, 1.0 to 4.0 grams (gr. xv- $\text{\textcircled{3}}\text{j}$), in powder, infusion, or extract; also externally as a styptic.

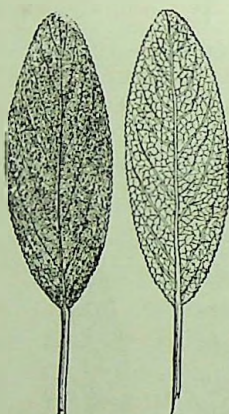
SALVIA.—SAGE.

Origin.—*Salvia officinalis*, *Lin.* *Natural order*, Labiatae.

Habitat.—Southern Europe; cultivated.

Description.—Petiolate, ovate-oblong, about 5 centimeters (2 inches) long, obtuse, finely crenulate, thickish, wrinkled, grayish-green, and beneath soft hairy and glandular; aromatic, bitterish, somewhat astringent.

Fig. 120.



Salvia.—Natural size, upper and lower surface.

Constituents.—Volatile oil $\frac{1}{2}$ – $\frac{3}{4}$ per cent., resin, tannin, albumen, extractive, etc. The volatile oil is of spec. grav. .88, freely soluble in alcohol, and contains a terpene and salviol.

Properties.—Stimulant, tonic, astringent, vulnerary. *Dose*, 1.0 to 4.0 grams (gr. xv- $\text{\textcircled{3}}\text{j}$), in infusion; externally as a gargle, etc.

THEA.—TEA.

Origin. — *Camellia Thea*, *Link.* *Natural order*, Ternstroëmiaceæ.

Habitat.—Southeastern Asia; cultivated.

Description.—Short-petiolate, oval or oblanceolate, 25 to 50 or 75 millimeters (1 to 2 or 3 inches) long, acute at both ends, or obtuse above, irregularly sinuate serrate, the lateral nerves anastomosing near the margin; odor agreeable, peculiar; taste pleasantly astringent and bitterish. In commerce the leaves are rolled; bluish-green or blackish.

Adulterations with other leaves are recognized by the shape, the character of the venation, and the serratures on the margin.

Constituents.—Volatile oil 0.6–1.0 per cent., theina (identical with caffeine) 1½–4 per cent., boheic acid, albumen, wax, resin, etc.

Properties.—Astringent, tonic, stimulant, nervine.

Dose, 2.0 to 8.0 grams (3ss–ij), in infusion.

CASTANEA.—CHESTNUT LEAVES.

Origin.—*Castanea vesca*, *Lin.* *Natural order*, Cupuliferæ.

Description.—From 15 to 25 centimeters (6 to 10 inches) long, about 5 centimeters (2 inches) wide, petiolate, oblong-lanceolate, acuminate, mucronate, feather-veined, sinuate serrate, smooth, of a slight odor, and a somewhat astringent taste.

They should be collected in September or October, while still green.

Constituents.—Tannin.

Properties.—Tonic, mild sedative. *Dose*, 2.0 to 8.0 grams (5ss-ij), in infusion or fluid extract, in whooping-cough.

CHIMAPHILA.—PIPSISSEWA, PRINCE'S PINE.

Origin.—*Chimaphila umbellata*, Nuttall. *Natural order*, Ericaceæ.

Habitat.—Northern continents.

Description.—Oblanceolate, about 5 centimeters (2 inches) long, sharply serrate above, wedge-shaped and nearly entire towards the base; coriaceous, smooth, dark-green on upper surface; nearly inodorous, and of an astringent and bitterish taste.

The leaves of the spotted pipsissewa, *Chim. maculata*, Pursh, indigenous to North America, are lanceolate or ovate-lanceolate, about 5 centimeters (2 inches) long, serrate, and upon the upper surface variegated with white.

Constituents.—Arbutin, ericolin, urson, tannin, chimaphilin (yellow, tasteless, volatile prisms), sugar, gum, etc.

Properties.—Astringent, tonic, diuretic, nephritic. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in decoction or fluid extract.

GAULTHERIA.—GAULTHERIA, WINTERGREEN.

Origin.—*Gaultheria procumbens*, *Lin.* *Natural order*, Ericaceæ.

Description.—Short-petiolate, obovate or roundish-oval, about 4 centimeters ($1\frac{3}{4}$ inch), and 2 centimeters ($\frac{4}{5}$ inch) or more broad, mucronate, slightly serrate with appressed teeth, coriaceous, smooth, glossy-green above, paler beneath; fragrant; taste aromatic and astringent.

Constituents.—Volatile oil, arbutin, ericolin, urson, tannin, sugar, gum, etc. The volatile oil is of spec. grav. 1.17, readily soluble in alcohol, colored dark purple by ferric chloride in alcoholic solution, and with nitric acid yields colorless prisms; it consists of gaultherilene, $C_{10}H_{16}$, and mainly of methyl salicylate, $CH_3.C_7H_5O_3$.

Properties.—Stimulant, astringent, diuretic, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in infusion.

Fig. 121.



Gaultheria.—Natural size.

LAUROCERASUS.—CHERRY LAUREL.

Origin.—*Prunus* (*Cerasus*, *Loiseleur*) *Laurocerasus*, *Lin.* *Natural order*, Rosaceæ, Amygdaleæ.

Habitat.—Western Asia; cultivated in Southern Europe.

Description.—Short-petiolate, oblong or oblong-lanceolate, acute, somewhat revolute, distantly sharply serrate, underneath near the base one to three pairs of depressed glands; odor (when bruised) bitter almond-like; taste aromatic bitter.

Constituents.—Compound of amygdalin(?), emulsin, bitter principle, tannin, sugar, gum; after bruising and macerating in water, yield hydrocyanic acid and volatile oil, consisting of benzaldehyd, C_7H_6O .

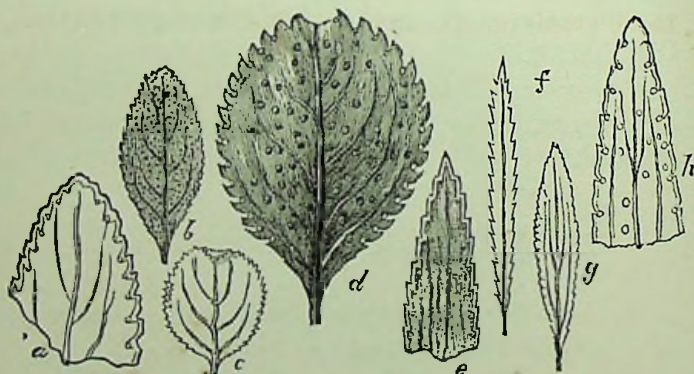
Properties.—Sedative; used for making cherry laurel-water.

BUCHU.—BUCHU.

Origin.—*Barosma betulina*, *Bartling*, *Bar. crenulata*, *Hooker*, and *Bar. serratifolia*, *Willdenow*. *Natural order*, Rutaceæ.

Habitat.—Southern Africa.

Fig. 122.



Buchu.—*a, b.* *Barosma crenata*, *Kze.* *c, d.* *Bar. betulina*, *Bartl.* *g, h.* *Bar. serratifolia*, *Willd.* *e, f.* *Empleurum serrulatum*, *Ait.* *b, c, f, g*, natural size.

Description. — Roundish-obovate, with a rather wedge-shaped base (*B. betulina*), or varying between oval and obovate (*B. crenulata*), about 2 to 3 centimeters ($\frac{4}{5}$ – $1\frac{1}{5}$ inch) long, obtuse, crenate or serrate, with a gland at the base of each tooth, pale green, thickish, pellucid-punctate; strongly aromatic, somewhat mint-like, pungent, and bitterish.

The leaves of *Bar. serratifolia* are about 3 to 4 centimeters ($1\frac{1}{5}$ – $1\frac{3}{5}$ inch) long, thinner, linear-lanceolate, obtuse—otherwise like the preceding.

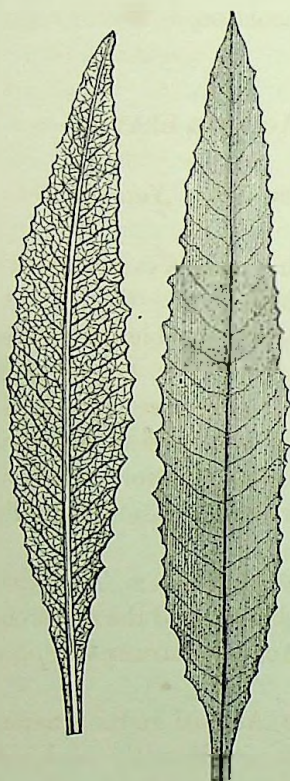
Varieties.—Short buchu from *B. betulina* and *B. crenulata*; long buchu from *B. serratifolia*. The latter are sometimes mixed with the very similar leaves of *Empleurum serrulatum*, *Ait.* (*Natural order*, Rutaceæ), which are narrow linear, and, at the apex, acute and glandless.

Constituents.—Volatile oil (1.2–1.6 per cent. from short, 0.66 from long buchu; the stearopten has a peppermint odor), resin, mucilage, bitter principle, rutin(?), etc.

Properties.—Stimulant, tonic, diuretic. *Dose*, 1.0 to 2.0 grams (gr. xv–xxx), in infusion or fluid extract.

ERIODICTYON.—ERIODICTYON.

Fig. 123.



Eriodictyon.—Natural size, lower and upper surface.

Origin.—Eriodictyon californicum, *Benth.* *Natural order,* Hydrophyllaceæ.

Habitat.—California.

Description.—Elliptic-lanceolate, 5 to 10 centimeters (2 to 4 inches) long, rather acute, more or less sinuately dentate; upper surface smooth, green, and varnished; lower surface reticulate and white-hairy; somewhat aromatic and balsamic, free from bitterness.

Constituents.—Volatile oil, resin.

Properties.—Expectorant.

Dose, 2.0 to 4.0 grams (3ss-j), in decoction or fluid extract.

HEPATICA.—LIVERWORT.

Origin.—Hepatica triloba, *Chaix.* *Natural order,* Ranunculaceæ.

Habitat.—North America and Europe, in woods.

Description.—Broad kidney-heart-shaped, about 5 centimeters (2 inches) long, petiolate, three-lobed, the lobes obtuse or acute; rather leathery, smooth, and

dark green above; inodorous, insipid, slightly astringent, and bitterish.

Constituents.—Mucilage, sugar, little tannin.

Properties.—Demulcent, deobstruent, tonic. *Dose*, 2.0 to 8.0 grams (3ss-ij), in decoction.

ACONITI FOLIA.—ACONITE LEAVES.

Origin.—*Aconitum napellus*, *Lin.* *Natural order*, Ranunculacæ.

Habitat.—Europe, Northern Asia, Western North America, in mountainous regions.

Description.—Leaves petiolate, suborbicular, somewhat cordate, 5 to 10 centimeters (2 to 4 inches) in diameter, smooth, palmately three- or five-parted, the segments narrow-wedge-shaped and incised, the divisions linear-lanceolate and toothed; petiole and midrib with a furrow above; odor slight; taste gradually bitter, acrid, tingling.

The leaves of *Aconitum Stoerckianum*, *Reichenb.*, have the parts broadly wedge-shaped and the divisions lanceolate. The leaves of *Ac. cammarum*, *Jacquin*, have rhomboid segments.

Constituents.—Aconitia (see *Aconiti radix*), napellina, gum, sugar, albumen, tannin, aconitic acid, ash 16 per cent.

Properties.—Anodyne, sedative, poisonous. *Dose*, 0.06 to 0.20 gram (gr. j-ij), in powder or extract.

TOXICODENDRON.—POISON OAK.

Origin.—*Rhus Toxicodendron*, *Lin.* *Natural order*, Terebinthaceæ.

Habitat.—North America.

Description.—Long-petioled, trifoliolate; the lateral leaflets sessile, about 10 centimeters (4 inches) long, obliquely-ovate, pointed; the terminal leaflet stalked, ovate or oval, pointed, with a wedge-shaped base; all leaflets either entire or variously notched, coarsely toothed or lobed, downy beneath; after drying papery and brittle; inodorous, somewhat astringent, and acrid.

Constituents.—Toxicodendric acid (volatile, reduces gold from the chloride), tannin, fixed oil, wax, mucilage, etc.

Properties.—Irritant, rubefacient; in paralysis, etc.

Dose, 0.12 to 0.3 gram (gr. ij-v), gradually increased, in powder or tincture.

MENYANTHES.—BUCKBEAN, BOGBEAN.

Origin.—*Menyanthes trifoliata*, *Lin.* *Natural order*, Gentianaceæ.

Habitat.—Temperate Northern Hemisphere, in bogs.

Description.—Long-petioled, trifoliolate; leaflets sessile, about 5 millimeters (2 inches) long, obovate-oblong, obtuse, narrowed below, entire or somewhat crenate, smooth, pale green; inodorous, bitter.

Constituents.—Menyanthin (amorphous, precipitated

by tannin, insoluble in ether, glucoside, yields menyanthol, having a bitter almond odor), mucilage, albumin, sugar, etc.

Properties. — Tonic, antiscorbutic, emmenagogue, vermifuge, febrifuge. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in decoction or extract.

RUTA.—RUE.

Origin. — *Ruta graveolens*, *Lin.* *Natural order*, Rutaceæ.

Habitat.—Southern Europe; cultivated.

Description.—Petiolate, triangular-ovate in outline, 5 to 10 centimeters (2 to 4 inches) long, the upper ones pinnatifid, the others twice or thrice pinnate, the divisions thickish, spatulate or obovate-oblong, sparingly crenate, the terminal ones larger, smooth, finely pellucid-punctate, aromatic, balsamic, bitter, somewhat acrid.

Constituents.—Volatile oil $\frac{1}{4}$ per cent., rutin, $C_{12}H_{18}O_6$ (splits into sugar and quercetin), resin, etc. The volatile oil is greenish-yellow, freely soluble in alcohol, consists chiefly of methyl-nonyl-ketone, $CH_3.CO.C_9H_{19}$, and with nitric acid yields œnanthyllic, caprylic, peltargonic, and caprinic acids.

Properties. — Irritant, stimulant, emmenagogue, nervine. *Dose*, 0.3 to 1.3 gram (gr. v–xx), in infusion.

CONII FOLIA.—CONIUM, HEMLOCK.

Origin.—Conium maculatum, *Lin.* *Natural order,* Umbelliferae, Campylospermæ.

Habitat.—Asia and Europe; naturalized in North America, in waste and moist places.

Description.—Petioles hollow and sheathing, upper leaves sessile, broadly triangular-ovate in outline, 10 to 20 centimeters (4 to 8 inches) long, pinnately twice or thrice decomposed, pinnae oblong-lanceolate, pointedly toothed or incised; thin, gray-green, smooth; odor and taste disagreeable, narcotic.

Constituents.—Conia (a minute quantity), volatile oil (not poisonous), albumen, mucilage, ash 12 per cent.

Properties.—Sedative, narcotic. *Dose,* 0.3 gram (gr. v); much larger doses have produced little effect.

7. HERBS.—HERBÆ.

Under this heading all those drugs are comprised which are usually met with in commerce having those organs which are necessary for their botanical identification. Besides the few medicinal cryptogams, all medicinal herbs are dicotyledons. Cryptogams which are employed in a partially developed state, or in a condition unsuited for botanical identification, will be found in Class 12.

Classification.

Sect. I. Thallogens. Plants destitute of fibro-vascular tissue and flowers.

Thallus flattened, with air-vesicles in pairs.

Fucus

vesiculosus.

Thallus compressed, the air-vesicles single.

Fucus nodosus.

Thallus filiform, flattened above, repeatedly forked, margin crisped.

Chondrus.

Thallus flattened, lobed, and toothed; brownish above, whitish beneath.

Cetraria.

Sect. II. Dicotyledons.

1. Petals distinct.

a. Petals five or four; stamens more than five; leaves alternate.

Leaves with linear acute lobes; akenes numerous, tipped with a long hairy style.

Pulsatilla.

Base of stem tuberous; leaves three divided; akenes numerous, short-beaked.

Ranunculus.

Rhizome golden yellow; leaves trifoliate; foliicles 7, few seeded.

Coptis.

Leaves lyrate-pinnatifid; capsule linear.

Chelidonium.

Stem somewhat woody; leaves simple; capsule several- or many-seeded.

Helianthemum.

Twigs pentangular; leaves small trifoliate; stamens monadelphous.

Scoparius.

b. Petals five, one-spurred; stamens five.

Leaves with foliaceous pinnatifid stipules.

Viola tricolor.

2. Petals united.

a. Flowers in a close head on a receptacle surrounded by an involucre.

Pappus slender bristly; leaves lanceolate, connate-perfoliate.

Eupatorium.

leaves alternate; rays numerous, very narrow, purplish or whitish.

Erigeron.

rays inconspicuous, not longer than pappus.

Erig.

Canadense.

florets yellow; heads in recurved racemes, small.

Solidago.

Pappus three awns; florets yellow; rays conspicuous.

Grindelia.

- Pappus none, or a short crown; leaves alternate; rays white; receptacle conical, chaffy.
 rays white; receptacle flat, chaffy.
 rays yellow; receptacle convex, naked.
 rays none; receptacle small, hairy.
 rays yellow; receptacle flat, naked.
- b. Flowers not in heads; corolla more or less two-lipped.
- Leaves alternate; stamens 5, forming a tube.
- Leaves opposite, glandular; lips nearly equal; stamens 4; inflorescence terminal; spikes slender, acute.
 spikes conical, obtuse.
- stamens 2; flowers in axillary whorls.
 upper lip erect; stamens 2, exserted; inflorescence cymose.
 stamens 4, exserted; inflorescence spicate.
 inflorescence corymbose, bracts reddish.
 inflorescence clustered, spicate, bracts gray-green.
- corolla short, slightly 2-lipped, stamens 4; inflorescence spicate; leaves small linear.
 leaves small ovate.
- corolla curved, two-lipped; stamens 4, upper pair shorter; flowers in axillary whorls.
- corolla small, two-lipped; filaments 4, only two with anthers.
- corolla long, with narrow lips; stamens 2; bracts variegated.
- upper lip arched; stamens 4, the lower pair shorter; floral leaves bract-like.
- upper lip erect; stamens 4, short; flowers in dense axillary whorls.
- stamens 4; calyx lips entire, upper one with helmet-like projection.
- Cotula.
 Achillea.
 Tanacetum.
 Absinthium.
 Calendula.
- Lobelia.
- Mentha viridis.
 Mentha piperita.
 Lycopus.
- Cunila.
- Hyssopus.
- Origanum.
- Majorana.
- Thymus (see Leaves).
 Serpyllum.
- Melissa.
- Hedeoma.
- Monarda.
- Cataria.
- Marrubium.
- Scutellaria.

c. Flowers not in heads; corolla rotate.

Leaves opposite sessile, oblong-ovate,
acute (or linear-oblong).

Sabbatia.

obovate-oblong obtuse.

Centaurium.

ovate-acuminate; drug brown.

Chiretta.

3. Petals absent.

Leaves digitate; leaflets lanceolate, acute
serrate.

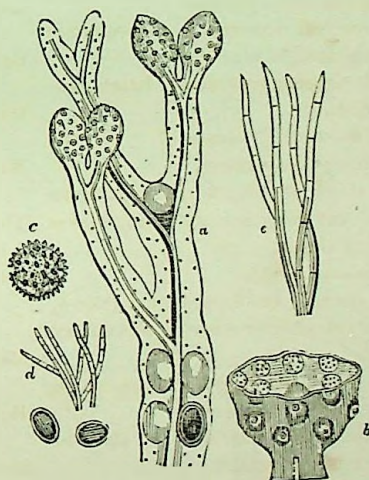
Cannabis.

FUCUS VESICULOSUS.—BLADDER-WRACK.

Origin.—*Fucus vesiculosus*, *Lin.* *Natural order*
Algæ.

Habitat.—Atlantic Ocean.

Fig. 124.



Fucus vesiculosus, *Lin.*—*b.* Section of a receptacle. *c.* Conceptacle.
d, e. Filaments and spores.

Description.—About 1 meter (40 inches) long, and
15 millimeters ($\frac{3}{8}$ inch) broad, flattened, branched,

with a midrib and the air-vesicles in pairs, blackish ; odor like sea-weeds ; taste mucilaginous, saline.

Fucus nodosus, *Lin.*, is narrow, without midrib, air-vesicles single, otherwise like the preceding.

Constituents.—Organic matter 62, ash 16, moisture 22 per cent. Organic principles : mucilage, mannit, fat, etc. Ash: chlorides, bromides, iodides, phosphates, and sulphates.

Properties.—Alterative. *Dose*, about 8 grams (3ij), in decoction ; recommended in obesity.

CHONDRUS.—IRISH MOSS.

Origin.—*Chondrus crispus*, *Lyngbye*, and *Chondrus mammilosus*, *Greville*. *Natural order*, Algæ.

Habitat.—Atlantic Ocean.

Fig. 125.



Chondrus crispus.

Description.—Yellowish or whitish, horny, translucent, when softened in water cartilaginous, many-

forked, segments flat, wedge-shaped or linear, at the apex emarginate or two-lobed; spore vessels imbedded in the frond, in *Ch. mammilosus* short-stipitate; odor slight seaweed-like; taste mucilaginous, somewhat saline.

One part of it boiled for ten minutes with 30 parts of water yields a solution which gelatinizes on cooling.

Constituents.—Aside from moisture, consists almost wholly of mucilaginous compounds and 8–15 per cent. ash, chiefly chlorides, sulphates, and phosphates, with traces of bromides and iodides.

Properties.—Demulcent, somewhat nutritive. *Dose*, 4 to 8 grams (5j–ij), in decoction or jelly.

CETRARIA.—Iceland Moss.

Origin.—*Cetraria islandica*, *Acharius*. *Natural order*, Lichenes.

Habitat.—Northern hemisphere.

Description.—Five to ten centimeters (2 to 4 inches) long, foliaceous, with fringed and channelled lobes, brownish above, whitish beneath, brittle and inodorous; when softened in water, cartilaginous and of a slight odor; taste mucilaginous and bitter.

Pine leaves, mosses, and other lichens, which are frequently found mixed with it, should be removed.

Constituents.—Lichenin, $C_{12}H_{20}O_{10}$, 70 per cent., cetraric acid, $C_{18}H_{16}O_8$, 2 per cent. (crys-

Fig. 126.



Cetraria islandica.

talline, bitter), lichenstearic acid, $C_{14}H_{34}O_3$, 1 per cent., fumaric acid, oxalic acid, sugar, cellulose 16 per cent., ash 1-2 per cent.

Properties.—Demulcent, tonic, nutritive. *Dose*, 4.0 to 8.0 grams (3j-ij), in decoction or jelly.

PULSATILLA.—PULSATILLA.

Origin.—Anemone (Pulsatilla, *Miller*) pratensis, *Lin.*; An. Pulsatilla, *Lin.*; and An. patens, *Lin.*, var. Nuttalliana, *Gray*. *Natural order*, Ranunculacæ.

Habitat.—Europe, the variety Nuttalliana in Western North America.

Description.—Leaves radical, petiolate, silky-vil-
lous, twice or thrice deeply three-parted or pinnately
cleft, with linear acute lobes, appearing after the large
purple (or in the last-named species sometimes whit-
ish) flowers; akenes numerous, prolonged into the
hairy style; inodorous; very acrid.

The herb should be collected shortly after flower-
ing, carefully preserved, and not kept longer than one
year.

Constituents.—Acrid, volatile oily substance, easily
converted into anemonin, $C_{15}H_{12}O_6$ (crystalline, when
melted very acrid), and anemonic acid, $C_{15}H_{14}O_7$ (crys-
talline, tasteless).

Properties.—Irritant, diuretic, diaphoretic, expec-
torant, dilating the pupil; poisonous. *Dose*, 0.12 to
0.6 (gr. ij-x), in powder, tincture, or extract.

RANUNCULUS.—CROWFOOT. BUTTERCUPS.

Origin.—*Ranunculus bulbosus*, *Lin.* *Natural order*, Ranunculaceæ.

Habitat.—Europe, naturalized in North America, in grassy places.

Description.—Base of stem tuberous; radical leaves with sheathing petioles, ternate, the lateral divisions sessile, rhomboid-wedge-shaped, three-cleft, hairy; stem leaves smaller; flowers yellow, 5-petalous, with a reflexed calyx, numerous stamens and ovaries, the latter forming akenes with a short curved beak; inodorous; taste very acrid.

Ranunculus repens, *Lin.*, not bulbous; leaflets stalked; akenes straight-beaked.

Ran. acris, *Lin.*, not bulbous, leaflets sessile; akenes with a sharp curved beak.

Constituents.—Yellow, volatile oily liquid, readily converted into anemonin and anemonic acid.

Properties.—Irritant, diuretic, externally used as a counter irritant.

COPTIS.—GOLDTHREAD.

Origin.—*Coptis trifolia*, *Salisbury.* *Natural order*, Ranunculaceæ.

Habitat.—Northern continents.

Description.—Rhizome filiform, golden yellow, with very thin rootlets; leaves radical, from a scaly base, petiolate, trifoliate, the leaflets about 1 centimeter ($\frac{2}{3}$ inch) long, wedge-obovate, obtusely three-lobed and

mucronately crenate; flowers single, yellowish; fruit about seven follicles, containing a few black seeds; inodorous, strongly bitter.

Constituents.—Berberina, coptina (white alkaloid), resin, sugar, etc. Ash 4–5 per cent.; no tannin.

Properties.—Tonic. *Dose*, 1.0 to 4.0 grams (gr. xv–℥j), in decoction.

CHELIDONIUM.—CELANDINE.

Origin.—Chelidonium majus, *Lin.* *Natural order*, Papaveraceæ.

Habitat.—Europe; naturalized in North America; in waste and cultivated grounds.

Description. — Root several-headed, red-brown; stem about 50 centimeters (20 inches) high, hairy; leaves 10 to 20 centimeters (4 to 8 inches) long, the upper ones sessile, light green above, glaucous beneath, lyrate-pinnatifid, the pinnæ ovate-oblong, obtuse, coarsely crenate or incised, the terminal one often three-lobed; petals 4, yellow; capsule linear, two-valved, one-celled, many-seeded; odor, when fresh, unpleasant; taste acrid. The whole plant contains a saffron-colored milk-juice.

Constituents. — Chelerythrina (identical with sanguinarina), chelidonina, $C_{19}H_{17}N_3O_3$ (crystalline, bitter, acrid, the salts colorless), chelidoxanthin (yellow bitter needles), chelidoninic (succinic?) acid.

Properties. — Diuretic, cathartic. *Dose*, 1 to 4 grams (gr. xv–℥j), the extract 0.5 to 1.0 gram (gr. viij–xv); the milk-juice externally as a caustic.

HELIANTHEMUM.—FROSTWORT.

Origin.—*Helianthemum canadense*, Michaux, and *Helianthemum corymbosum*, Michaux. *Natural order*, Cistaceæ.

Habitat.—North America, in sandy woods and fields.

Description. — About 30 centimeters (12 inches) high; stem rigid, slender, hairy; leaves alternate, entire, elliptic or linear-lanceolate, about 2 centimeters ($\frac{1}{2}$ inch) long, woolly beneath; flowers of two kinds, the earlier ones single with five large yellow caducous petals; the later ones in hoary clusters, nearly sessile, apetalous; inodorous, bitterish, astringent.

The second species is very similar, but has the stem branched from the base, the leaves narrower, densely tomentose underneath, the flowers all clustered at the summit, the apetalous ones being in glomerate terminal cymes.

Constituents.—Tannin, bitter principle.

Properties.—Tonic, astringent, alterative. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in decoction.

SCOPARIUS.—BROOM.

Origin.—*Sarothamnus Scoparius*, Koch. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Western Asia, Southern and Western Europe.

Description. — Thin flexible twigs, pentangular, winged, nearly smooth, tough, usually free from leaves, which are small trifoliate, the leaflets obovate-

oblong; flowers racemose, yellow, with ten monadelphous stamens; odor, when bruised, peculiar; taste disagreeably bitter.

Constituents.—Volatile oil, scoparin, $C_{21}H_{22}O_{10}$ (tasteless), sparteina, $C_{15}H_{25}N_2$ (colorless bitter oil), tannin, fat, wax, sugar, ash 5–6 per cent.

Properties.—Diuretic, somewhat narcotic, in large doses emetic. *Dose*, 1.0 to 2.0 grams (gr. xv–xxx), in decoction.

VIOLA TRICOLOR.—PANSY. HEART'S EASE.

Origin.—*Viola tricolor*, *Lin.* *Natural order*, Violaceæ.

Habitat.—Europe, North America, and Northern Asia; cultivated.

Description.—Stem 15 to 30 centimeters (6 to 12 inches) high, angular, nearly smooth; leaves alternate, petiolate, ovate or oblong, crenate; stipules leaf-like, pinnatifid; petals shorter or longer than the calyx, variegated, forming one obtuse spur; inodorous; taste mucilaginous, somewhat bitter and acrid.

Constituents.—Mucilage, sugar, bitter principle, resin, etc.

Properties.—Alterative, expectorant, in large doses emetic. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in decoction or extract.

EUPATORIUM.—THOROUGHWORT. BONESET.

Origin.—*Eupatorium perfoliatum*, *Lin.* *Natural order*, Compositæ.

Habitat.—North America, in low grounds.

Description.—Leaves opposite, united at base, lanceolate, 10 to 15 centimeters (4 to 6 inches) long, tapering, crenately serrate, rugosely veined, rough above, downy and resinous dotted beneath; flower heads corymbed, numerous, with an oblong involucre of lance-linear scales, and with 10 to 15 tubular white florets, having a bristly pappus in a single row; odor aromatic, weak; taste astringent and strongly bitter.

Constituents.—Eupatorin (bitter glucoside), volatile oil, tannin, gum, sugar, etc.

Properties.—Stimulant, tonic, diaphoretic, laxative, emetic. *Dose*, 2.0 to 4.0 grams (5ss-j), in infusion.

ERIGERON.—ERIGERON. FLEABANE. SCABIOUS.

Origin.—*Erigeron philadelphicus*, *Lin.*; *Erigeron annuum*, *Persoon*; and *Erigeron strigosum*, *Muhlenberg.* *Natural order*, Compositæ.

Habitat.—North America, in fields and pastures.

Description.—The three plants are similar in aspect; the leaves and flowering tops are collected. Radical leaves petiolate, ovate, or lanceolate, coarsely toothed, serrate, or (*E. strigosum*) nearly entire; stem leaves smaller, petiolate, the upper ones sessile, somewhat toothed or entire; all hairy; flower-heads corymbose,

with the involucreal scales narrow and nearly equal, the receptacle flattish and naked, the ray-florets numerous, narrow, in one or two rows, purplish or white, and the disk-florets numerous, tubular, and yellow; pappus bristly, simple (*E. philadelphicum*) or double (the other two species); odor slightly aromatic; taste bitterish, astringent.

Constituents.—Volatile oil a trace, bitter principle, tannin.

Properties.—Diuretic, diaphoretic, tonic. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion.

ERIGERON CANADENSE.—CANADA ERIGERON.

Origin.—*Erigeron canadense*, *Lin.* *Natural order*, Compositæ.

Habitat.—North America, in fields and waste places; naturalized in other countries.

Description.—The leaves and flowering tops are collected. Bristly-hairy; leaves lance-linear, nearly entire; flower-heads in corymbose panicles, numerous, small, with a cylindrical involucre, inconspicuous ray-florets, and a straw-colored bristly pappus; odor aromatic; taste bitterish, somewhat acrid and astringent.

Constituents.—Volatile oil, bitter principle, tannin. The volatile oil has spec. grav. .845, is soluble in alcohol, and becomes thick and brown by age.

Properties.—Stimulant, tonic, diuretic, styptic. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion.

SOLIDAGO.—GOLDEN ROD.

Origin.—Solidago odora, Aiton. *Natural order*, Compositæ.

Habitat.—North America, border of woods.

Description.—The leaves and tops are collected. Leaves smooth, sessile, linear-lanceolate, 3 to 5 centimeters (1 or 2 inches) long, entire, acute, pellucid-punctate; flower-heads small, numerous, in one-sided racemes, with a yellowish scaly appressed involucre; several yellow florets and bristly pappus; odor and taste sweet, anise-like.

Constituents.—Volatile oil, probably containing anisol.

Properties.—Stimulant, carminative, diaphoretic.

Dose, 2.0 to 8.0 grams (ʒss-ij), in infusion.

GRINDELIA.—GRINDELIA.

Origin.—Grindelia robusta, Nuttall. *Natural order*, Compositæ.

Habitat.—North America, west of the Rocky Mountains.

Description.—The leaves and flowering tops are collected. Leaves varying from broadly spatulate or oblong to lanceolate, sessile or clasping, about 5 centimeters (2 inches) or less long, obtuse, more or less sharply serrate, pale green, smooth, finely dotted, thick and brittle; heads many-flowered; the involucre hemispherical, about 15 millimeters ($\frac{3}{4}$ inch) broad, composed of numerous imbricated squarrosely tipped,

often resinous scales, ray-florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; pappus consisting of about three awns of the length of the disk-florets; odor balsamic; taste pungently aromatic and bitter.

Constituents.—Volatile oil, resin.

Properties.—Sedative in asthma; externally in rhus poisoning. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in tincture or fluid extract.

COTULA.—MAYWEED. WILD CHAMOMILE.

Origin.—Maruta (*Anthemis*, *Lin.*) *Cotula*, *D. C.*
Natural order, Compositæ.

Habitat.—Europe, naturalized in North America, in fields and waste places.

Description.—The plant is collected. Nearly smooth, pale green; stem branched, furrowed; leaves sessile, thrice pinnatifid with linear subulate segments; flower-heads terminal with a conical chaffy receptacle; white ligulate neutral rays, yellow perfect disk-florets and obovoid akenes without pappus; odor unpleasant aromatic; taste bitter acrid.

Constituents.—Volatile oil, valerianic acid, acrid fat, tannin, anthemidina (?), anthemic acid (crystalline, bitter, soluble in ether).

Properties.—Stimulant, antispasmodic, sudorific.
Dose, 2.0 to 8.0 grams (3ss-ij), in infusion.

ACHILLEA.—YARROW. MILFOIL.

Origin.—*Achillea Millefolium*, *Lin.* *Natural order*, Compositæ.

Habitat.—Northern temperate zone, in fields.

Description.—The leaves and flowering tops are collected. Leaves lanceolate in outline, glandular beneath, 5 to 25 centimeters (2 to 10 inches) long, thrice pinnatifid with linear-spatulate, toothed segments; flower-heads corymbed with an oblong imbricate involucre, flat chaffy receptacle, five short white pistillate rays, greenish-white perfect disk-florets, and oblong flat akenes without pappus; odor somewhat chamomile-like; taste bitter aromatic.

Constituents.—Volatile oil 0.1 per cent. (blue or dark green), achillein, $O_{20}C_{33}H_{21}N_{15}$ (amorphous, bitter), resin, tannin, aconitic acid; ash about 15 per cent.

Properties.—Stimulant, tonic, emmenagogue. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion.

TANACETUM.—TANSY.

Origin.—*Tanacetum vulgare*, *Lin.* *Natural order*, Compositæ.

Habitat.—Asia and Europe; naturalized in North America; cultivated.

Description.—The leaves and flowering tops are collected. Leaves about 15 centimeters (6 inches) long, bipinnatifid, the segments oblong, obtuse, serrate or incised, smooth, dark green, and glandular; flower-heads corymbose, with an imbricated involucre,

a convex naked receptacle, numerous yellow tubular florets, and obovate akenes having a short crown; odor strongly aromatic; taste pungent and bitter.

Constituents.—Volatile oil $\frac{1}{4}$ per cent. (spec. grav. .93, yellow or green, freely soluble in alcohol), tannacetin (bitter, granular, precipitated by tannin), fat, resin, tannin, mucilage, sugar.

Properties.—Stimulant, tonic, anthelmintic, diuretic, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in infusion.

ABSINTHIUM.—WORMWOOD.

Origin.—*Artemisia Absinthium*, *Lin.* *Natural order*, Compositæ.

Habitat.—Northern Asia, Europe, and Northern Africa; naturalized in North America; cultivated.

Description.—The leaves and flowering tops are collected. Leaves petiolate, about 5 centimeters (2 inches) long, silky-hoary, roundish-triangular in outline, twice or thrice pinnatifid, the segments lanceolate, the terminal one spatulate; flower-heads numerous, racemose, small, subglobose, with an imbricated involucre, a small hairy receptacle, tubular yellowish florets, and obovoid akenes crowned with a disk; odor aromatic; taste very bitter.

Constituents.—Volatile oil about 1 per cent. (spec. grav. .94, freely soluble in alcohol, mainly absinthol, $C_{10}H_{16}O$), absinthin, $C_{40}H_{58}O_9$ (bitter, white, precipitated by tannin, soluble in ether), tannin, resin, succinic acid, etc.

Properties.—Stimulant, tonic, febrifuge, anthelmintic. *Dose*, 1.0 to 4.0 grams (gr. xv-ʒj), in infusion.

CALENDULA.—MARIGOLD.

Origin.—*Calendula officinalis*, *Lin.* *Natural order*, Compositæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Stem about 50 centimeters (20 inches) high, somewhat angular, rough; leaves alternate, thickish, hairy, spatulate or oblanceolate, slightly toothed, the upper ones sessile and amplexicaul; ray-florets in one or several rows, fertile, the akenes incurved and muricate; odor somewhat narcotic; taste bitter and saline.

Constituents.—A trace of volatile oil, amorphous bitter principle, tasteless yellow calendulin, sugar, gum, etc.

Properties.—Stimulant, resolvent, vulnerary, alterative. *Dose*, 0.5 to 1.0 or 2.0 grams (gr. viij-xv-xxx), in infusion, tincture, or extract.

LOBELIA.—LOBELIA.

Origin.—*Lobelia inflata*, *Lin.* *Natural order*, Lobeliaceæ.

Habitat.—North America, in fields and open woods.

Description.—Leaves alternate, petiolate, the upper sessile, ovate or oblong, about 5 centimeters (2 inches)

long, irregularly toothed, pubescent, pale green; branches hairy, terminating in long racemes of small pale-blue flowers, having a superior narrowly five-toothed calyx, which is inflated in fruit, a two-lipped corolla, and 5 united stamens; odor slight, irritating; taste mild, afterwards burning and acrid.

Fig. 127.



Lobelia seed.
—Highly magnified.

The leaves and flowering tops should be collected after a portion of the capsules are ripe and contain a large number of minute reticulate seeds.

Constituents.—Lobelina (yellow, acrid, oily liquid, altered by heat; salts crystallizable), lobelacrin (probably lobelate of lobelina), lobelic acid (precipitated by copper sulphate, olive-brown by ferric salts), resin, wax, fat, gum.

Properties. — Expectorant, nervine, purgative, emetic, narcotic. *Dose*, 0.12, 0.5 to 2.0 grams (gr. ij-viii-xxx), in powder, infusion, or tincture.

MENTHA VIRIDIS.—SPEARMINT.

Origin. — *Mentha viridis*, *Lin.* *Natural order*, Labiatae.

Habitat.—Wild in Europe and North America; cultivated.

Description.—The leaves and flowering tops are collected. Leaves sessile, lance-ovate, about 5 centimeters (2 inches) long, acute, serrate, glandular, nearly smooth; branches quadrangular, mostly light green; flowers in terminal, interrupted, narrow, acute

spikes, with a tubular sharply five-toothed calyx, a light purplish four-lobed corolla, and 4 rather long stamens; aromatic and pungent.

Constituents.—Volatile oil about $\frac{1}{2}$ per cent. (spec. grav. .91, freely soluble in alcohol), resin, gum, etc.

Properties.—Carminative, stimulant, nervine. *Dose*, 2.0 to 4.0 grams (3ss-j), in infusion.

MENTHA PIPERITA.—PEPPERMINT.

Origin. — *Mentha piperita*, *Lin.* *Natural order*, Labiatæ.

Habitat. — Wild in Asia, Europe, and North America; cultivated.

Description.—The leaves and tops are collected. Leaves petiolate, ovate-lanceolate, about 5 centimeters (2 inches) long, acute, sharply serrate, glandular, nearly smooth; branches quadrangular, often purplish; flowers in terminal conical spikes, with a tubular, five-toothed, often purplish calyx, a purplish four-lobed corolla, and 4 short stamens; aromatic; taste pungent and cooling.

Constituents. — Volatile oil about 1 per cent., little tannin, resin, gum, etc. The volatile oil is $C_{10}H_{18}O$, and crystalline

Fig. 128.



Mentha piperita, *Lin.*

menthol, $C_{10}H_{20}O$, has the spec. grav. .90, and is freely soluble in alcohol.

Properties. — Carminative, stimulant, nervine, stronger than spearmint. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion.

LYCOPUS.—BUGLE.

Origin.—*Lycopus virginicus*, *Lin.* *Natural order*, Labiatae.

Habitat.—North America, in moist shady places.

Description. — Stem obtusely quadrangular, with slender runners; leaves about 5 centimeters (2 inches) long, short-petioled, elliptic-lanceolate, toothed above, smooth; flowers in axillary clusters, small, with a bluntly four-toothed calyx, a purplish four-lobed corolla, and two stamens; odor somewhat mint-like; taste bitter.

Lycopus europæus, *Lin.*, also indigenous to North America, has a sharply quadrangular stem, the leaves sinuate-toothed or pinnatifid at the base, and a sharply five-toothed calyx.

Constituents.—Volatile oil, bitter principle, tannin.

Properties.—Astringent, tonic, sedative. *Dose*, 0.5 to 2.0 grams (gr. viij–xxx), in infusion.

CUNILA.—DITTANY.

Origin. — *Cunila Mariana*, *Lin.* *Natural order*, Labiatae.

Habitat.—United States, in dry soil.

Description. — Stem thin; leaves nearly sessile,

about 25 millimeters (1 inch) long, ovate, serrate, subcordate; flowers in small cymes, with an ovate-tubular calyx, a two-lipped, pale purple corolla, and 2 exserted stamens; odor mint-like; taste pungent aromatic.

Constituents.—Volatile oil.

Properties. — Carminative, stimulant, sudorific.

Dose, 1.0 to 4.0 grams (gr. xv-5j), in infusion.

HYSSOPUS.—HYSSOP.

Origin.—Hyssopus officinalis, *Lin.* *Natural order*, Labiatae.

Habitat. — Southern Europe; naturalized in the United States; cultivated.

Description.—Stem branched, wand-like; leaves sessile, about 25 millimeters (1 inch) long, linear-lanceolate, rather obtuse; flowers in small clusters, with a five-toothed calyx, a two-lipped, purple corolla, and four exserted stamens; aromatic, pungent, bitterish.

Constituents.—Volatile oil about $\frac{1}{2}$ per cent., bitter principle, tannin, etc.

Properties. — Carminative, stimulant, sudorific.

Dose, 1.0 to 4.0 grams (gr. xv-5j), in infusion.

ORIGANUM.—WILD MARJORAM.

Origin.—Origanum vulgare, *Lin.* *Natural order*, Labiatae.

Habitat.—Asia, Europe, and Northern Africa; naturalized in North America.

Description.—Stem branched above; leaves petiolate, about 2 centimeters ($\frac{1}{2}$ inch) long, roundish-ovate, obtuse, nearly entire, hairy beneath; flowers corymbose, with a five-toothed calyx, a somewhat two-lipped, pale purple corolla, and 4 exserted stamens; aromatic, pungent, bitterish.

Constituents.—Volatile oil about 1 per cent. (spec. grav. .89, not freely soluble in alcohol), tannin, bitter principle, resin.

Properties.—Carminative, stimulant, emmenagogue.
Dose, 1.0 to 4.0 grams (gr. $\text{xy}-\text{3j}$), in infusion.

MAJORANA.—SWEET MARJORAM.

Origin.—*Origanum Majorana*, *Lin.* *Natural order*, Labiatae.

Habitat.—Asia Minor and Southern Europe; cultivated.

Description. — Stem branched, subterete; leaves sessile above, about 15 millimeters ($\frac{3}{8}$ inch) long, spatulate or obovate, obtuse, gray-green, soft hairy; flowers in clusters, spicate, with a two-lipped calyx, a whitish, somewhat two-lipped corolla, and 4 exserted stamens; fragrantly aromatic and pungent.

Constituents.—Volatile oil (spec. grav. .89, readily soluble in alcohol).

Properties.—Carminative, stimulant, emmenagogue, cephalic. *Dose*, 1.0 to 4.0 grams (gr. $\text{xv}-\text{3j}$), in infusion.

SERPYLLUM.—WILD THYME.

Origin.—Thymus Serpyllum, *Lin.* *Natural order*, Labiatae.

Habitat.—Northern Asia, Europe; naturalized in North America; cultivated.

Description.—Stem branched, pubescent; leaves short-petioled, about 6 millimeters ($\frac{1}{4}$ inch) long, ovate, obtuse, entire; flowers in small capitate spikes, with a two-lipped calyx, a purplish spotted, somewhat two-lipped corolla, and four usually short stamens; aromatic and pungent.

Constituents.—Volatile oil (spec. grav. .91, readily soluble in alcohol), tannin, bitter principle.

Properties.—Carminative, stimulant, tonic, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in infusion.

MELISSA.—BALM.

Origin.—Melissa officinalis, *Lin.* *Natural order*, Labiatae.

Habitat.—Asia Minor, Southern Europe; naturalized in the United States; cultivated.

Description.—Stem branched, pubescent; leaves petiolate, ovate, about 5 centimeters (2 inches) long, obtuse, crenate-serrate, somewhat hairy, glandular; branches quadrangular; flowers in about four-flowered cymules, with a tubular bell-shaped five-toothed calyx, a whitish or purplish two-lipped corolla, and four didynamous stamens; fragrant, aromatic, and bitterish.

Constituents.—Volatile oil (spec. grav. .89, soluble in alcohol), tannin, bitter principle.

Properties.—Carminative, stimulant, diaphoretic, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion.

HEDEOMA.—PENNYROYAL.

Origin.—*Hedeoma pulegioides*, *Persoon*. *Natural order*, Labiatae.

Habitat.—North America, in sandy fields.

Description.—Stem subterete, hairy; leaves opposite, short-petioled, about 12 millimeters ($\frac{1}{2}$ inch) long, oblong-ovate, obscurely serrate, glandular beneath; roundish flowers in small axillary cymes, with a tubular-ovoid, two-lipped and five-toothed calyx, and a small pale blue, spotted, two-lipped corolla, containing two sterile and two fertile exerted stamens; odor strong, mint-like; taste warm and pungent.

Constituents.—Volatile oil, spec. grav. 94, readily soluble in alcohol.

Properties.—Carminative, stimulant, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion.

MONARDA.—HORSEMINT.

Origin.—*Monarda punctata*, *Lin.* *Natural order*, Labiatae.

Habitat.—United States, in sandy fields.

Description.—Stem nearly simple; leaves petiolate, lanceolate, about 5 centimeters (2 inches) long, acute, somewhat toothed, glandular, nearly smooth; flowers

whorled, with sessile yellow and purple bracts, a tubular, downy, five-toothed calyx, a prominent, two-lipped, pale yellow and purple-spotted corolla, and two stamens; aromatic, pungent, and bitterish.

Constituents.—Volatile oil, spec. grav. .92, readily soluble in alcohol, contains thymol.

Properties.—Carminative, stimulant, nervine, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in infusion.

CATARIA.—CATNEP.

Origin.—*Nepeta Cataria*, *Lin.* *Natural order*, Labiatae.

Habitat.—Asia, Europe, naturalized in the United States.

Description.—Stem branched, hairy, gray; leaves petiolate, about 5 centimeters (2 inches) long, triangular-ovate, cordate, crenate-serrate, grayish-green, and hairy; flowers in terminal panicles with an obliquely five-toothed calyx, a two-lipped, whitish, purple spotted corolla, and four stamens; it has a peculiar, somewhat mint-like odor, and a bitterish, aromatic, and pungent taste.

Constituents.—Little volatile oil, tannin, bitter principle.

Properties.—Carminative, stimulant, tonic, diaphoretic, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in infusion.

MARRUBIUM.—HOREHOUND.

Origin.—*Marrubium vulgare*, *Lin.* *Natural order*, Labiatae.

Habitat.—Europe, Central Asia; naturalized in North America; cultivated.

Description.—Stem branched, white tomentose; leaves opposite, petiolate, roundish-ovate, about 25 millimeters (1 inch) long, obtuse, coarsely crenate, downy above, white hairy beneath; flowers in dense axillary woolly whorls, with a stiffly ten-toothed calyx, a whitish bilabiate corolla and four included stamens; aromatic and bitter.

Constituents.—Little volatile oil, tannin, resin, marrubiin (crystalline, soluble in ether, alcohol, and hot water, not precipitated by tannin, bitter).

Properties.—Stimulant, tonic, resolvent, deobstruent, anthelmintic. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx), in infusion.

SCUTELLARIA.—SKULLCAP.

Origin.—*Scutellaria lateriflora*, *Lin.* *Natural order*, Labiatae.

Habitat.—North America, in damp thickets.

Description.—Stem about 50 centimeters (20 inches) high, smooth, branched; leaves opposite, about 5 centimeters (2 inches) long, petiolate, lance-ovate or ovate-oblong, serrate; flowers in axillary one-sided racemes; corolla pale blue; calyx closed in fruit, upper lip helmet-shaped; odor slight; taste bitterish.

The following species having a more decidedly

bitter taste are sometimes collected; they are indigenous to North America, and have a nearly simple stem and blue flowers:—

Sc. integrifolia, *Lin.* Minutely hairy; leaves short-petioled, lance-oblong or linear-oblong, entire; racemes terminal.

Sc. pilosa, *Lin.* Hairy; leaves petiolate, rhombic-ovate or oblong-ovate, obtuse, crenate, in distant pairs; racemes terminal.

Sc. galericulata, *Lin.* Nearly smooth; leaves short-petioled, lance-ovate, slightly cordate, crenately serrate; flowers axillary, single.

Constituents.—Bitter principle.

Properties.—Tonic, nervine, antispasmodic. *Dose*, 2 to 4 or 8 grams (3ss-j-ij), in infusion or fluid extract.

SABBATIA.—SABBATIA. CENTAURY.

Origin.—*Sabbatia angularis*, *Pursh*, and *S. paniculata*, *Pursh.* *Natural order*, Gentianaceæ.

Habitat.—United States, in dry fields.

Description.—Stem branched above, winged, quadrangular, about 60 centimeters (2 feet) high, smooth, branched above, leaves opposite, clasping, oblong-ovate, acute, entire, five-nerved, or (*Sab. paniculata*) linear-oblong, obtuse, and one-nerved; corolla whitish, wheel-shaped or five-parted; stamens five; inodorous, bitter.

Erythræa Centaurium, *Persoon*, European centaury. Stem 30 centimeters (12 inches) high, leaves oval or ovate-oblong, obtuse, three- to five-nerved; otherwise resembling the preceding.

Constituents.—Bitter principle, erythrocentaurin, $C_{27}H_{24}O_8$ (tasteless, colored red by light).

Properties.—Tonic, febrifuge. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in decoction.

CHIRETTA.—CHIRETTA.

Origin.—*Ophelia Chirata*, *Grisebach*, s. *Agathotes Chirayta*, *Don*. *Natural order*, Gentianaceæ.

Habitat.—Mountains of Northern India.

Description.—Root nearly simple, about 75 millimeters (3 inches) long; stem branched, nearly 1 meter (40 inches) long, slightly quadrangular above; leaves opposite, sessile, ovate, entire, five-nerved; flowers numerous, small, with a four-lobed calyx and corolla; the whole plant smooth, pale brown, inodorous, and intensely bitter.

Constituents.—Ophelic acid, $C_{13}H_{20}O_{10}$ (bitter, amorphous, viscid), chiratin, $C_{26}H_{48}O_{15}$ (bitter, crystalline, precipitated by tannin, glucoside).

Properties.—Tonic, febrifuge. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in infusion.

CANNABIS INDICA.—INDIAN HEMP. GUNJA.

Origin.—*Cannabis sativa*, *Lin*. *Natural order*, Urticaceæ, Cannabineæ.

Habitat.—Asia, collected in India.

Description.—Only the flowering tops of the female plant are collected. About 5 centimeters (2 inches) long, compressed, brittle, branching, with few digitate leaves and lance-linear leaflets, and numerous sheath-

ing-pointed bracts, each containing two small pistillate flowers, sometimes with the nearly ripe fruit, the whole more or less agglutinated with a resinous exudation; it has a brownish-green color, a peculiar narcotic odor, and a slightly acrid taste.

Cannabis americana.—The hemp plant grown in the Southern United States. Stem 2 to 3 meters (6 to 10 feet) high, rough; leaves alternate above, petiolate, digitate, the leaflets linear-lanceolate, serrate; staminate flowers in loose pedunculate clusters, forming compound racemes; odor heavy; taste bitter, slightly acrid.

Constituents.—Little volatile oil, brown amorphous resin. American hemp contains a small proportion of resin.

Properties.—Anodyne, nervine, sudorific. *Dose*, 0.5 to 1.0 gram (gr. viij–xv), mostly as extract, 0.03 to 0.20 gram (gr. ss–iij).

8. LEAFY TOPS.—CACUMINA, SUMMITATES.

Among the herbs are included the tops of plants which are usually collected with flowers. The present division embraces a few drugs having imbricated leaves, and collected occasionally with the fruit, but never with the flowers. The plants yielding these drugs are trees of the natural order Coniferae.

Twigs quadrangular, the leaves with an oil-gland on the back.

Sabina.

oil-gland near the base of the leaves.

Juniperus virg.

Twigs two-edged, the flat leaves with a gland on the back.

Thuja.

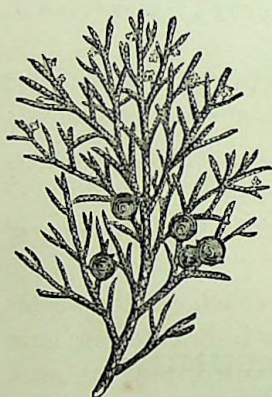
SABINA.—SAVINE.

Origin.—*Juniperus Sabina*, *Lin.* *Natural order*, Coniferæ.

Habitat.—Siberia, Europe, Canada, and Northern United States.

Description.—Short, thin, subquadrangular branchlets; leaves in four rows, opposite, scale-like, appressed, imbricated, the older ones sharply acute and spreading, on the back with a shallow groove containing an oblong or roundish gland; odor terebinthinate; taste nauseous, resinous, and bitter.

Fig. 129.



Sabina.

Constituents.—Volatile oil, $C_{10}H_{16}$, about 2 per cent., resin, tannin. The volatile oil is of spec. grav. .91, and not readily soluble in alcohol.

Properties.—Irritant, diuretic, hæmagogue, emmenagogue, vermifuge. *Dose*, 0.2 to 0.5 or 1.0 gram (gr. iij–viiij–xv), in powder, infusion, or fluid extract.

JUNIPERUS VIRGINIANA.—RED CEDAR.

Origin.—*Juniperus virginiana*, *Lin.* *Natural order*, Coniferæ.

Description.—About 25 millimeters (1 inch) long, somewhat quadrangular; leaves in four rows, oppo-

site, scale-like, appressed, imbricated, the older ones sharply acute and spreading, on the back with a longitudinal furrow and near its base a circular or oblong gland; odor terebinthinate; taste balsamic, bitterish, and acid.

Constituents. — Volatile oil (chiefly $C_{15}H_{24}$, not readily soluble in alcohol), resin, tannin, etc.

Properties. — Diuretic, emmenagogue, vermifuge, less irritant than savine. *Dose*, 0.2 to 0.5 or 1.0 grain (gr. iij-vij-xv), in powder or infusion.

THUJA.—ARBOR VITÆ.

Origin.—*Thuja occidentalis*, *Lin.* *Natural order*, Coniferae.

Habitat. — Canada and Northern United States; cultivated.

Description.—Twigs flattish, two-edged, the scale-like leaves appressed and closely imbricated in four rows, rhombic-ovate, obtusely pointed, the flat ones with a roundish gland upon the back, of a balsamic, somewhat terebinthinate odor, and a pungently aromatic, camphoraceous, and bitter taste.

Constituents.—Volatile oil about 1 per cent. (readily soluble in alcohol, contains O), resin, tannin, pini-picrin, $C_{22}H_{18}O_{11}$ (yellow, bitter), thujin, $C_{30}H_{22}O_{12}$ (crystalline, astringent, dark green with ferric salts).

Properties. — Stimulant, diuretic, irritant. *Dose*, 1.0 to 4.0 grams (gr. xv-5j), in infusion and fluid extract.

9. FLOWERS AND PETALS.—FLORES ET PETALA.

Flowers contain the male or female, or both kinds, organs of reproduction, surrounded by two circles of modified leaves, of which those of the inner circle, the petals forming the corolla, very generally have a color different from green, while those of the outer circle, the sepals forming the calyx, mostly have a green color. The modified leaves of these two whorls are sometimes of the same shape and color, or one of the whorls is entirely wanting; in both these cases they, whether green or of a different color, are called perianth or perigone. The flowers of some plants are placed close together upon a common receptacle, and such a head is surrounded by one or more whorls of modified, frequently scale-like leaves called the involucre, a term which is also employed to designate the whorl of modified leaves found outside of the calyx of each flower in certain plants. The male organs of reproduction, or stamens, consist each of a filament, which is usually thin and filiform, and bears at its apex the mostly two-celled anther; in the cells of the latter the pollen is contained. The female organ of reproduction consists of one or more ovules inclosed by one or more carpels (modified leaves) forming the ovary, and frequently prolonged above into a style bearing the stigma. In the absence of the style, the stigma is attached to the ovary, and is said to be sessile. The shortened axis upon which the organs of reproduction are attached is the torus, also called the

receptacle. The footstalk of a flower is called the peduncle, and its branches, the pedicels.

Classification.

- I. Buds, unexpanded flowers.
 - Calyx superior, four-cleft. Caryophyllus.
 - Small heads with an imbricated involucre. Santonica.
- II. Expanded flowers and petals.
 - 1. Petals distinct ; corolla polypetalous.
 - Calyx inferior, corolla white, ovary one. Aurantium.
 - Inflorescence paniculate ; sepals 5, reddish ; petals small. Brayera.
 - Petals numerous, clawed, rose-colored. Rosa centifolia.
 - deep red. Rosa gallica.
 - 2. Petals united ; corolla monopetalous.
 - Flowers compound, rays white ; receptacle conical, hollow. Matricaria.
 - rays white, in many rows ; receptacle conical, not hollow. Anthemis.
 - rays yellow ; pappus bristly. Arnica.
 - akenes curved, pappus none. Calendula.
 - Flowers not compound ; corolla whitish, wheel-shaped, five-lobed. Sambucus.
 - corolla blue, two-lipped ; calyx blue-gray, five-toothed. Lavandula.

CARYOPHYLLUS.—CLOVES.

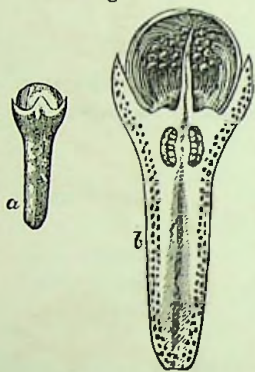
Origin.—*Eugenia caryophyllata*, *Thunberg*, s. *Caryophyllus aromaticus*, *Lin.* *Natural order*, Myrtaceæ.

Habitat.—Molucca Islands ; cultivated in tropical countries.

Description.—About 12 millimeters ($\frac{1}{2}$ inch long, dark brown, consisting of a subcylindrical, solid, and glandular calyx-tube, terminated by four teeth, and

surmounted by a globular head, formed by four petals, which cover numerous curved stamens and one style. Cloves emit oil when scratched, and have a strong aromatic odor and a pungent spicy taste.

Fig. 130.



Caryophyllus.—a. Natural size. b. Longitudinal section magnified.

Constituents. — Volatile oil 18 per cent., tannin 13 per cent., gum 13 per cent., resin 6 per cent. (tasteless), wax, caryophyllin, $C_{10}H_{16}O$ (white, tasteless needles), eugenin, $C_{10}H_{12}O_2$ (pearly scales from distillate). The volatile oil is readily soluble in alcohol, and consists of a hydrocarbon, $C_{10}H_{16}$, specific gravity .91, and eugenol or eugenic acid, $C_{10}H_{12}O_2$, a colorless oil, specific gravity 1.076.

Properties. — Stimulant, stomachic, antiemetic. *Dose*, 0.2 to 0.5 gram (gr. iiij–viiij), in powder; mostly used as a condiment.

SANTONICA.—SANTONICA, LEVANT WORMSEED.

Origin.—*Artemisia maritima*, var. *Stechmanniana*, Besser. *Natural order*, Compositæ.

Habitat.—Turkestan.

Description. — Unexpanded flower heads, oblong-ovoid, nearly 2 millimeters ($\frac{1}{12}$ inch) long, obtuse, smooth, somewhat glossy, grayish-green, after exposure to light brownish-green, with an involucre of

about 18 closely imbricated glandular scales, inclosing 4 or 5 rudimentary florets; odor strong, peculiar, somewhat camphoraceous; taste aromatic and bitter.

Constituents.—Volatile oil 1 per cent., santonin $1\frac{1}{2}$ –2 per cent., resin, gum, etc. Santonin, $C_{15}H_{18}O_3$, is white crystalline, nearly insoluble in cold water, colored yellow in sunlight, forms with alkalis bitter soluble compounds.

Properties.—Stimulant, anthelmintic. *Dose*, 1.0 to 4.0 grams (gr. xv–5j), in powder or electuary; santonin, 0.016 to 0.06 gram (gr. $\frac{1}{4}$ –j), in powder or troches.

Fig. 131.



Santonica. — Branch, leaf, flower-head, and floret.

AURANTII FLORES.—ORANGE FLOWERS.

Origin.—*Citrus vulgaris* and *Citrus Aurantium*, *Risso*. *Natural order*, *Aurantiaceæ*.

Habitat.—Northern India; cultivated in subtropical countries.

Description.—The partly expanded flowers are collected and used in the fresh state. About 12 millimeters ($\frac{1}{2}$ inch) long; calyx small, cup-shaped, five-toothed; petals five, oblong, obtuse, rather fleshy, white, and glandular punctate; stamens numerous, in about three sets; ovary globular, upon a small disk, with a cylindrical style and globular stigma; odor very fragrant; taste aromatic, somewhat bitter.

When it is desirable to keep orange flowers for some time, they may be preserved by being well mixed with half their weight of chloride of sodium.

Constituents.—Volatile oil (spec. grav. .89, fluorescent with alcohol), mucilage, bitter extractive.

Properties. — Stimulant, antispasmodic; used for preparing orange-flower water.

BRAYERA.—Koosso.

Origin.—*Brayera anthelmintica*, *Kunth* (*Hagenia abyssinica*, *Willd.*). *Natural order*, Rosaceæ, Rosæ.

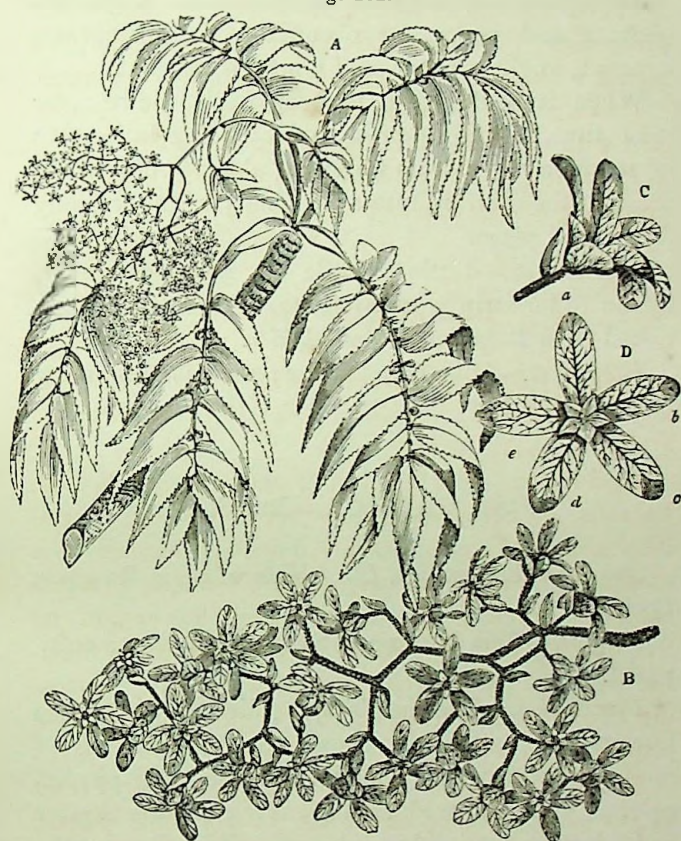
Habitat.—Abyssinia.

Description.—The female inflorescence is collected. In rolls, or compressed bundles, consisting of panicles about 25 centimeters (10 inches) long, with a sheathing bract at the base of each branch; the two roundish bracts at the base of each flower and the five obovate outer sepals are of a reddish color, membranous, and veiny; calyx top-shaped, hairy, inclosing two carpels or nutlets; odor slight tea-like; taste bitter and nauseous.

Constituents.—Tannin 24 per cent., bitter acrid resin $6\frac{1}{2}$ per cent., tasteless resin, ash 15 per cent. Kosin or koussin is yellow, crystalline, tasteless, fusible, insoluble in water.

Properties.—Anthelmintic, tænifuge. *Dose*, 16 to 24 or 32 grams (ʒiv-vj-ʒj), in powder or electuary.

Fig. 132.



Brayora anthelmintica, *Kth.*—A. Flowering branch. B. Branch of panicle.
C and D. A single flower; a, b, c, d, e, sepals.

ROSA CENTIFOLIA.—PALE ROSE.

Origin.—*Rosa centifolia*, *Lin.* *Natural order,* •
Rosaceæ, Rosæ.

Habitat.—Western Asia; cultivated.

Description.—The petals are collected. Roundish-obovate and retuse, or obcordate, pink, fragrant, sweetish, slightly bitter, and faintly astringent.

When it is desirable to keep fresh pale rose for some time, it is to be preserved by being intimately mixed with one half its weight of chloride of sodium, pressing the mixture into a suitable jar, and keeping it in a cool place.

Constituents.—Little volatile oil, mucilage, sugar, tannin (quercitrin?), malates, etc. Oil of rose is obtained from *Rosa damascena*, *Miller*.

Properties.—Mild carminative; used for preparing rose-water.

ROSA GALLICA.—RED ROSE.

Origin.—*Rosa gallica*, *Lin.* *Natural order*, Rosaceæ, Roseæ.

Habitat.—Asia Minor and Southern Europe; cultivated.

Description.—The petals are collected before the flowers are expanded. Small cones, consisting of numerous imbricated, roundish, retuse, deep purple-colored, yellow-clawed petals, having a roseate odor and a bitterish, slightly acidulous, and distinct astringent taste.

Constituents.—Volatile oil a trace, mucilage, sugar, quercitrin.

Properties.—Tonic, mild astringent. *Dose*, 1.0 to 4.0 grams (gr. xv– $\overline{3j}$), in powder, confection, or infusion.

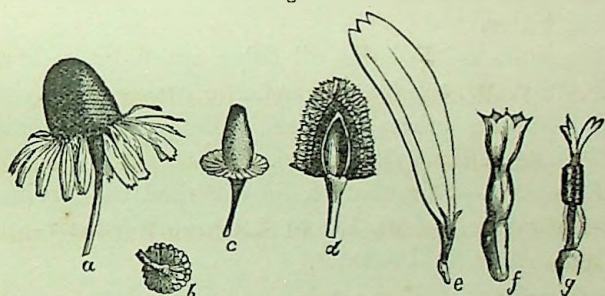
MATRICARIA.—GERMAN CHAMOMILE.

Origin.—*Matricaria Chamomilla*, *Lin.* *Natural order*, Compositæ.

Habitat.—Europe.

Description.—About 12 millimeters ($\frac{1}{2}$ inch) broad, composed of a flattish imbricated involucre, a conical, hollow, naked receptacle, about 15 white, ligulate, reflexed ray florets, and numerous yellow, tubular, perfect flowers without pappus; strongly aromatic and bitter.

Fig. 133.



Matricaria.—*a.* Flower-head. *b.* Involucre. *c.* Receptacle and involucre. *d.* Longitudinal section of receptacle, with disk florets. *e.* Ray floret. *f.* Disk floret. *g.* Stamens and style of disk floret.

The similar flower-heads of *Anthemis arvensis*, *Lin.*, and *Maruta cotula*, *DeCand.*, have a conical chaffy receptacle.

Constituents.—Volatile oil $\frac{1}{4}$ per cent. (dark blue, soluble in alcohol), bitter extractive, little tannin, malates, etc.

Properties.—Stimulant, mild tonic, carminative, nervine, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv-3j), in infusion.

ANTHEMIS.—CHAMOMILE.

Origin.—*Anthemis nobilis*, *Lin.* *Natural order*, Compositæ.

Habitat.—Southern and Western Europe; cultivated.

Description.—Collected from cultivated plants. Subglobular, about 2 centimeters ($\frac{4}{5}$ inch) broad, consisting of an imbricated involucre, numerous white, strap-shaped, three-toothed florets, and a few yellow, tubular disk florets inserted upon a chaffy, conical, solid receptacle; odor strong and pleasant; taste aromatic, bitter.

Constituents.—Volatile oil (blue, green, or yellow, spec. grav. .90, soluble in alcohol, contains isobutylic and isamylic ethers), bitter principle (anthemic acid?), resin, little tannin, etc.

Properties.—Stimulant, tonic, carminative, nervine, emmenagogue. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion or fluid extract.

ARNICA.—ARNICA FLOWERS.

Origin.—*Arnica montana*, *Lin.* *Natural order*, Compositæ.

Habitat.—Europe, Northern Asia, and Northwestern America, in mountainous districts.

Description.—Depressed, roundish, about 25 millimeters (1 inch) broad, consisting of a scaly involucre in two rows, and a small, flat, chaffy receptacle, bearing about 16 yellow, strap-shaped ray florets and

numerous yellow, five-toothed, tubular disk florets, having slender, spindle-shaped akenes crowned with a hairy pappus; feebly aromatic; acrid and bitter.

Constituents.—Volatile oil a trace, resin, arnicin (amorphous, yellow, acrid), etc.

Properties.—Stimulant, diuretic, vulnerary, irritant.

Dose, 0.3 to 1.0 gram (gr. v-xv), in infusion; mostly used externally as tincture.

CALENDULA.—MARIGOLD.

Origin.—*Calendula officinalis*, *Lin.* *Natural order*, Compositæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Flower-heads about 5 centimeters (2 inches) broad, with the involueral scales in two rows and equal, a flat and naked receptacle, yellow florets, and incurved, muricate akenes without pappus; the disk florets tubular, five-toothed, and staminate; the ray florets in one or occasionally in several rows, pistillate, ligulate, about 18 millimeters ($\frac{3}{4}$ inch) long, veined, and three-toothed; odor slightly narcotic; taste bitter, somewhat saline. Frequently the strap-shaped ray florets alone are collected.

Constituents.—Amorphous bitter principle, tasteless yellow calendulin, sugar, gum, etc.

Substitutions.—The flower-heads of *Tagetes erecta* and *Tag. patula*, *Lin.*, cultivated as French or African marigold, have a tubular involucre, yellow or variegated broad ray florets, and slender flattish akenes with a chaffy pappus.

Properties.—Stimulant, resolvent, vulnerary. *Dose*, 0.5 to 1.0 gram (gr. viij-xv), in infusion, tincture, or extract.

SAMBUCUS.—ELDER.

Origin.—*Sambucus canadensis*, *Lin.* *Natural order*, Caprifoliaceæ.

Habitat.—North America, in damp places.

Description.—In large corymbose five-rayed cymes; calyx superior, minutely five-toothed; corolla cream-colored, wheel-shaped, five-lobed, and on the short tube with five stamens, of a peculiar fragrance and slightly bitter taste.

Elder should be collected in dry weather, rapidly dried, and deprived of the stalks.

The flowers of *Sambucus nigra*, *Lin.*, the European elder, closely resemble the preceding.

Constituents.—Volatile oil a trace, little resin, mucilage, sugar, etc.

Properties.—Stimulant, carminative, diaphoretic.

Dose, 2.0 to 4.0 grams (ʒss-j), in infusion.

LAVANDULA.—LAVENDER.

Origin.—*Lavandula vera*, *DeCandolle.* *Natural order*, Labiatae.

Habitat.—Southern Europe; cultivated.

Description.—Calyx tubular, blue-gray, hairy, five-toothed, the upper tooth largest and roundish-rhomboid; corolla violet-blue, hairy and glandular on the outside, tubular, and two-lipped, the upper lip two-

lobed, the lower lip three-lobed; stamens four, short, on the corolla-tube; odor fragrant; taste bitterish aromatic, somewhat camphoraceous.

Constituents.—Volatile oil $1\frac{1}{2}$ per cent., resin, little tannin. The volatile oil is of spec. grav. .90, dissolves readily in alcohol, and is very fragrant; distilled from the leaves and stalks the odor is more rank.

Properties.—Stimulant, carminative, nervine, er-rhine. *Dose*, 1.0 to 2.0 grams (gr. xv-xxx), in infusion, but rarely used internally.

10. FRUITS.—FRUCTUS.

The fruit is the ripened ovary of a flower, and consists of the pericarp or fruit-integuments inclosing one or more seeds. The outer layer of the pericarp is called epicarp or exocarp, the inner layer endocarp. A middle layer, the mesocarp or sarcocarp, is present in many, particularly the fleshy, fruits. Fruits are crowned with the style or its remnants, or are marked with a scar where the style had been attached; a second scar is found at the base of the fruit, where it had been connected with the foot-stalk or attached to the floral axis.

With few exceptions, the officinal fruits consist of fructified simple pistils; the exceptions are two aggregate fruits (staranise and raspberry), composed of several carpels belonging to one flower; one anthocarpous fruit (rose hip), composed of a fleshy receptacle inclosing several akenes; and a few collective fruits, produced by the aggregation of several or many flowers.

Classification.

Sect. 1. Collective fruits.

Berry-like, containing three seeds with oil-glands.	<i>Juniperus.</i>
Cylindrical spikes of numerous coalesced berry-like fruits.	<i>Piper longum.</i>
Glandular strobiles with akenes at the base of the leafy bracts.	<i>Humulus.</i>
Pear-shaped fleshy receptacle with numerous akenes upon the inner surface.	<i>Ficus.</i>

Sect. 2. Fruits of single flowers.

I. Pitcher-shaped fleshy receptacle containing akenes.	<i>Rosa canina.</i>
II. Small drupes and berries, about the size of pepper; superior.	
Ten-celled, ten-seeded, with a dark purple juice.	<i>Phytolacca.</i>
Four-celled, four-seeded, with a convex inferior disk.	<i>Rhamnus catharticus.</i>
One-celled, one-seeded, bright red, woolly.	<i>Rhus glabra.</i>
black, globular, pericarp prolonged into a stalk.	<i>Cubeba.</i>
unstalked, the undeveloped embryo in a central cavity.	<i>Piper nigrum.</i>
whitish, globular, veined, not hollow.	<i>Piper album.</i>
III. Inferior drupaceous fruits.	
Globular, brown, two-celled, two-seeded.	<i>Pimenta.</i>
Oval-oblong, dark brown, two-celled, each with one or two seeds.	<i>Caryophylli fructus.</i>
IV. Superior drupes.	
Roundish-reniform, blackish, seed semi-lunar, bitter.	<i>Cocculus.</i>
Flattish-reniform, brown, nut-like, sarcocarp caustic.	<i>Anacardium occidentale.</i>
Flattish-ovate, blackish, nut-like, sarcocarp caustic.	<i>Anacardium orientale.</i>
Somewhat five-angled, orange- or blackish-brown, very astringent.	<i>Myrobalanus.</i>
Oblong, dark blue, glaucous, sweet.	<i>Prunum.</i>
Hemispherical, red, finely hairy, composed of many small drupes.	<i>Rubus idæus.</i>

V. Superior berries.

Globular, acidulous, sweet, few-seeded.	<i>Uva passa.</i>
six-celled, six-seeded, very astringent.	<i>Diospyros.</i>
ten-celled, many-seeded, very aromatic.	<i>Aurantium.</i>
twelve-celled, many-seeded, pulp hard, mucilaginous.	<i>Bela.</i>
Oval, with a nipple-shaped apex; pulp very acid.	<i>Limon.</i>
Oblong, two-celled, many-seeded, burningly acid.	<i>Capsicum.</i>

VI. Inferior berries.

Pulp white, spongy, separable into three many-seeded cells.	<i>Colocynth.</i>
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VII. Capsular fruits, superior.

Cylindrical, with numerous transverse parti- tions containing a sweet pulp.	<i>Cassia fistula.</i>
Broadly linear; internally fleshy, sweet.	<i>Ceratonia.</i>
Subglobose; stigmas sessile, radiating; seeds numerous, parietal.	<i>Papaver.</i>
Small utricle; seed lenticular, black, glossy.	<i>Chenopodium.</i>
Follicles 8, stellate, one-seeded, aromatic.	<i>Illicium.</i>

VIII. Capsular fruits, inferior.

Triangular-ovate, three-celled; pericarp dry, tasteless: seeds spicy.	<i>Cardamomum.</i>
Long-linear, subtriangular, fleshy, one- celled, many-seeded, aromatic.	<i>Vanilla.</i>

IX. Cremocarps; fruits of umbelliferæ.

Cœlospermous, globular, 2 vittæ in each mericarp.	<i>Coriandrum.</i>
Campylospermous, ovate, laterally com- pressed, vittæ none.	<i>Conium.</i>
Orthospermous, ovate, laterally compressed, hairy, each mericarp 15 vittæ.	<i>Anisum.</i>
ovate, laterally compressed, smooth, each mericarp 12 vittæ.	<i>Apium.</i>
ovate, laterally compressed, smooth, each mericarp 6 vittæ.	<i>Petroselinum.</i>
oblongterete, smooth, each mericarp 6 vittæ, ribs obtuse, prominent.	<i>Fœniculum.</i>
ribs obtuse, thin.	<i>Phellandrium.</i>

oblong, laterally compressed, each mericarp

6 vittæ, ribs 9, rough.

ribs 5, smooth.

oblong, dorsally compressed, each mericarp 6 vittæ, ribs 5, smooth.

ribs 9, bristly.

Cuminum.

Carum.

Anethum.

Carota.

X. Parts of fruits.

Pericarp leathery, glandular, orange-colored. yellow.

very hard, with adhering mucilaginous pulp.

brittle, brown, crowned with calyx.

Aurantii cortex.

Limonis cortex.

Bela

(see Fruits).

Granati fruct. cort.

Pulp acidulous, red-brown, with flat, sub-quadrangular, glossy seeds.

Tamarindus.

JUNIPERUS.—JUNIPER.

Fig. 134.



Juniperus.—*a*. Fertile catkin. *b*. The same deprived of lower scales. *c*. Galbulus. *d*. Seed (magnified) with oil glands. *e*. Transverse section of galbulus.

Origin.—*Juniperus communis*, *Lin. Natural order*, Coniferae.

Habitat.—Northern hemisphere.

Description.—Nearly globular, about 8 millimeters ($\frac{1}{3}$ inch) in diameter; dark purplish, with a bluish-gray bloom, at the apex with a three-rayed furrow; internally pulpy, greenish-brown, containing three ovate somewhat triangular bony seeds with several large oil glands on the surface; odor aromatic; taste sweet, balsamic, bitterish, and slightly acid.

The pulpy portion is produced from the coalesced three scales forming the upper whorl of the pistil-

late catkin. The galbulus ripens in the second year.

Constituents.—Volatile oil $\frac{1}{2}$ to $2\frac{1}{2}$ per cent., sugar 30 per cent., resins 10 per cent., yellowish juniperin, wax, fat, mucilage, etc. Oil of juniper berries is colorless, of about the specific gravity .88, levogyre, slightly soluble in 80 per cent. alcohol, fulminates with iodine, and has the composition $C_{10}H_{16}$.

Properties.—Stimulant, diuretic, externally used as an anodyne. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in infusion, the concentrated juice, distilled water and spirit, etc.

PIPER LONGUM.—LONG PEPPER.

Origin.—1. Piper (Chavica, *Miquel*) officinarum, *D. C.*, and 2. Piper longum, *Lin.* (Chavica Roxburghii, *Miquel*). *Natural order*, Piperaceæ.

Habitat.—1. Java and other East Indian islands; 2. Bengal and Philippine islands.

Description.—Spikes of the coalesced, immature, but full-grown fruit, about 35 millimeters ($1\frac{3}{8}$ inch) long, and 5 millimeters ($\frac{1}{5}$ inch) thick, cylindrical, uneven, dusty, blackish-gray; the numerous fruits spirally arranged, each crowned with remnant of style; odor and taste like black pepper. Bengal long pepper is darker colored and shorter, 20 to 25 millimeters ($\frac{4}{5}$ to 1 inch) long.

Constituents, Properties, and Uses.—Same as those of black pepper.

HUMULUS.—Hops.

Origin.—*Humulus Lupulus*, *Lin.* *Natural order*, Urticaceæ, Cannabineæ.

Habitat.—Northern temperate zone; cultivated.

Description.—Ovate, about 3 centimeters ($1\frac{1}{4}$ inch) long, consisting of a thin, hairy, undulated axis, and many obliquely ovate membranous greenish scales, which are in the upper part reticulately veined, and towards the base parallel-veined, glandular, and surrounding a subglobular akene; odor aromatic; taste bitter, aromatic, and slightly astringent.

Constituents.—Volatile oil 0.8 per cent., resin 9–18, tannin 3–4, ash 7–10 per cent. The aromatic and bitter virtues reside in the glands. (See *Lupulinum*.)

Properties.—Tonic, sedative, anodyne. *Dose*, 2.0 to 20.0 grams (3ss–v), in infusion or tincture; externally as fomentation and poultice.

FICUS.—Fig.

Origin.—*Ficus Carica*, *Lin.* *Natural order*, Urticaceæ, Artocarpeæ.

Habitat.—Western Asia; cultivated in subtropical countries.

Description.—Compressed, of irregular shape, fleshy, covered with an efflorescence of sugar, of a sweet fruity odor and very sweet mucilaginous taste. When softened in water, figs are pear-shaped, with a scar or short stalk at base, and a small scaly orifice at apex; hollow internally, the inner surface covered

with numerous yellowish, hard akenes. They consist of the fleshy receptacle, which in the unripe state contains an acrid milk-juice.

Fig. 135.



Ficus Carica, *Lin.*—*a.* Section of fig. *b.* Staminate, *c.* Pistillate flowers.

Constituents.—Akenes and cellular tissue 15, water 16, sugar 62 per cent., gum, fat, and salts.

Properties.—Demulcent, laxative; used internally as dietetic; externally as poultice.

ROSA CANINA.—HIPS.

Cynosbata.

Origin. — *Rosa canina*, *Lin.* *Natural order*,
Rosaceæ, Roseæ.

Habitat.—Europe.

Description.—Pitcher-shaped, about 2 centimeters ($\frac{4}{5}$ inch) long, bright red, glossy, fleshy, inner surface bristly, nearly inodorous, and of a sweetish acidulous, somewhat astringent taste. Hips consist of the receptacle (or calyx-tube), are crowned with the five sepals or their remnants, and inclose a number of brown hairy akenes. For medicinal use the akenes and hairs are removed.

Constituents.—Malic acid 7–8 per cent., citric acid 2–3, sugar 30, gum 25 per cent., tannin a trace, etc.

Properties.—Refrigerant, mild astringent, diuretic; used as a dietetic and as an excipient in the form of confection.

PHYTOLACCÆ BACCA.—POKEBERRY.

Origin.—*Phytolacca decandra*, *Lin.* *Natural order*, *Phytolaccaceæ*.

Habitat.—North America; naturalized in Europe.

Description.—Depressed, globular, dark purple, compound berry about 8 millimeters ($\frac{1}{3}$ inch) in diameter, composed of 10 carpels, each containing one lenticular black seed; juice purplish-red; inodorous, sweet, slightly acid.

Constituents.—Sugar, gum, coloring matter, turned yellow by alkalis and bleached by sunlight.

Properties.—Alterative, laxative, emetic. *Dose*, 0.5 to 1.0 gram (gr. viij–xv), in infusion, or the expressed juice in dose of half to one teaspoonful.

RHAMNUS CATHARTICUS.—BUCKTHORN.

Origin.—Rhamnus (Cervispina, *Moench*) catharticus, *Lin.* *Natural order*, Rhamnaceæ.

Habitat.—Europe and Northern Asia; naturalized in North America.

Description.—Globular, and, after drying, wrinkled, about 5 millimeters ($\frac{1}{3}$ inch) in diameter, green-brown or black, at the base with a convex disk, fleshy, with a brownish-green juice; endocarp parchment-like, four-celled, and four-seeded; the seeds triangular-convex, furrowed on the back; odor slight, unpleasant; taste disagreeable, bitter, and acrid.

Constituents.—Rhamnocathartin (amorphous, yellowish), rhamnin (yellowish granules, tasteless), sugar, gum, tannin, etc.

Properties.—Cathartic; the expressed juice made into syrup in doses of 10.0 to 20.0 grams (fʒij–iv). The juice treated with lime or alumina yields sap-green.

Allied drugs.—French berries from Rhamnus infectorius, *Lin.*, and Persian berries from Rhamnus saxatilis, *Lin.*, and other species of Rhamnus are collected unripe, resemble buckthorn berries, but are less wrinkled, internally yellowish, from 2- to 4-seeded, contain chrysorhamnin and rhamnoxanthin, and are employed for dyeing yellow.

RHUS GLABRA.—SUMACH.

Origin.—*Rhus glabra*, *Lin.* *Natural order*, Terebinthaceæ, Anacardiaceæ.

Habitat.—North America, in barren soil.

Description.—Subglobular, about 3 millimeters ($\frac{1}{8}$ inch) in diameter, drupaceous, crimson, densely hairy, containing a roundish-oblong, smooth putamen; inodorous; taste acidulous.

Constituents.—Acid calcium and potassium malates, tannin, coloring matter, etc.

Properties.—Refrigerant, diuretic, astringent; used mostly as gargle in decoction or fluid extract.

CUBEBA.—CUBEB.

Origin.—*Cubeba officinalis*, *Miquel*. *Natural order*, Piperaceæ.

Habitat.—Java; cultivated.

Description.—Collected unripe. Globular, about 4 millimeters ($\frac{1}{6}$ inch) in diameter, contracted at the base into a stipe nearly 6 millimeters ($\frac{1}{4}$ inch) long, reticulately wrinkled, blackish-gray, internally whitish and hollow, containing a partly developed depressed globular seed; odor strong spicy; taste pungently aromatic.

Cubeb should not be mixed with the nearly inodorous rachis or stalks.

Allied fruits.—*Cubeba Lowong*, *Miquel*, and *C. Wallichii*, *Miq.* Closely resembling cubeb.

Cubeba canina, *Miq.* The stipe is half the length of the globular portion.

Cubeba crassipes, *Miq.* Fruit larger than cubeb; pedicel stout and flattish; odor agreeable; taste bitter.

Constituents.—Volatile oil 5 to 15 per cent., resin 3 per cent., cubebic acid 1 to 3 per cent., cubebin, fat, wax, etc. Oil of cubeb is colorless, of spec. grav. 0.92, not freely soluble in 80 per cent. alcohol, levogyre, not fulminating with iodine, of composition $C_{30}H_{48}$. Cubeb resin is amorphous, not precipitated by alcoholic solution of lead acetate. Cubebic acid is more readily soluble in simple solvents, is precipitated by lead acetate, amorphous, some of its salts crystalline. Cubebin is white, pearly, crystalline, tasteless, colored red by sulphuric acid.

Properties.—Stimulant, local irritant, carminative (volatile oil), diuretic (resin and cubebic acid). *Dose*, 1.0 to 8.0 grams (gr. xv–3ij), in powder, fluid extract, or oleoresin.

PIPER—BLACK PEPPER.

Origin. — *Piper nigrum*, *Lin.* *Natural order*, Piperaceæ.

Habitat.—India; cultivated in the tropics.

Description.—Collected unripe. Globular, about 4 millimeters ($\frac{1}{4}$ inch) in diameter, reticulately wrinkled, brownish-black or grayish-black, internally lighter, hollow, with an undeveloped embryo; aromatic and of a spicy hot taste.

Constituents.—Volatile oil 1 to 2 per cent., piperina, $C_{17}H_{19}NO_3$, pungent resin (soluble in alkalis, alcohol, and ether), fat, ash 5 per cent. Volatile oil of pepper

is colorless, not pungent, of composition $C_{10}H_{16}$. Commercial oil of black pepper (so called) contains the pungent resin and fat, and is obtained as a by-product in the preparation of piperina. The latter is in colorless or yellowish prisms, inodorous, of a slowly developed peppery taste, colored blood-red by H_2SO_4 , and by alcoholic solution of alkalies decomposed into piperic acid, $C_{12}H_{10}O_4$, and piperidina, $C_5H_{11}N$, of an ammoniacal and peppery odor.

Properties.—Stimulant, irritant, tonic, febrifuge.
Dose, 0.3 to 1.5 gram (gr. v-xxij), in powder, confection, or oleoresin.

PIPER ALBUM.—WHITE PEPPER.

Origin.—*Piper nigrum*, *Lin.* (see above); the ripe fruit deprived of epicarp and sarcocarp.

Description.—Globular, smooth, with ten or twelve veins from base to apex, whitish, and, after the removal of the endocarp, reddish-brown; under the testa an albuminous seed; odor and taste pepper-like, less pungent.

Constituents and Properties.—Same as black pepper.

PIMENTA.—PIMENTO.

Semen amomi.—Allspice.

Origin.—*Eugenia Pimenta*, *DeCandolle*. *Natural order*, Myrtaceæ.

Habitat.—Tropical America; cultivated.

Description.—Nearly globular, about 6 millimeters ($\frac{1}{4}$ inch) in diameter, crowned with the short four-parted calyx-limb or its remnants and a short style, brownish or brown-gray and glandular, two-celled, each cell with one brown, plano-convex, roundish-reniform seed; pungently aromatic, clove-like.

Constituents.—Volatile oil 3 to 4 per cent., resin, fat, tannin, sugar, gum, etc. Oil of pimento has the spec. grav. 1.0374, and contains a hydrocarbon and eugenic acid.

Properties.—Stomachic, stimulant, carminative.

Dose, 0.5 to 2.0 grams (gr. viij-xxx), in powder.

CARYOPHYLLI FRUCTUS.—MOTHER-CLOVE. ANTHOPHYLLI.

Origin.—*Eugenia caryophyllata*, Thunberg, s. *Caryophyllus aromaticus*, Lin. *Natural order*, Myrtaceæ.

Habitat.—Molucca Islands; cultivated in the tropics.

Description.—Collected while unripe; oval-oblong, about 20 millimeters ($\frac{4}{5}$ inch) long, crowned with four calyx teeth, dark brown, two-celled, each cell with one or two seeds; odor and taste clove-like, mild.

Constituents and Properties.—Similar to cloves.

Fig. 136.



Caryophylli
fructus.

COCCULUS.—COCCULUS INDICUS. FISHBERRIES.

Origin.—Anamirta Cocculus, *Wight et Arn.* *Natural order*, Menispermaceæ.

Habitat.—East India.

Description. — Globular kidney-shaped, about 6 millimeters ($\frac{1}{4}$ inch) thick, blackish-brown, wrinkled, the basal and apical scars close together and united by an obscure ridge around the convex side; endocarp whitish, thin, on the concave side projecting deeply into the interior; seed semilunar, oily, very bitter.

Fig. 137.



Cocculus.—Fruit and longitudinal section.

Constituents.—The pericarp contains menispermia (soluble in ether) and paramenispermia, two tasteless alkaloids, hypopicrotoxic acid, resin, fat, gum, etc. The seed contains picrotoxin, $C_{36}H_{40}O_{16}$; bitter, poisonous, by long-continued boiling in benzol decomposed into picrotoxinin, $C_{15}H_{16}O_6$, and picrotin, $C_{21}H_{24}O_{10}$ (the latter being not poisonous), and anamirtin or cocculin, $C_{10}H_{24}O_{10}$ (not bitter or poisonous).

Properties.—Nervine, sedative. *Dose*, 0.1 to 0.2 gram (gr. jss–ijj), in powder; externally in decoction for killing vermin.

ANACARDIUM.—CASHEW NUT.

Origin.—Anacardium occidentale, *Lin.* *Natural order*, Terebinthaceæ, Anacardiaceæ.

Habitat.—Tropical America; naturalized in Africa and India.

Description.—Kidney-shaped, about 25 millimeters (1 inch) long, 18 millimeters ($\frac{3}{4}$ inch) broad, and 10 millimeters ($\frac{2}{3}$ inch) thick, gray-brown; between the brittle epicarp and endocarp a soft sarcocarp containing a black acrid juice; seed large, white, of a mild oily taste.

Constituents.—In the pericarp cardol, $C_{21}H_{30}O$ (oily, very acrid), resin, tannin, gum, etc.; in the seed a bland fixed oil.

Properties and Uses.—The pericarp as a rubefacient, epispastic, and caustic; the seed is edible, likewise the fleshy and acidulous pedicel.

SEMECARPUS.—ANACARDIUM ORIENTALE.

ORIENTAL CASHEW NUT.

Origin.—Semecarpus Anacardium, *Lin. fl.* *Natural order*, Terebinthaceæ, Anacardiaceæ.

Habitat.—East India.

Description.—Ovate heart-shaped, flattish, about 20 millimeters ($\frac{4}{5}$ inch) long, blackish-brown, in the pericarp with a brown acrid juice; seed white, mild, oily.

Constituents and Properties.—Like the preceding.

MYROBALANUS.—MYROBALAN.

Origin.—Terminalia Chebula, *Retz.*; *T. bellerica*, *Roxb.*; *T. citrina*, *Roxb.*, etc. *Natural order*, Combretaceæ.

Habitat.—Southern Asia.

Description.—Oblong, roundish-oval or pyriform,

3 to 5 centimeters (1 to 2 inches) long, more or less distinctly five-angled and five-ribbed, brown or orange-colored; sarcocarp of a somewhat resinous fracture; endocarp hard, resinous-dotted, containing a white oily seed; inodorous, strongly astringent.

Constituents.—Gallotannic acid about 45 per cent., gallic acid, resin, mucilage.

Properties.—Astringent; used for tanning purposes and for preparing tannin.

PRUNUM.—PRUNE.

Origin.—*Prunus domestica*, *Lin.* *Natural order*, Rosaceæ, Amygdaleæ.

Habitat.—Western Asia; cultivated in many varieties.

Descriptions.—Oblong or subglobular, shrivelled, blackish-blue, glaucous, the sarcocarp brownish-yellow, sweet and acidulous; putamen hard, smooth or irregularly ridged; the seed almond-like, but smaller, and of a bitter taste. For medicinal use the putamen and seed are rejected.

Constituents.—In the sarcocarp sugar 12 to 25 per cent., pectin, malic acid, salts; in the seed fixed oil, amygdalin, emulsin.

Properties.—The sarcocarp is nutritious and laxative; used as a corrective for senna in decoction and confection.

RUBUS IDÆUS.—RASPBERRY.

Origin. — *Rubus Idæus*, *Lin.* *Natural order*, Rosaceæ, Dryadææ.

Habitat.—Europe and Asia; cultivated.

Description.—Hemispherical, about 1 centimeter ($\frac{2}{3}$ inch) broad, with a conical cavity from the separation of the receptacle; red, finely hairy, composed of about 25 small drupes, which are coalesced at the base and crowned with the remnant of the style; juicy, of an agreeable odor, and a pleasant acidulous taste. The fruit is used in the fresh state only.

Rubus strigosus, *Michaux*, indigenous to North America, closely resembles the preceding; the color of the fruit is a lighter red.

Rubus occidentalis, *Lin.*, indigenous to North America, has a purplish-black fruit.

The blackberries, *Rubus villosus*, *Aiton*, etc., have the fruit united with the receptacle.

Constituents.—Volatile oil a trace, citric and malic acids, pectin, glucose, coloring matter.

Properties.—Refrigerant, mild laxative, dietetic.

UVA PASSA.—RAISINS.

Origin.—*Vitis vinifera*, *Lin.* *Natural order*, Vitaceæ.

Habitat.—Western Asia; extensively cultivated in Southern Europe.

Description.—Shrivelled and flattened, in the fresh state globular, one-celled berries, brownish, somewhat translucent, sweet, and acidulous.

Raisins should be freed from the stalks and seeds.

Varieties.—Large raisins, *passulæ majores*, produced in Spain, Italy, and Asia Minor; the Sultana raisins are seedless.

Small raisins, *passulæ minores*, or Corinthian raisins (often called currants), are chiefly exported from Greece.

Constituents.—In the epicarp tannin and coloring matter; in the pulp grape sugar, acid potassium tartrate, calcium tartrate, little malic acid, mucilage, etc.

Properties.—Nutritive, demulcent, refrigerant, aperient; used as a corrective and flavor of mucilaginous and bitter drinks, etc.

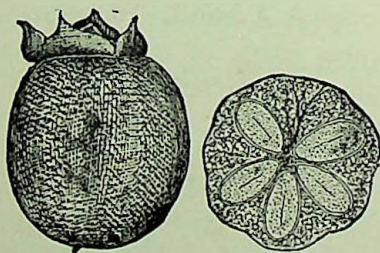
DIOSPYROS.—PERSIMMON.

Origin.—*Diospyros virginiana*, *Lin.* *Natural order*, Ebenaceæ.

Habitat.—United States, in low grounds and woods.

Description.—Globular or globular-oblong, about

Fig. 138.



Diospyros.—Fruit and transverse section, natural size.

25 millimeters (1 inch) long, green, smooth, at the base with the four-lobed calyx, at the apex with a short remnant of the style, six-celled and six-seeded; odor slight, fruit-like; taste very astringent. After exposure to frost the taste is acidulous and sweet.

Constituents.—Tannin, malic acid, pectin.

Properties.—Astringent. *Dose*, 1.0 to 4.0 grams (gr. xv-℥j), in infusion or tincture.

AURANTII FRUCTUS.—BITTER ORANGE.

Origin.—*Citrus vulgaris*, *Risso*. *Natural order*, *Aurantaceæ*.

Habitat.—Northern India; cultivated and naturalized in subtropical countries.

Description.—1. Orange berries, *Aurantia immatura*; the unripe fruit; globular or subglobular, 3 to 20 millimeters ($\frac{1}{8}$ to $\frac{4}{5}$ inch) in diameter, black-green or brownish, rugose, at the base with about ten round depressions forming a circular scar; at the apex with a short remnant of the style; hard, containing 8 to 12 cells, each with several undeveloped seeds; agreeably aromatic, very bitter.

2. Bitter orange, *Aurantii fructus*; the ripe fruit; of the size and shape of a sweet orange, but externally rougher, orange-red, the juice acidulous and bitter.

Constituents.—Volatile oil, hesperidin (bitter, crystalline glucoside, yellow by alkalies), resin, fat, gum, etc.; in the juice citric acid. The volatile oil of orange

berries was formerly sold as essence de petit grain (now often made of the leaves), and is mainly hesperidene, $C_{10}H_{16}$, like the oil of bitter orange obtained by grating the epicarp.

Properties.—Stimulant, stomachic, tonic. *Dose*, 1.0 to 2.0 grams (gr. xv–xxx), in tincture or wine. The juice of the ripe fruit is also refrigerant.

BELA.—BAEL. BENGAL QUINCE.

Origin.—Aegle (Cratæva, *Lin.*) Marmelos, *D. C.*
Natural order, Aurantiaceæ.

Habitat.—Himalaya Mountains; cultivated in India.

Description.—Collected while unripe. Globular or subglobose, 5 to 10 centimeters (2 to 4 inches) in diameter, twelve-celled; in commerce mostly in fragments, consisting of a brownish-gray, smooth, hard rind, 2 or 3 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) thick, to which a hard mucilaginous, somewhat acidulous, red-brown and internally whitish pulp is adhering, inclosing oblong flat woolly seeds; inodorous, slightly astringent; the infusion scarcely affected by iron salts.

Constituents.—Mucilage, pectin, sugar, and little tannin, bitter principle and volatile oil.

Properties.—Mild astringent. *Dose*, 1.0 to 3.0 grams (gr. xv–xlv), in infusion or fluid extract.

LIMON.—LEMON.

Origin.—Citrus Limonum, *Risso*. *Natural order*, Aurantiaceæ.

Habitat.—India; cultivated in subtropical countries.

Description.—Used in the fresh state. Oval or obovate, with a nipple-shaped apex, yellow, nearly smooth, but ruggedly glandular; internally divided into from 8 to 12 cells, each with 2 or 3 seeds and containing an acid juice; the rind fragrant and somewhat bitter (see Limonis cortex).

Constituents.—Yield of juice 20 to 30 grams (3v-vijss); spec. grav. about 1.04; yellowish; contains 7 to 9 per cent. of citric acid, a little malic acid, and mucilage. On keeping lemons for several months, the citric acid is decomposed into sugar and carbonic acid.

Properties.—Refrigerant. *Dose*, 8 to 20 grams (3ij-v), diluted with water and as syrup.

CAPSICUM.—CAYENNE PEPPER, BIRD PEPPER.

Origin.—Capsicum fastigiatum, *Blume*. *Natural order*, Solanaceæ.

Habitat.—Probably tropical America; cultivated.

Description.—Conical, from 12 to 18 millimeters ($\frac{1}{2}$ to $\frac{3}{4}$ inch) long, supported by a flattish, cup-shaped, five-toothed calyx, with a red, shining, membranous, and translucent pericarp, inclosing two cells, and containing flat, reniform, yellowish seeds attached to a

thick central placenta. It has a peculiar odor and an intensely hot taste.

The fruit of *Capsicum annuum*, *Lin.*, is larger, 5 to 8 centimeters (2 to 3¼ inches) long, conical, sometimes curved or subglobular; the fruit of *C. cerasiforme*, *Willd.*, is of the size and shape of a cherry.

Constituents.—Capsaicin, $C_9H_{14}O_2$, fixed oil, waxy matter, resin, coloring matter, trace of volatile oil having the odor of conia. Capsaicin is crystalline, colorless, fusible, volatile, extremely acrid, soluble in alcohol, ether, benzol, and fixed oils.

Properties.—Stimulant, stomachic, powerful rubefacient. *Dose*, 0.1 to 0.5 gram (gr. jss–viiij), in powder, infusion, tincture, or oleoresin; externally in liniments and plasters.

COLOCYNTHIS.—COLOCYNTH.

Origin.—*Citrullus* (*Cucumis*, *Lin.*) *Colocynthis*, *Schrader.* *Natural order*, Cucurbitaceæ.

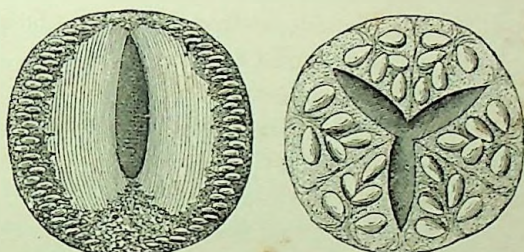
Habitat.—Southern and Western Asia and Northern Africa.

Description.—Deprived of the smooth, light brownish-yellow rind. Globular, 5 to 10 centimeters (2 to 4 inches) in diameter, white or yellowish-white, light, spongy, readily breaking into three wedge-shaped pieces, each containing near the rounded surface many flat, ovate, brown seeds; inodorous; taste intensely bitter.

The pulp alone (about 70 per cent. of the peeled fruit), deprived of the seeds, should be employed. Hard and dark-colored colocynth should be rejected.

Constituents.—Colocynthin, $C_{16}H_{24}O_{23}$, resin, colocynthitin (tasteless crystalline resin), pectin, gum, 11 per cent. ash. Colocynthin is yellow, amorphous, or crystalline, soluble in water and alcohol, very bitter, and splits into sugar and resinous colocynthein. The seeds contain little bitter principle, 17 per cent. of fixed oil, and 2.5 to 3 per cent. of ash.

Fig. 139.



Peeled Colocynth.—Longitudinal and transverse section.

Properties.—Drastic purgative, in overdoses emetic and irritant. *Dose*, 0.1 to 0.5 gram (gr. jss–viij), in powder, tincture, or extract.

CASSIA FISTULA.—PURGING CASSIA.

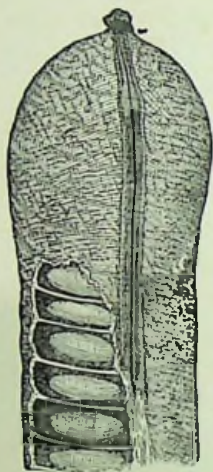
Origin.—Cassia (Cathartocarpus, Persoon) Fistiula, *Lin.* *Natural order*, Leguminosæ, Cæsalpinææ.

Habitat.—East India; naturalized in tropical Africa and America.

Description.—Cylindrical, 45 to 60 centimeters (18 to 24 inches) long, nearly 25 millimeters (1 inch) in diameter; pericarp blackish-brown, woody, somewhat

veined, the sutures smooth, forming two longitudinal bands, the ventral band with a shallow groove, and the dorsal one with a fine ridge; indehiscent; internally divided transversely into numerous cells, each containing an ovate, flattish, glossy seed imbedded in a blackish-brown sweet pulp; odor resembling prunes.

Fig. 140.



Cassia fistula.—Part of pod, natural size.

Other Varieties.—*Cassia moschata*, *Kunth*, of New Granada, perhaps also *C. baccularis*, *Lin. fil.*, of Surinam. 30 to 50 centimeters (12 to 20 inches) long, about 12 millimeters ($\frac{1}{2}$ inch) thick; often curved; the pericarp and pulp of a lighter color than in *Cassia Fistula*.

Cassia brasiliana, *Lam.*, s. *C. grandis*, *Lin. fil.*, of Brazil. 60 centimeters (24 inches) or more long, laterally compressed, about 38 millimeters ($1\frac{1}{2}$ inch) broad, black-brown, coarsely veined, the sutures prominent.

Constituents.—The pulp (yield about 30 per cent.) contains sugar 60 per cent., mucilage, pectin, albumenoids, salts (calcium oxalate).

Properties.—Laxative. *Dose*, 4 to 10 grams (3j-ijss); used for confection of senna.

CERATONIA.—ST. JOHN'S BREAD.

Siliqua dulcis.

Origin.—*Ceratonia Siliqua*, *Lin.* *Natural order*, Leguminosæ, Cæsalpineæ.

Habitat.—Southern Europe.

Description.—Broadly linear, about 15 centimeters (6 inches) long, 2 centimeters ($\frac{4}{5}$ inch) broad, and 3 millimeters ($\frac{1}{8}$ inch) thick, flat, thickened on the edges; epicarp leathery, brown, glossy; sarcocarp red-brown, pulpy; internally divided transversely into from 6 to 12 cells, each containing an ovate, flattish, glossy seed.

Constituents.—Sugar 40 to 50 per cent., mucilage, pectin, albumenoids, butyric acid, little tannin.

Properties.—Demulcent, laxative; used as an addition to expectorant mixtures.

PAPAYER.—POPPY.

Origin.—*Papaver somniferum*, *Lin.* *Natural order*, Papaveraceæ.

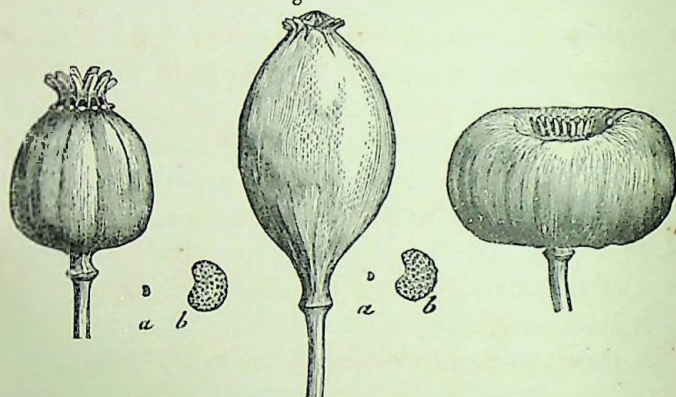
Habitat.—Western Asia; cultivated.

Description.—The capsules are collected when nearly ripe and freed from the seeds. Globular-ovate or ovate-oblong, crowned with the peltate, many-rayed stigma, one-celled, but on the inner surface furnished with numerous vertical projecting placentas; of a slight odor and bitter taste.

Constituents.—Alkaloids in variable proportion, from traces to 0.10, occasionally as much as 2 per

cent., consisting of morphia, narcotina, rheadina, narceina, codeia, and papaverosina; little meconic acid; citric and tartaric acids, mucilage, wax, ash about 14 per cent.

Fig. 141.



Black.

White.

Depressed.

Poppy capsules and seeds (*a*, natural size; *b*, magnified).

Properties.—Anodyne, hypnotic, sedative. *Dose*, 1 to 2 grams (gr. xv–xxx), in decoction, syrup, and extract; externally as poultice.

CHENOPODIUM.—WORMSEED.

Origin.—*Chenopodium ambrosioides*, *Lin.*, var. *anthelminticum*, *Gray*. *Natural order*, *Chenopodiaceæ*.

Habitat.—West Indies and Central America; naturalized in the United States.

Description.—Nearly 2 millimeters ($\frac{1}{12}$ inch) in diameter, depressed globular, glandular, dull greenish

or brownish, the integuments friable, containing a lenticular, obtusely-edged, glossy, black seed; odor peculiar, somewhat terebinthinate; taste bitterish pungent.

Constituents.—Volatile oil, spec. grav. 0.91, consists of $C_{10}H_{16}$ and $C_{10}H_{16}O$.

Properties.—Anthelmintic. *Dose*, 1 to 3 grams (gr. xv–xlv), in powder or electuary; the volatile oil 5 to 10 or 15 drops.

ILLICIUM.—STARANISE.

Origin.—*Illicium anisatum*, Loureiro. *Natural order*, Magnoliaceæ.

Habitat.—Southwestern China, Siam.

Fig. 142.

*Illicium anisatum*.

Fig. 143.

*Illicium religiosum*.

Description.—Eight carpels, stellately arranged around a central column about 5 millimeters ($\frac{1}{2}$ inch) long; carpels 12 to 15 millimeters ($\frac{1}{2}$ to $\frac{3}{4}$ inch) long, boat-shaped, somewhat woody, wrinkled, with a straight beak, brown, split along the upper suture; internally red-brown and glossy, containing a flattish, oval, glossy, brown seed; odor anise-like; taste sweet

aromatic, the seeds oily. 100 parts of fruit yield 78 parts of capsules and 22 parts of seed.

Adulteration.—*Illicium religiosum*, *Siebold*, indigenous to China and Corea, cultivated in Japan. Shikimi fruit. Poisonous. The fruit resembles the preceding, but the carpels are more woody, shrivelled and wrinkled, and have a thin beak, mostly turned upwards, a faintly aromatic, somewhat clove-like odor, and a disagreeable taste.

Constituents.—Volatile oil (from the capsules 5.3 per cent., from the seeds 1.8 per cent.), fat (from the capsules 2.8 per cent., from the seeds 20 per cent.), resin, etc. The volatile oil is chemically identical with the oil of *Pimpinella Anisum*, but has a slightly different odor and taste.

Shikimi fruit contains 0.44 per cent. of non-solidifying volatile oil, spec. grav. 1.006, and shikimin, the poisonous crystalline principle, soluble in alcohol, glacial acetic acid, ether, chloroform, and water.

Properties.—Carminative, anodyne, stimulant, diuretic. *Dose*, 0.5 to 1.5 gram (gr. viij–xxij); mostly used for flavoring.

CARDAMOMUM.—CARDAMOM.

Origin. — *Elettaria* (*Alpinia*, *Roxb.*, *Amomum*, *White*) *Cardamomum*, *Maton*. *Natural order*, *Zingiberaceæ*.

Habitat.—Malabar; cultivated in other parts of India.

Description.—Ovoid or oblong, from 1 to 2 centimeters ($\frac{2}{5}$ to $\frac{4}{5}$ inch) long, obtusely triangular, rounded

at the base, short-beaked, longitudinally striate, of a pale buff color, three-celled, with a thin, leathery, nearly tasteless pericarp and a central placenta; seeds about 20, reddish-brown, angular, transversely rugose, depressed at the hilum, surrounded by a thin membranous arillus; of an agreeable odor, and a pungent aromatic taste; the integuments nearly tasteless. 100 parts of fruit yield 22 parts of capsules and 78 parts of seeds.

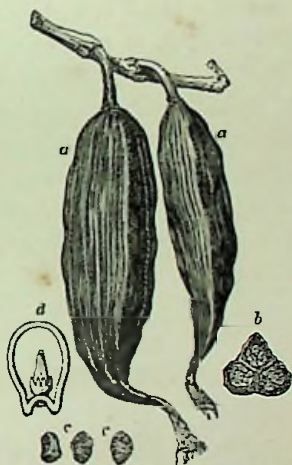
Varieties.—Malabar Cardamom, the most esteemed, of a light buff color, plump.

Fig. 144.



Malabar Cardamom.—*a*, short;
b, medium; *c*, long.

Fig. 145.



Ceylon Cardamom.—*a*, capsules;
b, transverse section of capsule;
c, seeds; *d*, section of seed with
embryo, magnified.

Aleppy Cardamom, mostly short, of a greenish tint.

Madras Cardamom, of a pale color, oblong, somewhat attenuated above.

The following varieties are of a somewhat different and inferior flavor:—

Ceylon Cardamom, from *Elettaria major*, *Smith*, s. E. Cardamomum, var. β . About 38 millimeters ($1\frac{1}{2}$ inch) long, triangular, prolonged into a beak about 15 millimeters ($\frac{3}{8}$ inch) long, dark gray-brown.

Round Cardamom, globular or globular-ovate, from *Amomum Cardamomum*, *Lin.*, of Siam and Java, and *Am. globosum*, *Lour.*, of China.

Bengal Cardamom, from *Amomum aromaticum*, *Roxb.*, near the apex with 9 wings.

Winged Java Cardamom, from *Am. maximum*, *Roxb.*, with from 9 to 12 wings from base to apex.

Constituents.—Volatile oil 4 to 5 per cent., fixed oil 10 to 11 per cent., starch in minute granules, albumenoids, mucilage, ash about 15 per cent., containing 0.8 per cent. of manganese.

Properties. — Carminative, stomachic, stimulant.
Dose, 0.3 to 1.0 gram (gr. v–xv), in powder, infusion, or tincture.

VANILLA.—VANILLA.

Origin. — *Vanilla planifolia*, *Andrews*. *Natural order*, Orchidaceæ.

Habitat.—Eastern Mexico, in hot damp woods; cultivated in the tropics.

Description. — Collected before ripe; the aroma developed by sweating. Linear, obscurely triquetrous, from 15 to 25 centimeters (6 to 10 inches) long, nar-

rowed and bent or hooked at the base, rather oblique at the apex, wrinkled, somewhat warty, dark brown, glossy, leathery, one-celled, containing a blackish-brown fragrant pulp with numerous minute seeds and more or less acicular crystals.

Varieties.—Mexican Vanilla, the finest quality.

Bourbon Vanilla, rather shorter and lighter than the preceding, the odor suggestive of tonka.

Venezuelan Vanilla, about 10 centimeters (4 inches) long, thick; resembling tonka in odor; probably from *Vanilla guianensis*, *Splittberger*.

Brazilian Vanilla, vanillon, from *Vanilla Pompona*, *Schiede*, longer and thicker than the preceding; of an inferior vanilla odor.

Constituents.—Vanillin, $C_8H_8O_3$ (1.7 per cent. in Mexican, 2 per cent. in Bourbon, and 2.75 in Java Vanilla, in the last two associated with odorous oil), fixed oil 11 per cent., resin, sugar, mucilage, etc. Vanillin is the aldehyd of methyl-protocatechuic acid, and is prepared artificially from coniferin (in the sap-wood of pines), carbolic acid, eugenic acid, and benzoin.

Properties.—Carminative, stimulant, aphrodisiac, antihysteria. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in powder, tincture, or syrup.

CORIANDRUM.—CORIANDER.

Origin.—*Coriandrum sativum*, *Lin.* *Natural order* Umbelliferae, Coelospermæ.

Habitat.—Central Asia and Southern Europe; cultivated.

Fig. 146.



Coriandrum.—Fruit and longitudinal section, magnified 3 diameters; transverse section, magnified 8 diameters.

Description.—Globular, about 3 millimeters ($\frac{1}{8}$ inch) in diameter, crowned with the calyx teeth, brownish-yellow, with slight longitudinal ridges; the two mericarps cohering, inclosing a lenticular cavity, and each furnished on the face with two oil-tubes; odor and taste agreeably aromatic.

Constituents.—Volatile oil $\frac{1}{2}$ to 1 per cent., fat 13 per cent., mucilage, etc.

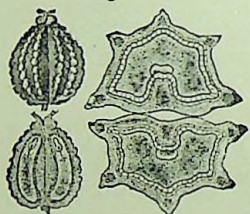
Properties.—Carminative, stimulant, stomachic.

Dose, 0.5 to 2.0 grams (gr. viij-xxx).

CONII FRUCTUS.—CONIUM FRUIT.

HEMLOCK FRUIT.

Fig. 147.



Conium.—Fruit and longitudinal section, magnified 3 diameters; transverse section, magnified 8 diameters.

Origin.—*Conium maculatum*, Lin. Natural order, Umbelliferae, Campylospermæ.

Habitat.—Europe and Asia; naturalized in North America.

Description.—The fruit is gathered when full grown, while yet green. About 3 millimeters ($\frac{1}{8}$ inch) long, broadly ovate, laterally compressed, gray-green, smooth, often divided into the two mericarps, and these with five crenate ribs, without oil-tubes, and containing a seed which is grooved on the face; odor and taste slight; triturated with solution of potassa, a strong disagreeable odor is given off.

Constituents.—Conia, $C_8H_{15}N$, $\frac{1}{5}$ – $\frac{1}{2}$ per cent., methylconia, $C_8H_{14}CH_3N$, conhydrina, $C_8H_{17}NO$, little volatile oil, fixed oil. Conia is colorless, oily, of spec. grav. 0.88, volatile, of a disagreeable odor and an acrid taste, soluble in alcohol, ether, and water, less in hot water. Methylconia resembles conia. Conhydrina is in iridescent scales, melts at $120.6^\circ C.$ ($249^\circ F.$), and is less poisonous than conia.

Properties.—Sedative, narcotic. *Dose*, 0.1 to 0.3 gram (gr. jss–v); of conia 0.005 gram (gr. $\frac{1}{12}$).

ANISUM.—ANISE.

Origin.—Pimpinella Anisum, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

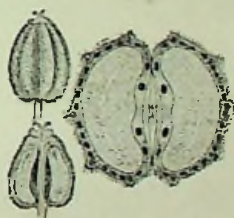
Habitat.—Western Asia, Egypt, Southeastern Europe; cultivated.

Description.—Four or five millimeters ($\frac{1}{8}$ – $\frac{1}{3}$ inch) long, ovate, compressed at the sides, grayish, finely hairy, and consisting of two mericarps, each with a flat face, five light brownish filiform ridges, and about fifteen or more thin oil-tubes; odor agreeable, aromatic; taste sweet, spicy.

The fruit of conium is usually in separate mericarps, smooth, grooved upon the face, and has no oil-tubes.

Constituents.—Volatile oil $1\frac{1}{2}$ –3 per cent., fixed oil 3–4 per cent., sugar, mucilage, etc. Oil of anise is colorless or yellowish, of

Fig. 148.



Anisum.—Fruit and longitudinal section, magnified 3 diameters; transverse section, magnified 8 diameters.

spec. grav, 0.97, congeals at about 10° C. (50° F.), and consists chiefly of anethol, $C_{10}H_{12}O$.

Properties. — Carminative, stimulant, stomachic.

Dose, 0.5 to 2.0 grams (gr. viij-xxx), in powder, spirit, volatile oil.

APIUM.—CELERY FRUIT.

Origin.—*Apium graveolens*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—About 1 millimeter ($\frac{1}{25}$ inch) long, roundish-ovate, laterally compressed, brown, smooth, mostly divided into the two mericarps, and these with five filiform ribs, flat on the face, and containing about 12 oil-tubes; aromatic.

Constituents.—Volatile oil, spec. grav. 0.88, fixed oil, mucilage.

Properties. — Carminative, stimulant; used for flavoring.

PETROSELINUM.—PARSLEY FRUIT.

Origin.—*Petroselinum sativum*, *Hoffmann.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Southern Europe; extensively cultivated.

Description.—About 2 millimeters ($\frac{1}{12}$ inch) long, ovate, laterally compressed, greenish- or brownish-gray, smooth, mostly divided into the two mericarps, and these with five filiform pale-colored ribs, flat on the face, and containing six oil-tubes; aromatic.

Constituents.—Volatile oil $1\frac{1}{2}$ to 3 per cent., fixed oil 12 per cent., resin 5 per cent., apiol, mucilage. The crude volatile oil contains much stearopten, volatilizing with difficulty. Apiol is colorless or yellowish, oily, and has the specific gravity 1.075, a strong parsley odor, and a pungent taste; it is a mixture of several constituents.

Properties.—Carminative, stimulant, diuretic. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder, infusion, or spirit. Apiol, 0.2 to 0.5 gram (gr. iij-viij), as a supposed febrifuge.

FENICULUM.—FENNEL.

Origin.—*Fœniculum vulgare*, Gaertner. *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Oblong, nearly cylindrical, slightly curved, 4 to 6 millimeters ($\frac{1}{5}$ to $\frac{1}{4}$ inch) long, brownish or greenish-brown; readily separable into the two mericarps, and these with five light brown conspicuous obtuse ribs, 4 oil-tubes on the back and 2 or 4 oil-tubes upon the flat face; odor and taste aromatic, anise-like.

Varieties.—Saxon or German Fennel, described above.

Roman Fennel. Larger than the preceding, 8 to 10 millimeters ($\frac{1}{3}$ – $\frac{2}{5}$ inch) long.

Bitter Fennel, collected in Southern France from wild growing plants; smaller, 3 to 5 millimeters ($\frac{1}{8}$ to $\frac{1}{4}$ inch) long; taste bitterish and spicy.



Fig. 149.

Fœniculum.—Fruit, 3 diameters; transverse section, 8 diameters.

Constituents.—Volatile oil 2 to 4 per cent., fixed oil 12 per cent., sugar, mucilage. Oil of fennel is colorless or yellowish, sweet, of spec. grav. 0.97, congeals below 10° C. (50° F.), and contains both solid and liquid anethol.

Properties. — Carminative, stimulant, stomachic, galactagogue. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder, spirit, volatile oil.

PHELLANDRIUM.—WATER-DROPWORT.

Five-leaved water-hemlock.

Origin.—*Cœnanthe Phellandrium*, *Lam.*, s. *Phellandrium aquaticum*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Europe and Northern Asia.

Description.—Oblong or oblong-ovate, 3 or 4 millimeters ($\frac{1}{8}$ to $\frac{1}{6}$ inch) long, nearly terete, brown or blackish-brown, smooth, each mericarp with five broad and obtuse ribs, four narrow grooves, and six oil-tubes; odor caraway-like, but unpleasant; taste aromatic bitter, somewhat acrid.

Constituents.—Volatile oil 1 to 1½ per cent., fixed oil, resin, mucilage.

Properties. — Carminative, stimulant, diaphoretic, diuretic. *Dose*, 1 to 2 or 4 grams (gr. xv-xxx-3j), in powder or infusion.

CUMINUM.—CUMIN FRUIT.

Origin.—Cuminum Cyminum, *Lin.* *Natural order,* Umbelliferae, Orthospermæ.

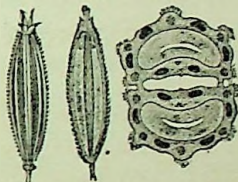
Habitat.—Northeastern Africa; cultivated.

Description.—Oblong, 5 or 6 millimeters long, narrowed at both ends, laterally compressed, brown, rough-hairy; each mericarp with five filiform yellowish ribs, four broader ones of a brown color, and six oil-tubes; odor and taste peculiar, somewhat like caraway.

Constituents.—Volatile oil 1 to 3 per cent., fixed oil, resin, mucilage. Oil of cumiu is of spec. grav. 0.92, and consists chiefly of cymol or cymene, $C_{10}H_{14}$, and cuminol or cuminaldehyd, $C_{10}H_{12}O$.

Properties.—Carminative, stimulant, antispasmodic. *Dose,* 0.5 to 2.0 grams (gr. viij-xxx), in powder or volatile oil.

Fig. 150.



Cumin.—Fruit and longitudinal section, 3 diameters; transverse section, 8 diameters.

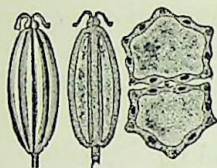
CARUM.—CARAWAY.

Origin.—Carum Carui, *Lin.* *Natural order,* Umbelliferae, Orthospermæ.

Habitat.—Central and Western Asia; cultivated.

Description.—Oblong, laterally compressed, about 4 millimeters ($\frac{1}{6}$ inch) long, brown, smooth, usually separated into the two mericarps, and these curved, narrower at both ends, with five pale-colored filiform

Fig. 151.



Carum.—Fruit and longitudinal section, 3 diameters; transverse section, 8 diameters.

ribs and with six oil-tubes; odor aromatic, agreeable; taste sweetish, spicy.

Constituents.—Volatile oil 5 to 7 per cent., fixed oil, resin, sugar, mucilage, little tannin. Oil of caraway has the spec. grav. 0.92, and consists of carvene, $C_{10}H_{16}$, and carvol, $C_{10}H_{14}O$.

Properties.—Carminative, stimulant, diuretic. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder, infusion, spirit, and volatile oil.

ANETHUM.—DILL.

Origin.—Anethum (Peucedanum) graveolens, *Lin*.

Natural order, Umbelliferae, Orthospermæ.

Habitat.—Levant and Southern Europe; cultivated.

Description.—Oblong or oval, about 4 millimeters ($\frac{1}{8}$ inch) long, dorsally compressed, brown, smooth, usually separated into the two thin mericarps, and these with six oil-tubes and with five ribs, of which three are filiform and the two lateral ones broadly winged and light-colored; odor and taste spicy, caraway-like.

Fig. 152.



Anethum. — Fruit, 3 diameters; transverse section, 5 diameters.

Constituents.—Volatile oil 3 to 4 per cent., fixed oil, mucilage. Oil of dill has the spec. grav. 0.87, and consists chiefly of anethene, $C_{10}H_{16}$, of a lemon-like odor, and probably carvol.

Properties. — Carminative, stimulant, stomachic.
Dose, 0.5 to 2.0 grams (gr. viij-xxx), in powder, infusion, or volatile oil.

CAROTA.—CARROT FRUIT.

Origin.—*Daucus Carota*, *Lin.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Northern Asia and Europe; naturalized in North America; cultivated.

Description.—About 4 millimeters ($\frac{1}{8}$ inch) long, oval, dorsally compressed, gray-brown, each mericarp with six thin oil-tubes and with nine ribs, of which five are hairy and four beset with long spiny bristles; odor slightly aromatic; taste pungent.

The fruit is collected from wild plants.

Constituents.—Trace of volatile oil, fixed oil.

Properties. — Stimulant, diuretic. *Dose*, 1 to 2 grams (gr. xv-xxx), in infusion.

AURANTII CORTEX.—ORANGE PEEL.

Origin.—1. *Citrus vulgaris*, *Risso*, bitter orange.
 2. *Citrus Aurantium*, *Risso*, sweet orange. *Natural order*, Aurantiaceæ.

Habitat.—Northern India; cultivated in subtropical countries.

Description.—Narrow thin bands, the epidermis glandular and dark brownish-green (bitter orange), or orange-yellow (sweet orange), and with very little of the spongy white inner layer adhering to it; odor

fragrant; taste aromatic and bitter, or, in the sweet orange peel, faintly bitter. In commerce frequently met with in curved elliptical sections, about 75 millimeters (3 inches) long, with a rather thick layer of the white zest.

Constituents.—Volatile oil, hesperidin (see *Aurantii fructus*); in the white zest a principle giving a black color with ferric salts. Oil of bitter orange peel (essence de Bigarade) and oil of sweet orange peel (essence de Portugal) consist mainly of hesperidene, $C_{10}H_{16}$, with a small portion of an easily altered compound, $C_{10}H_{16}O$.

Properties.—Stimulant, tonic. *Dose*, 1 to 2 grams (gr. xv-xxx), in infusion or tincture. The volatile oil used for flavoring and in perfumes.

LIMONIS CORTEX.—LEMON PEEL.

Origin.—*Citrus Limonum*, *Risso*. *Natural order*, *Aurantiaceæ*.

Habitat.—Northern India; cultivated in subtropical countries.

Description.—Narrow thin bands, the epidermis deep lemon-yellow and ruggedly glandular, and with very little of the spongy white inner layer adhering to it; odor fragrant; taste aromatic bitterish. In commerce frequently met with in curved elliptical sections with a rather thick layer of white zest.

Constituents.—Volatile oil and hesperidin. Oil of lemon is pale yellow, of spec. grav. 0.85, and consists mainly of several hydrocarbons, $C_{10}H_{16}$, with a little cymene, $C_{10}H_{14}$, and a compound ether.

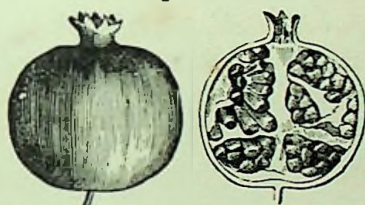
Properties.—Stimulant; used for its flavor.

GRANATI FRUCTUS CORTEX.—
POMEGRANATE RIND.

Origin.—*Punica Granatum*, *Lin.* *Natural order*, *Granataceæ*.

Description.—In irregular curved brittle fragments, 1 or 2 millimeters ($\frac{1}{25}$ to $\frac{1}{12}$ inch) thick, some of them with the tubular six- to nine-toothed calyx attached; externally roughish-tubercular and reddish-brown; inner surface lighter colored, marked with depressions; inodorous; taste astringent.

Fig. 153.



Fruit of *Punica Granatum*.

Constituents. — Tannin 28 per cent., gum, little sugar, ash 6 per cent.

Properties.—Astringent, anthelmintic. *Dose*, 1 to 3 grams (gr. xv-xxx), in powder or decoction.

TAMARINDUS.—TAMARIND.

Pulpa tamarindorum.

Origin.—*Tamarindus indica*, *Lin.*, s. *T. officinalis*,
Hooker. *Natural order*, *Leguminosæ*, *Cæsalpineæ*.

Habitat.—India and tropical Africa; naturalized in the West Indies.

Description. — A reddish-brown sweet acidulous pulpy mass, containing strong somewhat branching fibres, and polished brown flattish subquadrangular seeds, each inclosed in a tough membrane.

Varieties. — West Indian tamarinds, described above; the inner part of the fruit is mixed with syrup.

East Indian tamarinds; preserved without syrup; tough, dark-colored masses, of a strong acid taste.

Egyptian tamarinds; preserved without sugar, formed into cakes, and dried; hard flattish acid cakes, frequently mouldy.

Constituents.—Tartaric, citric, a little malic, and acetic acids, mostly as potassium compounds; sugar, pectin, tannin, the latter in the testa of the seeds.

Properties.—Refrigerant, laxative. *Dose*, 2 to 20 grams (3ss-v) or more, in infusion, whey, confection.

11. SEEDS.—SEMINA.

The seed is the fully developed ovule, and contains the embryo. It is invested with one or two integuments, the outer one being called testa or spermoderm, and the inner one tegmen or endopleura. In many seeds the tegmen is blended with the testa or coheres with the kernel. The seed-stalk, called funiculus or podosperm, is usually absent in the officinal seeds; the scar left by its detachment is the hilum. The continuation of the funiculus along the

testa is the raphe, and where it is confluent with the nucleus the chalaza or inner hilum is located. The micropyle, a small depression of the testa, marking the location of the radicle, is in nearly all officinal seeds near the hilum; most of the seeds are anatropous, and have the hilum and chalaza at nearly opposite ends and united by a raphe, while the campylotropous seeds, which are more or less kidney-shaped, have hilum, chalaza, and micropyle close together.

Within the seed-integuments is contained the embryo, consisting of radicle, plumule, and one or two cotyledons, and either completely filling the seed-coats, in which case the seed is exalbuminous, or it is invested with another tissue, usually horny, oily, or amylaceous, which is called the albumen. The kernel of exalbuminous seeds consists chiefly of the cotyledons, the radicle and plumule being usually small; but albuminous seeds have frequently a small embryo, the greater portion of the seed-kernel consisting often of the albumen.

Classification.

Sect. 1. Dicotyledonous seeds.

I. Exalbuminous.

a. Embryo straight.

Angular ovate; testa mucilaginous.	Cydonium.
Flattish ovate; testa membranous, brown, and scurfy; taste bland.	Amygdala dulcis.
taste bitter.	Amyg. amara.
testa coriaceous, white.	Melo.
Flat, ovate; testa white, grooved near the margin, edge obtuse.	Pepo.
testa white, ungrooved, edge thickish, acute.	Cucumis.
testa marbled or orange-brown, edge obtuse.	Citrullus.

- Oblong ; testa blackish, fragile ; fragrant. Dipterix.
 Ovate-oblong ; testa brown, fragile ; cotyledons crumbling when cut. Theobroma.
- b. Embryo curved.
 Reniform-oblong, with a long furrow on the convex side. Physostigma.
 Rhomboid, with a diagonal furrow. Fœnum græcum.
 Globular ; testa yellowish, finely pitted. Sinapis alba.
 testa blackish-brown, finely reticulate. Sinapis nigra.
 testa blue-black, finely pitted, larger. Rapa.
- II. Albuminous.
- a. Embryo straight.
 Orbicular, horny. Nux vomica.
 Oblong, angular. Ignatia.
 Tetrahedral ; testa black, pitted. Delphinium.
 testa gray-brown, pitted. Staphisagria.
 Flattish-ovate ; testa brown, mucilaginous. Linum.
 Globular-ovate ; testa removed ; albumen marbled. Myristica.
 Oval-oblong ; testa glossy, grayish, variegated with red-brown. Ricinus.
 surface dull gray-brown mottled with black. Tigilium.
 testa dull black, with fine fissures. Curcas.
- b. Embryo curved.
 Elliptic plano-convex, grooved on the flat side. Caffea.
 Reniform ; testa black, reticulate, and pitted. Stramonium.
 testa gray-brown, finely pitted. Hyoseyamus.
 testa blackish, bluish, or whitish, with shallow pits. Papaver.
- Sect. 2. Monocotyledonous seeds ; all albuminous.
- Linear-oblong ; blackish-brown. Sabadilla.
 Subspherical ; testa granular ; albumen horny. Colchicum.
 Roundish-angular, spicy ; hilum depressed. Granum paradisi.
 hilum tufted. Melegueta.

CYDONIUM.—QUINCE SEED.

Origin.—*Cydonia vulgaris*, *Persoon*. *Natural order*, Rosaceæ, Pomeæ.

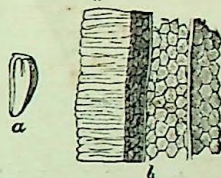
Habitat.—Western Asia; cultivated.

Description.—About 6 millimeters ($\frac{1}{4}$ inch) long, ovate or ovate-oblong, triangularly compressed; hilum near the pointed end; testa brown, covered with a whitish mucilaginous epithelium, causing the seeds of each cell to adhere together, and, on immersion in water, forming a gelatinous zone; taste of the unbroken seed insipid; embryo white, oily, and of a bitter almond taste.

Constituents.—Mucilage 20 per cent., not precipitated by borax.

Properties.—The unbroken seeds are demulcent and protective. A thick mucilage is yielded from 1 part of seeds to 50 parts of water.

Fig. 154.



Cydonium.—*a.* Natural size. *b.* Magnified section through epithelium, testa, and tegmen, into a cotyledon.

AMYGDALA.—ALMOND.

Origin.—*Amygdalus communis*, var. α amara, β dulcis, *D. C.*, s. *Prunus Amygdalus*, *Baillon*. *Natural order*, Rosaceæ, Amygdaleæ.

Habitat.—Western Asia; naturalized in the Mediterranean basin; cultivated.

Description.—Flattish ovate or ovate-lanceolate, 20 to 25 millimeters ($\frac{4}{5}$ to 1 inch) long; testa brown, scurfy, with about 16 longitudinal veins; hilum near

the pointed end; chalaza broad at the rounded end; embryo white, oily, consisting of two ovate-lanceolate plano-convex cotyledons and a short projecting conical radicle; inodorous.

Fig. 155.



Amygdala.—Seed with and without putamen. *a.* Cotyledon. *b.* Radicle and plumule.

Amygdala dulcis. Mostly large, and sides rather convex; taste bland.

Amygdala amara. Mostly smaller and flattish; taste bitter; the emulsion with water has an odor resembling that of hydrocyanic acid.

Constituents.—Fixed oil, 45 (in bitter almonds) to 56 per cent. (in sweet almonds), mucilage 3 per cent., sugar 6 per cent., proteids 25 per cent.; the latter consist of amandin and emulsin or synaptase, of which only the former is precipitated by acetic acid. Bitter almonds contain, in addition to these compounds, 1 to 3 per cent. of amygdalin, $C_{20}H_{27}NO_{11}$, which splits into glucose, hydrocyanic acid (1 part from 17 parts amygdalin), and benzaldehyd, C_7H_6O , or oil of bitter almonds. The latter in the crude state has the spec. grav. 1.06–1.075; when freed from hydrocyanic acid it is 1.043–1.049.

Properties.—Demulcent, used in emulsion; the bitter almond sedative.

MELO.—MELON SEED.

Origin.—*Cucumis Melo*, *Lin.* *Natural order*, Cucurbitaceæ.

Habitat.—Central Asia; cultivated.

Description.—About 1 centimeter ($\frac{2}{3}$ inch) long, flattish ovate; testa white or whitish, smooth, the edge rather blunt; hilum near the pointed end; cotyledons plano-convex, white, and oily; inodorous; taste bland.

Properties.—Anthelmintic. *Dose*, 30 to 65 grams (3j-ij), in emulsion.

PEPO.—PUMPKIN SEED.

Origin.—*Cucurbita Pepo*, *Lin.* *Natural order*, Cucurbitaceæ.

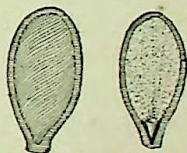
Habitat.—Tropical Asia and America; cultivated.

Description.—Flat, broadly ovate, about 2 centimeters ($\frac{1}{2}$ inch) long; testa white or whitish with a shallow groove and flat ridge parallel to the margin; hilum near the pointed end; cotyledons flat, white, and oily; radicle short, conical; inodorous; taste bland.

Constituents.—Fixed oil 44 per cent., proteids, starch, resin, and sugar.

Properties.—Tæniifuge. *Dose*, 30 to 65 grams (3j-ij), in powder or emulsion.

Fig. 156.



Pepo.—Seed and cotyledon with radicle and plumule.

CUCUMIS.—CUCUMBER SEED.

Origin.—*Cucumis sativus*, *Lin.* *Natural order*, Cucurbitaceæ.

Habitat.—Central Asia; cultivated.

Description.—Flat and thin, about 8 millimeters ($\frac{1}{3}$ inch) long, ungrooved, acutely edged; otherwise resembling pumpkin seed.

Constituents.—Fixed oils, proteids, etc.

Properties.—Diuretic, anthelmintic. *Dose*, 8 to 65 grams (3ij–5ij).

CITRULLUS.—WATERMELON SEED.

Origin.—*Cucumis* (*Cucurbita*, *Lin.*) *Citrullus*, *Sér.* s. *Citrullus vulgaris*, *Schrader*. *Natural order*, Cucurbitaceæ.

Habitat.—Southern Asia; cultivated.

Description.—Flat, ovate, 12 to 15 millimeters ($\frac{1}{2}$ – $\frac{3}{4}$ inch) long; testa blackish and marbled, or orange-brown, blunt on the edge; otherwise resembling pumpkin seed.

Constituents.—Fixed oil and proteids.

Properties.—Diuretic, anthelmintic. *Dose*, 8 to 65 grams (3ij–5ij).

DIPTERIX.—TONCO. TONCA BEAN.

Origin.—1. *Dipterix* (*Coumarouna*, *Aublet*) *odorata*, *Willd.*; 2. *D. oppositifolia*, *Willd.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Guiana.

Description.—Oblong, somewhat compressed, 4 to 6 centimeters ($1\frac{1}{2}$ –2 inches) long, about 1 centimeter ($\frac{3}{8}$ inch) broad; hilum near the thin end; testa blackish, fragile, thin, somewhat glossy and wrinkled; embryo pale brown, oily; radicle short and thick; cotyledons plano-convex, inclosing a rather large pinnate plumule and acicular crystals; fragrant; taste aromatic, bitter.

Varieties.—Dutch Tonca. About 5 centimeters long, frequently covered with a crystalline inflorescence.

English Tonca. About 4 centimeters long; its surface with little or no efflorescence.

Constituents.—Fixed oil, coumarin, $C_9H_6O_2$, sugar, mucilage. Coumarin is in glossy aromatic prisms, is sparingly soluble in water, and melts at $67^\circ C.$ ($152.6^\circ F.$).

Properties.—Stimulant; used only for its flavor.

THEOBROMA.—CACAO.

Origin.—Theobroma Cacao, *Lin.* *Natural order,* Byttneriaceæ (Sterculiaceæ).

Habitat.—Tropical America; cultivated.

Description.—The seeds are either dried when removed from the fruit, or are previously buried in the ground (claying), until the astringency disappears. Ovate or ovate-oblong, 15 to 20 millimeters ($\frac{3}{8}$ – $\frac{1}{2}$ inch) long; testa reddish-brown to brown-gray, thin, fragile, with numerous longitudinal veins; hilum at the broad end; chalaza at the narrow end; embryo red-brown, oily; radicle short; cotyledons ribbed upon the face,

irregularly lobed from the back through the folds of the tegmen, and readily breaking into angular fragments; aromatic; taste oily, aromatic, and bitterish. Unsweated cacao has a more bitter and astringent taste. 100 parts of cacao yield about 12 parts of shells and 88 parts of kernels.

Constituents.—Fat 50 per cent., starch 16 per cent., proteids 18 per cent., ash 3.5 per cent., sugar 0.6 per cent., coloring matter and about 1.5 per cent. (less in the testa) of theobromina, $C_7H_8N_4O_2$, which is white, crystalline, bitter, slightly soluble in water, alcohol, and ether, and may be converted into caffeine.

Properties.—Nutritive, stimulant; used for preparing chocolate.

PHYSOSTIGMA.—CALABAR BEAN.

Origin.—*Physostigma venenosum*, Balfour. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Tropical Western Africa, near the mouth of the Niger and old Calabar.

Description.—Oblong and somewhat reniform, about 25 millimeters (1 inch) long, and 15 millimeters ($\frac{3}{8}$ inch) broad; testa granular, chocolate brown; hilum in a broad black groove extending over the entire length of the convex edge, and having at one end the micropyle, at the other end the chalaza; embryo with a short curved radicle and two large white concavo-convex cotyledons; inodorous, taste bean-like.

Fig. 157.



Physostigma.—View from the side and edge, showing length of hilum.

On moistening the embryo with solution of potassa, it acquires a pale yellow color.

Fig. 158.

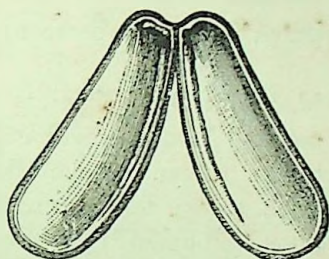


Fig. 159.



Physostigma split, showing cotyledons.

Physostigma cylindrospermum.

The seed of *Physostigma* (*Mucuna*, *Oliver*) *cylindrospermum*, *Holmes*, is $\frac{1}{4}$ centimeters ($1\frac{3}{8}$ inch) long, nearly cylindrical, has a shorter groove and hilum, otherwise closely resembles the preceding.

Constituents.—*Physostigmia* or *eserina*, $C_{11}H_{21}N_3O_2$ (amorphous, tasteless, soluble in alcohol, ether, chloroform, benzol, carbon bisulphide, less freely in water, reddened by alkalies and by chlorinated lime), *calabarina* (tetanic, insoluble in ether), *phytosterin* (indifferent, crystalline), starch 48 per cent., proteids 23 per cent., mucilage, ash 3 per cent.

Properties.—Sedative, poisonous; contracts the pupil. *Dose*, 0.06 to 0.27 gram (gr. j-iv), in powder, tincture, or extract; *eserina*, 0.001 to 0.005 gram (gr. $\frac{1}{64}$ – $\frac{1}{12}$).

FÆNUM GRÆCUM.—FENUGREEK.

Origin.—*Trigonella Fœnum græcum*, *Lin.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—India, naturalized in the Mediterranean basin; cultivated.

Description.—Rhomboid, about 3 millimeters ($\frac{1}{8}$ inch) long, and 2.5 millimeters ($\frac{1}{10}$ inch) broad, compressed, four edged; from the hilum, on one edge, diagonally furrowed on both sides; testa brownish or yellowish, hard; tegmen (albumen?) colorless, horny; embryo light yellow, oily, the radicle curved upon the back of one of the cotyledons; odor peculiar; taste mucilaginous, bitter.

Constituents.—Mucilage (chiefly in the inner seed coat), fat, volatile oil, proteids, bitter principle, free from starch.

Adulteration.—Powdered fenugreek is sometimes adulterated with ground amylaceous seeds.

Properties.—Demulcent, discutient; used in veterinary practice.

SINAPIS ALBA.—WHITE MUSTARD.

Origin.—*Sinapis* (*Brassica*, *Hooker fil.*) *alba*, *Lin.* *Natural order*, Cruciferae, Siliquosæ.

Habitat.—Asia and Southern Europe; cultivated.

Description.—Almost globular, nearly 2 millimeters ($\frac{1}{12}$ inch) in diameter; hilum circular; testa yellowish, finely pitted, hard; embryo greenish-yellow, oily,

with a curved radicle and two cotyledons, one folded over the other; inodorous; taste pungent and acrid.

Constituents.—Fixed oil (20–25 per cent., bland), mucilage, myrosin (proteid), sinalbin, $C_{30}H_{44}N_2S_2O_{14}$ (colorless prisms, soluble in water, sparingly soluble in cold alcohol; glucoside yielding sugar, sinapina sulphate, $C_{16}H_{23}NSO_9$, and acrinyl sulphocyanide, C_8H_7NSO ; the latter is an acrid non-volatile oil); free from starch.

Properties.—Tonic, laxative, diuretic, stimulant, emetic; externally rubefacient and epispastic. *Dose*, 1 to 4 grams (gr. xv–3j), entire, in powder, or infusion; externally as poultice.

SINAPIS NIGRA.—BLACK MUSTARD.

Origin.—*Sinapis* (*Brassica*, *Koch*) *nigra*, *Lin.* *Natural order*, Cruciferae, Siliquosae.

Habitat.—Asia and Southern Europe; cultivated.

Fig. 160.



Sinapis.—Entire, magnified.

Embryo.

Transverse section.

Description.—Almost globular, about 1 millimeter ($\frac{1}{25}$ inch) in diameter, with a circular hilum; testa blackish-brown, finely reticulate, hard; embryo greenish-yellow, oily, with a curved radicle and two cotyle-

dons one folded over the other; inodorous when dry, but when moist of a pungent, penetrating, irritating odor.

Constituents.—Fixed oil 25 per cent. (bland), mucilage, myrosin (proteid), sinnigrin or potassium myronate, $C_{10}H_{18}NS_2KO_{10}$, about 0.5 per cent. (silky white needles, soluble in water, slightly soluble in absolute alcohol; glucoside, yielding sugar, acid potassium sulphate and allyl sulphocyanide or volatile oil of mustard, C_4H_7NS ; the latter is very pungent and acrid, has the density 1.017, and dissolves in sulphuric acid without coloration); no starch; ash 4 per cent.

Properties and Dose similar to *Sinapis alba*.

Allied Seeds.—Turnip seed, from *Brassica Rapa*, *Lin.* Larger than the preceding, nearly black, finely pitted; slightly acrid.

Rape seed, Cole or Colza seed, from *Brassica Napus*, *Lin.* Larger than turnip seed, finely pitted, blue-black, slightly acrid.

NUX VOMICA.—Nux Vomica.

Origin.—*Strychnos Nux vomica*. *Lin.* *Natural order*, Loganiaceæ.

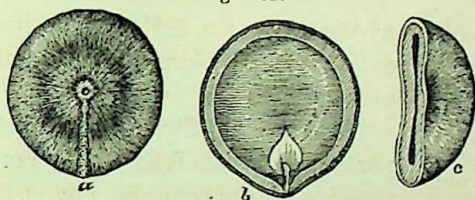
Habitat.—India and East India Islands.

Description.—Orbicular, about 25 millimeters (1 inch) in diameter, grayish or greenish-gray; soft-hairy, of a silky lustre, with a slight ridge (raphe) extending from the centre of one side to the edge; albumen horny, whitish, somewhat translucent, very tough, with a large circular cavity, into which the heart-shaped nerved cotyledons project; inodorous, persistently bitter.

Constituents.—Strychnia, $C_{21}H_{22}N_2O_{21}$, $\frac{1}{4}$ – $\frac{1}{2}$ per cent.,

brucia, $C_{23}H_{26}N_2O_4$, $\frac{1}{2}$ –1 per cent., igasuria (probably impure brucia), proteids 11 per cent., fat, gum, sugar 6 per cent., igasuric acid (dark-green by ferric salts).

Fig. 161.



Nux vomica.—a. Whole seed; b. cut longitudinally; c. cut transversely.

Strychnia is in four sided prisms, insoluble in ether, soluble in 5 parts of chloroform and in 120 parts of cold 80 per cent. alcohol. Sulphuric acid with potassium bichromate colors deep violet or blue; similar color by sulphuric acid and lead peroxide or potassium ferridcyanide, changing to red and yellow; its salts are very bitter.

Brucia is in rectangular octahedra, containing $4H_2O$, is readily soluble in alcohol and in 7 parts of chloroform; nitric acid colors blood-red, changing to orange and yellow; its salts are very bitter.

Properties.—Tonic, spinal nervine, poisonous. *Dose*, 0.03 to 0.3 gram (gr. ss–v), in tincture or extract. Strychnia, 0.001 to 0.01 gram (gr. $\frac{1}{64}$ – $\frac{1}{8}$).

IGNATIA.—BEAN OF ST. IGNATIUS.

Origin.—*Strychnos Ignatii*, *Bergius*, s. *Ignatiana philippinica*, *Lour.* *Natural order*, Loganiaceæ.

Habitat.—Philippine Islands.

Description.—Oblong or ovate, irregularly angular, about 3 centimeters ($1\frac{1}{8}$ inch) long, dull brownish or blackish, very hard, horny; hilum at one end; fracture granular, irregular; the albumen brownish, somewhat translucent, inclosing an irregular cavity with an oblong embryo; inodorous, very bitter.

Fig. 162.



Ignatia.—Vertical section.

Constituents.—Strychnia (0.5 to) 1.5 per cent., brucia 0.5 (to 1.4) per cent., proteids 10 per cent., fat, etc.

Properties.—Like nux vomica. *Dose*, 0.03 to 0.2 gram (gr. ss-ijj).

DELPHINIUM.—LARKSPUR SEED.

Origin.—Delphinium Consolida, *Lin.* *Natural order*, Ranunculaceæ.

Habitat.—Central Europe; cultivated.

Description.—Flattish tetrahedral, 1 to 1.5 millimeter ($\frac{1}{25}$ to $\frac{1}{16}$ inch) broad, acute on the edges; testa black, roughly pitted; albumen whitish, oily, inclosing a small straight embryo; inodorous, taste bitter and acrid.

Constituents.—Fixed oil, probably also delphinia.

Properties.—Diuretic, cathartic, emetic, poisonous; externally rubefacient; rarely employed.

STAPHISAGRIA.—STAVESACRE.

Origin.—Delphinium Staphisagria, *Lin.* *Natural order*, Ranunculaceæ.

Description.—Flattish tetrahedral, 3 or 4 millimeters

($\frac{1}{8}$ or $\frac{1}{6}$ inch) broad, one side convex, testa brown or brown-gray, with reticulate ridges; albumen whitish, oily, inclosing a straight embryo; nearly inodorous; taste bitter and biting.

Constituents.—Delphinia, $C_{24}H_{33}NO_2$ (white, soluble in ether, chloroform, benzol, and petroleum benzin; brown by sulphuric acid; acrid), staphisaina, $C_{16}H_{23}NO_2$ (yellow, insoluble in ether, acrid), fixed oil 20 per cent., proteids, mucilage.

Properties.—Diuretic, cathartic, emetic, poisonous; externally rubefacient; mostly used for killing vermin.

LINUM.—FLAXSEED.

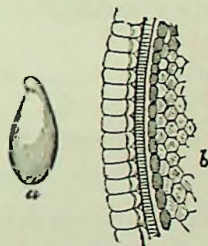
Origin.—*Linum usitatissimum*, *Lin.* *Natural order*, Linaceæ.

Habitat.—Levant and Southern Europe; cultivated and spontaneous in most temperate countries.

Description.—Flattish ovate or oblong ovate, about 4 millimeters ($\frac{1}{6}$ inch) long, obliquely pointed at one end; testa brown, glossy, very finely pitted, covered with a transparent mucilaginous epithelium, which swells considerably in water; hilum near the pointed end; embryo whitish, oily; cotyledons large, plano-convex, covered with a thin albumen: inodorous, mucilaginous, oily, and bitter.

Constituents.—Fixed oil 30–35 per cent. (in the nucleus), mucilage

Fig. 163.



Linum seed.—a. Entire. b. Section through the epithellum, testa, and tegmen to the albumen.

15 per cent. (in the epithelium), proteids 25 per cent., resin, wax, sugar, ash 3 per cent.

Properties.—Demulcent. *Dose*, 4 to 10 grams (3j–ijss) or more, in infusion; externally as poultice.

MYRISTICA.—NUTMEG.

Origin.—*Myristica fragrans*, *Houttuyn* (*M. moschata*, *Thunb.*; *M. aromatica*, *Lam.*; *M. officinalis*, *Lin.f.*). *Natural order*, *Myristicaceæ*.

Habitat.—Molucca Islands; cultivated in tropical countries.

Fig. 164.



Nutmeg, with mace and transverse section.

Fig. 165.



Wild nutmeg, with mace.

Description.—Roundish-ovate, about 25 millimeters (1 inch) long; deprived of the brittle woody testa; externally light brown, reticulately furrowed; hilum and micropyle on the broad end, chalaza near the upper end, united by a groove corresponding to the raphe; embryo small, in a cavity at the base; inter-

nally pale brownish with dark-brown veins and of a fatty lustre; strongly aromatic, somewhat bitter.

Varieties.—Limed or Dutch nutmegs; covered with a white powder, lime.

Penang and Singapore nutmegs; unlimed.

False nutmegs.—*Myristica fatua*, *Houttuyn*, wild or male nutmegs; 4 to 5 centimeters ($1\frac{1}{2}$ –2 inches) long; kernel pale colored, scarcely aromatic.

Torreya californica, *Torrey*; kernel oblong, marbled, terebinthinate.

Constituents.—Volatile oil 2 to 8 per cent., fixed oil 25–30 per cent., starch, proteids, mucilage. Volatile oil of nutmeg has the spec. grav. 0.93, and consists of myristicene, $C_{10}H_{16}$, and a little myristicol, $C_{10}H_{14}O$. Expressed oil of nutmeg consists of myristin, with another fat, resinous matter, and volatile oil.

Properties.—Stimulant, stomachic. *Dose*, 0.5 to 1.5 gram (gr. viij–xxij).

RICINUS.—CASTOR OIL SEED.

Origin.—*Ricinus communis*, *Lin.* *Natural order*, Euphorbiaceæ.

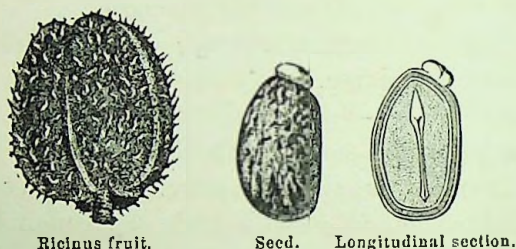
Habitat.—India; cultivated in tropical and warm temperate countries.

Description.—Variable in size and color; about 15 millimeters ($\frac{3}{8}$ inch) long, oval oblong, somewhat flattened; on one end with a whitish caruncle, covering the hilum and micropyle; chalaza near the broader end; raphe on the flat side; testa glossy, grayish or pale grayish-brown variegated with red-brown; tegmen white, thin, adhering to the white

oily albumen; embryo straight, with a short conical radicle and two thin broad cotyledons; inodorous; taste oily, acrid.

Constituents.—Fixed oil 45 to 50 per cent. (see *Oleum ricini*), ricinin (crystalline), proteids 20 per

Fig. 166.



cent., mucilage, sugar, a poisonous principle (not isolated), ash (testa 10 per cent., kernel 4 per cent.).

Properties.—Violently cathartic and emetic; used for preparing castor oil.

TIGLIUM.—CROTON SEED.

Origin.—Croton Tiglium, *Lin.*, s. Tiglium officinale, *Klotzsch.* *Natural order*, Euphorbiaceæ.

Habitat.—India; cultivated.

Fig. 167.



Croton Tiglium.—Lateral and ventral view, and transverse section of seed.

Description.—About 12 or 15 millimeters ($\frac{1}{2}$ to $\frac{3}{8}$ inch) long; oval oblong, somewhat quadrangular; surface dull gray-brown; on the removal of the outer coat, black; otherwise like castor oil seeds.

Constituents.—Fixed oil 50 to 60 per cent. (see *Oleum tiglii*), proteids, ash 3 per cent.

Properties.—Violently drastic; used for preparing croton oil.

CURCAS.—PURGING NUT.

Origin. — *Curcas purgans*, *Adanson*, s. *Jatropha Curcas*, *Lin.* *Natural order*, Euphorbiacæ.

Habitat.—Tropical America; naturalized in other tropical countries.

Description.—About 20 millimeters ($\frac{1}{2}$ inch) long; resembles croton seed, but the testa is dull black and marked with numerous small fissures; taste less acrid.

Constituents.—Fixed oil 40 per cent. (yellowish or colorless, vesicating), proteids, etc.

Properties.—Drastic and emetic; similar to, but milder than, croton seed.

CAFFEA.—COFFEE.

Origin. — *Coffea arabica*, *Lin.* *Natural order*, Rubiacæ, Caffææ.

Habitat.—Tropical Africa; cultivated in tropical countries.

Description.—Elliptic, from 8 to 12 millimeters ($\frac{1}{2}$ to $\frac{1}{2}$ inch) long, plano-convex, on the flat side with a

longitudinal groove, penetrating with a curve deeply into the horny albumen; somewhat oblique on one end; hilum near the groove beneath the rounded end; testa membranous, usually wanting on the back; embryo small at the oblique end, slightly curved under the convex side; odor peculiar; taste somewhat bitter, astringent.

Varieties.—The cultivated varieties vary in size, color, and flavor. The large and well-flavored Liberian coffee is obtained from *Coffea liberica*, *Hiern*.

Constituents.—Fat 13 per cent., glucose and dextrin 15 per cent., proteids 13 per cent., caffeina 0.8 per cent., caffeotannic acid, trace of volatile oil, ash 5 to 8 per cent. Caffeina, $C_8H_{10}N_4O_2$, is methyltheobromina, in white silky needles, faintly bitter, soluble in water, more so in alcohol and chloroform; on boiling with barium hydrate converted into carbonic anhydrid, CO_2 , and caffeidina, $C_7H_{12}N_4O$, and the latter ultimately into sarkosina, formic acid, methylamina, and ammonia.

Caffeotannin is amorphous, yields with liquid potassa yellow crystalline caffeic acid, and with fusing potassa protocatechuic acid.

By the roasting of coffee the fat and tannin are destroyed, caffeina is slowly volatilized, and empyreumatic volatile oils are produced.

Properties.—Tonic, stimulant, nervine, antiemetic. *Dose*, 4 to 16 grams (3j–iv), in infusion; caffeina 0.1 to 0.2 gram (gr. jss–iij).

STRAMONII SEMEN.—STRAMONIUM SEED.

Thornapple seed.

Origin.—*Datura Stramonium*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Asia; naturalized in most countries.

Description.—Reniform, flattened, about 4 millimeters ($\frac{1}{6}$ inch) long; hilum and micropyle on the

Fig. 168.



Stramonium.—Capsule and longitudinal section.

Stramonium seed and section, magnified 3 diam.

concave edge; testa dull brownish-black, pitted, and wrinkled; albumen whitish, oily, inclosing a cylindrical embryo curved parallel with the edge of the seed; inodorous · taste oily and bitter.

Constituents.—Fixed oil 25 per cent., resin, mucilage, proteids, ash 3 per cent., daturia 0.1 per cent. (see *Stramonii folia*).

Properties.—Diuretic, dilating the pupil, narcotic.
Dose, 0.06 to 0.2 gram (gr. j–ij), in powder, tincture, or extract.

HYOSCYAMI SEMEN.—HYOSCYAMUS SEED.

Origin.—*Hyoscyamus niger*, *Lin.* *Natural order*, Solanaceæ.

Habitat.—Europe and Asia; naturalized in some parts of North America.

Description.—Roundish-reniform, flattened, 1 to 1.5 millimeter ($\frac{1}{25}$ to $\frac{1}{16}$ inch) long; hilum and micropyle



Hyoscyamus seed.—
a. Slightly magnified.
b. Section.

on the concave edge; testa finely pitted, roughish, light gray-brown; albumen whitish, oily, inclosing a cylindrical embryo curved parallel with the edge of the seed, but with the tip of the cotyledons incurved; inodorous; taste oily, bitter, somewhat acrid.

Constituents.—Fixed oil 25 per cent., resin, mucilage, proteids, hyoscyamia (see Hyoscyami folia).

Properties.—Anodyne, hypnotic, dilating the pupil, narcotic. *Dose*, 0.1 to 0.3 gram (gr. jss-v), in powder or emulsion.

PAPAVER.—POPPY SEED. MAW SEED.

Origin.—Papaver somniferum, Lin. *Natural order*, Papaveraceæ.

Habitat.—Western Asia; cultivated.

Description.—Reniform, 1 to 1.5 millimeter ($\frac{1}{25}$ to $\frac{1}{16}$ inch) long; testa varying in color, bluish, blackish, or whitish, with shallow pits; albumen whitish, oily, inclosing a cylindrical semilunar embryo; inodorous; taste oily.

Constituents.—Fixed oil 45 to 50 per cent., proteids, morphia 0.05 per cent.

Properties.—Demulcent, mild anodyne. *Dose*, 1 to 4 grams (gr. xv-3j), in emulsion.

SABADILLA.—CEVADILLA.

Origin. — *Asagraea* (Helonias, *Don*) *officinalis*, *Lindley*, s. *Veratrum Sabadilla*, *Schlecht*. *Natural order*, Melanthaceæ.

Habitat.—Mexico to Venezuela.

Description.—Narrow-oblong or lance-linear, 4 to 6 millimeters ($\frac{1}{6}$ to $\frac{1}{4}$ inch) long, rounded below, rather beaked above, somewhat angular; testa brownish-black, rugosely wrinkled; albumen whitish and oily, with a small linear embryo near the base; inodorous, bitter, persistently acrid, sternutatory.

The papery follicles sometimes present should be rejected.

Constituents. — Veratrina, $C_{37}H_{53}NO_{11}$, cevadina, $C_{32}H_{49}NO_9$, cevadillina, $C_{34}H_{53}NO_9$, cevadic acid (sublimable, odor of butyric acid), veratric acid (sublimable in prisms), fixed oil. Veratrina (of Wright and Luff) is amorphous, and by potassa is split into veratric acid and verina, $C_{23}H_{45}NO_5$. Cevadina (Merck's veratrina) crystallizes in prisms, and by potassa is split into cevadic acid and cevina, $C_{27}H_{43}NO_5$. Medicinal veratria is a white powder, acrid, sternutatory, readily soluble in alcohol, ether, and chloroform, less freely soluble in glycerin and olive oil, and is colored deep red by sulphuric acid, yellow by nitric acid, and deep red by hot hydrochloric acid.

Properties.—Powerful irritant; used for preparing veratrina, and for killing vermin. *Dose*, of veratrina,

0.002 to 0.006 or 0.01 gram (gr. $\frac{1}{32}$ to $\frac{1}{16}$ or $\frac{1}{8}$), in pills; mostly externally in ointment.

COLCHICI SEMEN.—COLCHICUM SEED.

Origin.—*Colchicum autumnale*, *Lin.* *Natural order*, Melanthaceæ.

Habitat.—Europe, in meadows.

Description.—Subglobular, about 2 millimeters ($\frac{1}{12}$ inch) thick; hilum circular, furnished with a soft caruncle; testa dull reddish-brown, finely pitted; albumen whitish, oily, hard, and tough, inclosing a small embryo nearly opposite the hilum; inodorous; taste bitter, somewhat acrid.

Fig. 170.



Colchici semen.—

a. Natural size. b. Section, magnified.

Constituents.—Fixed oil 6 to 8 per cent., gum, sugar, colchicin, and derivatives of the latter. Colchicin, $C_{17}H_{23}NO_6$, is colorless or yellow, amorphous, soluble in water, alcohol, and chloroform, less soluble in ether, of a saffron-like odor and bitter taste, precipitated by tannin, turns moist litmus-paper slowly blue, and in aqueous solution is colored yellow by hydrochloric acid. Colchicein, $C_{17}H_{21}NO_5 \cdot 2H_2O$, is in white crystals, inodorous, soluble in alcohol, chloroform, and hot water, colored green by ferric chloride, and, after several days' standing, precipitated by tannin. Colchicoresin, $C_{31}H_{60}N_2O_{11}$, is brown, amorphous, soluble in chloroform and alcohol, insoluble in ether, and very sparingly soluble in cold water. Beta-colchicoresin, $C_{34}H_{34}NO_{10}$, is blackish-brown, soluble in strong

alcohol and chloroform, and insoluble in water and ether. The last two principles are not, or but slightly, affected by tannin, are colored brown-green by ferric chloride, and dissolve in potassa with a brown color. Colchicin and colchicein yield with potassa a yellow solution. The four principles yield with sulphuric acid and potassium nitrate a deep blue or purplish-blue color, and when this has disappeared, by concentrated potassa solution, a more permanent brick-red color. They are extracted from the unbroken seeds by digestion with alcoholic liquids, while maceration in the same exhausts only about two-thirds of the principles.

Properties.—Cathartic, emetic, sedative; in gout and rheumatism. *Dose*, 0.1 to 0.3 or 0.5 gram (gr. jss-v-viiij), in powder, tincture, wine, or fluid extract.

GRANUM PARADISI.—GRAIN OF PARADISE.

Origin.—1. *Amomum granum Paradisi*, *Afzelius*.
2. *Am. Melegueta*, *Roscoe*. *Natural order*, Zingiberaceæ.

Habitat.—Western Africa.

Description.—Roundish-angular, 2 to 3 millimeters ($\frac{1}{12}$ to $\frac{1}{8}$ inch) long; hilum at the slightly conical end, rather broad and depressed (*granum Paradisi*), or grayish tufted (*Melegueta*); testa reddish-brown, finely warty; albumen whitish, mealy, and oily, inclosing a small embryo; odor slightly spicy; taste pungent, pepper-like.

Constituents.—Volatile oil 0.3 per cent., acrid resin, starch, gum, ash 2 to 3 per cent.

Properties.—Stimulant; used mainly in cattle powder, and for imparting artificial strength to spirits.

12. CELLULAR DRUGS NOT READILY RECOGNIZED AS DISTINCT ORGANS OF PLANTS.

This class embraces excrescences, hairs, glands, sporules, and such other vegetable drugs which do not belong to any of the preceding classes, and do not constitute a distinct organ of a plant, or are not readily recognizable as such. The starches, though not truly cellular, but being of a definite shape, are embraced in this class.

Classification.

Sect. 1. Not farinaceous.

Globular, tuberculated above.	Galla.
Irregular-ovate, tuberculated or lobed, hollow; shell thin.	Gallæchinenses et japonicæ.
Irregular-globose, falling into a brown-black powder.	Ustilago.
Narrow oblong and subtriangular, three-grooved.	Ergota.
Cylindrical, brownish, horn-like.	Laminaria.
Cylindrical, white, spongy, mucilaginous.	Sassafras medulla.
Flat, divided into narrow bands, aromatic.	Macis.
Thread-like, notched above, orange-brown red.	Crocus.
Long, silky, thread-like, yellowish.	Stigmata maydis.
Curling, white filaments; under the microscope band-like.	Gossypium.

Curling, brown, glossy filaments, under the microscope jointed.	Cibotium.
Stiff, brown-red, under the microscope retrorsely serrate.	Mucuna.
Pulverulent, brick-red, consisting of hairs and glands.	Kamala.
Brown-yellow, aromatic, under the microscope subglobular or hood-shaped.	Lupulina.
Pale yellow, tasteless, under the microscope tetrahedral.	Lycopodium.
Viscid liquid, containing roundish cells.	Fermentum.
<i>Sect. 2. Farinaceous.</i>	
I. Unaltered starch granules, consisting of more or less distinct layers.	Amylum.
II. Granules partly altered.	
Globular grains; granules oblong, truncate.	Sago.
Irregular lumps; granules muller-shaped.	Tapioca.
III. Granules wholly or partly inclosed in tissue.	
Globular grains with a brown groove; granules similar to wheat starch.	Hordeum.
Meal; granules polyhedral, small, united to globules.	Avena.

GALLA.—NUTGALL.

Origin.—Excrescences on *Quercus lusitanica*, *Webb*, var. *infectoria*, *DeCand.*, s. *Q. infectoria*, *Olivier*, *Natural order*, Cupuliferæ, caused by the punctures and deposited ova of *Cynips gallæ tinctoriæ*, *Olivier*.
Class, Insecta. *Order*, Hymenoptera.

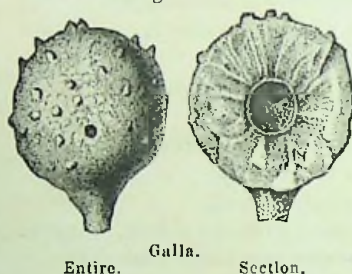
Habitat.—Levant.

Description.—Subglobular, 2 centimeters ($\frac{4}{5}$ inch) or less in diameter, with a short stipe, more or less tuberculated above, otherwise smooth; heavy, hard, often with a circular hole near the middle, blackish-olive-green or blackish-gray; fracture granular,

grayish; in the centre a cavity containing either the partly developed insect or pulverulent remains left by it; nearly inodorous; taste strongly astringent.

Light, spongy, and whitish-colored nutgalls should be rejected.

Fig. 171.



Entire.

Galla.

Section.

Varieties.—Aleppo or Syrian nutgalls, dark colored and heavy.

Smyrna nutgalls, of a grayish-olive color, intermixed with white galls.

Sorian nutgalls, size of a pea; blackish.

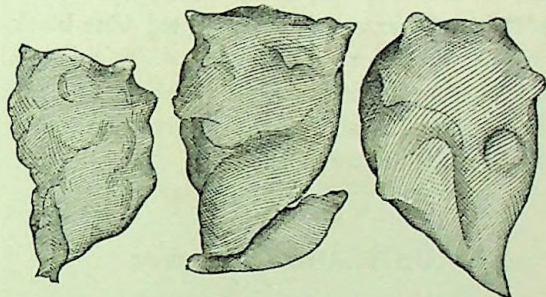
Indigenous nutgalls, globular, smooth or tuberculate, white or blackish, spongy or firm, varying according to origin; the galls of *Quercus virens*, *Aiton*, are of a firm texture, dark color, and rich in tannin (40 per cent.).

California oak balls, from *Quercus lobata*, are globular, 5 centimeters (2 inches) in diameter, orange-brown, internally white and spongy; very astringent.

Chinese nutgalls, from *Rhus semialata*, *Murray*, by the sting of *Aphis chinensis*, *Bell*; about 4 or 5 centimeters (1½ to 2 inches) long, ovate, but very irregular, tuberculate, grayish-downy, hollow; shell thin, fragile, inclosing the remnants of numerous insects.

Japanese nutgalls, from *Rhus semialata* or an allied species; about 2 to 3 centimeters ($\frac{1}{2}$ to $1\frac{1}{2}$ inch) long, usually lobed, and the lobes tuberculate, otherwise like the preceding.

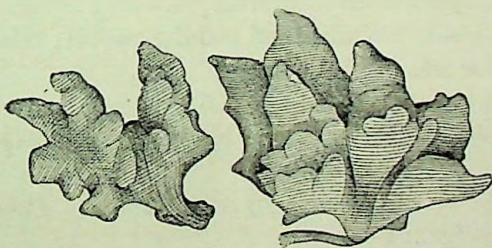
Fig. 172.



Gallæ chinenses.

Constituents.—Tannin 50 to 60 per cent. (white galls about 30 per cent.), gallic acid 2 to 3 per cent., mucilage, sugar, resin, and, in the nucleus, starch.

Fig. 173.



Gallæ japonicæ.

Tannin, gallotannic acid or digallic acid, $C_{14}H_{10}O_6$, is yellowish-white, amorphous, insoluble in absolute

ether, soluble in glycerin, alcohol, and water, precipitated blue-black by ferric salts and white by gelatin. Commercial tannin contains a little odorous and coloring matter and variable quantities of glucose. Gallic acid, $C_7H_6O_5 \cdot H_2O$, is in white silky needles, soluble in alcohol, less so in ether, and sparingly soluble in cold water; is precipitated blue-black by ferric salts, the color disappearing on boiling, and is not affected by gelatin, except in presence of gum. The tannin of Chinese nutgalls differs somewhat from that of the officinal nutgalls.

USTILAGO.—CORNSMUT.

Origin.—Ustilago Maydis, Lév. *Natural order*, Fungi.

Habitat.—Upon all parts of Zea Mays, Lin., most frequently upon the fruit.

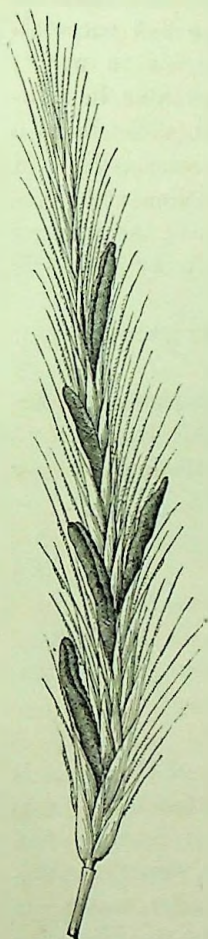
Description.—Irregular globose masses, sometimes 15 centimeters (6 inches) in diameter, consisting of a blackish gelatinous membrane, inclosing innumerable brown-black, globular, and nodular spores; odor and taste disagreeable.

Constituents.—Fixed oil 2.5 per cent., crystalline principle (soluble in carbon bisulphide), mucilage, ash 4 per cent.

Properties.—Emmenagogue, parturient. *Dose*, 1 to 2 grams (gr. xv-xxx).

ERGOTA.—ERGOT.

Fig. 174.



Ergotized rye.

Secale cornutum.

Origin.—*Claviceps purpurea*,
Tulasne. Natural order, Fungi.

Habitat.—In the inflorescence
of *Secale cereale*, *Lin.*, and other
grasses.

Description.—Somewhat fusi-
form, obtusely triangular, usually
curved, about 25 millimeters (1

Fig. 175.



Ergota.

inch) long, about 3 millimeters
($\frac{1}{8}$ inch) thick, three-furrowed,
obtuse at both ends, purplish-
black, internally whitish, break-
ing with a short fracture; odor
peculiar, heavy, increased by tri-
turation with solution of potassa;
taste oily, unpleasant.

Ergot should be preserved in a dry place, and should be renewed every year.

Constituents.—Fixed oil 30 per cent., mycose, proteids, sclerotic acid 4 per cent. (brownish, tasteless, soluble in water, ecboic), scleromucin 2–3 per cent. (brown, tasteless, after drying insoluble in water; ecboic), sclererythrin $\frac{1}{100}$ per cent. (soluble in alkalis with a deep-red color), scleroiodin (violet in alkalis), picrosclerotin (poisonous), scleroecrystallin and scleroxanthin (crystalline, inert), ecbolina and ergotina (probably identical, and, when pure, inert), ergotinina (crystalline alkaloid, fluorescent, by sulphuric acid red, violet, and blue).

Bonjean's ergotin is the aqueous extract of ergot, precipitated by alcohol, and evaporated.

Properties.—Emmenagogue, ecboic, parturient, hemostatic, poisonous. *Dose*, 0.3 to 1.5 gram (gr. v–xxij), in powder (freshly prepared), infusion, wine, or fluid extract; ergotin 0.06 to 0.2 gram (gr. j–ij).

LAMINARIA.—LAMINARIA.

Origin.—*Laminaria digitata*, Lamour., s. L. Clausoni, Edmonston. *Natural order*, Algæ.

Habitat.—North Atlantic Ocean.

Description.—The stipitate portion of the plant is used. Cylindrical pieces about 1 centimeter ($\frac{2}{3}$ inch) thick, deeply wrinkled, brownish or brown, often with a saline efflorescence, horn-like, sometimes hollow in the centre (from old plants); after soaking in water brown-green, elastic, and four or five times the former thickness; in the cortical portion with large

mucilage cells, odor slight seaweed-like; taste mucilaginous, somewhat saline.

Constituents.—Mucilage, mannite, salts.

Properties.—Absorbent, dilatant; turned cylindrical or conical, used as tents.

SASSAFRAS MEDULLA.—SASSAFRAS PITH.

Origin.—Sassafras officinale, *Nees*. *Natural order*, Lauraceæ.

Habitat.—North America.

Description.—Slender cylindrical pieces, often curved or coiled, light, spongy, white, inodorous, insipid.

Constituents.—Mucilage; from its aqueous solution it is not precipitated by alcohol or subacetate of lead.

Properties.—Demulcent; used mostly in collyria.

MACIS.—MACE.

Origin.—Myristica fragrans, *Houttuyn*. *Natural order*, Myristicaceæ.

Habitat.—Molucca Islands; cultivated in the tropics.

Description.—It is the arillus of nutmeg. In narrow bands, about 25 millimeters (1 inch) long, somewhat branched and lobed above, united to broader pieces at the base; of a brownish-orange color, fatty when scratched or pressed; fracture short, showing numerous yellow oil cells; fragrant; taste warm, aromatic.

Constituents.—Volatile oil 8 per cent. (mostly ma-

cene, $C_{10}H_{16}$, with little oxygenated compound), resin, fat, sugar, mucilage, proteids, no starch granules.

Properties.—Stimulant, tonic; used chiefly for flavoring.

CROCUS.—SAFFRON.

Origin.—*Crocus sativus*, *Lin.* *Natural order*, Iridaceæ.

Habitat.—Western Asia; cultivated.

Description.—It consists of the stigmas, which are separate, or three, attached to the top of the style, about

3 centimeters ($1\frac{1}{2}$ inch) long, flattish-tubular, almost thread-like, broader and notched above; orange-brown red; odor peculiar, aromatic; taste bitterish and aromatic. When chewed it tinges the saliva deep orange-yellow.

Saffron should not be mixed with the yellow styles. When pressed between filtering paper, it should not leave an oily stain. When soaked in water, it colors the liquid orange-yellow, and does not deposit any pulverulent mineral matter, nor show the presence of organic substances differing in shape from that described.

Fig. 176.



Crocus. — *a.* Stigma, upper part, magnified four diameters. *b.* Style with stigmas. *c.* Papillose margin of stigma, magnified 120 diameters.

Varieties.—Commercial saffron is mostly of Spanish or French (Gatinais) origin. African saffron is usually safflower (*carthamus*). Cape saffron consists of the corolla of *Lyperia crocata*, *Eckl.*, *Natural order*, *Scrophulariaceæ*.

Constituents.—Volatile oil 1 per cent., fixed oil, wax, mucilage, sugar, proteids, ash 5 per cent., and polychroit, $C_{48}H_{60}O_{18}$. The latter is insoluble in ether, soluble in ordinary alcohol and water, and is split into sugar, heavy essential oil, $C_{10}H_{14}O$, and crocin, $C_{18}H_{18}O_6$, which is insoluble in ether, nearly insoluble in water, and is colored blue by sulphuric acid, like polychroit.

Properties.—Diaphoretic, carminative, emmenagogue, anodyne, mildly narcotic. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in powder, infusion, tincture, or syrup.

MAYDIS STIGMATA.—CORNSILK.

Origin.—*Zea Mays*, *Lin.* *Natural order*, *Graminacæ*.

Habitat.—Tropical America; cultivated in the warm temperate zone.

Description.—The stigmas are collected. Fine thread-like, 15 centimeters (6 inches) and more long, about 0.5 millimeter ($\frac{1}{30}$ inch) broad, yellowish or greenish, soft-silky, finely hairy, inodorous, taste sweetish.

Constituents.—Sugar, mucilage, maizenic acid(?).

Properties.—Diuretic, lithontriptic. *Dose*, about 2 grams (3ss) in decoction or syrup; of the aqueous extract, 0.3 to 0.5 gram (gr. v-viij).

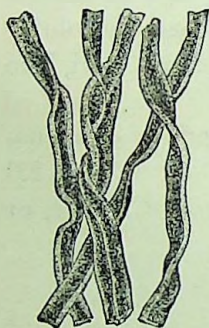
GOSSYPIUM.—COTTON.

Origin.—*Gossypium herbaceum*, *Lin.*, and other species of *Gossypium*. *Natural order*, Malvaceæ.

Habitat.—Tropical Asia and Africa; cultivated in tropical and subtropical countries.

Description.—The hairs attached to the seeds are used. One-celled filaments, about 2 (short staple) to 4 (long staple) centimeters ($\frac{1}{8}$ – $1\frac{3}{8}$ inch) long, and about 0.02 millimeter (0.0008 inch) broad; white, soft, curling, under the microscope appearing as flattened, hollow, and twisted bands, which are spirally striate and slightly thickened at the obtuse edges; inodorous, tasteless, insoluble in water, alcohol, ether, and potassa solution; blackened by warm solution of stannic chloride, not dyed by picric acid, soluble in ammoniacal solution of copper sulphate.

Fig. 177.



Cotton fibres.

Constituents.—Cellulose and fixed oil 9–10 per cent., the latter removed by repeated boiling with caustic alkali (absorbent cotton).

Uses.—For preparing collodion and for surgical dressings.

CIBOTIUM.—PENGHAWAR.

Penghawar-Djambi, Paku-kidang, Pulu.

Origin.—*Cibotium Baromez*, *Kunze*, *Cib. Djambianum*, *Hasskarl*, and other species of ferns. *Natural order*, Filices.

Habitat.—Sumatra, Java.

Description.—The chaffy hairs of the bases of the fronds and stem are collected. Curling filaments, about 0.05 millimeter (0.002 inch) broad, glossy, brown or brown-yellow; under the microscope flat and jointed; inodorous, tasteless. Penghawar is about 25 millimeters (1 inch) long, and of a yellowish tint. Paku-kidang, from *Alsophila lurida*, *Bl.*, etc., is about 5 centimeters (2 inches) long, and of a brown color. Pulu, or Pulu-pula, from *Cibotium glaucum*, *Hooker*, etc., is slightly curling and very soft.

Constituents.—Humin compounds, little resin, wax, etc.

Properties.—Hæmostatic through the mechanical absorption of the blood serum.

MUCUNA.—COWAGE.

Origin.—*Mucuna* (*Stizolobium*, *Pers.*; *Dolichos*, *Lin.*) *pruriens*, *DeC.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—East and West Indies.

Description.—The hairs attached to the legumes are used. One-celled, 2 or 3 millimeters ($\frac{1}{2}$ – $\frac{3}{8}$ inch) long, stiff, brown-red, under the microscope appearing sharp-pointed, retrorsely serrate, rather thick-walled and partly filled with a brown granular matter. The hairs easily penetrate the skin, causing violent itching.

Constituents.—Little tannin and resin.

Properties.—Anthelmintic, externally irritant. *Dose*, 0.1 to 0.2 gram (gr. jss–iij), mixed with syrup.

ROTTLERA.—KAMALA.

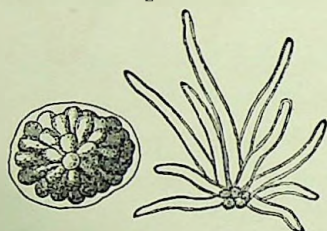
Origin.—*Rottlera tinctoria*, *Roxburgh*, s. *Mallotus philippinensis*, *Mueller Arg.* *Natural order*, Euphorbiaceæ.

Habitat.—Abyssinia, India, China, Philippine Islands, and Australia.

Description.—The glands and hairs of the capsules are collected. Granular, mobile, brick-red, inodorous

and nearly tasteless powder, imparting a deep-red color to alkaline liquids, alcohol, ether, and chloroform. Under the microscope it is seen to consist of stellately arranged colorless hairs, mixed with depressed globular glands, containing numerous red

Fig. 178.



Rottlera.—Magnified 100 diameters.

club-shaped vesicles. When heated in a crucible to redness, it leaves an ash, weighing not over 8 per cent. of the drug.

Constituents.—Resins nearly 80 per cent., one soluble in cold, the other in hot alcohol; rottlerin, $C_{22}H_{20}O_6$ (crystallizing from ether, yellow, easily altered on exposure to air), ash about 4 per cent.

Adulteration.—Earthy matters, sometimes to the extent of 60 per cent.; best detected by incineration.

Properties.—Tæniifuge. *Dose*, 4 to 8 or 12 grams (3j-ij-ijj), in powder or electuary.

LUPULINUM.—LUPULIN.

Origin.—*Humulus Lupulus*, *Lin.* *Natural order*, Urticacæ, Cannabinæ.

Habitat.—Northern temperate zone; cultivated.

Description.—The glands attached to the axis and bracts of the strobiles are collected. Bright brownish yellow, becoming yellowish-brown; resinous, aromatic, and bitter, consisting of minute granules, which, under the microscope, are subglobular or rather hood-shaped, and reticulate, the lower half being obtusely conical.

Fig. 179.



Lupulin (fresh).

When agitated with water and allowed to stand, no appreciable sediment consisting of sand should be deposited.

Constituents.—Volatile oil 3 per cent., resin, wax (myricin), lupamaric acid, $C_{32}H_{50}O_7$ (bitter prisms, insoluble in water). The volatile oil, on exposure, yields valerianic acid.

Properties.—Stimulant, tonic, anodyne. *Dose*, 0.2 to 0.5 or 1.0 gram (gr. iij–viii–xv), in powder, tincture, fluid extract, or oleoresin.

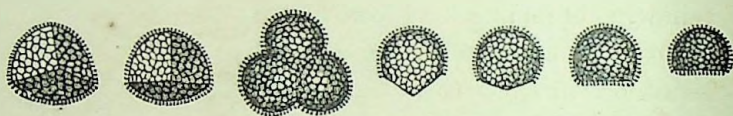
LYCOPODIUM.—LYCOPODIUM.

Origin.—*Lycopodium clavatum*, *Lin.*, and other species of *Lycopodium*. *Natural order*, Lycopodiaceæ.

Habitat.—Europe, Asia, and North America, in dry woods.

Description.—A fine powder, pale yellowish, very mobile, inodorous, tasteless, floating upon water and not wetted by it, burning quickly when thrown into a flame. Viewed under the microscope the granules are seen to be tetrahedral, reticulated, rounded on one side and on the edges with short projections.

Fig. 180.



Lycopodium.

Constituents.—Fixed oil 47 per cent., volatile bases small quantity; ash 4 per cent.

Uses.—For protecting excoriated surfaces and for preventing the mutual adhesion of pills.

Adulterations.—Pine pollen consists of an elliptic cell, at both ends of which a globular cell is attached.

Fig. 181.



Pollen of pine.

Starch is colored blue by iodine. Powdered turmeric is colored red-brown by alkalis. Mineral admixtures subside in carbon bisulphide and increase the yield of ash.

FERMENTUM.—YEAST.

Origin.—Torula (Saccharomyces, Meyen) cerevisiae, Turpin. Natural order, Fungi.

Habitat.—In fermenting malt liquors.

Description.—A viscid liquid or semifluid frothy mass, containing numerous isolated roundish or oval cells (bottom yeast), or the cells are arranged in short branching rows (top yeast); odor peculiar, taste bitter.

Properties.—Tonic, stimulating, laxative, antiseptic.

Dose, 30 to 65 grams (℥j-ij); externally for poultices.

Fig. 182.



Yeast cells.

AMYLUM.—STARCH.

Origin.—In most vegetables. For medicinal and dietetic purposes and for uses in the arts starch is prepared from amylaceous seeds, tubers, rhizomes, and palm stems.

Description.—Fine white powder, sometimes superficially adhering so as to form irregular angular or columnar masses, white, inodorous, tasteless, insoluble in ether, alcohol, and cold water; under the microscope, appearing as minute granules, varying in size and shape according to origin, and consisting of more or less distinct concentric or excentric layers, which

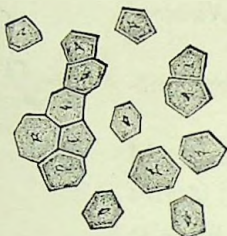
are arranged around a cavity, called the hilum or nucleus. Its composition is $C_6H_{10}O_5$. Boiled with water the granules are ruptured and dissolve in water,

Fig. 183.



Wheat starch.

Fig. 184.



Corn starch.

Fig. 185.



Rice starch.

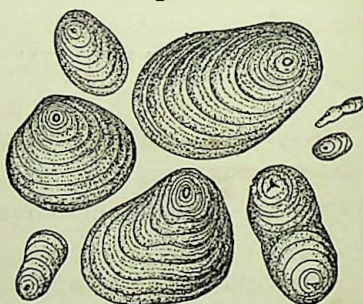
yielding on cooling a jelly or mucilaginous liquid, acquiring a blue color with iodine. Heated to 180° C. (356° F.) starch is converted into dextrin. Boiled

Fig. 186.



Maranta starch.

Fig. 187.



Potato starch.

with dilute sulphuric acid, starch yields dextrin and finally glucose.

The most important starches found in commerce may be distinguished by the microscopic appearance

of the granules, as follows: (The cuts represent the starch granules magnified 250 diameters).

Fig. 188.



Canna starch.

Fig. 189.



Curcuma starch.

Lenticular, large and minute granules; layers indistinct; hilum slight, near the centre.

Triticum
vulgare.

Polyhedric, uniform; size of wheat starch (nearly); hilum central, large.

Zea Mays.

Polyhedric, uniform; much smaller; hilum small.

Oryza sativa.

Ovate; layers delicate, distinct; hilum at broad end, often cleft.

Maranta arun-
dinacea.

Ovate or roundish ovate; larger than preceding; layers very distinct; hilum rather small at the narrow end.

Solanum
tuberosum

Ovate or ovate-oblong; larger than preceding; layers numerous, delicate; hilum inconspicuous, mostly at the narrow end.

Canna spec.

Elliptic, flat, contracted at one end; layers numerous, delicate; hilum small at the narrow end.

Curcuma spec.

SAGO.—PEARL SAGO.

Origin.—Metroxylon Sagus, *Kæmig*, s. Sagus Rumphii, *Willd.*, and other palms. *Natural order*, Palmæ.

Habitat.—East India Islands; cultivated.

Description. — Globular, pearl-like grains, prepared by granulation with heat; white or brownish, somewhat diaphanous; the unaltered starch granules oblong, elliptic, or ovate, truncate at one end; layers more or less distinct; hilum at the rounded end often cleft.

Fig. 190.



Sago starch.

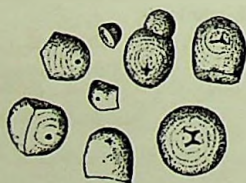
TAPIOCA.—TAPIOCA.

Origin. — Manihot utilissima, *Pohl*, s. Jatropha Manihot, *Lin.*, and Man. Aipi, *Pohl*, s. Jatr. dulcis, *Gmelin*. *Natural order*, Euphorbiaceæ.

Habitat.—Brazil; cultivated in the tropics.

Description.—The starch of the rhizome (cassava starch), while still moist, is dried on heated plates.

Fig. 191.



Cassava starch.

Fig. 192.



Altered starch granules from tapioca.

Irregular lumps, white and opaque or somewhat diaphanous; the unaltered starch granules muller-shaped; layers indistinct; hilum near the rounded end, small, often cleft.

HORDEUM.—PEARL BARLEY.

Origin. — *Hordeum distichon*, *Lin.*, and other cultivated species of *Hordeum*.
Natural order, Graminaceæ.

Habitat.—Asia; cultivated.

Description.—The fruit is almost completely deprived of the integuments. Globular, white, mealy, on one side with a groove, containing remnants of the brown integuments; the starch granules resemble those of wheat, but are rather smaller; a portion of the gluten is present.

Fig. 193.



Barley starch.

AVENÆ FARINA.—OAT MEAL.

Origin. — *Avena sativa*, *Lin.*
Natural order, Graminaceæ.

Habitat.—Probably Asia; cultivated.

Description.—Meal not uniform, grayish-white, containing the gluten and fragments of the integu-

Fig. 194.



Oat starch.

ments ; taste bitterish ; the starch granules polyhedric, or muller-shaped, often united to subspherical masses ; layers scarcely observable ; hilum rather distinct.

Properties.—Starches are demulcent ; farinaceous substances containing both starch and gluten, are demulcent and nutritive.

PART III.

DRUGS WITHOUT CELLULAR STRUCTURE.

THESE comprise secretions, exudations, and other organic products which are destitute of cellular structure, though fragments of tissue are in some of them always present, and which, if of animal origin, like some of the fats, are not readily recognized as such.

1. EXTRACTS AND INSPISSATED JUICES. EXTRACTI ET SUCCI INSPISSATI.

These are of a black or brown color, either wholly or partly soluble in water and alcohol, yielding brown-colored solutions; two of the inspissated milk-juices are completely insoluble in both menstrua.

Classification.

Sect. 1. Wholly or partly soluble in water and alcohol.

I. Taste bitter.

Containing fragments of tissue; also starch and tannin; red-brown, black-green by ferric salts.

Guarana.

Fragments of tissue; neither starch nor tannin; red-brown, blood-red by ferric salts.

Opium.

Neither tissue, starch, nor tannin; gray-brown, not altered by ferric salts.	Lactucarium.
dark orange-brown, black by ferric salts.	Aloe.
II. Taste sweet.	
Brown-black, glossy.	Extractum glycyrrhizæ.
III. Taste astringent and sweetish.	
Dark brown, more or less glossy; black-green by ferric salts.	Catechu.
Brown, earthy, crystalline; black-green by ferric salts.	Gambir.
Brown-red, angular pieces; black-green by ferric salts.	Kino.
Black-brown, somewhat acrid; blue-black by ferric salts.	Monesia.
Brown-red; violet-black by ferric salts.	Extr. hæmatoxyli.
Sect. 2. Insoluble in water and alcohol.	
Plastic in hot water.	Gutta percha.
Elastic at ordinary temperature.	Elastica.

GUARANA.—GUARANA.

Origin.—Paullinia sorbilis, *Martius*. *Natural order*, Sapindaceæ.

Habitat.—Northern and Western Brazil.

Preparation.—The seeds are dried, powdered, beaten with water into a pasty mass, formed into cakes, and dried by artificial and solar heat.

Description.—Subglobular, elliptic, or cylindrical cakes, hard, dark reddish-brown; fracture uneven, lighter colored, showing fragments of seeds invested with a black testa; odor slight, peculiar; taste astringent and bitter; partly soluble in water and alcohol with a brown color.

Constituents.—Caffeina, $C_8H_{10}N_4O_2$, 4 to 5 per cent.,

tannin 26 per cent. (coloring ferric salts black-green), starch, mucilage, fat, saponin, resin, volatile oil.

Properties.—Mild astringent, tonic, stimulant, nervine. *Dose*, 0.5 to 4.0 grams (gr. viij-3j), in powder, syrup, or fluid extract. The extract (made with diluted alcohol), 0.2 to 1.0 gram (gr. iij-xv).

OPIUM.—OPIUM.

Meconium, Thebaicum, Succus thebaicus.

Origin.—*Papaver somniferum*, *Lin.* *Natural order*, Papaveraceæ.

Habitat.—Western Asia; cultivated.

Preparation.—The green capsule is scarified transversely by a one-bladed knife (Asia Minor and Egypt), or longitudinally by a several-bladed knife (India, Japan), the white milk-juice assumes a brown color, thickens, and is then scraped off and formed into cakes. In Asia Minor the cakes are wrapped in a poppy leaf and packed with rumex-capsules; this constitutes the officinal opium.

Description.—Irregular or subglobular cakes, with the remains of poppy leaves and some fruits of a species of rumex adhering to the surface, plastic, and chestnut-brown, or harder, darker, and somewhat shining; internally with some tears and with fragments of vegetable tissue; odor heavy narcotic; taste bitter.

10 grams of opium—previously dried at a temperature of 105° C. (220° F.), exhausted with cold water, and the solution evaporated to dryness—yield an extract weighing between 5 and 6 grams (or between

50 and 60 grains from 100 grains of well-dried opium). Opium should contain 10 per cent. of morphia.

Varieties. — Smyrna, Turkey, or Constantinople opium, described above.

Egyptian opium. Flattish cakes, enveloped in poppy leaf, free from rumex fruit; now rarely exported.

Persian opium. Cylindrical sticks, short cones, or small balls of a rather light brown color, wrapped in paper or oftener packed in poppy trash; oily and of rather firm consistence.

East Indian opium. In globular balls weighing about 1900 grams (nearly $4\frac{1}{4}$ lbs. avoirdupois), and inclosed in a hard shell formed of poppy petals (provision opium); or in flat square or circular cakes wrapped in oiled paper (Abkari opium).

European and American opium, prepared experimentally, but never on a large scale.

Factitious opium has been occasionally met with; it was probably the aqueous extract of the poppy plant, of a blackish-brown color, soft consistence, and deficient in odor and taste.

Adulterations. — Lead balls, shot, pebbles, starch, and gum have been used for the purpose.

Constituents. — Free from starch and tannin. Contains odorous principle, glucose, mucilage, pectin, caoutchouc, wax, fatty matter, coloring principle, ash 6 per cent., meconic acid, $C_7H_4O_7$ (ferric salts produce a deep red color, which is not discharged by hydrochloric acid or mercuric chloride), lactic acid $1\frac{1}{4}$ per cent., meconin, $C_{10}H_{10}O_4$ (bitter, soluble in alcohol and ether), meconoiosin, $C_8H_{10}O_2$ (red, changing to purple when evaporated with slightly diluted sulphuric acid,

while meconin turns green), and numerous alkaloïds.

Narcotina, $C_{22}H_{23}NO_7$, 1.3 to 10.9 per cent. Soluble in ether; blood red by a mixture of sulphuric and nitric acids; heated with nitric acid yields opianic acid, meconin, and cotarnina, $C_{12}H_{13}NO_3$, a stronger base.

Morphia, $C_{17}H_{19}NO_3 \cdot H_2O$, 2.5 to 15 or 22.8 per cent. Insoluble in ether and benzol, soluble in alkalis; blood-red, orange, then yellow with nitric acid; orange-colored by chlorinated alkalies; deep blue by ferric chloride; liberates iodine from iodic acid; heated with hydrochloric acid under pressure yields apomorphia, $C_{17}H_{17}NO_2$, which is emetic.

Codeia, $C_{18}H_{21}NO_3$, 0.2 to 0.4 per cent. Soluble in ether, benzol, and water; melts in hot water; yellow by nitric acid; blue by sulphuric acid containing a trace of nitric acid or ferric salt; methylmorphia, having the same composition, differs somewhat from codeia.

Pseudomorphia (phormia), $C_{17}H_{19}NO_4$, 0.2 per cent. Insoluble in ether; red by nitric acid, and blue by ferric chloride.

Thebaina (paramorphia), $C_{19}H_{21}NO_3$, 0.15 to 1.0 per cent. Soluble in ether; red and yellow by sulphuric acid; yellow by nitric acid.

Narceina, $C_{23}H_{29}NO_9$, 0.02 to 0.1 or 0.7 per cent. Insoluble in ether; transiently yellow by nitric acid; blue by a little iodine.

Papaverina, $C_{21}H_{21}NO_4$, 1.0 per cent. Slightly soluble in ether; violet-blue by sulphuric acid, changing to green with a nitrate.

Rhœadina, $C_{21}H_{21}NO_5$. Nearly insoluble in simple

solvents; solutions in dilute acids tasteless and colorless, turning purple by sulphuric acid.

Cryptopia, $C_{21}H_{23}NO_5$. Sparingly soluble in most simple solvents; salts gelatinizing from hot water; blue by sulphuric acid, changing to orange-yellow by a nitrate.

Lanthopia, $C_{23}H_{23}NO_4$. Readily soluble in chloroform; orange-red by nitric acid; pale violet color by sulphuric acid, dark brown on heating.

Meconidia, $C_{21}H_{23}NO_4$. Readily soluble in ether, benzol, and chloroform; olive-green by sulphuric acid; orange-red by nitric acid.

Laudania, $C_{20}H_{23}NO_4$. Sparingly soluble in ether; rose-red by sulphuric acid, violet on heating; orange-red by nitric acid; green with ferric chloride.

Codamina, $C_{20}H_{23}NO_4$. Readily soluble in simple solvents; blue with sulphuric acid, on heating green and dark violet; green by nitric acid.

Deuteropia, $C_{20}H_{21}NO_5$. Not known in pure state.

Laudanosina, $C_{21}H_{27}NO_4$. Soluble in ether; melts at $89^\circ C.$ ($192.2^\circ F.$).

Protopia, $C_{20}H_{19}NO_5$. Slightly soluble in ether.

Hydrocotarnina, $C_{19}H_{15}NO_4$. Soluble in ether; melts at $50^\circ C.$ ($122^\circ F.$).

The last-named ten alkaloids are present only in minute quantity.

Properties. — Narcotic, sedative, anodyne, antispasmodic, hypnotic, chiefly due to the morphia present. Narcotina is antiperiodic and tetanizing. Codeia is hypnotic, used in diabetes. Thebaina is soporific, excitant, and convulsifying. Narceina is feebly hypnotic. Papaverina is hypnotic and sedative. Cryptopia is hypnotic. *Dose*, Opium 0.06 to

0.13 gram (gr. j-ij) or more. Morphia 0.01 to 0.03 gram (gr. $\frac{1}{6}$ -ss) or more.

LACTUCARIUM.—LACTUCARIUM.

Origin.—*Lactuca virosa*, *Lin.*, *L. sativa*, *Lin.*, and *L. Scariola*, *Lin.* *Natural order*, Compositæ.

Habitat.—Southern and Central Europe; cultivated. (*L. sativa* is the garden lettuce.)

Preparation.—The top of the flowering stalks is cut off, and the milk-juice scraped into earthen vessels to harden.

Description.—In sections of plano-convex circular cakes, or in irregular angular pieces; externally gray-brown or dull reddish-brown; internally whitish or yellowish, of a waxy lustre; odor narcotic; taste bitter.

It is partly soluble in alcohol and ether, and, when triturated with water, yields a turbid mixture. Diluted alcohol dissolves between 36 and 44 per cent. of the lactucarium.

Lactuca canadensis, *Lin.*, at the time of flowering, yields a good lactucarium; earlier in the season its milk-juice is not bitter.

Constituents.—Lactucin, $C_{11}H_{12}O_3 \cdot H_2O$ (bitter scales, soluble in 60 parts of cold water; turns red and brown by alkalis, and loses its bitter taste), lactucic acid (crystalline, bitter, red by alkalis), lactucopierin (amorphous, bitter), lactucerin or lactucon about 50 per cent. (tasteless needles; composition variable), caoutchouc, resin, sugar, mucilage, asparagin, trace of volatile oil, ash 8 to 10 per cent., etc.

Properties.—Anodyne, hypnotic, sedative. *Dose*, 0.1 to 0.3 or 0.5 gram (gr. jss-v-vij), in syrup or fluid extract.

Thridace or French lactucarium is not the milk-juice, but the extract of the herb.

ALOE.—ALOES.

Origin.—1. *Aloe socotrina*, *Lamarck*. 2. *A. vulgaris*, *Lamarck*. 3. *A. spicata*, *Thunberg*, and other species of *Aloe*. *Natural order*, *Liliaceæ*.

Habitat.—1. Eastern Africa. 2. India and North-eastern Africa; naturalized in the West Indies. 3. Southern Africa, where 6 or 8 additional species are used in the preparation of aloes.

Preparation.—The leaves are cut off and the juice exuding from them is collected without using any pressure, after which it is evaporated.

Description.—Of different shades of brown, opaque, and in thin layers translucent or transparent; fracture somewhat conchoidal, dull waxy or glossy resinous; odor peculiar, when breathed upon saffron-like; taste bitter, nauseous. Aloes is almost completely soluble in alcohol, in boiling water, and in alkalies.

Varieties.—*Aloe socotrina*; Socotrine aloes. Hard, or the interior occasionally soft, opaque, yellowish-brown or orange-brown, not greenish, translucent; odor rather pleasant. Mixed with alcohol, and examined under the microscope, it exhibits numerous crystals. It comes from *A. socotrina*, and is exported from Zanzibar and other places of Eastern Africa, frequently *via* Bombay.

Aloe barbadense; Barbadoes aloes. Deep orange-brown, opaque, translucent; odor differing somewhat from that of the preceding; under the microscope crystalline. It comes from *A. vulgaris*, and is exported from the island of Barbadoes. Bonare and Curaçao aloes are derived from the same plant and are more glossy.

Aloe capensis; Cape aloes. Blackish-brown or olive-black, transparent and red-brown on the edges, glossy; odor unpleasant; not crystalline under the microscope.

Natal aloes. Light yellowish-gray-brown, dull, and opaque; odor and taste weaker than in the other varieties; crystalline under the microscope; medicinally of little value. The plant yielding it is unknown; it is exported from Port Natal.

Moka aloes. Brown-black, opaque, impure, and of disagreeable odor; from the interior of Arabia.

Caballine aloes; Horse aloes. Dark colored, opaque, and fetid.

Constituents.—Volatile oil a minute quantity, aloin, so-called resin; the latter amounts to about 60 per cent., is soluble in hot water, and almost wholly reprecipitated on boiling. The crystalline aloin is yellow or pale yellow, and not freely soluble in simple solvents.

Socaloin, $C_{15}H_{16}O_7$, is little affected by cold nitric acid.

Nataloin, $C_{16}H_{18}O_7$, is colored crimson by cold nitric acid. If added to cold sulphuric acid, and the vapor of nitric acid passed over it, the orange color will rapidly change to green, red, and blue; the other aloins are little affected by this test.

Barbaloin, $C_{17}H_{20}O_7$, is colored crimson by cold nitric acid.

Properties.—Laxative, drastic, emmenagogue, vermifuge. *Dose*, 0.12 to 0.3 or 0.5 to 1.0 gram (gr. ij–v or viij–xv), in pills, tincture, wine, enema, or suppository.

EXTRACTUM GLYCYRRHIZÆ.—LIQUORICE. LICORICE.

Succus liquiritiæ.

Origin.—*Glycyrrhiza glabra*, *Lin.* *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Southern Europe; cultivated.

Preparation. — The bruised root is boiled with water, expressed, the liquid evaporated, and the stiff extract while warm rolled out into sticks.

Description. — Cylindrical brown-black sticks of varying dimensions, somewhat flexible when warm, breaking with a glossy and flat conchoidal fracture, and yielding a brown powder; odor slight; taste sweet, somewhat acid.

Licorice loses on drying from 10 to 15 per cent. of moisture, and, if now treated with cold water, yields to it from 60 to 70 per cent. of its weight, and subsequently an additional quantity to dilute ammonia.

Constituents. — Glycyrrhizin, free and combined with bases, the former soluble in ammonia; glucose, starch, fragments of tissue, ash 6 to 8 per cent.

Adullerations.—Dextrin and gum are precipitated from the aqueous infusion by alcohol; glucose is not precipitated.

Properties.—Demulcent, expectorant. *Dose*, 1.0 or

2.0 grams (gr. xv-xxx); used for correcting the taste of bitter medicines.

CATECHU.—CATECHU. CUTCH.

Origin.—Acacia Catechu, *Willd.*, and Ac. Suma, *Kurz.* *Natural order*, Leguminosæ, Mimosæ.

Habitat.—India; the second species also in Eastern Africa.

Preparation.—The brown heartwood is boiled with water and the decoction evaporated.

Description.—In irregular masses, containing fragments of leaves, dark brown, glossy, brittle, breaking with a conchoidal fracture, often somewhat porous in the interior; nearly inodorous; taste strongly astringent and sweetish; soluble in alcohol and partly soluble in cold water.

Constituents.—Catechutannic acid, $C_{38}H_{34}O_{15}$, about 50 per cent. (brown, insoluble in ether, black-green with ferric salts), catechin, $C_{21}H_{18}O_8$, or $C_{21}H_{20}O_9$ (white needles, sparingly soluble in cold water, soluble in ether, sweetish, green with ferric salts), catechu red, quercetin, ash 0.6 per cent.

Properties.—Tonic, astringent. *Dose*, 0.5 to 2.0 grams (gr. viij-3ij), in powder, pills, troches, and tincture.

CATECHU PALLIDUM.—GAMBIR.

Origin.—Uncaria (Nauclea, *Hunter*) Gambir, *Roxburgh.* *Natural order*, Rubiaceæ, Cinchoneæ.

Habitat.—East India Islands.

Preparation.—The leaves and young shoots are boiled in water and the decoction is evaporated.

Description.—Irregular masses or cubes about 25 millimeters (1 inch) square; externally dull brown, internally pale gray-brown, under the microscope crystalline, friable, inodorous, astringent, and sweetish; slightly soluble in cold water.

Constituents.—Catechin, little catechutannin.

Properties.—Tonic, astringent. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder, pills, troches, or tincture.

KINO—KINO.

Origin.—Pterocarpus Marsupium, Roxburgh. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—East Indies.

Preparation.—Incisions are made into the trunk of the tree and the exuding red juice is inspissated without the use of artificial heat.

Description.—Small, angular, dark brown-red, shining pieces, brittle, in thin layers ruby-red and transparent; inodorous, very astringent, and sweetish; when masticated, becomes adhesive to the teeth and tinges the saliva deep red; soluble in alcohol and in alkalies, partly soluble in water, nearly insoluble in ether.

Constituents.—Kinotannic acid (black-green by ferric salts; in neutral solution violet by ferrous salts); kino-red (tasteless), pyrocatechin (a trace, soluble in ether and water; by ferric chloride green, changed to red by alkalies), kinoin (slightly soluble in ether and cold water; by ferric chloride red), ash 1.3 per cent.

Varieties.—Malabar kino, described above.

Bengal or Palas kino, from *Butea frondosa*, *Roxb.*, Leguminosæ. Blackish-red, in transparent light ruby-red tears or fragments, often with impressions of leaf-veins, brittle, not adhesive on mastication.

Gambia kino, from *Pterocarpus erinaceus*, *Poir.*, is now not an article of commerce.

Australian or Botany Bay kino, from different species of *Eucalyptus*, Myrtaceæ; varying in solubility and composition; some varieties contain much gum.

West Indian kino, from *Coccoloba uvifera*, *Lin.*, Polygonaceæ. Dark brown-red, almost wholly soluble in water and alcohol; taste astringent and bitterish.

Properties.—Tonic, astringent. *Dose*, 0.5 to 2.0 grams (gr. viij—xxx), in powder, pills, troches, and tincture.

MONESIA.—MONESIA.

Origin.—*Chrysophyllum glyciphloeum*, *Cusaretti*.
Natural order, Sapotaceæ.

Habitat.—Brazil.

Preparation.—Probably by boiling the bark in water and evaporating.

Description.—Black-brown cakes or angular fragments, soluble in water, inodorous; taste sweet, astringent, and acrid.

Constituents.—Tannin 52 per cent. (blue-black by ferric salts); sweet principle (resembling glycyrrhizin, but not precipitated by acids), monesin (resembling saponin, acrid, foaming in aqueous solution), pectin, coloring matter, ash 3 per cent.

Properties.—Stimulant, tonic, astringent. *Dose*, 0.3 to 1.5 gram (gr. v—xxij), in powder, tincture, and syrup.

Substitutions.—The astringent extracts described above have been sold in place of it; also

Extractum Hæmatoxyli, extract of logwood, which is red-brown, not acrid, and yields with water a red solution.

GUTTA PERCHA.—GUTTA PERCHA.

Origin.—Dichopsis (Isonandra, *Hooker*) Gutta, *Bentley et Trimen*. *Natural order*, Sapotaceæ.

Habitat.—Malay peninsula and islands.

Collection.—The trees are felled, the bark is incised or strips of it are removed, and the milky juice collected and allowed to harden, or coagulated by boiling it with water.

Properties.—Grayish or yellowish masses, often with red-brown streaks, hard, rather horny, somewhat flexible, but scarcely elastic; spec. grav. about .98; elastic above 60° C. (140° F.), very soft at the temperature of boiling water; nearly inodorous and tasteless; insoluble in water and cold alcohol; soluble in chloroform, oil of turpentine, and carbon bisulphide.

Constituents.—A hydrocarbon, $C_{20}H_{32}$ (white fine powder), a yellow resin, $C_{20}H_{32}O$, and a white crystalline resin, $C_{20}H_{32}O_2$; the last two separate on cooling from hot alcohol.

Uses.—As an adhesive and protective agent for wounds and abrasions, and for the preparation of bougies, pessaries, and caustic pencils.

ELASTICA. RESINA ELASTICA.—CAOUTCHOUC,
INDIA RUBBER.

Origin.—In the milk-juices of many plants; prepared chiefly from trees of the natural order of Euphorbiaceæ (Siphonia, Hevea, Jatropha, etc.), Apocynaceæ (Urceola, Vahea, Alstonia, etc.), and Artocarpaceæ (Ficus, Castilloa, etc.); these grow in tropical countries.

Preparation.—Incisions are made, and the milk-juice is allowed to congeal in mass, or it is dried over clay or wooden moulds with or without the aid of artificial heat.

Description.—In cakes, balls, or hollow bottle-shaped pieces, externally blackish-brown, internally brownish; spec. grav. about .96; very elastic; odor slight peculiar, nearly tasteless; soluble in carbon bisulphide, chloroform, and oil of turpentine. It melts at about 125°C . (257°F .), and, after cooling, remains soft and adhesive; on dry distillation it yields caoutchoucine, containing coatchin, $\text{C}_{10}\text{H}_{16}$, and isoprene, C_5H_8 .

Constituents.—A hydrocarbon, $\text{C}_{20}\text{H}_{32}$. On combining it with about 10 per cent. of sulphur, vulcanized rubber is obtained; and on incorporating half its weight of sulphur and hardening by pressure, vulcanite or ebonite is produced.

Uses.—For plasters, bougies, pessaries, syringes, etc.

2. SUGARS.—SACCHARA.

Sugars have a sweet taste, are soluble in water and diluted alcohol, and insoluble in ether.

Classification.

Sect. 1. Solid sugars.

Crystalline; not fermentable; does not reduce cupric oxide.	Saccharum.
Fermentable; reduces cupric to cuprous oxide; contains dextrin.	Saccharum uveum.
contains mucilage and mannit.	Manna.
White, gritty, not forming a syrup.	Saccharum lactis.

Sect. 2. Liquid sugars.

Brown, somewhat empyreumatic.	Syrupus fuscus.
Brownish, aromatic; gradually becomes granular.	Mel.

SACCHARUM.—SUGAR. CANE SUGAR.

Origin. — Saccharum officinarum, *Lin.* *Natural order,* Graminaceæ.

Habitat.—Southern Asia; cultivated in tropical and subtropical countries.

Preparation. — Sugar cane yields by expression about 80 per cent. of juice, containing about 80 per cent. of water and 18 per cent. of sugar. The juice is evaporated, the residue granulated, the treacle or molasses drained off, and the raw sugar refined by dissolving in water, heating with blood, skimming, filtering through animal charcoal, and concentrating in a vacuum pan, until, after cooling, it congeals to a

crystalline mass, from which the mother-liquor is washed out by percolation with water or sugar solution. Sugar is also prepared from the sugar-beet, which contains about 12 per cent. of it.

Description.—White crystalline pieces or granules, of spec. grav. 1.60, not hygroscopic, inodorous, very sweet; soluble in half its weight of cold water, forming a colorless syrup; sparingly soluble in strong alcohol; insoluble in ether. Its aqueous solution, under the influence of heat and light, is slowly converted into glucose, and is then directly fermentable, and reduces red cuprous oxide from an alkaline solution of cupric oxide.

Composition.— $C_{12}H_{22}O_{11}$

Adulteration.—Inferior sugars are whitened with ultramarine or Prussian blue.

Derivatives. — Saccharum crystallisatum, rock candy, is cane sugar in large crystals.

Saccharum hordeatum, barley sugar, is cane sugar melted at $160^{\circ} C.$ ($320^{\circ} F.$); it is amorphous, transparent, and gradually becomes crystalline upon the surface.

Caramel, $C_{12}H_{18}O_9$. Cane sugar is heated to about $200^{\circ} C.$ ($392^{\circ} F.$), the conversion is hastened by alkalis. Dark brown, used for coloring liquors.

Properties. — Demulcent, lenitive; externally in certain ulcerations.

SACCHARUM UVEUM.—GRAPE SUGAR.

Saccharum amylaceum. Starch sugar. Glucose.

Origin and Preparation.—Starch is boiled for a

considerable time with dilute sulphuric acid, the free acid removed by calcium carbonate, and the filtered solution evaporated.

Description. — Whitish or yellowish masses or irregular granules, slightly hygroscopic, inodorous, sweet (less so than cane sugar), soluble in about one part of cold water, but in all proportions in hot water; sparingly soluble in strong alcohol, insoluble in ether. Its cold aqueous solution, mixed with twice its bulk of alcohol, yields a whitish precipitate if dextrin is present, and a white precipitate with ammonium oxalate from the presence of calcium sulphate. Commercial liquid grape sugar is called glucose, and contains much dextrin. The dilute solution in water is readily fermentable, is colored brown when heated with potassa, speedily reduces red cuprous oxide from an alkaline solution of cupric oxide, and decolorizes an alkaline solution of potassium ferridcyanide on boiling.

Composition.— $C_{12}H_{24}O_{12}$; on heating it caramel is obtained.

Properties.—Similar to cane sugar.

MANNA.—MANNA.

Origin.—*Fraxinus Ornus*, *Lin.*, s. *Ornus europæa*, *Persoon.* *Natural order*, *Oleaceæ*.

Habitat.—Basin of the Mediterranean.

Collection.—In Sicily transverse incisions are made through the bark, and the exuding juice is allowed to harden on the trunk of the tree or on tiles.

Description.—Flattish three-edged pieces, occasion-

ally 20 centimeters (8 inches) long and 5 centimeters (2 inches) broad, usually smaller, friable, externally yellowish-white, internally white, porous, and crystalline. Or in fragments of different size, brownish-white, and somewhat glutinous on the surface, internally white and crystalline; odor honey-like; taste sweet, slightly bitter, and faintly acid.

Manna consisting of brownish viscid masses containing few or no fragments having a crystalline structure, should be rejected.

Varieties.—Large flake manna; the larger yellowish-white pieces.

Small flake manna; smaller pieces, occasionally of a brownish hue.

Manna in sorts; minute tears or small glutinous fragments, internally crystalline.

Fat manna; brownish viscid masses, without crystalline fragments.

Constituents.—Mannit, $C_6H_{14}O_6$. 90 per cent. in the best varieties, glucose, mucilage, resin, fraxin, $C_{32}H_{36}O_{20}$. Mannit crystallizes in white prisms, dissolves in 6.5 parts of cold water, and sparingly in strong alcohol. The amount of glucose is largest in the inferior kinds of manna, which also contain a larger proportion of fraxin, to which the fluorescence of the aqueous solution is due.

The mannas of Briauçon from *Larix europæa*, *D.C.*, of Armenia from *Quercus vallonea*, *Kotschy*, of Persia from *Alhagi camelorum*, *Fischer*, and others are not met with in commerce.

Properties.—Demulcent, laxative. *Dose*, 4.0 to 32.0 grams (3j–3j), in solution, syrup, or as addition to other medicines.

SACCHARUM LACTIS.—MILK SUGAR.

Origin.—The milk of mammals.

Preparation.—After the removal of the butter and casein from cows' milk, the whey is concentrated and allowed to crystallize upon sticks or cords.

Description.—Hard white translucent four sided prisms, usually aggregated into cylindrical masses, soluble in 6 parts of cold water without forming a syrupy solution, insoluble in strong alcohol and in ether; inodorous; of a sandy and sweetish taste.

The solution in water boiled with potassa turns yellowish-brown, slowly reduces cuprous oxide from alkaline solutions of cupric oxide, and does not decolorize an alkaline solution of potassium ferridecyanide on boiling.

Composition.— $C_{12}H_{24}O_{12}$; on heating it caramel is obtained.

Properties.—Demulcent, laxative; chiefly used as a vehicle.

SYRUPUS FUSCUS.—MOLASSES.

Sacchari fæx, Theriaca, Treacle.

Origin.—Obtained in the manufacture and refining of sugar.

Description.—Syrupy liquid of various shades of brown, clear or nearly clear, spec. grav. about 1.40; reaction slightly acid; odor slightly empyreumatic; taste very sweet; is not precipitated by an equal bulk of alcohol.

Varieties.—West India and sugar-house molasses; the former has a lighter color and somewhat different odor.

Properties.—Like sugar.

MEL.—HONEY.

Origin and Preparation.—Honey is deposited in the honeycomb by the bee, *Apis mellifica*, *Lin.* *Class*, Insecta. *Order*, Hymenoptera. It is obtained either by draining or by melting the honeycomb.

Description. — Syrupy, light yellowish or pale brownish-yellow, translucent, gradually becoming crystalline and opaque, of a slight acid reaction, agreeable aromatic odor, and sweet, faintly acrid taste.

Boiled with water and allowed to cool, it does not become blue on the addition of compound solution of iodine; and when diluted with one part of water, and the solution mixed with an equal bulk of alcohol, no precipitate, or but a very slight one, is produced.

Constituents.—Grape sugar (becomes crystalline), fruit sugar (remains liquid), little wax, volatile oil, coloring matter, mucilage, and acid.

Properties.—Demulcent, laxative; externally as a mild stimulant.

3. GUMS.—GUMMATA.

Gums have an insipid taste, are insoluble in alcohol and ether, but dissolve in water, forming a mucilaginous liquid, or form with water a jelly-like adhesive mass.

Classification.

Soluble in water; distinct tears, transparent, but fissured internally.	Acacia.
Swelling in water; curved bands, translucent, composed of several layers.	Tragacantha.

ACACIA.—GUM ARABIC.

Origin.—Acacia Verek, *Guil. et Perott.*, s. A. Senegal, *Willd.*, and other species of Acacia. *Natural order*, Leguminosæ, Mimosæ.

Habitat.—Eastern Africa, principally Kordofan; Western Africa near the river Senegal.

Production.—The gum exudes spontaneously and from incisions made into the bark.

Description.—Roundish brittle tears of various sizes, or broken into angular fragments, with a glass-like, sometimes iridescent fracture, opaque from numerous fissures, but transparent and nearly colorless in thin pieces; nearly inodorous; taste insipid, mucilaginous; insoluble in alcohol; soluble in water, forming a thick mucilaginous liquid. This solution has an acid reaction to test-paper, yields gelatinous

precipitates with subacetate of lead, ferric chloride, and concentrated solution of borax, and is not colored blue by iodine.

Varieties.—Kordofan gum, the best kind, described above.

Senaar gum, nearly equal to the preceding.

Savakin (Suakin) gum, of handsome appearance, very brittle; does not completely dissolve in water except after the addition of a little alkali.

East India gum is mostly produced from Eastern Africa, and shipped by way of Bombay.

Senegal gum. The tears are often larger, color more yellow or reddish; fissures fewer in number, therefore more transparent and less brittle; taste sometimes bitterish.

Mezquite gum from *Algarobia glandulosa*, *Torrey et Gray*, in Western Texas and Mexico; resembles gum Arabic, but is mostly yellow or red-brown; its solution in water is not precipitated by subacetate of lead, ferric chloride, or borax.

Considerable gum is also produced from different species of *Acacia* in Morocco, the Cape Colony, and Australia.

Composition. — Arabic acid, $C_{12}H_{22}O_{11}$, combined with calcium, magnesium, and potassium; ash 3 to 4 per cent. Arabic or gummy acid, after drying, swells with water, but does not dissolve in it, except after the addition of an alkali (Savakin gum).

Properties.—Demulcent.

TRAGACANTHA.—TRAGACANTH.

Origin.—*Astragalus gummifer*, *Labillardière*, and other species of *Astragalus*. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Western Asia.

Production.—The tissue of the pith and medullary rays is gradually altered to a compound swelling with water, and in this condition exuding spontaneously and from incisions into the stem of the shrubs.

Description.—Narrow or broad bands, more or less curved or contorted, marked by parallel lines or ridges; white or faintly yellowish, translucent, horn-like, tough, rendered more pulverizable by a heat of 50° C. (122° F.); inodorous; taste insipid, sometimes faintly bitterish. It swells with water into a gelatinous mass which is tinged blue by iodine, and the fluid portion of which is precipitated by alcohol and lead acetate, but not disturbed by ferric chloride and borax.

Varieties.—Flake tragacanth, the bands described above.

Vermiform tragacanth; 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.

Constituents.—Traganthin, $C_{12}H_{20}O_{10}$, and the calcium compound of a gummic acid, not identical with Arabic acid; starch, fragments of cells, ash 3 per cent.

Properties.—Demulcent.

4. GUM RESINS.—GUMMI-RESINÆ.

Gum resins are milky exudations of plants, and consist of gum which is wholly or partly soluble in water, and resin which is soluble in alcohol. Many gum resins contain also volatile oil. Fragments of vegetable tissue, small fruits, or seeds are occasionally met with in the commercial gum resins, all of which yield emulsions on being triturated with water.

Classification.

Sect. 1. Gum resins containing volatile oil.

Tears internally white, turning red on exposure, imbedded in a brown sticky mass.	Asafoetida.
Tears small, internally whitish, superficially adhesive; occasionally brownish, semifluid.	Galbanum.
Tears few, imbedded in a brown sticky mass; emulsion brown; odor garlic-like.	Sagapenum.
Tears brownish, internally milk-white, distinct, or superficially adhering.	Ammoniacum.
Tears or masses, dull reddish-brown.	Opopanax.
Tears yellowish, translucent.	Olibanum.
Tears or masses, reddish-brown, translucent; fracture waxy.	Myrrha.
Resembling myrrh; but tincture not colored purple by nitric acid.	Bdellium.

Sect. 2. Gum resins free from volatile oil.

Pipes or cakes; bright orange-yellow.	Gambogia.
Tears, frequently hollow; light brown-yellow.	Euphorbium.
Cakes greenish-black or grayish; internally porous; odor cheese-like.	Scammonium.

ASAFŒTIDA.—ASAFETIDA.

Origin.—1. *Ferula Narthex*, *Boissier*, s. *Narthex Asafoetida*, *Falconer*. 2. *Ferula Scorodosma*, *Benth. et Hook.*, s. *Scorodosma foetidum*, *Bunge*. *Natural order*, *Umbelliferae*, *Orthospermæ*.

Habitat.—1. Western Thibet and probably Kashmir. 2. Persia, Turkestan, and Afghanistan.

Collection.—The top of the large root is laid bare, thin slices are cut off, and the exuding milk-juice is scraped off.

Description.—In irregular masses composed of whitish tears, imbedded in a yellowish-gray or brown-gray sticky mass. The tears when hard break with a milk-white conchoidal fracture, turning gradually to a pink and finally to a brown color. The sticky mass always contains vegetable fragments and earthy impurities (calcium sulphate, etc.). The odor is alliaceous; the taste bitter, acrid, and alliaceous. It is partly soluble in ether and in alcohol, and yields with water a milk-white emulsion. Good asafetida yields to alcohol 60 per cent. of soluble matter. Moistened with alcohol, asafetida acquires a greenish color on the addition of hydrochloric acid.

Varieties.—Liquid asafetida; white opaque syrupy or semifluid mass, gradually turning brown.

Asafetida in tears; tears of various sizes, distinct or adhesive and agglutinated.

Amygdaloid asafetida; the kind described above.

Stony asafetida; consists of gypsum and other earthy matters, agglutinated with the milk-juice; unsuited for medicinal purposes.

Constituents.—Aside from the impurities asafetida contains 3 to 6 or 9 per cent. of volatile oil (sulphurets of ferulyl, C_6H_{11} , odor strongly alliaceous), 20 to 30 per cent., sometimes more, of gum (partly soluble in water, mostly soluble in alkalies), and 50 to 70 per cent. of resin, of which a small portion (3–4 per cent.) is insoluble in ether, and which contains a little ferulaic acid, $C_{10}H_{10}O_4$. The earthy additions consist of calcium sulphate, calcium carbonate, and sand, occasionally to the amount of 40 per cent. On dry distillation the resin yields umbelliferon.

Properties.—Stimulant, expectorant, laxative, antispasmodic. *Dose*, 0.3 to 1.5 gram (gr. v–xxij), in pills, emulsion, or tincture.

GALBANUM.—GALBANUM.

Origin.—*Ferula galbaniflua*, *Boissier et Buhse*, and other species of *Ferula*. *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Persia.

Production. — Galbanum exudes spontaneously, chiefly from the lower part of the stem.

Description.—In tears, from the size of a pin's head to that of a pea, and larger, mostly agglutinated, forming a more or less hard mass; externally yellowish, or pale brown, internally milk-white or yellowish, with a waxy lustre; odor peculiar, balsamic; taste bitter and acrid; partly soluble in ether and alcohol; yields with water a milk-white emulsion. When moistened with alcohol, it acquires a purple color on the addition of a little hydrochloric acid.

Varieties.—Galbanum in tears, the kind described above.

Lump galbanum; soft or hard masses, of a more or less brown color, inclosing tears or free from the same; it differs more or less in odor from the preceding and is often not colored by alcohol and hydrochloric acid. It may, in part, be derived from *Ferula rubricaulis*, *Boissier*.

Constituents.—Volatile oil 6 to 9 per cent., $C_{10}H_{16}$, resin 60 to 66 per cent. (soluble in ether, alcohol, carbon bisulphide, and alkalies; yields on dry distillation a blue volatile oil and umbelliferon), gum 15 to 20 per cent., umbelliferon, $C_6H_2O_3$ (soluble in alcohol and ether, sparingly soluble in cold water, the latter solution blue fluorescent with ammonia).

Properties.—Stimulant, expectorant, antispasmodic. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in pills or emulsion, externally in plasters.

Allied Gum Resin.—Sagapenum; probably obtained from a species of *Ferula*; yellowish-brown or brown, amygdaloid or free from tears; blue by hydrochloric acid; contains umbelliferon, the volatile oil free from sulphur.

AMMONIACUM.—AMMONIAC.

Origin.—*Dorema Ammoniacum*, *Don.* *Natural order*, Umbelliferae, Orthospermæ.

Habitat.—Eastern Persia and Turkestan.

Production.—Ammoniac exudes spontaneously from the stem.

Description.—Globular or irregular roundish, often

somewhat flattened tears, either distinct or agglutinated, pale brownish-yellow externally, and breaking with a conchoidal waxy milk-white fracture. It softens by the heat of the hand, yields a white emulsion when triturated with water, and has a peculiar somewhat balsamic odor, and a bitter acrid and nauseous taste. When moistened with alcohol, it is not colored on the addition of hydrochloric acid.

Cake ammoniac having the tears imbedded in a brown resinous mass should not be employed internally.

Constituents.—Volatile oil $\frac{1}{2}$ to 4 per cent. (free from sulphur), resin 70 per cent. (an acid and an indifferent resin; does not yield umbelliferon) gum 18 to 22 or 28 per cent. (partly soluble in water, mostly soluble in alkalies).

Properties.—Stimulant, expectorant. *Dose*, 0.3 to 2.0 grams (gr. v-xxx), in pills and emulsion.

Allied Gum Resins.—African ammoniac from *Ferula tingitana*, *Lin.*, in Northern Africa; darker colored than the preceding, of a rather more agreeable odor and acrid not bitter taste; yields umbelliferon.

Opopanax from *Opopanax Chironium*, *Koch*, of Southern Europe; dull reddish-brown masses or tears, friable, of waxy lustre; odor unpleasant; taste balsamic, bitter.

OLIBANUM.—FRANKINCENSE.

Origin.—*Boswellia Carterii*, *Birdwood*, and other species of *Boswellia*. *Natural order*, Terebinthaceæ, Burseraceæ.

Habitat.—Eastern Africa and Arabia.

Production.—Frankincense exudes from incisions, made into the bark.

Description.—Roundish, oblong, or irregular tears, variable in size, externally dusty; fracture flattish, waxy, yellowish or pale reddish, translucent; odor balsamic terebinthinate; softened by mastication; taste balsamic, bitterish; partly soluble in alcohol; yields with water a milk-white emulsion.

Lump olibanum consists of irregular impure masses which have been gathered from the ground.

Constituents.—Volatile oil, 4 to 7 per cent. (olibene, $C_{10}H_{16}$, and oxygenated portion), resin 56 to 72 per cent., gum about 30 per cent. (resembles gum arabic), bitter principle (soluble in alcohol and water).

Properties.—Stimulant, expectorant. *Dose*, 1.0 to 3.0 grams (gr. xv-xlv), in emulsion, mostly used in plasters and for fumigations.

MYRRHA.—MYRRH.

Origin.—Balsamodendron Myrrha, *Nees*. *Natural order*, Terebinthaceæ, Burseraceæ.

Habitat.—Eastern Africa and Southwestern Arabia.

Production.—Myrrh exudes spontaneously from the bark.

Description.—Roundish or irregular tears or masses, dusty brown-yellow or reddish-brown; fracture waxy, somewhat splintery, translucent on the edges, sometimes marked with whitish veins; odor balsamic; on mastication adhesive; taste bitter and acrid. When

triturerated with water, myrrh yields a brown-yellow emulsion. Alcohol yields a brown-yellow tincture which acquires a purple hue on the addition of nitric acid. Dark-colored pieces the alcoholic solution of which is not rendered purple by nitric acid, and pieces of gum which dissolve completely or merely swell in water, and are but slightly soluble in alcohol, should be rejected.

Constituents.—Volatile oil 2 to 4 per cent. (oxygenated, easily resinifying), resin 25 to 40 per cent., gum 40 to 60 per cent. (precipitated by lead acetate), bitter principle (soluble in alcohol and water), ash 3 to 4 per cent.

Properties.—Stimulant, tonic, expectorant, emmenagogue, vulnerary. *Dose*, 0.3 to 2.0 grams (gr. v–ʒss), in pills and emulsion; externally in powder and tincture.

BDELLIUM.—BDELLIUM.

Origin.—1. *Balsamodendron Mukul*, *Hooker*; 2. *B. africanum*, *Arnott*. *Natural order*, Terebinthaceæ, Burseraceæ.

Habitat.—1. East India; 2. Western Africa.

Description.—1. Globular or irregular pieces, externally dusty; fracture flat conchoidal, dark brown or blackish, translucent in thin fragments. 2. Irregular, globular, or oval tears, externally dusty; fracture angular, waxy, yellowish to brown-red, translucent; odor and taste myrrh-like; the tincture is not colored red by nitric acid.

Constituents.—Volatile oil, resin, gum, bitter principle.

Properties and Uses.—Similar to myrrh, mostly used in plasters.

GAMBOGIA.—GAMBOGE.

Gutti. Cambogia.

Origin.—*Garcinia Hanburii*, *Hooker fil.* s. *G. Morella*, *Desrousseaux*, var. *pedicellata*, *Hanbury*. *Natural order*, *Guttiferæ*.

Habitat.—Anam, Camboja, and Siam.

Production.—The milk-juice exudes from incisions, and is collected in bamboo joints.

Description.—In cylindrical pieces, sometimes hollow in the centre, 25 to 50 millimeters (1 to 2 inches) in diameter, longitudinally striate on the surface; fracture flattish conchoidal, smooth, of a waxy lustre; orange-red or in powder bright yellow; inodorous; taste very acid; the powder sternutatory. It is partly soluble in alcohol and ether; when triturated with water yields a yellow emulsion, and forms with solution of potassa an orange-red solution, from which, on the addition of hydrochloric acid, yellow resin is precipitated. Boiled with water, gamboge yields a liquid which after cooling does not become green with compound solution of iodine.

Varieties.—Pipe gamboge; the kind described above. Cake gamboge; in irregular lumps or cakes, dried in flat vessels; more liable to be adulterated.

Constituents.—Gum 16 to 20 per cent. (not precipitated by lead acetate or ferric chloride), resin or cam-

bogic acid about 80 per cent. (soluble in alcohol and colored black-brown by ferric chloride; soluble in alkalies with a red color).

Properties.—Hydragogue cathartic. *Dose*, 0.03 to 0.3 (gr. ss-v), in pills, in combination with other medicines.

EUPHORBIIUM.—EUPHORBIIUM.

Origin.—*Euphorbia resinifera*, *Berg.* *Natural order*, Euphorbiaceæ.

Habitat.—Morocco.

Production.—Euphorbium exudes from incisions made into the stem.

Description.—In conical or globular nodular pieces, often hollow or inclosing fragments of the spines or flowers, dull brownish-yellow, slightly translucent, brittle; nearly inodorous, the dust violently sternutatory; taste very acrid; partly soluble in alcohol and ether; triturated with water, a turbid mixture is obtained, but not a complete emulsion.

Constituents.—Gum 18 per cent. (precipitated by lead acetate), resin $C_{10}H_{16}O_2$, 38 per cent. (soluble in cold alcohol, very acrid), euphorbon $C_{13}H_{22}O$ (tasteless, crystalline, soluble in ether, chloroform, and boiling alcohol), malates 12 per cent., and other mineral compounds 10 per cent.

Properties.—Drastic purgative and emetic; sternutatory, rubefacient, vesicant, suppurant; only used externally.

SCAMMONIUM.—SCAMMONY.

Origin.—*Convolvulus Scammonia*, *Lin.* *Natural order*, *Convolvulaceæ*.

Habitat.—Western Asia.

Production.—The top of the root is laid bare, thin slices are cut off, and the milk-juice is collected in shells.

Description.—Irregular angular pieces or circular cakes, greenish-gray or blackish, internally porous and of a resinous lustre, breaking with an angular fracture; odor peculiar, somewhat cheese-like; taste slightly acrid; powder gray or greenish-gray. When triturated with water, scammony yields a greenish emulsion. It does not effervesce with acids, and the decoction, when cold, is not colored blue by iodine. Ether dissolves at least 80 per cent. of it, and when the residue left on evaporating the ether is treated with a hot solution of potassa, it yields a solution which is not precipitated by acids.

Constituents.—Resin 80 to 90 or 95 per cent., gum. The resin is scammonin, $C_{34}H_{46}O_{16}$, and is identical with jalapin of *Ipomœa orizabensis*; it is by alkalies converted into scammonic acid which is soluble in water.

Adulterations.—Calcium carbonate, starch, occasionally other resins.

Properties.—Hydragogue cathartic. *Dose*, 0.06 to 0.3 or 0.5 gram (gr. j–v–viij), in pills, powder, or emulsion, usually combined with other medicines.

5. RESINS.—RESINÆ.

Resins are solid, rarely crystalline, fusible, not volatile, combustible with a sooty flame, insoluble in water, but soluble in one or more of the following menstrua: alcohol, ether, chloroform, carbon bisulphide, fixed oils, volatile oils, the fixed alkalies, carbonated alkalies, and ammonia. Those soluble in alkaline liquids (resin soaps) are called resin-acids.

Resins are excretions or secretions of plants, and are found either diffused in the other constituents, or separated in cells (heartwood of guaiacum), in ducts or upon the surface of plants. When exuding from plants, resins are probably dissolved in volatile oils.

The natural resins are usually mixtures of two or more resins; a few contain also benzoic or cinnamic acid; all are free from nitrogenated compounds. Those containing coloring matters may often be bleached by means of chlorine or by repeatedly precipitating them from their alcoholic solution with water.

Classification.

Sect. 1. Resins free from benzoic and cinnamic acid.

Greenish or gray friable fragments; bitter, containing crystals.	Elaterium.
Tears yellowish, transparent; on mastication plastic.	Mastiche.
on mastication pulverulent.	Sandaraca.
Masses yellowish to brown, transparent, friable.	Colophonium.
Masses roundish, yellowish, transparent, harder than preceding.	Dammara.
Roundish or angular, often verrucose, yellowish to brownish, hard.	Copal.

Irregular, yellow to red-brown, hard and brittle; when heated, aromatic.	Succinum.
Brown-red sticks, or thin glossy brownish or brown fragments.	Lacca.
Tears or masses, greenish-brown, by tincture of ferric chloride blue or green.	Guaiaici resina.
<i>Sect. 2. Resins containing benzoic or cinnamic acid.</i>	
Sticks or cakes, brittle, dark brown-red, powder bright red.	Draconis resina.
Milk-white tears, imbedded in dull light brown or glossy reddish-brown mass.	Benzoinum.
Brittle pieces, externally brownish-yellow, internally yellow.	Xanthorrhœæ resina.

ELATERIUM.—ELATERIUM.

Origin.—Ecballium (*Momordica*, *Lin.*) *Elaterium*, *Richard.* *Natural order*, Cucurbitaceæ.

Habitat.—Western Asia and Southern Europe; cultivated.

Production.—The nearly ripe fruit is cut lengthwise, slightly pressed, the juice passed through a hair sieve and then set aside; the deposit is collected on calico and rapidly dried between bibulous paper or on porous tiles.

Description.—In light, friable, flattish fragments, pale green when fresh, afterwards gray or light buff colored, with minute crystals on the surface; fracture granular; odor slight tea-like; taste acrid and very bitter. It does not effervesce with acid, and the decoction with water, after cooling, is not colored blue on the addition of a drop of compound solution of iodine. When 1 gram (16 grains) is exhausted with chloroform, and ether is added to the solution, a crys-

talline deposit of elaterin is obtained weighing not less than 25 centigrams (4 grains).

Constituents.—Elaterin 27 to 33 per cent., chlorophyll, ash 8 to 10 per cent., perhaps also prophetin (soluble in ether, brown-red with sulphuric acid, bitter), ecballin (soft, yellow, acrid, and bitter), hydro-elaterin (soluble in water), and elaterid (bitter, insoluble in ether and water). Elaterin, $C_{20}H_{38}O_5$, is crystalline, readily soluble in chloroform and hot alcohol, insoluble in ether and petroleum benzin, very bitter in alcoholic solution, and is not colored by chlorinated alkalis and but slightly colored by cold sulphuric acid.

Adulterations.—Starch and calcium carbonate or other mineral substances are used for this purpose.

Properties.—Hydragogue cathartic. *Dose*, 0.008 to 0.016 gram (gr. $\frac{1}{8}$ – $\frac{1}{4}$); elaterin, 0.004 to 0.005 gram (gr. $\frac{1}{16}$ to $\frac{1}{12}$), in pill or alcoholic solution.

MASTICHE.—MASTIC. MASTICH.

Origin.—*Pistacia Lentiscus*, *Lin.* *Natural order*, Terebinthaceæ, Anacardiaceæ.

Habitat.—Mediterranean basin.

Production.—Mastic exudes from vertical incisions into the bark of the staminate trees, and is collected in the island of Scio.

Description.—Globular or elongated tears, of the size of a pea, usually covered with a whitish dust, pale yellow, transparent, of a glass-like lustre, brittle, becoming plastic when masticated; odor weak, bal-

samic; taste slight terebinthinous; soluble in ether and volatile oils.

Bombay mastic from *Pistacia cabulica* and *P. Khinjuk*, *Stocks*, closely resembles Scio mastic, but is usually less clean and more opaque.

Constituents.—Volatile oil a trace, alpha resin or mastichic acid, $C_{20}H_{32}O_2$, 90 per cent. (soluble in alcohol), masticin (insoluble in alcohol).

Adulterations.—Sandarac, see below.

Properties.—Mild stimulant, mostly used as a masticatory, for filling decayed teeth, for cements and varnishes.

SANDARACA.—SANDARAC.

Origin.—*Callitris quadrivalvis*, *Ventenat.* *Natural order*, Coniferæ.

Habitat.—Northwestern Africa.

Production.—Sandarac exudes spontaneously or from incisions made through the bark.

Description.—Elongated, pale yellow tears, 6 to 15 millimeters ($\frac{1}{4}$ – $\frac{3}{8}$ inch) long, covered with a whitish dust, of a glass-like lustre, transparent, brittle, becoming pulverulent when masticated; odor and taste somewhat terebinthinous balsamic and faintly bitter; soluble in hot alcohol.

Constituents.—Three resins, differing in solubility; bitter principle.

Properties.—Mild stimulant; used chiefly for varnishes.

COLOPHONIUM.—RESINA. ROSIN.

Origin.—*Pinus australis*, *Michaux*, and other species of *Pinus*. *Natural order*, Coniferæ.

Habitat.—United States.

Production.—The volatile oil is distilled from turpentine; the residue constitutes colophony.

Description.—Transparent amber-colored masses, having a glossy and shallow conchoidal fracture, melting at about 100° C. (212° F.); odor and taste faintly terebinthinate; soluble in alcohol, ether, volatile oils, fixed oils, and alkalies.

Varieties.—Distinguished according to color.

Constituents.—Abietic anhydrid, $C_{44}H_{62}O_4$, in the presence of dilute alcohol converted into abietic acid.

Properties.—Mild stimulant; used in plasters and ointments.

DAMMARA.—DAMMAR.

Origin.—1. *Dammara orientalis*, *Lambert*; 2. *Dammara australis*, *Don*. *Natural order*, Coniferæ.

Habitat.—1. East India islands; 2. New Zealand.

Production.—Dammar exudes spontaneously; the New Zealand dammar or kauri resin is also found fossil.

Description.—Transparent straw-colored roundish masses, having a glossy conchoidal fracture, melting at about 100° C. (212° F.) to a thick liquid, harder than rosin, but softer than copal; nearly inodorous and tasteless; partly soluble in alcohol and ether.

Kauri resin softens somewhat between the teeth, and is often in large masses.

Constituents.—Several resins differing in solubility; dammaryl, $C_{20}H_{32}$, insoluble in boiling alcohol, soluble in cold ether. By distillation in a current of steam, a terpene, $C_{10}H_{16}$, of the boiling point 158° C. (316° F.) is obtained.

Uses.—Mostly for varnishes, and rarely in plasters.

COPAL.—COPAL.

Origin.—Fossil in Zanzibar and probably in Western tropical Africa; also the exudations of different species of *Trachylobium*, *Hymenæa*, and *Guibourtia*.
Natural order, Leguminosæ, Cæsalpinæ.

Habitat.—Africa, South America, West Indies.

Description.—Irregular spherical or flattish and angular, the surface often finely verrucose (goose skin), varying between pale yellowish, reddish, and brownish, nearly as hard as amber, transparent or translucent, fracture conchoidal, glossy; inodorous and tasteless; melts with difficulty, acquiring a darker color; after fusion more readily soluble in alcohol and oil of turpentine.

Constituents.—Several resins, differing in solubility.

Uses.—For the preparation of varnishes.

SUCCINUM.—AMBER.

Origin.—Fossil, from *Pinitis succinifer*; *Gæppert*, an extinct coniferous tree of the southern coast of the Baltic.

Description.—Roundish or flattish pieces, the surface usually rough and dull, hard and brittle; fracture conchoidal, glossy, transparent or translucent, pale yellowish to brown-red; inodorous and tasteless; melts at 287.5° C. (550° F.), giving off succinic acid and aromatic vapors; soluble in chloroform, nearly insoluble in alcohol, ether, and oils.

Constituents.—Succinic acid, $C_4H_6O_4$, and several resins.

Uses.—For fumigations, and for the preparation of succinic acid and (empyreumatic) oil of amber, also used in the arts.

LACCA.—LAC.

Origin.—1. *Aleurites laccifera*, Willd.; 2. *Ficus indica*, Roxb., and other trees. *Natural order*, 1. Euphorbiaceæ; 2. Urticaceæ, Artocarpeæ.

Habitat.—East Indies.

Production.—By the puncture of the impregnated female *Coccus Lacca*, Kerr, order Hemiptera.

Description.—Stick lac. Thin branches, covered with a brown-red resin, containing a blackish-red powder; softens between the teeth and colors the saliva red; taste bitterish, slightly astringent; on being heated, of an aromatic odor.

Seed lac. Irregular, somewhat glossy fragments, detached from the twigs.

Lump lac. Made by boiling with water and melting. Brown translucent cakes, deprived of the purplish-red coloring matter.

Shellac. Thin, glossy, more or less transparent

fragments, varying from amber-colored to dark brown; brittle, tasteless; soluble in the fixed alkalies and in borax solution; almost wholly soluble in cold alcohol, ether, and volatile oils.

Constituents.—Coloring matter (lac dye), five resins, waxy matter.

Uses.—For the preparation of varnish and sealing-wax.

GUAIACI RESINA.—GUAIAC RESIN.

Origin.—Guaiacum officinale, *Lin.* *Natural order*, Zygophyllaceæ.

Habitat.—West India Islands and Northern South America.

Production.—Guaiac resin exudes from incisions through the bark, but is mostly obtained by melting the resin of the heartwood with fire.

Description. — Irregular masses or subglobular pieces, greenish-brown or reddish-brown, internally of a glossy lustre, transparent in thin splinters, fusible, feebly aromatic, somewhat acrid; powder grayish, turning green on exposure; soluble in solution of potassa and in alcohol; the alcoholic solution colored blue on the addition of tincture of chloride of iron.

Constituents. — Guaiacic acid and guaiac yellow (both crystalline, dissolved by milk of lime), guaia-retic acid, $C_{20}H_{26}O_4$, about 10 per cent. (crystalline, not colored blue by nitric acid), guaiaconic acid, $C_{10}H_{20}O_5$, about 70 per cent. (amorphous, colored blue by oxidizing agents), betaresin about 10 per cent. (insoluble in ether), little gum and ash. By dry dis-

obtainable by distillation. In place of the latter, cinnamic acid appears to be sometimes present, or both acids may be wanting.

Properties.—Mild stimulant and astringent; used for plasters, tooth-powders, and varnishes.

BENZOINUM.—BENZOIN.

Origin.—*Styrax Benzoin*, *Dryander*. *Natural order*, *Styracæ*.

Habitat.—Sumatra, Java, probably also Siam.

Production.—Benzoin exudes from incisions made into the bark of the tree.

Description.—In lumps consisting of agglutinated yellowish-brown tears, which are internally milk-white, or of a brown mass more or less mottled from whitish tears imbedded in it. It has a somewhat aromatic and acrid taste and an agreeable balsamic odor, gives off when heated fumes of benzoic acid, and is soluble in alcohol and in solution of potassa; the alcoholic solution is colored dark brown with ferric chloride.

Varieties.—Sumatra benzoin. Mass brown-gray, melting at 95° C. (203° F.), containing white tears melting at 85° C. (185° F.); odor rather weak, and in Penang benzoin somewhat like storax. Inferior kinds contain few or no tears, and sometimes a large percentage of chips.

Siam benzoin. Mass red-brown, translucent, with a variable proportion of large or small tears; softened and plastic on mastication, melting at 75° C. (167° F.); odor agreeable, vanilla-like; taste slight.

Constituents.—Benzoic acid, $C_7H_6O_2$, 12 to 20 or 24 per cent. (usually fragrant from adhering volatile oil, sublimable, sparingly soluble in cold water), vanillin (in Siam benzoin), cinnamic acid, $C_9H_8O_2$ (variable quantity in Siam and Penang benzoin), several resins, yielding with melted potassa paraoxybenzoic acid, $C_7H_6O_3$, protocatechuic acid, $C_7H_6O_4$, and pyrocatechin, $C_6H_6O_2$. Cinnamic acid is detected by boiling benzoin with milk of lime, filtering while warm, and adding potassium permanganate, when the odor of oil of bitter almond will become apparent.

Properties.—Stimulant, expectorant. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in powder or tincture. Externally as a protective; also in tooth-powders, lotions, and fumigations.

XANTHORRHÆÆ RESINA.—ACAROID RESIN.

Botany Bay resin.

Origin.—Xanthorrhœa hastilis, *R. Brown*. *Natural order*, Liliaceæ.

Habitat.—Australia.

Production.—The spontaneous exudation on the leaves and in the stem is separated by crushing and sifting.

Description. — Brownish-yellow, brittle masses, opaque, internally light yellow, resembling gamboge, fusible; odor agreeable balsamic; taste balsamic, somewhat acrid; nearly insoluble in water; soluble in alcohol, and this solution is turned brown-black by ferric chloride.

Red acaroid resin from Xanthorrhœa australis, *R.*

Br., resembles dragon's blood, is deep brown-red, internally bright red, in thin splinters ruby-red and transparent; fracture glass-like; odor balsamic.

Constituents.—Benzoic acid, cinnamic acid, resins. With melting potassa pyrocatechin, paraoxybenzoic, and protocatechuic acids are obtained.

Properties.—Mild stimulant, tonic. *Dose*, 0.5 to 1.0 or 2.0 grams (gr. viij–xv–xxx), in powder, mixture, or tincture.

6. BALSAMS AND OLEORESINS.— BALSAMA ET OLEORESINÆ.

The term balsam is often used to designate unctuous or liquid preparations, chiefly intended for external use, and to which valuable curative powers are attributed. It is also employed for those liquid or soft exudations of plants, which are wholly or chiefly composed of resins and volatile oils, and are properly designated as oleoresins. The British and United States Pharmacopœias restrict the use of the word balsam to those liquid or soft products, which contain resin, an odorous principle, and benzoic or cinnamic acid. Some authors recognize as solid balsams those resins which contain benzoic or cinnamic acid.

Classification.

Sect. 1. Containing benzoic or cinnamic acid : Balsams.

Liquid, black-brown, aromatic, slightly soluble in oil of turpentine.

Balsamum
peruvianum.

Semiliquid or soft, in the cold brittle mass ; aromatic, in thin layers transparent.	Balsamum tolutanum.
Thick liquid, brownish-yellow, transparent, aromatic, drying to a yellowish-brown resin.	Liquidambar.
Thick liquid, brown-gray, opaque ; after the evaporation of the water, dark-brown, transparent.	Styrax liquidus.
<i>Sect. 2.</i> Free from benzoic or cinnamic acid : Oleo-resins.	
Thin or viscid liquid, light yellow or brownish, transparent, odor peculiar.	Copaiba.
Viscid liquid, opaque and grayish in reflected light, transparent and brown in transmitted light ; odor like copaiba.	Gurjun.
Thick liquid, transparent, pale yellow ; odor pleasantly terebinthinate.	Terebinthina Canadensis.
Thick liquid, slightly turbid, pale yellow, somewhat fluorescent ; odor terebinthinate.	Terebinthina Veneta.
Viscid, yellowish opaque liquid, becoming granular ; or	} Terebinthina.
Yellowish-white opaque mass ; fracture crummy ; odor terebinthinate.	
Yellowish-brown, opaque, brittle in the cold ; fracture conchoidal, translucent.	Pix burgundica.
Dark red-brown, opaque, translucent on the edge, brittle in the cold.	Pix canadensis.
Yellowish mass, internally white, granular, opaque.	Elemi.
Thick liquid, black-brown, becoming granular ; odor empyreumatic, terebinthinate ; soluble in oil of turpentine.	Pix liquida.

BALSAMUM PERUVIANUM.—BALSAM OF PERU.

Origin.—Myroxylon (*Myrospermum*, *Royle*; *Tolui-fera*, *Baillon*) *Pereiræ*, *Klotzsch*. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Central America.

Production.—The bark is loosened by beating, and charred; the exudation is collected on rags, and these are placed in hot water and expressed.

Description.—A rather thick brownish-black liquid, in thin layers red-brown and transparent, of a syrupy consistence; specific gravity about 1.15; odor agreeably balsamic and somewhat smoky; taste warm bitterish, afterwards acrid. It has an acid reaction to test paper, is completely soluble in five parts of alcohol, and does not diminish in volume when agitated with an equal volume of cold petroleum benzin or water.

Constituents.—Cinnamein or benzylic cinnamate, $C_9H_7(C_7H_7)O_2$, about 60 per cent. (colorless aromatic oil), resin about 32 per cent. (insoluble in carbon bisulphide; on dry distillation yields benzoic acid, styrol, C_8H_8 , and toluol, C_7H_8), benzalcohol, C_7H_8O , benzylic benzoate, $C_7H_5(C_7H_7)O_2$, stilbene, $C_{14}H_{12}$, cinnamic and benzoic acid.

Adulterations.—Fixed oils (soluble in petroleum benzin; on trituration with sulphuric acid and washing with water, leave a sticky mass), resins, oleoresins, alcohol.

Properties. — Stimulant, expectorant, vulnerary. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in emulsion, syrup, or alcoholic solution; externally in ointment.

BALSAMUM TOLUTANUM.—BALSAM OF TOLU.

Origin.—Myroxylon (*Myrospermum*, *Richard*) *Toluifera*, *Kunth*, s. *Toluifera Balsamum*, *Miller*. *Natural order*, Leguminosæ, Papilionaceæ.

Habitat.—Venezuela and New Granada.

Production.—The balsam exudes from V-shaped incisions and is received in calabash cups.

Description.—Semifluid or nearly solid, brittle in the cold, yellowish or brownish-yellow and transparent in thin layers; odor agreeably balsamic; taste aromatic, slightly acrid. It is completely soluble in alcohol, the solution being of an acid reaction to test paper, and is almost insoluble in water, petroleum benzin, and carbon bisulphide.

Constituents.—Resins (not investigated; the principal constituents), benzylic benzoate, $C_7H_5(C_7H_7)O_2$ (colorless aromatic oil), benzylic cinnamate, toluene, $C_{10}O_{16}$, 1 per cent. (colorless, thin, aromatic oil), cinnamic and benzoic acid.

Adulterations.—Turpentine (soluble in carbon bisulphide), sweet gum (yields to warm petroleum benzin styracin, which crystallizes on cooling).

Properties. — Stimulant, expectorant, vulnerary.

Dose, 0.5 to 2.0 grams (gr. viij-xxx), in emulsion or tincture, mostly used as an agreeable flavor.

LIQUIDAMBAR.—SWEET GUM.

Origin.—Liquidambar styraciflua, *Lin.* *Natural order*, Hamamelaceæ, Balsamifluæ.

Habitat.—United States, Mexico, and Central America.

Production.—The balsam exudes spontaneously under a subtropical climate.

Description.—Thick brownish-yellow clear liquid, or a transparent yellowish-brown resin, breaking in the cold with a resinous fracture, showing whitish streaks; softened by the warmth of the hand; odor pleasantly balsamic, storax-like; taste aromatic and pungent; soluble (except the impurities) in alcohol, ether, and chloroform.

Constituents.—Aromatic hydrocarbon $3\frac{1}{2}$ per cent. (styrol?), cinnamic acid $5\frac{1}{2}$ per cent., styracin, and brown tasteless resin.

Properties.—Stimulant, expectorant, diuretic. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in emulsion, also externally in ointment or cerate; mostly used as an agreeable flavor.

STYRAX.—STORAX.

Origin.—Liquidambar orientalis, *Miller*. *Natural order*, Hamamelaceæ, Balsamifluæ.

Habitat.—Asia Minor.

Production.—The inner bark is steeped in hot water, and the melted balsam is skimmed off and expressed from the bark.

Description.—Semiliquid, gray, opaque, separating on standing a heavier dark-brown, in thin layers transparent stratum; odor agreeably balsamic; taste balsamic and acrid; soluble (the impurities excepted) in alcohol, ether, chloroform, and carbon bisulphide; warm petroleum benzin, agitated with storax, remains colorless, and, on cooling, deposits white crystals.

Constituents.—Styrol or cinnamene, C_8H_8 (colorless fragrant liquid, at $200^\circ C.$ converted into solid meta-cinnamene), cinnamic acid, $C_9H_8O_2$, styracin or cinnamyl cinnamate, $C_9H_7(C_9H_9)O_2$ (crystallizing from hot benzin), phenylpropyl cinnamate, $C_9H_7(C_9H_{17})O_2$ (inodorous thick liquid), ethyl cinnamate, $C_9H_7(C_2H_5)O_2$, a small quantity, probably ethyl vanillin in minute quantity, storesin, $C_{36}H_{58}O_3$, in considerable quantity, and the cinnamic ether of this alcohol; also a resinous compound.

Properties.—Stimulant, expectorant, diuretic. *Dose*, 0.5 to 2.0 grams (gr. viij-xxx), in emulsion or tincture; mostly externally in liniment or ointment.

COPAIBA.—COPAIVA.

Origin.—1. *Copaifera Langsdorffii*, Desf. 2. *Cop. officinalis*, Lin., and other species of *Copaifera*. *Natural order*, Leguminosæ, Cæsalpineæ.

Habitat.—1. Brazil. 2. Venezuela and New Granada.

Production.—The oleoresin flows from bore-holes or boxes cut through the bark into the heart-wood of the tree.

Description.—A more or less viscid liquid, pale yellow or brown-yellow, transparent or slightly turbid, lighter than water (spec. grav. .94-.99); odor peculiar; taste bitter and acrid; soluble in absolute alcohol, benzol, carbon bisulphide, and petroleum benzin.

Varieties.—Para copaiva; pale colored and limpid; usually contains 70 to 85 per cent. of volatile oil.

Maranham and Rio Janeiro copaiva; of the consistence of olive oil; contains 50 to 60, but sometimes 80 per cent. of volatile oil; yields, like Para copaiva, a clear mixture with one-third or one-half ammonia.

Maracaibo copaiba; viscid, dark yellow or brownish, slightly turbid; contains 20 to 40 per cent. of volatile oil; solidifies with magnesia.

Constituents.—Volatile oil, $C_{13}H_{24}$, bitter principle (soluble in water), and resins, bitterish and mostly amorphous; copaivic acid, $C_{20}H_{30}O_2$, oxycopaivic acid, $C_{20}H_{28}O_3$ (from Para copaiva), and metacopaivic acid, $C_{22}H_{34}O_4$ (from Maracaibo copaiva), are crystalline.

Adulterations.—Turpentine (recognized by odor on warming); fixed oils (mostly insoluble in alcohol; on evaporation a soft and sticky residue is left); Gurjun balsam (is fluorescent, see below, becomes gelatinous).

Properties.—Stimulant, expectorant, diuretic, laxative, nauseant. *Dose*, 0.5 to 2.0 or 4.0 grams (gr. viij-3ss-j), in emulsion; the resin 0.3 to 0.6 gram (gr. v-x).

GURJUN.—GURJUN BALSAM. WOOD OIL.

Origin.—*Dipterocarpus turbinatus*, Gaertner, and other species of *Dipterocarpus*. *Natural order*, Dipterocarpaceæ.

Habitat.—India and East Indian Islands.

Production.—The oleoresin exudes from excavations cut into the wood and charred by fire.

Description.—Thick viscid liquid, opaque and grayish or brownish in reflected light, transparent and brown in transmitted light; odor resembling

that of copaiba; taste bitter; soluble in chloroform and carbon disulphide, partially soluble in alcohol, ether, and petroleum benzin; above 130°C . (266°F .) it becomes permanently gelatinous or solid.

Constituents.—Volatile oil, $\text{C}_{15}\text{H}_{24}$, 40 to 70 per cent. (dissolved in carbon bisulphide, and agitated with a drop of mixed sulphuric and nitric acids, red or violet color is produced), gurgunic acid, $\text{C}_{44}\text{H}_{68}\text{O}_8$ (a small quantity; crystalline), resin (insoluble in potassa solution).

Properties and Uses.—Similar to Copaiva.

TEREBINTHINA CANADENSIS.—CANADA TURPENTINE.

Balsam of fir.

Origin.—*Abies balsamea*, *Marshall*. *Natural order*, Coniferae.

Habitat.—Canada and Northern United States.

Production.—The oleoresin is secreted in vesicles in the bark, and collected by puncturing them.

Description.—A yellowish or faintly greenish transparent viscid liquid, of an agreeable terebinthinate odor, and a bitterish, slightly acrid taste, on exposure drying slowly into a transparent mass; completely soluble in ether, chloroform, and benzol; partly soluble in alcohol.

Constituents.—Volatile oil, $\text{C}_{10}\text{H}_{16}$, 25 to 30 per cent., uncrystallizable resin, bitter principle soluble in water.

*Allied Turpentine*s.—Oregon Balsam of Fir, from *Abies Menziesii*, *Lindley*, resembles the preceding in

physical properties when fresh; but becomes gradually granular and opaque.

Strassburg Turpentine, *Terebinthina argentoratensis*, from *Abies pectinata*, *DeCandolle*; like Canada turpentine, but completely soluble in absolute alcohol; odor slightly lemon-like; taste not acrid.

Venice Turpentine, *Terebinthina veneta*, from *Larix europæa*, *DeC.*, procured from the heart-wood by bore-holes; yellowish, greenish-yellow, or brownish, nearly transparent; odor terebinthinate balsamic; taste bitter and acrid; completely soluble in 90 per cent. alcohol; does not become crystalline on drying.

Adulterations.—Solutions of rosin in oil of turpentine, flavored with another volatile oil, are sometimes sold.

Properties.—Stimulant, diaphoretic, diuretic; mostly used externally.

TEREBINTHINA.—TURPENTINE.

Terebinthina communis, s. *vulgaris*.

Origin.—*Pinus australis*, *Mich.* (*P. palustris*, *Miller*), and *P. Tæda*, *Lin.* *Natural order*, *Coniferæ*.

Habitat.—Southern United States.

Production.—Turpentine exudes spontaneously, but is mostly collected in boxes cut into the alburnum.

Description.—Rarely seen in commerce as a yellowish, viscid, more or less opaque liquid. Usually as yellowish, opaque, tough masses, brittle in the cold, softened by the heat of the hand, crummy-crystalline in the interior, of a peculiar odor, and bitter and acrid taste; known as white turpentine; also as *Thus*

americanum or common frankincense, and corresponds to the *galipot* of French commerce.

European Turpentine is obtained from *Pinus Pinaster*, *Solander*, *P. Laricio*, *Poiret*, *P. sylvestris*, *Lin.*, and other allied species.

Constituents.—Volatile oil 20 to 30 per cent., abietic anhydrid, crystallizing as abietic acid, $C_{41}H_{64}O_5$; bitter principle soluble in water, small quantities of formic and succinic acid; perhaps also other resin acids (pinic and sylvic acid). Oil of turpentine, $C_{10}H_{16}$, is colorless, dextrogyre, or (the French oil) levogyre; spec. grav. 0.86; boiling point 150° – 160° C. (300° – 320° F.); readily soluble in strong alcohol; forms with HCl a crystalline compound, $C_{10}H_{16}HCl$ (artificial camphor).

Properties.—Stimulant, diuretic, diaphoretic, astringent. *Dose*, 1.0 to 4.0 grams (gr. xv–3j), in pills (hardened with magnesia); externally in ointments and plasters. Oil of turpentine, 0.3 to 1.0 or 2.0 grams (gr. v–xv–xxx), in emulsion; externally in liniments.

PIX BURGUNDICA.—BURGUNDY PITCH.

Origin.—*Abies excelsa*, *DeC.*, s. *Pinus Abies*, *Lin.*
Natural order, Coniferæ.

Habitat.—Europe, in the southern part, in mountainous districts.

Production.—The oleoresin exudes spontaneously and from incisions, is melted in hot water, and strained.

Description.—Yellowish-brown or reddish-brown,

opaque or translucent, not crystalline; hard, yet gradually taking the form of the vessel in which it is kept; brittle when cold; fracture shining, conchoidal; aromatic, not bitter; soluble in glacial acetic acid and strong alcohol.

Allicd Products.—Resina pini; white turpentine fused in hot water and strained; resembles the preceding, but gradually becomes crystalline.

Terebinthina cocta; the residue from the distillation of turpentine with water, strained.

Constituents.—Volatile oil, $C_{10}H_{16}$, in variable proportion, water, and resin.

Substitution.—A mixture of rosin, palm oil or other fat, and water; incompletely soluble in warm glacial acetic acid.

Properties.—Stimulant, irritant; used in plasters.

PIX CANADENSIS.—CANADA PITCH. HEMLOCK PITCH.

Origin.—Abies (Pinus, Lin.) canadensis, Mich.
Natural order, Coniferæ.

Habitat.—Canada and Northern United States.

Production.—The oleoresin exudes chiefly from incisions; the wood and bark, rich in oleoresin, are heated in water, the melted oleoresin is skimmed off, remelted, and strained.

Description.—Dark reddish-brown, opaque or translucent, not crystalline; hard, yet gradually taking the form of the vessel in which it is kept; brittle when cold; fracture shining, conchoidal; odor weak, terebinthinate, balsamic.

Adulteration.—Rosin.

Constituents.—Little volatile oil, water, and resins.

Properties.—Stimulant, irritant; used in plasters.

ELEMI.—ELEMI.

Origin.—Probably from *Canarium commune*, *Lin.*
Natural order, Terebinthaceæ, Burseraceæ.

Habitat.—Philippine Islands.

Production.—The oleoresin exudes from incisions.

Description.—Soft, yellowish, granular, more or less crystalline; when old friable; odor strong, resembling fennel and lemon, somewhat terebinthinate; taste bitter, disagreeable, and pungent.

Constituents.—Volatile oil, $C_{10}H_{16}$, 10 per cent., brein 60 per cent. (amorphous resin readily soluble in cold alcohol), amyrin 25 per cent. (resin crystallizing from hot, strong alcohol), bryoidin (easily soluble in alcohol, bitter and acrid, crystallizes from hot water), breidin (crystalline, less soluble in water and ether), elemic acid, $C_{35}H_{56}O_4$ (crystalline).

Varieties.—Manila elemi, described above.

Brazilian elemi, from *Icica Icicariba*, *DeC.*, and allied species; yellowish-white or greenish-white, fragrant.

Mauritius elemi, from *Colophonia mauritiana*, *DeC.*, resembles Manila elemi.

Mexican elemi, probably from *Amyris elemifera*, *Royle*; yellow or greenish, more or less translucent, of waxy lustre.

Properties.—Stimulant, irritant; used in plasters and ointment.

PIX LIQUIDA.—TAR.

Origin.—The wood of different species of *Pinus*.
Natural order, Coniferæ.

Production.—The wood is subjected to destructive distillation, either in retorts or packed in stacks covered with earth.

Description.—Thick viscid semifluid, heavier than water, blackish-brown, transparent in thin layers, becoming granular and opaque by age; odor empyreumatic, terebinthinate; taste sharp, empyreumatic, and bitterish; of an acid reaction; soluble in alcohol, volatile oils, and potassa solution; slightly soluble in water.

Constituents.—Acetic acid, acetone, methylic alcohol, mesityl, toluol, xylol, cumol, methol; these pass over with the light oil of tar. Naphthalin, pyrene, chrysene, retene, paraffin, phenols, creasote, pyrocatechin, empyreumatic resin. The composition of commercial tar is variable.

Pyrocatechin, $C_6H_6O_2$, is crystalline, sublimable, readily soluble in water, alcohol, and ether, has a sharp persistent taste, and in aqueous solution becomes dark green with ferric chloride, changing to violet with ammonia.

Allied Products.—Juniper tar, Oil of Cade, from the wood of *Juniperus Oxycedrus*, *Lin.*; it is more liquid, and of a somewhat different odor.

Birch tar, Dagget, from the wood of *Betula alba*, *Lin.*, has the peculiar odor of Russian leather, and contains much pyrocatechin.

Properties.—Stimulant, irritant, insecticide. *Dose*,

0.3 to 1.5 gram (gr. v-xxij), in pills, mixtures, and aqueous or vinous infusions; externally in ointment, plaster, and as fumigation.

7. VOLATILE OILS AND CAMPHORS.— OLEA VOLATILIA ET CAMPHORÆ.

Volatile oils are odorous volatile liquids which produce upon paper a greasy stain, disappearing on the application of heat. They are readily soluble in absolute alcohol, ether, chloroform, petroleum benzin, benzol, carbon bisulphide, and fixed oils, and many of them dissolve also freely in 80 per cent. alcohol. All are but slightly soluble in water. They exist ready-formed in plants, but in some cases (volatile oils of mustard, almond, etc.) are the results of chemical action in the presence of water. They are mostly obtained by distillation with water, occasionally by expression of the parts containing them, like the volatile oils of lemon, orange peel, etc.

Volatile oils are usually mixtures of two or more compounds, differing in volatility and odor, the portion volatilizing first being sometimes designated as *elæopten*, and the portion volatilizing last as *stearopten* or *camphor*. The latter usually contains oxygen, the former mostly consists of carbon and hydrogen; a few volatile oils (of mustard, garlic, asafetida) contain sulphur, and in the volatile oils of amygdalæ (almond, etc.) nitrogen is found combined to hydrocyanic acid. The compounds existing in volatile oils are mostly imperfectly known; but besides the hydrocarbons,

some of these have been proved to belong to the classes of alcohols, aldehyds, ethers, and compound ethers. The yellow, blue, and brown color of volatile oils is due to distinct compounds.

On exposure to the air, more particularly in the presence of light and moisture, volatile oils become darker and thicker or even solid from resinification; the addition of a little alcohol will usually retard or prevent these changes.

As a class, the volatile oils consisting of hydrocarbons are lightest in color and in specific gravity (the latter generally ranging between 0.85 and 0.91), are less prone to resinification, and are not freely soluble in 85 per cent. alcohol. The oxygenated volatile oils have usually a density from 0.90 to 0.99, and several of them are heavier than water, some being 1.10. They are mostly more freely soluble in 80 per cent. alcohol, are usually more or less colored, and the color is deepened on exposure.

Adulterations.—Chloroform (adapted only for the heavy volatile oils) is readily detected on fractional distillation at a temperature of about 70° C. (158° F.).

Alcohol will dissolve or soften fragments of fused calcium chloride or dry potassium acetate. Agitation with water will cause a diminution of volume.

Fixed oils will leave a permanent greasy stain on paper; on agitation with 80 per cent. alcohol, the volatile oil will be dissolved and the fixed oil left behind.

Cheap volatile oils are recognized by their odor on the slow evaporation from bibulous paper or from the hands. The behavior to alcohol and to various chemical reagents is sometimes of value.

CAMPHORA.—CAMPHOR.

Origin.—Cinnamomum (Laurus, *Lin.*) Camphora, *F. Nees et Ebermaier*, s. Camphora officinarum, *C. G. Nees*. *Natural order*, Lauraceæ.

Habitat.—China and Japan.

Production.—The branches and wood are exposed to the vapors of boiling water, the volatilized camphor is condensed, drained and pressed from the adhering volatile oil (oil of camphor), and subsequently refined by sublimation in vessels of glass or iron.

Description.—Crude camphor is in whitish granular masses, that from Japan having often a reddish tint, while Formosa camphor is grayish or blackish and more impure. Refined camphor is in translucent masses of a tough consistence and crystalline texture, readily pulverizable in the presence of a little alcohol or ether, has the spec. grav. 0.99, melts at 175° C. (347° F.), boils at 205° C. (401° F.), sublimes and burns without leaving any residue; odor penetrating, peculiar; taste pungent; readily soluble in alcohol and ether; sparingly soluble in water.

Composition.— $C_{10}H_{16}O$. Heated with zinc chloride it yields cymol, $C_{10}H_{14}$, and with nitric acid, camphoric acid, $C_{10}H_{16}O_4$, and camphoronic acid, $C_9H_{12}O_5$.

Allied Camphor.—Borneo, Sumatra, or Barus camphor, from Dryobalanops Camphora, *Colebrook*, *Natural order*, Dipterocarpaceæ, has a somewhat different odor, is slightly heavier than water, less readily volatile, and with nitric acid yields ordinary camphor.

Properties.—Stimulant, antispasmodic, sedative, rubefacient, resolvent. *Dose*, 0.06 to 0.5 or 1.0 gram

(gr. j-viiij-xv), in pills or emulsion; externally in liniments and ointments.

OLEUM CAMPHORÆ.—OIL OF CAMPHOR.

Origin and Production.—See Camphora.

Description.—Deep yellow or yellowish-brown; spec. grav. 0.94; boiling point about 180° C. (356° F.); odor and taste strongly camphoraceous; completely soluble in alcohol.

Composition.—Hydrocarbon, $C_{10}H_{16}$, and camphor, which crystallizes in the cold.

Properties.—Like camphor, mostly used in liniments.

OLEUM CAJUPUTI.—OIL OF CAJEPUT.

Origin.—Melaleuca Cajuputi, *Roxburgh*, s. M. minor, *Smith*, s. M. Leucadendron, var. *Bentham*. *Natural order*, Myrtaceæ.

Habitat.—East Indian Islands.

Production.—The leaves are distilled with water.

Description.—Green or, after rectification, colorless or yellowish, neutral, very mobile; spec. grav. about 0.92; odor aromatic; taste warm, camphoraceous, cooling; not congealing at -25° C. (-13° F.).

Constituents.—Chiefly cajuputol, $C_{10}H_{18}O$. The crude (green) oil often contains a trace of copper, which yields a red-brown color or precipitate on agitating the oil with warm dilute hydrochloric acid and adding potassium ferrocyanide to the watery liquid.

Properties.—Carminative, stimulant, diaphoretic, rubefacient, counter-irritant. *Dose*, 0.1 to 0.5 or 1.0 gram (gr. jss-viiij-xv), in mixtures; externally in liniments.

OLEUM ROSÆ.—OIL OF ROSE. ATTAR OF ROSE.

Origin.—*Rosa damascena*, *Miller*. *Natural order*, Rosaceæ, Roseæ.

Habitat.—Cultivated in Rumelia.

Production.—The flowers are distilled with water, cohobation being resorted to.

Description.—Pale yellow liquid, spec. grav. 0.86, of an agreeable rose odor when diluted, and a sweetish taste; separating at or below 15° C. (59° F.) transparent scaly crystals, which remain suspended in the liquid.

Constituents.—Elæopten containing oxygen, very fragrant, readily soluble in alcohol; stearopten, probably $C_{16}H_{32}$ or $C_{16}H_{34}$, inodorous, iridescent crystals, requiring about 100 parts of alcohol for solution.

Adulterations.—Spermaceti and paraffin crystallize in a rather opaque crust. An addition of oil of gingergrass or roshé oil from *Andropogon Schœnanthus*, *Lin.*, lowers the congealing point of attar of rose.

Uses.—For perfuming ointments and mixtures.

OLEUM SUCCINI.—OIL OF AMBER.

Production.—Amber is subjected to destructive distillation.

Description.—Thick brown liquid, of about spec. grav. .99. After rectification, pale yellow, spec. grav. .91–.95; odor empyreumatic, balsamic; taste warm and acrid; soluble in 4 parts of strong alcohol; with nitric acid it acquires a red color, and after some time is almost wholly converted into a brown resinous mass.

Adulterations.—Petroleum and the empyreumatic oils of resins.

Properties.—Stimulant, antispasmodic, irritant.
Dose, 0.2 to 0.5 or 1.0 gram (gr. iij–viij–xv), in capsules or emulsion; externally in liniments.

Syllabus of the Official Volatile Oils.

Magnoliaceæ.

Oleum Anisi (stellati), from the fruit of *Illicium anisatum*, Lour. Pale yellow, congeals at about 2° C. (35.6° F.), spec. grav. .98, sweet; consists of $C_{10}H_{16}$ and anethol, $C_{10}H_{12}O$.

Cruciferae.

Oleum Sinapis, from the seeds of *Brassica nigra*, Koch. Yellow, neutral, spec. grav. 1.018, pungent and acrid, soluble in 6 parts of sulphuric acid without change of color; chiefly C_4H_5NS .

Rutaceæ.

Oleum Rutæ, from the herb of *Ruta graveolens*, Lin. Greenish-yellow, neutral, spec. grav. .88, bitterish; congeals below 0° C. (32° F.), solution in sulphuric acid brown-red; chiefly methyl-nonyl-ketone, $CH_3.CO.C_9H_{19}$.

Aurantiacæ.

Oleum Limonis, from the rind of *Citrus Limonum*, Risso. Yellowish, neutral, spec. grav. .85, bitterish; chiefly $C_{10}H_{16}$.
 Oleum Bergamii, from the rind of *Citrus Bergamia*, var. vul-

garis, *Risso*. Greenish, faintly acid, spec. grav. .87, bitterish; consists of $C_{10}H_{16}$ and hydrates.

Oleum Aurantii amari, from the rind of *Citrus vulgaris*, *Risso*. Yellowish, neutral, bitterish, spec. grav. about .86; chiefly $C_{10}H_{16}$.

Oleum Aurantii dulcis, from the rind of *Citrus Aurantium*, *Risso*. Yellowish, neutral, spec. grav. about .86; chiefly $C_{10}H_{16}$; readily altered.

Oleum Aurantii florum, from the flowers of *Citrus vulgaris*, *Risso*. Colorless or brownish, neutral, bitterish, spec. grav. about .88; chiefly $C_{10}H_{16}$. Yields violet fluorescence with alcohol.

Leguminosæ.

Oleum Copaibæ, from the oleoresin of *Copaifera* spec. Colorless, neutral, spec. grav. .89; consists of $C_{15}H_{24}$.

Rosacæ.

Oleum Amygdalæ amaræ, from the seeds of *Amygdalus communis*, var. *amara*, *DeC*. Yellowish, slightly bitter, spec. grav. 1.07 (1.046, if deprived of HCN); chiefly C_7H_6O with HCN. Evaporated with potassa and alcohol, the residue, dissolved in distilled water, yields a nearly transparent solution, free from brown-yellow sediment.

Oleum Rosæ (see page 419).

Myrtacæ.

Oleum Cajuputi (see page 418).

Oleum Eucalypti, from the leaves of *Eucalyptus globulus*, *Lab*. Yellowish, neutral, spicy and cooling; contains $C_{10}H_{14}$, $C_{10}H_{16}$ and $C_{10}H_{16}O$.

Oleum Caryophylli, from the flower-buds of *Eugenia caryophyllata*, *Thunb*. Yellowish-brown, slightly acid, spec. grav. 1.05; contains $C_{10}H_{16}$ and eugenol, $C_{10}H_{12}O_2$.

Oleum Pimentæ, from the fruit of *Eugenia Pimenta*, *DeC*. Colorless or pale yellow, slightly acid, spec. grav. 1.04; contains $C_{10}H_{16}$ and $C_{10}H_{12}O_2$.

Oleum Myrciæ, from the leaves of *Myrcia acris*, *DeC*. Yellowish or brownish-yellow, slightly acid, spec. grav. 1.04; contains $C_{10}H_{16}$ and $C_{10}H_{12}O_2$. The last three oils congeal with potassa.

Umbellifere.

Oleum Carui, from the fruit of *Carum Carui*, *Lin*. Colorless, neutral, spec. grav. .92; contains carvene, $C_{10}H_{16}$, and carvol, $C_{10}H_{14}O$.

Oleum Fœniculi, from the fruit of *Fœniculum vulgare*, *Gaertner*.

Colorless, neutral, sweet, spec. grav. .97; congeals near 0° C. (32° F.); contains $C_{10}H_{16}$ and anethol, $C_{10}H_{12}O$.

Oleum Anisi, from the fruit of *Pimpinella Anisum*, *Lin.* Color-

less or yellowish, neutral, sweet, spec. grav. .98; congeals near 10° C. (50° F.); contains $C_{10}H_{16}$ and anethol, $C_{10}H_{12}O$.

Oleum Anethi, from the fruit of *Anethum graveolens*, *Lin.*

Pale yellow, neutral, sweetish, spec. grav. .87; chiefly $C_{10}H_{16}$, probably also carvol.

Oleum Coriandri, from the fruit of *Coriandrum sativum*, *Lin.*

Colorless or yellowish, neutral, sweet, spec. grav. .87; chiefly $C_{10}H_{18}O$.

Valerianacæ.

Oleum Valerianæ, from the rhizome and rootlets of *Valeriana*

officinalis, *Lin.* Yellowish or brownish, somewhat viscid,

slightly acid, spec. grav. .95; contains borneene, $C_{10}H_{16}$, borneol, $C_{10}H_{18}O$, its ether, $(C_{10}H_{17})_2O$, and its valerianic ether.

Compositæ.

Oleum Anthemidis, from the flowers of *Anthemis nobilis*, *Lin.*

Pale blue, green, or yellow, slightly acid, spec. grav. .90;

contains the isobutylic and isamylic ethers of angelic and tiglinic acids.

Oleum Matricariæ, from the flowers of *Matricaria Chamomilla*,

Lin. Deep blue, rather viscid, neutral, bitter, spec. grav. .93;

contains $C_{10}H_{16}$, and probably angelic and valerianic ethers.

Oleum Erigerontis, from the herb of *Erigeron canadense*, *Lin.*

Pale yellow, neutral, spec. grav. .85; contains oxygen.

Ericacæ.

Oleum Gaultheriæ, from the leaves of *Gaultheria procumbens*,

Lin. Yellowish or reddish, slightly acid, sweetish, spec.

grav. 1.17; chiefly methyl salicylate, $CH_3.C_7H_5O_2$; yields with nitric acid colorless crystals.

Labiatæ.

Oleum Lavandulæ, from the flowers (and leaves) of *Lavandula*

vera, *DeC.* Colorless or yellowish, neutral, bitterish, spec.

grav. about .90; contains $C_{10}H_{16}$, and probably compound ethers. The oil from the flowers is most fragrant.

Oleum. *Menthæ viridis*, from the herb of *Mentha viridis*, *Lin.*

Pale yellow, neutral, spec. grav. .90; contains $C_{10}H_{16}$ and a compound, $C_{10}H_{14}O$.

Oleum *Menthæ piperitæ*, from the herb of *Mentha piperita*,

Hudson. Pale yellow or greenish, neutral, taste warm and

cooling, spec. grav. .90; contains $C_{10}H_{18}O$ and menthol, $C_{10}H_{18}O$.

Oleum Origani, from the herb of *Origanum vulgare*, *Lin.* Light yellow, neutral, bitterish, spec. grav. .88; contains oxygen.

Oleum Thymi, from the herb of *Thymus vulgaris*, *Lin.* Red-brown or yellowish, neutral, spec. grav. .88; contains cymene, $C_{10}H_{14}$, thymene, $C_{10}H_{16}$, and thymol, $C_{10}H_{11}O$.

Oleum Monardæ, from the herb of *Monarda punctata*, *Lin.* Reddish-brown or yellowish, neutral, spec. grav. .90; contains thymol.

Oleum Hedeomæ, from the herb of *Hedeoma pulegioides*, *Pers.* Pale yellow, neutral, spec. grav. .94; contains oxygen.

Oleum Rosmarini, from the leaves of *Rosmarinus officinalis*, *Lin.* Colorless, neutral, spec. grav. .90; contains $C_{10}H_{16}$, and probably $C_{10}H_{18}O$.

Myristicaceæ.

Oleum Myristicæ, from the kernel of *Myristica fragrans*, *Houtt.* Colorless, neutral, spec. grav. .93; chiefly myristicene, $C_{10}H_{16}$, also myristicol, $C_{10}H_{14}O$.

Chenopodiaceæ.

Oleum Chenopodii, from the fruit of *Chenopodium ambrosioides*, *Lin.*, var. *anthelminticum*, *Gray.* Pale yellow, neutral, bitterish, spec. grav. .92; contains oxygen.

Lauraceæ.

Oleum Camphoræ (see page 418).

Oleum Cinnamomi, from the bark of *Cinnamomum zeylanicum*, *Breyne.* Yellow or reddish, slightly acid, sweet and spicy, spec. grav. 1.04; chiefly cinnamic aldehyd, C_9H_8O , also hydrocarbons.

Oleum Cinnamomi Cassiæ, from the bark of *Cinnamomum Cassia*, *Blume.* Like the preceding; flavor less agreeable; spec. grav. about 1.06.

Oleum Sassafras, from the root of *Sassafras officinale*, *Nees.* Yellowish or brownish, neutral, spec. grav. 1.09; contains safrene, $C_{10}H_{16}$, and safrol, $C_{10}H_{10}O_2$; with nitric acid dark red and resinous.

Piperaceæ.

Oleum Cubebæ, from the fruit of *Cubeba officinalis*, *Miquel.* Colorless or faintly greenish or yellowish, neutral, spec. grav. .92; consists of $C_{15}H_{24}$.

Santalaceæ.

Oleum Santali, from the wood of *Santalum album*, *Lin.* Light

yellow, rather thick, slightly acid, spec. grav. 0.96; contains oxygen.

Coniferæ.

Oleum Terebinthinæ, from the oleoresin of different species of *Pinus*. Colorless, neutral, bitterish, spec. grav. .87; consists of $C_{10}H_{16}$.

Oleum Juniperi, from the fruit of *Juniperus communis*, *Lin.* Colorless or faintly greenish, neutral, sweetish, spec. grav. .87; consists of $C_{10}H_{16}$.

Oleum Sabinæ, from the branches (tops) of *Juniperus Sabina*, *Lin.* Colorless, neutral, bitterish, spec. grav. .91; consists of $C_{10}H_{16}$.

8. FIXED OILS AND WAXES.—OLEA PINGUIA ET CERÆ.

Fats are found in plants and animals, and are mostly colorless or white, inodorous and tasteless; but some commercial fats always contain coloring matter and volatile oil or other odorous principle; the fats of the volatile fatty acids have a distinct odor, all of them are lighter than water (spec. grav. mostly between 0.913 and 0.956), are insoluble in water and mostly also in cold alcohol; they are soluble in ether, chloroform, petroleum benzin, benzol, and carbon bisulphide. The liquid fats are transparent; the solid fats melt, by heat, to a transparent liquid. The mucilaginous and protein compounds, often present in crude fats, are removed by decantation, by filtration, or by treatment with about 2 per cent. of sulphuric acid. The color of certain fats is destroyed by heat, or by exposure to sunlight, or by treatment with potassium bichromate and sulphuric acid.

Most fats are mixtures of two or more compounds, the most important of which are stearin, $C_{18}H_{36}O_2$.

$3C_{18}H_{35}O_2$; palmitin, $C_3H_5.3C_{16}H_{31}O_2$; myristin, $C_3H_5.3C_{14}H_{27}O_2$; laurin, $C_3H_5.3C_{12}H_{23}O_2$; and olein, $C_3H_5.3C_{18}H_{33}O_2$. The drying oils which gradually harden on exposure to the air, contain linolein, the acid having the formula $C_{16}H_{29}O_4$. Fats become rancid through the generation of volatile fatty acids and perhaps of other compounds. On saponification most of the liquid and solid fats yield glycerin, $C_3H_8O_3$. Soaps made with potassa are softer than soda soaps, and the soaps of drying oils are softer than those prepared from non-drying oils.

Fats having a high fusing point, are often called waxes; but this name is more properly applied to the compounds of the fatty acids with the radicals of monatomic alcohols, such as cetyl, $C_{16}H_{33}$ (in spermaceti), ceryl, $C_{27}H_{55}$ (in Chinese wax), and myricyl, $C_{30}H_{61}$ (in beeswax).

Adullerations.—The detection is difficult. The specific gravity, the melting point, and the congealing point should be observed. Drying and non-drying oils are distinguished by the effect of nitrous acid, which causes the latter to congeal in the course of two or three hours to one or two days, through the conversion of liquid olein into solid elaidin; linolein and allied oils are not affected by this agent. The test is applied by mixing 2 parts of nitric acid, spec. grav. 1.42, 3 parts of water, and 5 parts of the oil, and adding 1 part of copper. Maumené's sulphuric acid test is applied by stirring together 50 grams of the oil and 10 cubic centimeters of sulphuric acid, and noting the rise of temperature. Heydenreich's test consists in adding to 10 or 12 drops of the oil 2 or 3 drops of sulphuric acid, noting the color, then stirring and again noting

the color. For Calvert's test, 1 volume of sulphuric acid, spec. grav. 1.53, is agitated for about five minutes with 5 volumes of the oil, after which the color is observed.

Oil of	TESTS.			
	Nitrous acid.	Mau- mené's.	Heydenreich's.	Calvert's.
Almond	whitish, solid	52° C	yellow	white.
Arachis	whitish, solid	67	yellow, green-brown	yellow.
Cod-liver	yellow, liquid	102	purple, red	purple.
Cotton seed	yellow, soft	—	reddish and brown	yellow.
Hemp	yellow, liquid	98	brown, black, solid	dark-green.
Lard	yellow, solid	43	yellow, brown	yellowish.
Linseed	brownish, liquid	103	brown-red, blackish	dark-green.
Olive	yellowish, solid	42	yellow, brownish	greenish.
Poppy	yellow, liquid	—	yellow, brown-green	grayish.
Rapeseed	brownish, soft	68	green or brownish	brown.
Ricinus	whitish, soft	47	brownish	grayish-white.
Sesame	red-brown, soft	68	brown-red, gelatinous	dirty-green.
Sunflower	yellow, soft	—	red-brown, brown	yellow.

Classification.

Sect. 1. Liquid fats.

I. Non-drying oils.

Yellowish, slightly nutty, not congealing at
—10° C.

Ol. Amygdalæ
express.

Pale yellow, deposits granules near 0° C.

Ol. Olivæ.

Pale yellow, opaque at 0° C.

Ol. bubulum.

Yellowish, solidifying near 0° C.

Ol. Adipis.

II. Drying oils.

Yellow or brownish; not solid at —15° C.

Ol. Lini.

Pale yellow, bland, congeals at —18° C.

Ol. Papaveris.

Nearly colorless, nutty; congeals at —20° C.

Ol. Juglandis.

Green, unpleasant; congeals at —15° C.

Ol. Cannabis.

III. Intermediate oils.

Yellow, odor and taste fishy.

Ol. Morrhuæ.

Brownish-yellow, acrid.

Ol. Tiglii.

Yellowish, mawkish, slightly acrid.

Ol. Ricini.

Yellow, bland, congeals below 0° C.

Ol. Gossypii.

Yellow, bland, congeals at —5° C.

Ol. Sesami.

Sect. 2. Solid fats.

I. Containing volatile oil.

Butyraceous, granular, green, spicy.

Mottled orange-brown, melting at 45° C.

Ol. Lauri.

Ol. Myristicæ
expr.

II. Odorous, but free from volatile oil.

Yellowish-white, chocolate odor, melting at
30° C.

Orange-red, violet odor, melting at 27° C.

Brownish-white, acrid, melting at 42° C.

White, disagreeable odor, melting at 23° C.

Yellow, sweet, melting at 28° C.

Ol. Theobromæ.

Ol. Palmæ.

Ol. Gynocardia.

Ol. Coccois.

Butyrum.

III. With no characteristic odor.

White, melting at 35° C.

White, melting at 45° C.

Adeps.

Sevum.

Sect. 3. Waxes.

White, crystalline, melting at 50° C.

Yellow or white, melting at 62° C.

Cetaceum.

Cera.

OLEUM AMYGDALÆ EXPRESSUM.—

ALMOND OIL.

Origin.—*Amygdalus communis*, *Lin.* *Natural order*, Rosaceæ *Amygdaleæ*.

Habitat.—Western Asia, naturalized in the Mediterranean basin; cultivated.

Production.—Crushed bitter almonds are subjected to powerful pressure preceding their being used for preparing oil of bitter almond. Sweet almonds are likewise occasionally expressed. Yield 40 to 50 or 55 per cent.

Description.—Yellowish, thin, spec. grav. .92, congealing near -20° C. (-4° F.), of a slight nutty odor and bland taste. A mixture of the oil with an equal bulk of nitric acid, spec. grav. 1.16, on being warmed

to 60° C. (140° F.) will not acquire a yellow or orange color.

Constituents.—Chiefly olein.

Substitution.—The fixed oils expressed from the seeds of the peach and apricot closely resemble almond oil; but warmed with nitric acid, spec. grav. 1.16, speedily turn yellow and orange-red.

Properties.—Lenitive. *Dose*, 2 to 16 grams (3ss-iv), in emulsion; externally in liniments and ointments.

OLEUM OLIVÆ.—OLIVE OIL.

Origin. — *Olea europæa*, *Lin.* *Natural order*, Oleaceæ.

Habitat.—Southern Europe; cultivated.

Production.—The crushed fruit, subjected to cold pressure, yields virgin oil; a second quality of oil is obtained by mixing the press cake with hot water, and again expressing; and an inferior more or less rancid oil is yielded from the residue after it has undergone decomposition.

Description.—Pale yellow or light greenish-yellow, spec. grav. .918; near 5° C. (41° F.) separating white crystalline granules; of a slight agreeable odor, and a bland, faintly acrid taste. The mixture, made upon a porcelain slab, of 10 drops of the oil and 5 or 6 drops of sulphuric acid, does not acquire a brown-red or greenish-brown color.

Constituents. — Mainly olein; the solid fats are chiefly palmitin with arachin and possibly stearin; also cholesterin, $C_{26}H_{44}O$, soluble in alcohol.

Properties and Uses.—Like Almond Oil.

OLEUM BUBULUM.—NEAT'S-FOOT OIL.

Production.—The fatty tissue of neat's feet is boiled with water and the fat skimmed off and strained.

Description.—Pale yellow, spec. grav. about .92, opaque at or below 0° C. (32° F.); odor slight; nearly tasteless.

Constituents.—Olein and solid fats.

Use.—Chiefly externally.

OLEUM ADIPIS.—LARD OIL.

Production.—Lard is exposed to a low temperature and expressed. Yield about 50 to 60 per cent.

Description.—Pale yellowish or colorless, spec. grav. about .92, solidifying near 0° C. (32° F.); odor and taste slight.

Constituents.—Olein with palmitin and stearin.

Use.—Externally.

OLEUM LINI.—FLAXSEED OIL. LINSEED OIL.

Origin.—*Linum usitatissimum*, *Lin.* *Natural order*, Linacæ.

Habitat.—Levant and Southern Europe; cultivated.

Production.—The crushed seeds are expressed; yield by cold pressure 10 to 20 per cent.; by hot pressure 25 to 28 per cent.

Description.—Yellow, limpid, spec. grav. about .93; not congealing at -15° C. (5° F.); odor slight;

taste bland. Expressed with heat, linseed oil is of a darker color, stronger odor, and acrid taste.

Constituents.—Chiefly linolein, with palmitin and myristin. By exposure it dries to linoxyn, $C_{32}H_{54}O_{11}$.

Properties.—Demulcent, laxative. *Dose*, 4 to 65 grams (5j-3ij); externally as a protective.

OLEUM PAPAVERIS.—POPPYSEED OIL.

Origin.—*Papaver somniferum*, *Lin.* *Natural order*, Papaveraceæ.

Habitat.—Western Asia; cultivated.

Production.—The crushed seeds are expressed. Yield 40 to 45 per cent.

Description.—Pale yellow, limpid, spec. grav. .92; congealing at about -18° C. (0° F.); odor slight; taste bland.

Constituents.—Chiefly linolein, with palmitin and perhaps other fats.

Properties.—Demulcent and protective.

OLEUM JUGLANDIS.—NUT OIL.

Origin.—1. *Juglans regia*, *Lin.* 2. *Juglans cinerea*, *Lin.* 3. *Carya amara*, *Nuttall.* *Natural order*, Juglandaceæ.

Habitat.—1. Central Asia; cultivated. 2, 3. North America.

Production.—The crushed seeds are expressed; yield about 25 per cent.

Description. — Pale greenish or nearly colorless, somewhat thicker than the preceding, spec. grav. .92, congealing at about -20° C. (-4° F.); odor and taste nutty.

Constituents.—Probably linolein with some solid fats.

Properties.—Like Poppyseed Oil.

OLEUM CANNABIS.—HEMPSEED OIL.

Origin. — *Cannabis sativa*, *Lin.* *Natural order*, Urticacæ, Cannabineæ.

Habitat.—Southern and Central Asia; cultivated.

Production.—The crushed fruit (hempseed) is expressed; yield about 25 per cent.

Description.—Green, becoming lighter on exposure; spec. grav. .93; odor unpleasant; taste rather mild; thickens at -15° C. (5° F.).

Constituents.—Linolein, probably with palmitin.

Properties.—Like Poppyseed Oil.

OLEUM MORRHUÆ.—COD-LIVER OIL.

Oleum jecoris aselli.

Origin.—*Gadus Morrhua*, *Lin.*, and other species of *Gadus*. *Class*, Pisces. *Order*, Teleostia. *Family*, Gadida.

Habitat.—North Atlantic Ocean.

Production.—The fresh livers are slowly heated and the oil is decanted from the water.

Description. — Pale yellow, limpid, faintly acid,

spec. grav. .92; near 0° C. (32° F.) separating a white granular deposit; odor and taste mild, fishy. Sulphuric acid colors it deep violet, changing to brown-red. If obtained by means of a greater heat by boiling with water, or from stale livers, cod-liver oil has an amber-brown or dark-brown color, a stronger acid reaction, a more disagreeable odor and more or less bitter taste, and deposits granules at a higher temperature.

Constituents. — Chiefly olein, with palmitin and stearin, iodine .03–.04 per cent., traces of chlorine, bromine, phosphorus, and sulphur, biliary compounds, probably also butyric and acetic acid.

Properties. — Demulcent, alterative. *Dose*, 8 to 16 grams (3ij–ḡss).

OLEUM TIGLII.—CROTON OIL.

Origin. — Croton Tiglium, *Lin.* *Natural order*, Euphorbiaceæ.

Habitat. — India; cultivated.

Production. — The crushed seeds are expressed or are exhausted by carbon bisulphide; yield 50 to 60 per cent.

Description. — Yellow or brownish-yellow, somewhat viscid, slightly acid, spec. grav. about .95; odor slight; taste oily, afterwards acrid and burning. Croton oil is more soluble in alcohol when old than when fresh.

Constituents. — Glycerides of formic, acetic, isobutyric, tiglinic ($C_3H_8O_2$), valerianic, lauric, myristic, palmitic, and stearic acids; also crotonol, $C_{13}H_{28}O_4(?)$.

Properties. — Powerful purgative, irritant, rube-facient. *Dose*, 0.016 to 0.12 (gr. $\frac{1}{4}$ –ij), in fixed oil or emulsion; externally as an addition to liniments.

OLEUM RICINI.—CASTOR OIL.

Origin.—*Ricinus communis*, *Lin.* *Natural order*, Euphorbiaceæ.

Habitat.—India; cultivated.

Production.—The seeds are crushed, freed from integuments by winnowing, kiln-dried, and expressed; the oil is clarified by mixing with warm water and decanting.

Description.—Viscid, transparent after filtration, nearly colorless; congeals near -18° C. (0° F.); spec. grav. .96; odor mild, rather mawkish, taste slightly acrid; soluble in an equal weight of strong alcohol, partly soluble in petroleum benzin.

Constituents.—Ricinolein and palmitin; acrid principle.

Properties.—Demulcent, purgative. *Dose*, 4 to 16 or 32 grams (3j–iv–3j).

OLEUM GOSSYPII.—COTTON-SEED OIL.

Origin.—*Gossypium herbaceum*, *Lin.*, etc. *Natural order*, Malvaceæ.

Habitat.—Asia and Africa; cultivated.

Production.—The seeds are expressed and the crude red-brown oil is bleached with alkali and sulphuric acid. Yield 30–40 per cent.

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Description.—Yellow or yellowish; congeals below 0° C. (32° F.); odor and taste mild, nutty.

Constituents.—Olein and palmitin.

Properties.—Demulcent.

OLEUM SESAMI.—BENNE-SEED OIL.

Origin.—*Sesamum indicum*, *Lin.* *Natural order*, Pedaliaceæ.

Habitat.—India; cultivated.

Production.—The seeds are expressed; yield 45–50 per cent.

Description.—Yellow, limpid, transparent; spec. grav. .92; congeals at about –5° C. (23° F.); nearly inodorous, bland; colored green on being agitated with a cold mixture of sulphuric and nitric acids.

Constituents.—Olein, myristin, palmitin, stearin; resinoid compound.

Properties.—Demulcent.

OLEUM LAURI.—LAUREL OIL. OIL OF BAYS.

Origin.—*Laurus nobilis*, *Lin.* *Natural order*, Lauraceæ.

Habitat.—Levant and Southern Europe.

Production.—The fruit is steeped in hot water and expressed.

Description.—Of the consistence of butter, green, granular; odor strongly aromatic; taste aromatic, spicy; coloring matter and aromatic principle soluble in alcohol.

Constituents.—Laurin, olein, chlorophyll, volatile oil, resin.

Properties.—Stimulant, nervine; used in liniments and ointments.

OLEUM MYRISTICÆ EXPRESSUM.—EXPRESSED
OIL OF NUTMEG.

Oleum nucistæ. Butyrum nucistæ. Nutmeg butter.

Origin.—Myristica fragrans, *Houtt.* *Natural order,* Myristicaceæ.

Habitat.—Molucca Islands; cultivated.

Production.—Crushed nutmegs are expressed between hot plates; yield 28 per cent.

Description.—In blocks, of the consistence of tallow, unctuous, marbled whitish and orange brown; spec. grav. .995; fusing point near 45° C. (113° F.); odor aromatic; taste spicy; soluble in 4 parts of hot strong alcohol.

Constituents.—Myristin, soft fat, volatile oil, coloring matter.

Properties.—Stimulant, carminative, digestive. *Dose,* 0.3 to 1.0 gram (gr. v–xv), in emulsion; mostly used externally.

OLEUM THEOBROMÆ.—OIL OF THEOBROMA.

Butyrum (Oleum) cacao. Butter of cacao.

Origin.—Theobroma Cacao, *Lin.* *Natural order,* Byttneriaceæ (Sterculiaceæ).

Habitat.—South America.

Production.—The seeds are deprived of the testa and expressed between heated plates; yield 40–45 per cent.

Description.—Yellowish-white, becoming white on keeping, harder than tallow, yet melting in the mouth; spec. grav. about .90; fusing point between 30° and 33° C. (86° and 91.4° F.), aromatic, of a bland chocolate-like taste. On dissolving 2 grams (gr. xxx) of the oil in 4 grams (5j) of petroleum benzin or of ether, by immersing the test-tube in water of 17° C. (62.6° F.), and afterwards plunging the test-tube into water of 0° C. (32° F.), the mixture does not become turbid, and does not produce a granular deposit in less than three minutes.

Constituents.—Stearin, palmitin, olein, probably a little resin.

Properties.—Demulcent. *Dose*, 2 to 4 grams (ʒss–j), in emulsion; mostly used for suppositories and in ointments.

OLEUM PALMÆ.—PALM OIL.

Origin.—*Elæis guineensis*, Jacquin. *Natural order*, Palmæ.

Habitat.—Western Africa; cultivated in tropical America.

Production.—The fruit is heated with water and expressed.

Description.—Harder than butter, orange-red, bleached by exposure to light, and by rapidly heating to 240° C. (464° F.); fusing point 27° C. (80.6° F.); odor agreeable, violet-like; taste bland. It rapidly

becomes rancid, and acquires an acid reaction, a higher melting point, and an acrid taste.

Properties.—Demulcent; used in ointments, mostly for soap and candles.

OLEUM GYNOCARDIÆ.—CHAULMUGRA OIL.

Origin.—Gynocardia (Chaulmoogra, *Roxb.*) odorata, *R. Br.* *Natural order*, Bixaceæ.

Habitat.—Malayan peninsula.

Production.—The seeds are boiled in water and expressed.

Description.—Of the consistence of tallow, brownish-white, of an acid reaction; fusing point 42° C. (107.6° F.); odor peculiar; taste acrid; partly soluble in cold alcohol; by sulphuric acid colored red-brown, afterwards olive-green; after agitation with warm water, the oil separates as a milky emulsion.

Constituents.—Albumenoids; glycerides of cocinic, hypogæic, palmitic, and gynocardic ($C_{11}H_{21}O_2$) acids, the last two also in the free state. The acrid taste and reaction with sulphuric acid are due to gynocardic acid.

Properties.—Alterative, emetic. *Dose*, about 0.3 grams (gr. v), in emulsion or dissolved in other oils.

OLEUM COCOIS.—COCOANUT OIL.

Origin. — *Cocos nucifera*, *Lin.* *Natural order*, Palmæ.

Habitat.—Tropical countries.

Production.—The seeds are boiled with water and expressed.

Description.—Of butyraceous consistence, white; melting point 23° C. (73.4° F.); odor disagreeable.

Constituents.—Glycerides of lauric (predominating), with palmitic, myristic, caprinic, caprylic, and capronic acids.

Properties.—Demulcent; mostly used for soap.

BUTYRUM.—BUTTER.

Origin.—*Bos Taurus*, *Lin.* (femina). *Class*, Mammalia. *Order*, Ruminantia.

Habitat.—Domesticated.

Production.—The cream rising upon cows' milk is churned.

Description.—Soft, yellow, neutral, fusing point near 28° C. (82.4° F.), congealing point 26.5° C. (79.7° F.), rising to 32° C. (89.6° F.); odor delicate and sweet; taste bland. For medicinal use, butter should be freed from salt and casein by melting it in warm water and decanting the clear liquid. 100 parts of pure butter on being saponified by an alkali, and the soap decomposed by hydrochloric acid, yield fatty acids, which, after washing and drying, weigh between 85 and 88 parts.

Constituents.—Odorous principle a trace, olein about 30 per cent., palmitin and stearin about 68 per cent., and about 2 per cent. of the glycerides of butyric, capronic, caprylic, and caprinic acids. Butter having an acid reaction contains free butyric acid.

Properties.—Demulcent, lenitive; used as a dietetic and in ointments.

ADEPS.—LARD.

Axungia porci.

Origin.—*Sus scrofa*, *Lin.* *Class*, Mammalia. *Order*, Pachydermata.

Habitat.—Domesticated.

Production.—The fat attached to the mesentery, omentum, and kidneys is melted with water and strained.

Description.—Soft, white, neutral, spec. grav. .938; melting point near 35° C. (95° F.); odor faint; taste bland; completely soluble in ether. Distilled water boiled with lard does not acquire an alkaline reaction, is not precipitated by silver nitrate, and is not colored blue by iodine.

Properties.—Demulcent, lenitive; used in ointments and cerates.

SEVUM.—SUET.

Sevum ovillum.

Origin.—*Ovis aries*, *Lin.* *Class*, Mammalia. *Order*, Ruminantia.

Habitat.—Domesticated.

Production.—The internal fat is melted in a water-bath and strained.

Description.—Solid, smooth, white, neutral; melting point near 45° C. (113° F.); congealing point about 37° C. (98.6° F.), rising to about 40° C. (104° F.); odor slight; taste bland.

Constituents.—Stearin (predominating), palmitin, olein, and hircin.

Allied Fat.—Sevum bovinum, the internal fat of Bos Taurus, *Lin.* Like the preceding, but melting point near 40° C. (104° F.); contains more palmitin, no hircin.

Properties.—Lenitive; used in cerates.

CETACEUM.—SPERMACETI.

Origin.—Physeter macrocephalus, *Lin.* *Class*, Mammalia. *Order*, Cetacea.

Habitat.—Pacific and Indian Oceans.

Production.—The fat contained in cavities in the head is allowed to congeal, expressed, and remelted in water.

Description.—White, translucent, slightly unctuous masses; fracture scaly-crystalline, of a pearly lustre; pulverizable in the presence of a little alcohol; spec. grav. .94 to .95; melting point near 50° C. (122° F.); congealing point near 45° C. (113° F.); soluble in ether and in boiling alcohol.

Constituents.—Mainly cetylic palmitate or cetin, $C_{16}H_{33} \cdot C_{16}H_{31}O_2$.

Properties.—Lenitive; used in ointments and cerates.

CERA.—WAX. BEESWAX.

Origin.—Apis mellifica, *Lin.* *Class*, Insecta. *Order*, Hymenoptera.

Production.—The honeycomb, after draining the honey, is melted in water and the melted wax decanted. It is bleached by exposing the wax in thin sheets to moisture and sunlight.

Description.—Cera flava, Yellow wax. Yellow or somewhat brownish-yellow, breaking with a granular fracture at and below 10° C. (50° F.), becoming plastic by the heat of the hand; spec. grav. .96 to .97; melting point between 62° and 63° C. (about 145° F.); congealing with a smooth and level surface; odor aromatic, honey-like; taste mild; partly soluble in alcohol; soluble in boiling ether and in chloroform.

Cera alba, White wax. Yellowish-white circular cakes, somewhat translucent in thin layers, brittle in the cold, but becoming plastic by the heat of the hand; melting point 65° C. (149° F.); odor slightly rancid.

Constituents.—Aromatic and coloring matters in yellow wax; cerin or cerotic acid, $C_{27}H_{54}O_2$, 10 to 20 per cent. (crystallizes from boiling alcohol); myricin or myricyl palmitate, $C_{30}H_{61}.C_{16}H_{31}O_2$ (acicular crystals, slightly soluble in hot alcohol, soluble in hot ether).

Adulterations.—Tallow renders wax softer and lessens its specific gravity. Paraffin is not destroyed by hot sulphuric acid; 5 grams of the wax are heated in a flask for fifteen minutes with 25 grams of sulphuric acid to 160° C. (320° F.), and the mixture is diluted with distilled water; a layer of paraffin should not be separated. Resin is dissolved by hot 70 per cent. alcohol, and, after cooling, is precipitated by water. Mineral and starchy substances are insoluble in chloroform.

Properties.—Protective; used in ointments, cerates, and plasters.

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