scription of *Round Zedoary* (*Zedoaria rotunda*). It occurs in segments (halves, quarters, or flat sections) of a roundish or ovate tuber. The external portion of the tuber is marked by the remains, membranes, and fibres, and is of a pale brownish-gray or whitish appearance. When cut it presents a yellowish marble appearance, not very dissimilar to the cut surface of rhubarb. It has a warm, aromatic, bitter taste, and an aromatic odour. It has been analyzed by Bucholz, (*Trommsdorff's Journal*, xxv. 2, p. 3,) and by Morin (*Journ. de Pharm*, t. ix. p. 257). Its constituents, according to the latter chemist, are—*Volatile oil, Resin, Gum, Starch, Woody fibre, Vegeto-animal Matter* (?) *Osmazome* (?) *free Acetic Acid, Acetate of potash, Sulphur*, and in the ashes *Carbonate* and *Sulphate of potash, Chloride of potassium, Phosphate of Lime, Alumina, Silica, Oxides of Iron and Manganese.* It possesses aromatic and tonic properties. It is less heating than ginger and galangal, and is more analogous to turmeric.

7. Zingiber Cassamunar, Roxburgh.—This perhaps is the plant from whence is derived the root known by English druggists as *Cassamunar Root*, and which they regard as identical with Zerumbet Root. (Private information; also Gray, *Pharmacology.*) It appears to me to be the *Turmeric-coloured Zedoary* of Ainslie. (*Materia Indica*, vol. i. p. 490.) It occurs in segments (halves or quarters) of an ovate tuber (which in the dried state must have been about the size of a pigeon's egg), the external surface of which is marked with circular rings and the bases of the root-fibres, and is of a dirty turmeric-yellow colour. Internally it is reddish-brown, and has some resemblance, in its colour and pellucidity, to a fresh-fractured surface of Socotrine aloes. Its flavour is warm and aromatic; its odour is aromatic. It has not been analyzed. Its effects must be similar to those of ginger. It was at one time used in convulsive and other cerebral diseases. (Sir Hans Sloane, *Phil. Trans.* vol. xxii. No. 264, p. 580.)

8. Curcuma Zerumbet, Roxburgh.—This I suspect to be the origin of the *Zerumbet Root* given me by Dr. Royle. It is very similar in shape to a curved or arched piece of long turmeric. Its colour is yellowish-gray.

Order XX.—ORCHIDEÆ, *R. Brown.*—THE ORCHIS TRIBE.

Orchides, *Jussieu.* Orchidaceæ and Vanillaceæ, *Lindley.*

This remarkable order of gynandrous monocotyledons is, in reference to its dietetical and medicinal properties, of little importance.

The tuberous or palmate roots abound in gummy and, at certain times, in farinaceous matters, which render them nutritive, emollient, and demulcent. *Salep* is the prepared and dried roots of several orchideous plants, and is sometimes sold in the state of powder. *Indigenous Salep* is procured from *Orchis mascula*, *O. latifolia*, and other native plants of this order, (Dr. Percival, *On the Preparation, Culture, and Use of the Orchis Root*, 1773.) *Oriental Salap* is procured from other Orchideæ. Professor Royle states that the salap of Cachmere is obtained from a species of *Eulophia*. The notion of the aphrodisiac properties of salap seems to be founded on the doctrine of signatures.

Fig. 168.

Vanilla aromotica.

The *Vanilla* of the shops is the fruit of *Vanilla aromatica*, Sw., a native of Peru, Mexico, Jamaica, and Cuba. Schiede (Schlechtendal's *Linnea*. Oct. 1829, S. 573) mentions three other Mexican species (*V. sativa*, *V. sylvestris*, and *V. Pompona*) which yield vanilla. Notwithstanding the strong odour of this fruit, no volatile oil can be obtained by distillation. (See Bucholz's analysis in Buchner's *Repert.* ii. 253.) The white acicular crystals found on the fruit are a kind of solid volatile oil. Vanilla is employed in this country for flavouring chocolate, ice-creams, &c. But on the continent it is used as a medicinal agent. It is an aromatic stimulant; has an exhilarating effect on the mental functions, prevents sleep, increases the energy of the muscular system, and excites the sexual feelings. (Sundelin, *Heilmittellehre*, ii. 203, 3te Aufl.) It has been administered in asthenic fevers, rheumatism, hysteria, impotence of the male, melancholy, &c. The dose of it is from 8 to 12 grains. (Vogt. *Pharmak.* ii. 600, 2 Aufl.)

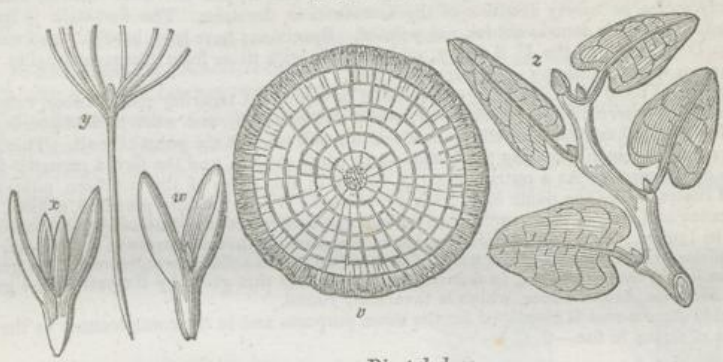
3. EXOGENÆ, *De Cand.*—EXOGENS.

Dicotyledones, *Jussieu.*

Essential Characters.—*Trunk*, consisting of bark, wood, and pith, placed one within the other; the pith being innermost. *Bark*, composed of strata (the younger and inner being called *liber*), increasing by the deposit of new cortical matter on its inner side. *Wood*, consisting of ligneous strata, traversed by *medullary rays*, and increasing by the deposit of new woody matter on its outer side (*exogenous growth*): the older and inner strata are called *duramen*, or *perfect wood*; the younger and outer strata are termed *alburnum*, or *sap wood*.

Leaves articulated with the stems; their veins branching and anastamosing (*angulinerved; reticulated*). *Flowers*, if with a distinct calyx, often having a quinary arrangement. *Em-*

FIG. 169.



Exogens, or *Dicotyledons*.

v Transverse section of a dicotyledonous stem, showing medullary rays, and the distinction of bark, wood, and pith.
w Embryo with two cotyledons.
x Embryo with four cotyledons.
y Embryo with many cotyledons.
z Stem and leaves of a cotyledon, showing the articulation and the anastomosing veins of the leaves.

bryo with two or more cotyledons (*dicotyledonous*); if two, they are opposite; if more than two, they are verticillate: radicle naked; *i. e.* elongating, without penetrating any external case (*exorrhizous*).

ORDER XXI.—CYCADACEÆ, *Lindl.*—THE CYCAS TRIBE.

CYCADEÆ, *Richard* and *R. Brown*.

I notice this order for the purpose of stating, that a feculent matter is obtained from the soft centre of some species of *Cycas* (as *C. circinalis*, *C. revoluta*, *C. inermis*). This fecula (*Japan sago*) is quite unknown to me; and I doubt whether it ever reaches this country.[1]

FIG. 170.

Cycas revoluta, or *the Japan Sago-tree*.

[To this family also belongs the genus Zamia, the species of which afford a nutritive fecula.

ZAMIA, Lin. *Gen. des. Male flowers:* anthers open, collected in pedunculated terminal strobiles, inserted all round a common rachis. Each one ovoid, attenuated at base into a stipe, with an apex uniformly peltiform, sub-bilobate, lobes polleniferous beneath. *Female flowers:* carpels numerous, one-leafed, open, collected in pedunculated terminal strobiles inserted all round a common rachis, each at base attenuated to the form of a stalk, dilated at the free extremity, which is hexagonal and peltiform, face, beneath, bearing a single inverted ovule. Fruit sub-discrete. Seeds ovoid, sub-globose, testa bony, enveloped by a thin fleshy epidermis. Embryo inverted, in the axis of the fleshy albumen, radicle centripetal with respect to the common rachis. (*Endlicher. Gen. Plant.*)

Zamia integrifolia.—Fronds pinnate, folioles lanceolate, rotundo-obtuse, attenuated at base, serrulate at the apex, stipe smooth, sub-tetragonal. (*Willdenow.*) The leaves arise immediately from the root in a cluster, and are from a foot to two feet or more in height. The leaflets are from ten to twenty pairs, opposite or alternate, sessile, each two to three inches long, and varying in breadth from a quarter to three-fourths of an inch, shining, striated with parallel ribs. The cones arise from among the leaves on stalks several inches in length: the male are three inches long, an inch wide, of a reddish brown colour; the female thicker and larger. The fruit is three or four inches long, elliptical, pointed, downy; the scales finally separate widely, each is pellate and angular, remaining after the drupe has fallen. The drupe is ellip-

[1] Consult on this subject Schenk's *Naturgeschichte der vorzüglichsten Handelspflanzen*, 4to. Bd. 2ex. S. 139, Taf. xlvi.

tical, about half an inch in length, with a small quantity of sweet orange coloured pulp, and a large, rather pointed nut. Pursh states that this plant grows in Florida.

Zamia Media.—This is an intermediate species, between *Z. integrifolia* and *Z. angustifolia.* It differs from the former in having more numerous, longer, and narrower leaflets, which are perfectly entire, or nearly destitute of the serratures at the apex. The foot-stalk is hairy at base, and the female cone is obtuse, not pointed. Specimens have been brought me from Florida by Dr. Godon, of the U. S. Navy, which agree with those from the same locality in the Herbarium of the Academy of Natural Sciences.

The root of these plants is a large spheroidal or somewhat tapering coated tuber, rough and dark-coloured externally, fleshy, internally white and succulent, and when incised pouring forth a fluid of gummy consistence, which hardens in small tears at the point of exit. This root is called *coonti root* in Florida, by the Indians and white settlers, and the farina prepared from it is also called *coonti.* As a nutriment it is found in the shops of the northern cities of the United States, under the name of *Florida arrow-root.* When carefully prepared, it has a mealy appearance and feel, is of a pure white colour, and somewhat of a lustrous appearance; it is apt to be lumpy. The mode of preparation is the same as that of Bermuda arrow-root. The form of the granule is that of the "half, fourth or third of a solid sphere," some of the granules are completely muller shaped, in fact the form is exactly that given by Raspail for the granule of the *Maranta Arundinacea*, which is invariably round.

Florida Arrow-root is employed for the same purposes and in the same manner as the other species of farina in use.—J. C.]

Order XXII.—CONIFERÆ, *Jussieu.*—THE FIR TRIBE.

Conaceæ or Pinaceæ, *Lind.*

Essential Characters.—*Flowers* monœcious or diœcious. *Males* monandrous or monadelphous; each floret consisting of a single *stamen*, or of a few united, collected in a deciduous amentum, about a common rachis; *anthers* two-lobed or many-lobed, bursting outwardly; often terminated by a crest, which is an unconverted portion of the scale out of which each stamen is formed; *pollen* large, usually compound. *Females* in cones. *Ovary* spread open, and having the appearance of a flat scale destitute of style or stigma, and arising from the axil of a membranous bract. *Ovule* naked; in pairs on the face of the ovary, having an inverted position, and consisting of one or two membranes, open at the apex, and of a nucleus. *Fruit* consisting of a cone formed of the scale-shaped ovaries, become enlarged and indurated, and occasionally of the bracts also, which are sometimes obliterated, and sometimes extend beyond the scales in the form of a lobed appendage. *Seed* with a hard crustaceous integument. *Embryo* in the midst of fleshy oily albumen, with two or many opposite *cotyledons;* the *radicle* next the apex of the seed, and having an organic connexion with the albumen. *Trees* or *shrubs*, with a branched trunk abounding in resin. *Wood*, with the ligneous tissue marked with circular disks. *Leaves* linear, acerose or lanceolate, entire at the margins; sometimes fascicled in consequence of the non-development of the bracts to which they belong; when fascicled, the primordial leaf to which they are then axillary is membranous, and enwraps them like a sheath. (Lindley.)

Properties.—Every part of coniferous plants contains an oleo-resinous juice, which yields by distillation a volatile oil, differing often in odour but agreeing in composition in each species. This juice is a local irritant, and acts as a powerful stimulant to the vascular system and the organs of secretion (especially the kidneys and the mucous membranes). Moreover, it appears to possess a specific influence over the nervous system: for oil of turpentine, in large doses, has operated as an inebriant and soporific; savin is said by Orfila (*Toxicol. Gén.*) to act on the nervous system; and the leaves of the yew are narcotic.

1. PI'NUS, *De Candolle.*—THE PINE.

Pinus sylvestris, *L. D.*—Various species, *E.*

Sex. Syst. Monœcia, Monadelphia.

Terebinthina vulgaris, *L. D.*; (Terebinthina, U. S.); Oleum Terebinthinæ, *L. E. D.* (U. S.); Resina, *L. E. D.* (U. S.); Pix liquida, *L. E. D.* (U. S.); Pix nigra, *L.*; Pix arida, E.)

Botany.—**Gen. Char.**—*Flowers* monœcious. Males:—*catkins* racemose, compact and terminal; squamose; the *scales* staminiferous at the apex. *Stamens* two; the *anthers* one-celled. Females:—*catkins* or *cones* simple, imbricated with acuminate scales. *Ovaries* two. *Stigmas* glandular. Scales of the *cone* oblong, club-shaped, woody; umbilicato-angular at the apex. *Seeds* [nuts, *De C.*) in pairs, covered with a sharp-pointed membrane. *Cotyledons* digitato-partite. *Leaves* two or many, in the same sheath (De Candolle and Dubuy, *Bot. Gall.*) Hardy, evergreen trees.

Species.—1. Pi'nus sylves'tris, Linn. L. D.; *Wild Pine* or *Scotch Fir.*—*Leaves* in pairs, rigid. *Cones* ovato-conical, acute; young ones stalked, recurved,

as long as the leaves; generally in pairs. Crest of the *anthers* very small. *Embryo* five-lobed. (*Bot. Gall.*)—Highlands of Scotland, Denmark, Norway, and other northern countries of Europe. Flowers in May and June. A tall, straight, hardy, long-lived tree, determinately branched. Its *wood* is the red or yellow deal. It yields *common turpentine*, *tar* and *pitch*.

2. Pi'nus Pinas'ter, Aiton, Lambert; *P. maritima*, De Cand.; *The Pinaster* or *Cluster Pine*.—*Leaves* twin, very long, rigid, pungent, furnished at the base with a reflexed scale. *Cones* oblong-conical, obtuse, very smooth, bright, shorter than the leaves. *Scales* bristly. (*Bot. Gall.*)—Southern maritime parts of Europe. Very abundant in the neighbourhood of Bordeaux, and between this city and Bayonne. It is a much larger tree than the Scotch fir. Flowers in May. It yields *Bordeaux turpentine*, *galipot*, *tar*, and *pitch*.

Fig. 171.

Fig. 172.

Fig. 173.

Fig. 174.

Fig. 171. *Pinus sylvestris.*
Fig. 172. Branch and cones of ditto.

Fig. 173. Branch and cones of *Pinus Pinaster.*
Fig. 174. Branch and cone of *Pinus Pinea.*

3. Pi'nus palus'tris, Lambert; *the Swamp Pine*.—*Leaves* three, very long. *Cones* subcylindrical, armed with sharp prickles. *Stipules* pinnatifid, ragged, persistent (Lambert).—A very large tree, growing in dry sandy soils, from the southern parts of Virginia to the Gulf of Mexico. "Its mean elevation is 60 or 70 feet, and the diameter of its trunk about 15 or 18 inches for two-thirds of this height. The *leaves* are about a foot in length, of a brilliant green colour, and united in bunches at the ends of the branches. The names by which the tree is known in the Southern States are *long-leaved pine*, *yellow pine*, and *pitch pine*; but the first is the most appropriate, as the last two are applied also to other species. This tree furnishes by far the greater proportion of *turpentine*, *tar*, &c. consumed in the United States, or sent from this to other countries." (*United States Dispensatory.*)

4. Pi'nus Tæda, Lambert; *the Frankincense Pine*.—Abundant in Virginia. Yields *common turpentine*, but of a less fluid quality than that which flows from the preceding species.

5. Pi'nus Pi'nea, Lambert, De Candolle; *the Stone Pine.*—Grows in the south of Europe and northern part of Africa. Yields the cones called, in the shops, *pignoli pines*, the seeds of which, termed *pine nuts*, (πιτυίδες, Diosc.; *pityida*, Pliny; *nuclei pineæ, pineoli*) are used as a dessert.

6. Pi'nus Pumil'io, Lambert; *the Mugho* or *Mountain Pine.*—A native of the mountains of the south of Europe. An oleo-resin, called *Hungarian balsam* (*balsamum hungaricum*), exudes spontaneously from the extremities of the branches and from other parts of the tree. By distillation of the young branches with water, there is obtained in Hungary an essential oil, called *Krummholzöl*, or *Oleum Templinum.*

7. Pi'nus Cem'bra, Lambert; De Candolle; *the Siberian Stone Pine.*—The seeds, like those of Pinus Pinea, are eaten. By distillation the young shoots yield *Carpathian Balsam* (*Balsamum Carpathicum; B. Libani*).

A'BIES, *De Candolle.*—THE FIR.

Pinus Abies and P. balsamea, *L. D.*—Abies excelsa and A. balsamea, *E.*
Sex. Syst. Monœcia, Monadelphia.

(Abietis resina, *L.*; Thus, *D.*; Pix Abietina, *L.*; Pix Burgundica, *E. D.* (Pix Abietis, U. S.) Terebinthina Canadensis, *L.* (U. S.) Balsamum Canadense, E. D.) (Pix Canadensis, U. S.)

Botany. **Gen. Char.**—*Flowers*, monœcious. Males—*catkins* solitary, not racemose; the *scales* staminiferous at the apex. *Stamens* two; the *anthers* one-celled. Females—*catkins* simple. *Ovaries* two. *Stigmas* glandular. Scales of the *cone* imbricated; thin at the apex, rounded, (neither thickened, angular, nor umbilicated on the back). *Cotyledons digitato-partite. Leaves* solitary in each sheath (*Bot. Gall.*)

Species.—1. A'bies excel'sa, De Cand. E.; *Pinus Abies*, Linn. L. D.; *the Norway Spruce Fir.*—*Leaves* tetragonal. *Cones* cylindrical; the scales rhomboid, flattened, jagged, and bent backwards at the margin (*Bot. Gall.*).—A na-

Fig. 175.

Abies excelsa.

Fig. 176.

a, Abies Picea.
b, Abies Balsameæ.
c, Abies Canadensis.

tive of Germany, Russia, Norway, and other parts of Europe; also of the northern parts of Asia. Commonly cultivated in England. Flowers in May and June. A very lofty tree, growing sometimes to the height of 150 feet. It yields, by spontaneous exudation, *Common Frankincense* (*Abietis resina*, L.; *Thus*, D.), from which is prepared *Burgundy Pitch* (*Pix Abietina*, L., *Pix Burgundica*, E. D.) (*Pix Abietis*, U. S.)

2. A'bies Balsa'mea, Lindley, E.; *Pinus balsa'mea*, Linn. Lambert, L. D.; *the Canadian Balsam Fir: Balm of Gilead Fir.*—*Leaves* solitary, flat, emarginate, subpectinate, suberect above. Scales of the flowering *cone* acuminate, reflexed. An elegant *tree*, seldom rising more than 40 feet. Inhabits Canada, Nova Scotia, Maine, Virginia, and Carolina. Yields *Canada Balsam* (*Terebinthina Canadensis*, L. (U. S.); *Balsamum Canadense*, E. D.)

3. A'bies Canaden'sis, Lindley; (Loudon's *Encycl. of Plants*,) *Pinus canadensis*, Linn., Lambert; *the Hemlock Spruce Fir.*—Said to yield an oleo-resin analogous to Canada balsam.

4. A'bies Pi'cea, Lindley; *Abies pectinata*, De Candolle; *Pi'nus Pi'cea*, Linnæus; *the Silver Fir.*—Mountains of Siberia, Germany, and Switzerland. Yields *Strasburgh Turpentine*.

5. A'bies Ni'gra, Michaux; *Pi'nus nigra*, Lambert; *the Black Spruce Fir.*—The concentrated aqueous decoction of the young branches is *Essence of Spruce*, used in the preparation of *Spruce Beer*. (*United States Dispensatory.*)

3. LA'RIX EUROPŒ'A, *De Candolle.*—THE COMMON LARCH.

Abies Larix, *Lam.* E.; Pinus Larix, *Linn.* D.
Sex. Syst. Monœcia, Monadelphia.
(Terebinthina Veneta, *L. D.*)

BOTANY. **Gen. Char.**—*Flowers* monœcious. *Character* as in Abies; but the *Cotyledons* are simple, and never lobed. *Cones* lateral. *Leaves*, when first expanding, in tufted fascicles, becoming somewhat solitary by the elongation of the new branch. (*Bot. Gall.*)

Sp. Char.—*Leaves* fascicled, deciduous. *Cones* ovate-oblong. Edges of *scales* reflexed, lacerated. *Bracts* panduriform. (Lambert.)

Hab.—Alps of Italy, Switzerland, Germany, Siberia, &c. Cultivated in woods.

PRODUCTS.—This species yields *Larch* or *Venice turpentine*. When the larch forests of Russia take fire, a gum issues forth from the medullary part of the trunks, during combustion, which is called *Orenburgh gum* (*gummi orenburgense*). A saccharine matter exudes from the larch, about June, which is called *Manna of the Larch*, or *Manna de Briançon*. Lastly, a fungus, called *Polyporus Laricis*, (*vide* p. 46,) is nourished on this tree.

MEDICINAL SUBSTANCES OBTAINED FROM THE PRECEDING CONIFEROUS PLANTS.

The term *Turpentine* (*Terebinthina*) is ordinarily applied to a liquid or soft solid oleo-resinous juice of certain coniferous plants, as well as of the *Pistachia Terebinthus*, a plant of the order *Terebintaceæ*, Juss. Indeed this last-mentioned plant, *Pistachia Terebinthus*, is probably the true *Terebinthus* of the ancients, (Τερμίνθος, Theoph. and Dioscorides). When submitted to distillation, these juices are resolved into a *Volatile Oil* (*Oleum Terebinthinæ*) and a *Resinous Residuum*. The roots and other hard parts of coniferous trees yield, by a kind of *distillatio per descensum*, the thick liquid called *Tar*, from which *Pitch* is procured. Hence it will be convenient to speak of the coniferous terebinthinates under four heads:—1st, the *oleo-resinous juices;* 2dly, the *volatile oil* obtained therefrom by distillation; 3dly, the *resinous residuum;* 4thly *tar* and *pitch*.

1. Oleo-Resinous Terebinthinæ.—Terebinthinate Oleo-Resins.

PREPARATION; PROPERTIES; AND COMPOSITION.—At first these oleo-resins are liquid, but by age and exposure to the air they become, more or less speedily in the different varieties, solid, partly by the volatilization, partly by the resinification, of the volatile oil. They have a certain general similarity in taste and odour. They soften and become very fluid by heat, readily take fire in the air, and burn with a white flame, and, if the supply of air be limited, with the copious deposition of finely-divided carbon (*lamp black*). They are almost completely soluble in alcohol and ether; and yield, by distillation, a volatile oil, which passes over (usually with a small quantity of succinic acid?), and a resinous residuum. Water acquires a terebinthinate flavour when digested with them; and by the aid of the yolk or the white of an egg, or still better by that of vegetable mucilage, forms an emulsion with them.

1. Common Turpentine (*Terebinthina vulgaris*, L. D.)—Under this name we find oleo-resins brought from various parts of the world, obtained from different species of *Pinus*, and, though agreeing in the main in their properties, possessing certain distinctive characters. At the present time the London market is almost exclusively supplied from New York, a small quantity only being imported from Bordeaux. In the years 1830 and 1831, the quantities of turpentine (not of greater value than 12*s.* per cwt.) which were imported from the United States and France, were as follows:

	1830.			1831.		
	cwts.	*qrs.*	*lbs.*	*cwts.*	*qrs.*	*lbs.*
From France	43	1	12	799	3	19
United States of America	234,747	0	12	317,095	1	7
Total	234,790	1	24	317,895	0	26

α. *American* or *White Turpentine* (*Terebinthina*, U. S.) (the *Térébenthine de Boston* of the French) "is procured chiefly from the *Pinus palustris*, partly also from the *Pinus Tæda*, and perhaps some other species inhabiting the Southern States. In former times large quantities were collected in New England; but the turpentine trees of that section of the Union are said to be nearly exhausted; and our commerce is almost exclusively supplied from North Carolina and the south-eastern parts of Virginia." (*United States Dispensatory.*)

The method of procuring this turpentine is as follows:—A hollow is cut in the tree, a few inches from the ground, and the bark removed for the space of about 18 inches above it. The turpentine runs into this excavation from about March to October; more rapidly, of course, during the warmer months. It is transferred from these hollows into casks.[1] It is imported from New York in casks; those from North Carolina holding 2 cwts., while those from South Carolina contain $2\frac{1}{2}$ cwts. It is yellowish-white, with an aromatic odour, and a warm, pungent, bitterish taste. It is translucent or opaque. Its consistence varies, being semifluid, or, in cold weather, that of a soft solid. It contains various impurities (leaves, twigs, chips, &c.) That got from the first tappings is the best, and is called *Virgin Turpentine*. Recent American turpentine is said (*United States Dispensatory*) to yield 17 per cent. of essential oil.

β. *Bordeaux Turpentine* is obtained by making incisions in the *Pinus Pinaster*, Lambert (*P. maritima*, De Candolle), and collecting the turpentine in hollows at the foot of the tree. Every month these hollows are emptied, and the oleo-resin conveyed in pails to a reservoir. In this state it is called *soft gum* (*gomme molle*). It is purified either by heating it in large boilers, and filtering through straw (*térébenthine galipot*), or by exposing it in a barrel, the bottom of which is perforated by holes, to the sun; the liquid which drains through is called *térébenthine au soleil*. The last method yields the best product, since less volatile oil is dissipated by it. (Guibourt, *Hist des Drog.* t. ii. p. 578; Duhamel,

[1] Michaux, *N. Am. Sylv.* iii.; Way, *Trans. of the Soc. of Arts*, vol. xxviii. p. 89; Duhamel, *Traité des Arbres*, t. ii. p. 146. Paris, 1755.

Traité des Arbres, t. ii. p. 147.) The turpentine which flows during the winter is called *galipot* in Provence, *barras* in Guienne. It is in the form of semi-opaque, solid, dry crusts of a yellowish-white colour, a terebinthinate odour, and a bitter taste. (Guibourt, *op. cit.*)

Bordeaux turpentine is whitish, thickish, and turbid. It has a disagreeable odour, and an acrid, bitter, nauseous taste. On standing it separates into two parts: one thinner, yellow, and almost transparent; another thicker, whitish, and of the consistence of thick honey, having a granular consistence. Bordeaux turpentine readily becomes hard and dry by exposure to the air. It enjoys, with balsam of copaiva, the property of solidifying with magnesia, and in this respect is distinguished from Strasburgh turpentine.

Common turpentine has been analyzed by MM. Moringlane, Duponchel, and Bonastre, (*Journ. de Pharm.* t. viii. p. 329,) and by Unverdorben. (Berzelius, *Traité de Chim.* and Gmelin, *Hand. d. Chem.*) The last mentioned chemist found it to consist of *two Volatile Oils* (*oil of turpentine*), *Pinic acid*, a little *Sylvic acid*, a trace of an *Indifferent Resin* not soluble in oil of petroleum, and a small quantity of *Bitter Extractive*. The quantity of volatile varies from 5 to 25 per cent. of the weight of the turpentine.

2. **Larch or Venice Turpentine.** (*Terebinthina veneta*, E. D. *Terebinthina laricea.*)—Obtained from *Larix europæa*, De Cand. by boring the trunks of the trees, and adapting to each hole a wooden gutter, which conveys the juice into a tub or trough, from which it is afterwards withdrawn for filtration. (Duhamel, *Traité des Aubres*, tom. i. p. 335.)

Through the kindness of Professor Guibourt I have received an authentic sample of larch turpentine. It was collected in the wood of the Bishop of Maurienne, in Savoy, by order of the bishop, and at the urgent solicitation of M. Bonjean, Pharmacien, naturalist of Chambery. The same kind of turpentine, collected in Switzerland (*Swiss turpentine*) (Guib. MSS.), is sold in Paris as *Strasburgh turpentine* (*Térébenthe de Strasbourg*) (Guib. MSS.; *Hist. des Drog.* t. ii. p. 577, 3me éd.), and was formerly called *Venice turpentine*. It is a thick and consistent fluid, flowing with difficulty, is sometimes transparent, but more frequently cloudy, has a yellow or greenish-yellow tint, an odour which is peculiar, not very agreeable, weaker than that of either Strasburg or common turpentine, but less disagreeable than the latter, and an acrid, very bitter taste. It has little or no tendency to concrete by keeping—a property known to Pliny, (*Hist. Nat.* lib. xvi. cap. 19, ed. Valp.) and which distinguishes it from common turpentine.

A factitious substance (*Terebinthina veneta factitia*) is sold by London druggists for Venice turpentine. It is prepared by mixing f℥v. of oil of turpentine with lb. j. of black rosin. A similar preparation is found in the shops of the United States of America, (*United States Dispensatory*,) and is probably identical with that imported from America under the name of Venice turpentine, (Dr. Maton, in Lambert's *Descrip. of the genus Pinus*; and Dr. A. T. Thomson, *Lond. Disp.*) It is, in fact, absurd in the Dublin and Edinburgh Colleges to retain Venice turpentine in their pharmacopœias, seeing that not a grain of that oleo-resin has been imported (commercially) for many years past.

Berzelius and Unverdorben, (Berzelius, *Traité de Chim*, t. v. p. 477; and Gmelin, *Handb. d. Chem.*) have submitted Venice turpentine to examination, and with the following results:

Berzelius's Analysis.	*Unverdorben's Analysis.*
1. Oil of turpentine, probably composed of two oils.	1. Volatile oil, which readily distils.
2. Resin insoluble in cold oil of petroleum.	2. Volatile oil, which distils less readily, and has a tendency to resinify.
3. Resin soluble in cold oil of petroleum.	3. Succinic acid (small quantity).
	4. Much Pinic acid.
	5. A little Sylvic acid.
	6. Indifferent resin, insoluble in oil of petroleum.
	7. Bitter Extractive.
Old Venice Turpentine.	Fresh Venice Turpentine.

Larch resin yields from 18 to 25 per cent. of volatile oil. (Berzelius, *op. cit.*)

3. **Strasburgh Turpentine** (*Terebinthina argentoratensis; Térébenthine au citron, ou Térébenthine d'Alsace*, Guib.)—This is obtained from *Abies Picea*. The peasantry, in the vicinity of the Alps, collect it by puncturing the vesicles adhering to the bark with sharp-pointed hooks, and receiving the juice in a bottle. It is afterwards filtered through a rude kind of bark funnel. (Duhamel, *Traité de Arbres*, t. i. p. 9.)

Strasburgh turpentine is very fluid, transparent, of a yellowish colour, has a very agreeable odour of citron, and a taste moderately acrid and bitter. It consists, according to Caillot, (*Journ. de Pharm.* xvi. p. 436,) of *Volatile Oil* 33·5, *Resin* insoluble in alcohol 6·20, *Abietin* (a crystallizable resin) 10·85, *Abietic acid* (? Pinic and Sylvic acids) 46·39, *Extractive* and *Succinic acid* 0·85, *Loss* (principally volatile oil) 2·21.

4. **Canadian Turpentine** or *Canada Balsam* (*Terebinthina canadensis*, L. (U. S.) *Balsamum canadense*, E. D.) is obtained from *Abies balsamea* in Canada and the state of Maine. Between the bark and the wood of the trunks and branches of these trees are vesicles containing this oleo-resin, which exudes when they are broken, and is received in a bottle. It is imported in casks containing each about one cwt. In 1838 the quantity imported was 7259 lbs. (*Trade List* for 8th Jan. 1839.) When fresh it has the consistence of thin honey, but by age gradually solidifies; it is yellow, transparent, very tenacious, of a peculiar and agreeable terebinthinate odour, and of a slightly bitter, somewhat acrid, taste.

Canada balsam has been analized by Bonastre, (*Journ. de Pharm.* viii. 337,) who obtained the following results:—*Volatile oil* 18·6, *Resin easily soluble in alcohol* 40·0, *Subresin difficultly soluble* 33·4, *Fibrous Caoutchouc, like Subresin*, 4·0, *Acetic acid* traces, *Bitter Extractive and Salts* 4·0.

5. **Common Frankincense** (*Abietis resina*, L. *Thus.* D.) This is the spontaneous exudation of *Abies communis*. It concretes in distinct drops, or tears, which are compact, opaque, of a deep yellow colour. What is found in the shops of London is a soft solid, having considerable resemblance to the dried opaque portion of common turpentine. The turpentine (? Thus) of the *Abies communis* has been analyzed by Caillot, (*Journ de Pharm.* t. xvi. p. 436,) who obtained the following results:—*Volatile Oil* 32·00, *Resin* insoluble in alcohol 7·40, *Abietin* (a crystallizable resin) 11·47, *Abietic acid* (? Pinic and Sylvic acids) 45·37, *Extractive* and *Succinic acid* 1·22, *Loss* (principally volatile oil) 2·54.

Physiological Effects.—The effects of terebinthinate substances have been before noticed (vol. i. p. 184). Locally they operate as irritants. Applied to the skin they cause rubefaction, and sometimes a vesicular eruption. Swallowed they give rise to a sensation of warmth at the stomach, in large doses occasion sickness, and promote the peristaltic movement of the intestines. After their absorption they operate on the general system as stimulants, and excite the vascular system, especially of the abdominal and pelvic viscera. Their influence is principally directed to the secreting organs, more especially to the mucous membranes and the urinary apparatus. They act as diuretics, and communicate a violet odour to the urine. This odour depends on a portion of the oil having undergone a slight change in its nature during its passage through the system. Part of the oil, however, is thrown off unchanged; for Moiroud (*Pharmacol.-Veterin.* p. 312) has observed, that at the same time that the turpentines cause a violet odour, they flow in part with the urine. "I have verified," says he, "this double phenomenon on many horses, to whom turpentine has been given, for some days, in the enormous dose of ten or twelve ounces." But the kidneys are not the only parts engaged in getting rid of the absorbed turpentine. All the secreting organs, but more especially the bronchial surfaces and the skin, are occupied in the same way. By these the oil is exhaled

apparently unchanged, or at least with its usual odour. During the circulation of the terebinthinate particles in the system, they exercise a local influence over the capillaries and secerning vessels, in the vital activity of which they effect a change. In certain morbid conditions, this change is of a most salutary nature. In catarrhal affections of the mucous membranes the secerning vessels become constringed under the use of terebinthinates, and the discharge is, in consequence, checked.

The most important, because by far the most active, constituent of the terebinthinate oleo-resins is volatile oil. Hence their effects are almost identical with those of the latter. (Vide *Oleum Terebinthinæ*, p. 168.) Some slight differences, however, are to be noticed. They are less rapidly absorbed, are more permanent in their operation, confine their influence principally to the apparatus of organic life, not affecting, at least to the same extent, the brain, and act less powerfully on the cutaneous system.

We have few data on which to rely in judging of the comparative influence of the different terebinthinates; but as their most active constituent is volatile oil, we may fairly infer that those which possess the greatest liquidity, and which, in consequence, contain the largest quantity of oil, are the most powerful preparations. *Venice* and *Strasburgh Turpentines* stand in this respect pre-eminent. *Canada Balsam* is valuable on account of its purity and agreeable flavour. In activity, purity, and flavour, *Common Turpentine* holds the lowest rank.

Uses.—The terebinthinate oleo-resins are, with some exceptions, applicable for the same purposes as the volatile oil. The following are the principal cases in which they are employed:

1. *In mucous discharges from the urino-genital organs;* as gonorrhœa, gleet, leucorrhœa, and chronic cystirrhœa.
2. *In chronic catarrh, both mucous and pituitous*, occurring in old persons of a lax fibre and lymphatic temperament.
3. *In chronic mucous diarrhœa, especially when accompanied with ulceration of the mucous follicles.*
4. *In colic and other cases of obstinate constipation*, Cullen (*Treat. of the Mat. Med.*) found a turpentine emulsion used as a clyster "one of the most certain laxatives."
5. *In chronic rheumatism*, especially sciatica and lumbago, the turpentines are occasionally used.
6. *As detergents and digestives* they have been sometimes applied to indolent and ill-conditioned ulcers.

Administration.—The dose of the terebinthinate oleo-resins is from a scruple to a drachm. They are given in the form of *pill*, *emulsion*, or *electuary*. To give the softer kinds a consistence fit for making pills, liquorice powder may be added to them. Bordeaux turpentine, mixed with about one-twenty-eighth part of its weight of calcined magnesia, solidifies in about twelve hours: the acid resins of this turpentine combine with the magnesia, and form solid resinates, which absorb the volatile oil. A turpentine emulsion is made with the yolk of egg, or mucilage of gum Arabic, sugar, and some aromatic water. To form an electuary the turpentine is mixed with sugar or honey. An emulsion, containing from half an ounce to an ounce of turpentine, may be used as a clyster, in obstinate constipation, ascarides, &c.

The terebinthinate oleo-resins yield several officinal substances, and enter into several preparations:

1. Terebinthina vulgaris, L. D. yields *Oleum Terebinthinæ*, L. E. D. and *Resina*, L. E. D.; and enters into the composition of *Emplastrum Galbani*, L. and *Unguentum Elemi*, L.
2. Terebinthina veneta, E. D. is a constituent of *Emplastrum Cantharidis compositum*, E. and *Unguentum Infusi Cantharidis*, E.

3. Abietis Resina, L. Thus, D. yields *Pix Abietina*, L. (*Pix Burgundica*, E. D.); and enters into the composition of *Emplastrum Galbani*, L., *Emplastrum Opii*, L., *Emplastrum Picis*, L.; *Emplastrum Aromaticum*, D., and *Emplastrum Thuris*, D. [already described.]

2. Oleum Terebinthinæ, *L. E. D.* (U. S.)—Oil of Turpentine.

This essential oil is frequently, though erroneously, called *Spirits of Turpentine*.

Preparation.—It is obtained by submitting to distillation a mixture of American turpentine (which has been melted and strained) and water in due proportions, in the ordinary copper still, with a naked fire. The distilled product is found to consist of oil of turpentine swimming on water; the residue in the still is resin. If no water be employed a much higher temperature is required to effect the distillation, and danger is thereby incurred of causing empyreuma. Mr. Flockton, a large distiller of turpentine in this metropolis, informs me that the average quantity of oil yielded by American turpentine is from 14 to 16 per cent. He also tells me that Bordeaux turpentine yields an oil having a more disagreeable odour, and a rosin of inferior quality.

The *Dublin College* directs oil of turpentine to be prepared as follows: Take of common turpentine, *by weight*, lb. v.; Water, Oiv. [*wine measure*]. Distil the oil from a copper alembic; yellow resin will remain after the distillation.

To deprive it of all traces of resinous and acid matters, oil of turpentine should not be re-distilled from a solution of caustic potash, and this is actually done, as Mr. Flockton informs me. The British Colleges, however, direct it to be purified by distillation with water only.

The directions given by the British Colleges for the preparation of Rectified Oil of Turpentine (*Oleum Terebinthinæ purificatum*, L. E. *Oleum Terebinthinæ rectificatum*, D.) are as follows:

Take of Oil of Turpentine, Oj. [Oij. *wine measure*, D.]; Water, Oiv. [*wine measure*, D.] Let the oil cautiously distil.—The Dublin college directs a pint and a half only of the oil to be distilled.

Properties.—Pure oil of turpentine is a colourless, limpid, very inflammable fluid. It has a peculiar, and, to most persons, disagreeable odour, and a hot taste. When pure it is neutral to test paper. Its sp. gr. is 0·86 at about 70° F. It boils at about 314° F.; the density of its vapour is 4·76 (Dumas). When moist and cooled down to 1°4 F. it deposits, after a considerable time, a *crystallized hydrate* compound of C^{10} H^8 + 2 Aq. It is very slightly soluble in hydrated alcohol. Exposed to the air, it absorbs oxygen, becomes yellowish, and somewhat denser, owing to the formation of resin (*pinic and sylvic acids*). Crystals (*hexahydrate of oil of turpentine*) sometimes form in old hydrous oil of turpentine. By submitting to distillation a mixture of water and old oil, an aqueous liquid is obtained, which yields more or less of the same crystals. Nitric acid resinifies oil of turpentine: the resin, by long boiling with nitric acid, is converted into crystals of *Turpentinic Acid* C^{14} H^9 O^7 + Aq.

Oil of turpentine is composed of

	Atoms.	*Eq. Wt.*	*Per Cent.*
Carbon	10	60	88·23
Hydrogen	8	8	11·76
Oil of Turpentine	1	68	99·99

It yields two or more distinct, but probably isomeric oils. One of these (*Dadyl*, *Terebene*; *Camphilene*) forms with hydrochloric acid a crystalline compound (*Artificial Camphor*; *Hydrochlorate of Oil of Turpentine*), whose formula is C^{20} H^{17} Cl.; another (*Peucyl* or *Peucylene*) forms with the same acid a liquid compound. But as the boiling points of the two oils, called by Blanchet and Sell, *dadyl* and *peucyl*, are higher than the boiling point of the oil of turpentine, these substances ought rather to be regarded as products than educts.

Physiological Effects. *α. On Vegetables.*—Plants exposed to the vapour of this oil are rapidly destroyed. (De Candolle, *Phys. Vég.* p. 1347.)

β. On Animals.—On both vertebrated and invertebrated animals it operates as a poison. Injected into the veins of horses and dogs it excites pneumonia. (Hertwich and Gaspard; quoted by Wibmer, *Wirk. d. Arzn. u. Gifte.* Bd. iv. p. 212.) Two drachms thrown into the veins of a horse, caused trembling, reeling, falling, inclination to pass urine and stools, and frequent micturition. Inflammatory fever, with cough, continued to the 8th day; then putrid fever appeared. On the 9th day death took place. The body presented all the signs of putrid fever and pneumonia (Hertwich). Schubarth (Wibmer, *op. cit.*) found that two drachms of the rectified oil, given to a dog, caused tetanus, failure of the pulse and breathing, and death in three minutes. The skin of the horse is very sensible to the influence of oil of turpentine, which produces acute pain. "It is a remarkable circumstance," says Moiroud, (*Pharm.-Vétér.* p. 314,) "that this pain is not accompanied with any considerable hyperæmia. It is quickly produced, but it is of short duration." Oil of turpentine is sometimes employed by veterinarians as a blister, but it is inferior to cantharides, and, if frequently applied, is apt to blemish (*i. e.* to cause the hair of the part to fall off). In doses of three ounces it is a most valuable antispasmodic in the colic of horses. (Youatt, *The Horse*, in *Lib. of Useful Knowledge.*) In small doses it acts as a diuretic. Tiedemann and Gmelin (*Versuch ü. d. Wege auf welch. Subst. ins Blut gelang,*) detected oil of turpentine in the chyle of a dog and a horse, to whom this agent had been given.

γ. On Man.—In *small doses* (as six or eight drops to f℥j.) it creates a sensation of warmth in the stomach and bowels, becomes absorbed, circulates with the blood, and in this way affects the capillary vessels, and is thrown out of the system by the different excretories, on the secerning vessels of which it acts in its passage through them. The exhalations of the skin and bronchial membranes acquire a marked terebinthinate odour, while the urine obtains the smell of violets. By its influence on the renal vessels it proves diuretic. By the same kind of local influence on the cutaneous vessels it proves sudorific. It appears to have a constringing effect on the capillary vessels of the mucous membranes, for, under its use, catarrhal affections of, and hemorrhages from, these parts are frequently checked, and often are completely stopped. Its continued use sometimes brings on irritation of the urinary organs, or when this state pre-existed, it is often aggravated by the use of turpentine.

In a *medium dose* (f℥j. or f℥ij.) its effects are not constant. Dr. Ed. Percival (*Ed. Med. and Surg. Journ.* vol. ix.) saw two drachms given without any unpleasant effect being produced either on the digestive or urinary organs; they acted as an agreeable stomachic, and promoted the catamenia. Mr. Stedman, (*Edinb. Med. Essays*, vol. ii. p. 42,) on the other hand, has seen this dose produce strangury, bloody urine, suppression of this secretion, fever, thirst, and vomiting. These two cases, however, may be regardrd as the opposite extremes; and, in general, we may expect, from a medium dose, a feeling of heat in the stomach and bowels, accelerated peristaltic motion, increased frequency of pulse, diaphoresis, diuresis, and sometimes irritation of the urinary organs. Occasionally it provokes the catamenia.

In *a large* or *maximum dose* (f℥iv. to f℥ij.) its effects are not constant. It usually causes a sensation of abdominal heat, sometimes nauseates, and in general operates as a tolerably active purgative, without causing any unpleasant effects. I have given from one to two fluidounces in a considerable number of cases of tapeworm, and never saw any ill consequences therefrom. "It has been given," says Dr. Duncan, (*Edinb. Dispens.*,) "even to the extent of four ounces in one dose, without any perceptible bad effects, and scarcely more inconvenience than would follow from an equal quantity of gin." Cases are reported, however, in which it has failed to produce purging, and in such it has

acted most violently on the system, accelerating the pulse, depressing the muscular power, and giving rise to a disordered state of the intellectual functions, which several persons have compared to intoxication. A remarkable and well-detailed instance of this occurred in the person of Dr. Copland, (*Lond. Med. and Phys. Journ.* vol. 46, p. 107,) who refers the disorder of the cerebral functions, in his case, to diminished circulation of blood in the brain; while the gastric heat, &c. he ascribes to increased vascular activity in the abdominal region. The oil passed off most rapidly by the skin and lungs (principally by the latter), and the air of the apartment became strongly impregnated with its effluvia. In some cases it has caused sleepiness. Purkinje (quoted by Wibmer, *Wirk. d. Arzn.*) experienced this effect from one drachm of the oil. Dr. Duncan has sometimes seen it produce "a kind of trance, lasting twenty-four hours, without, however, any subsequent bad effect." The same writer adds, "the largest dose I have known given has been three ounces, and without injury. A scarlet eruption is mentioned by Wibmer as being produced in one case by an ounce of the oil.

Uses.—The following are the principal uses of the oil of turpentine:

1. *As an Anthelmintic.*—It is the most effectual remedy for *tapeworm* we possess. It both causes the death of, and expels the parasite from the body. To adults it should be given in doses of an ounce at least. I have frequently administered an ounce and a half, and sometimes two ounces. In no instance have I ever seen any ill effects arise from its use. Yet occasionally, as in Dr. Copland's case, it fails to purge, but becoming absorbed, operates most severely on the system, causing disorder of the cerebral functions. It is said to be more apt to act thus in persons of a full and plethoric habit. To prevent these ill consequences an oleaginous purgative should be either conjoined with it, or given at an interval of four or five hours after it. An excellent and safe method of employing it is to combine it with a castor-oil emulsion. *Chabert's empyreumatic oil* (described in vol. i. p. 374) used by Bremser (*Traité sur les Vers Intest.* p. 488) against tape-worm, consists principally of oil of turpentine. A very effectual remedy for the *small thread-worm* (*Ascaris vermicularis*) is the turpentine enema.

2. *In Blennorrhœa.*—Oil of turpentine sometimes checks or stops profuse chronic discharges from the mucous membranes. It appears to effect this by a topical influence over the capillary and secerning vessels, in its passage through them out of the system. In many cases it would appear to confine its operation to the production of an increase of tonicity in the vessels which pour out mucus; but in other instances, especially in blennorrhœa of the urinary apparatus, it seems to set up a new kind of irritation in the affected membrane, which supersedes the previously existing disease. Hence its use is not admissible in acute or recent affections of these tissues. In gonorrhœa and gleet I have frequently employed it as a substitute for balsam of copaiva with success. In leucorrhœa it has occasionally proved serviceable. In catarrhus vesicæ or cystirrhœa it now and then acts beneficially, but it requires to be used in small doses and with great caution. In chronic pulmonary catarrh, either mucous or pituitous, it is said to have been employed with advantage. In chronic diarrhœa and dysentery it has proved advantageous: in these cases it has a direct local action on the affected part, besides exerting its influence over this in common with other mucous membranes after its absorption.

3. *In Hemorrhages.*—In sanguineous exhalations, called hemorrhages, from the mucous surfaces, oil of turpentine may, under some circumstances, act efficaciously. On the same principle that it checks excessive secretion of mucus in catarrhal conditions of these tissues, so we can readily conceive it may stop the exhalation of blood. But it is only admissible in cases of a passive or atonic character, in the absence of plethora and a phlogistic diathesis. (Adair, *Med. Facts and Observ.* vol. iv. p. 25; Copland, *Lond. and Med. Phys. Journ.*

vol. xlvi. p. 194.) In purpura hæmorrhagica it has been recommended as a purgative, by Dr. Whitlock Nichol, (*Ed. Med. and Surg. Journ.* vol. xviii. p. 240,) Dr. Magee, (*Ed. Med. and Surg. Journ.* vol. xxiv. p. 307,) and others. I have seen it act injuriously in this disease, while blood-letting has seemed to relieve.

4. *In Puerperal Fever.*—The use of the oil of turpentine as a specific in this disease was introduced by Dr. Brenan, of Dublin: (*Thoughts on Puerperal Fever, and its Cure by Spirits of Turpentine:* Lond. 1814,) and strong testimonies were subsequently borne to its efficacy by several highly respectable practitioners. (*Vide* Bayle, *Bibl. Thérap.* t. iv.). Dr. Brenan gave one or two tablespoonsful of the oil, every three or four hours, in cold water, sweetened, and applied flannel soaked in oil to the abdomen. But the apparent improbability of a stimulant like turpentine curing an inflammatory disease, has prevented many practitioners placing any faith in it, or even giving it a trial. In other instances the unconquerable aversion which patients have manifested to it, has precluded its repetition. Lastly, it has failed, in the hands of some of our most accurate observers, to produce the good effects which Dr. Brenan and others have ascribed to it, and in some instances has appeared to aggravate the malady. These reasons have been conclusive against its employment, at least in the way advised by Dr. Brenan. But there are two valuable uses which may be made of turpentine, in puerperal fever: it may be given in the form of clyster, to relieve a tympanitic condition of the intestines, and for this purpose no remedy perhaps is superior to it; secondly, flannel soaked in the hot oil may be applied to the abdomen, to cause rubefaction, as a substitute for a blister, to the employment of which several objections exist.

5. *In Ordinary Fever.*—As a powerful stimulant in some forms of low fever, oil of turpentine has been well spoken of by Dr. Holst, (*Hufeland's Journ.* Bd. 20, St. 2, S. 146,) Dr. Chapman, (*Elem. of Therap.* vol. ii. p. 129, 4th ed.) Dr. Douglas, (*Dubl. Hosp. Rep.* vol. iii.,) and more recently by Dr. Wood, (*North Amer. Med. and Surg. Journ.* April, 1826.) When the skin is dry, the bowels flatulent, and ulceration of the mucous membrane suspected, it often proves most serviceable.

6. *In Rheumatism.*—In chronic rheumatism oil of turpentine has long been celebrated. Its beneficial influence depends on its stimulant and diaphoretic operation, and is more likely to be evinced in old and debilitated persons. I have found medium doses occasionally succeed when small ones had failed. But for the most part I have not met with that success with it in chronic rheumatism, to induce me to place much confidence in it. In the form of liniment it has often proved serviceable.

7. *In Sciatica and other Neuralgic affections.*—Oil of turpentine was proposed as a remedy for sciatica by Drs. Pitcairn and G. Cheyne. Its efficacy was subsequently confirmed by Dr. Home. (*Clin. Experiments.*) More recently it has been extensively employed, and with great success, in France, in sciatica as well as in various other neuralgias. (Martinet, *Lond. Med and Phys. Journ.* March, 1829; Bayle, *Bibl. Thérap.* t. iv.) But it has proved more successful in those which affect the lower extremities. My own experience does not lead me to speak very favourably of it. In a disease the pathology of which is so imperfectly understood as is that of neuralgia, it is in vain to attempt any explanation of the *methodus medendi* of an occasional remedy for it. I have known oil of turpentine now and then act most beneficially in sciatica, without giving rise to any remarkable evacuation by the bowels, skin, or kidneys, so that the relief could not be ascribed to a cathartic, a diaphoretic, or a diuretic operation.

8. *In Suppression of Urine.*—I have seen oil of turpentine succeed in reproducing the urinary secretions when other powerful diuretics had failed.

9. *In Infantile Diabetes.*—Dr. Dewees (*Treatise on the Phys. and Moral*

Treatment of Children,) has cured three cases of diabetes [?] in infants under fifteen months old, "by keeping the bowels freely open, and putting a quantity of the spirits of turpentine upon the clothes of the children, so as to keep them in a terebinthinate atmosphere."

10. *In Nephritic Diseases.*—In some diseases of the kidneys, as ulceration, the use of oil of turpentine has been much extolled. It has proved successful in renal hydatids. (Bayle *op. cit.*)

11. *In Dropsy.*—Oil of turpentine has occasionally proved serviceable in the chronic forms of this disease. (See the authorities quoted by Dr. Copland, *Lond. Med. and Phys. Journ.* vol. xlvi. p. 201.) Its efficacy depends, in part, on its derivative operation as a stimulating diuretic; and in part, as I conceive, on its powerful influence over the capillary and secerning vessels, by which it exercises a direct power of checking effusion. It is inadmissible, or is contraindicated, in dropsies accompanied with arterial excitement, or with irritation of stomach or of the urinary organs. When the effusion depends on obstruction to the return of venous blood, caused by the pressure of enlarged or indurated viscera, tumours, &c. turpentine can be of no avail. But in the atonic forms of dropsy, especially in leucophlegmatic subjects, attended with deficient secretion of the skin and kidneys, this oil is calculated to be of benefit. Dr. Copland (*op. cit.* p. 202,) has used it in the stage of turgescence, or invasion of acute hydrocephalus, as a drastic and derivative.

12. *In Spasmodic Diseases.*—Oil of turpentine has been employed successfully in the treatment of epilepsy, by Drs. Latham, Young, Ed. Percival, Lithgow, Copland, and Prichard. (Copland's *Dict. of Pract. Med.* p. 806.) No benefit can be expected from this or any other medicine, when the disease depends on organic lesion within the osseous envelopes of the nervous centres. But when the disease is what Dr. Marshall Hall terms *centripetal* or *eccentric*, (as the convulsion of infants frequently is,) that is, takes its origin in parts distant from the cerebro-spinal axis, which becomes affected only through the incident or excitor nerves, we can easily understand that benefit may be obtained by the use of agents like this, which, while it stimulates the abdominal viscera, operates as a cathartic and anthelmintic, and produces a derivative action on the head. A more extended experience of its use in chorea, hysteria, and tetanus, is requisite to enable us to speak with confidence of its efficacy in these diseases, though a few successful cases have been published.[1]

13. *In Inflammation of the Eye.*—Mr. Guthrie (*Lond. Med. Gaz.* vol. iv. p. 509,) has employed oil of turpentine in inflammation of the iris and choroid coat, on the plan recommended by Mr. Hugh Carmichael. (*Loc. cit.* vol. v. p. 836.) In some cases, especially those of an arthritic nature, it succeeded admirably, in others it was of little or no service. It was given in doses of a drachm three times a day.

14. *In Tympanites.*—To relieve flatulent distension of the stomach and bowels, and the colic thereby induced, both in infants and adults, oil of turpentine is a most valuable remedy. It should be given in full doses, so as to act as a purgative; or when, from any circumstance, it cannot be exhibited by the mouth, it may be employed in the form of clyster. Dr. Ramsbotham (*Lond. Med. Gaz.* vol. xvi. p. 118,) speaks in the highest terms of the efficacy of the oil of turpentine in the acute tympanites of the puerperal state, and thinks that most of the cases of the so-called puerperal fever, which yielded to this oil, were in fact cases of acute tympanites; and in this opinion he is supported by Dr. Marshall Hall.

15. *In obstinate Constipation.*—Dr. Kinglake, (*Lond. Med. and Phys. Journ.* vol. xlvi. p. 272,) in a case of obstinate constipation, with a tympanitic

[1] Copland, *Lond. Med. and Phys. Journ.* vol. xlvi. p. 199; Phillips, *Med. Chir. Trans.* vol. vi.; Elliotson, *Lancet*, May, 1830; Gibbon, *Lond. Med. Gaz.* vol. vii. p. 428.

condition of the intestines, found oil of turpentine a successful cathartic, after the ordinary means of treating these cases had been assiduously tried in vain. Dr. Paris (*Pharmacologia*) also speaks highly of it in obstinate constipation depending on affections of the brain.

16. *To assist the passage of Biliary Calculi.*—A mixture of three parts sulphuric ether and two parts oil of turpentine has been recommended as a solvent for biliary calculi.[1] But there is no foundation for the supposition that the relief which may be obtained by the use of this mixture in icterus and during the passage of a biliary calculus, depends on the dissolution of the latter.

17. *As an External Remedy.*—Oil of turpentine is employed externally, as a *rubefacient*, in numerous diseases, on the principle of counter-irritation, before explained (vol. i. p. 154). Thus, in the form of liniment, it is used, either hot or cold, in chronic rheumatism, sprains, sore throat, neuralgic affections of the extremities, &c. In the form of fomentation the hot oil is applied to produce redness of the skin in puerperal peritonitis, as I have already mentioned. As a powerful local *stimulant*, it was recommended by Dr. Kentish (*Essay on Burns*) as an application to burns and scalds, his object being to restore the part gradually, not suddenly, to its natural state, as in the treatment of a case of frost-bite. The practice is most successful when the local injury is accompanied with great constitutional depression. I can bear testimony to its efficacy in such cases, having employed it in several most severe and dangerous burns with the happiest results. In that form of gangrene which is not preceded by inflammation, and is called *dry* or *chronic*, oil of turpentine may occasionally prove serviceable, especially when the disease affects the toes and feet of old people. There are many other topical uses to which it has been applied; but as they are for the most part obsolete, at least in this country, I omit any further mention of them. They are fully noticed in the works of Voigtels (*Arzneimittell.* Bd. ii. S. 260), and Richter. (*Arzneimittell.* Bd. ii. S. 74.) Oil of turpentine is the principal ingredient in *Whitehead's Essence of Mustard*, which contains also camphor and a portion of the spirits of rosemary. *St. John Long's liniment* consisted of oil of turpentine and acetic acid, held in suspension by yolk of egg. (Dr. Macreight, *Lancet* for 1837-8, vol. ii. p. 485.)

Administration.—When given as a diuretic, and to affect the capillary and secerning vessels (in catarrhal affections of the mucous membranes, dropsy, suppression of urine, hemorrhage, &c.) the dose is from six or eight minims to f℥j.; as a general stimulant (in chronic rheumatism, chorea, &c.) or to produce a change in the condition of the intestinal coats (in chronic dysentery), from f℥j. to f℥ij.; as an anthelmintic (in tape-worm) or as a revulsive (in apoplexy, in epilepsy previous to an expected paroxysm, &c.) from f℥ss. to f℥ij. It may be taken floating on some aromatic water, to which some hot aromatic tincture, as *tinctura capsici*, has been added; or it may be diffused through water by the aid of mucilage or an emulsion; or it may be made into a linctus with honey or some aromatic syrup.

1. ENEMA TEREBINTHINÆ, L. E. D.; *Clyster of Turpentine.*—(Oil of turpentine, f℥j.; Yolk of Egg, q. s. "Rub them together, and add, Decoction of Barley, f℥xix. *L.*—The *Edinburgh College* substitutes plain Water for Barley Water.—The *Dublin College* directs ℥ss. of Common Turpentine to be rubbed with the Yolk of one Egg, and ten Ounces of Water, of a temperature not exceeding 100° F., to be added.)—Used as an anthelmintic in ascarides; as an antispasmodic and purgative in colic, obstinate constipation, and tympanites. Dr. Montgomery (*Observ. on the Dublin Pharmacopœia*), says, "it is much used in cases of peritoneal inflammation."

2. LINIMENTUM TEREBINTHINÆ, L. D. (U. S.); *Linimentum Terebinthinatum*, E.; *Turpentine Liniment.*—(Soft Soap, ℥ij.; Campohor, ℥j.; Oil of Tur-

[1] Durande, *Observ. sur l'Efficacité du Mélange d'Ether sulph. et d'Huile volatile de Térèb. dans Coliques hépat. produites par des Pierres Biliaires.* 1790.

pentine, f℥xvj. "Shake them together until they are mixed," *L.*—Resinous Ointment, ℥iv.; Oil of Turpentine, f℥v.; Camphor, ℥ss. "Melt the ointment, and gradually mix with it the camphor and oil, till a uniform liniment be obtained," *E.*—Ointment of White Resin, lb. j.; Oil of Turpentine, lb. ss. "Having melted the ointment, gradually mix the oil of turpentine with it," *D.*)—[The U. S. Pharmacopœia directs Oil of Turpentine, half a pint; Resin Cerate, a pound. Add the turpentine to the melted cerate and mix them.]—Introduced by Dr. Kentish (*Essay on Burns*) as a dressing for burns and scalds. The parts being first bathed with warm oil of turpentine, alcohol, or camphorated spirit, are to be covered with pledgets of lint thickly spread with this liniment. When the peculiar inflammation, excited by the fire, has subsided, milder applications are then to be resorted to. This liniment may also be used in any other cases requiring the employment of a more stimulant application than the ordinary soap liniment.

3. Resinæ Terebinthinæ.—Terebinthinate Resins.

1. *Resina*, L. E. D. (U. S.)—*Rosin, or Common Resin.*

Preparation.—This is the residue of the process for obtaining oil of turpentine. It is run, while liquid, into metallic receivers coated with whiting to prevent adhesion, and from these is ladled into wooden moulds or casts. When the distillation is not carried too far, the product contains a little water, and is termed *Yellow Rosin* (*Resina flava*). A more continued heat expels the water and produces *Transparent Rosin;* and if the process be pushed as far as it can be, without producing a complete alteration of properties, the residue acquires a deep colour, and is termed *Brown* or *Black Rosin* or *Colophony* (*Resina nigra* seu *Colophonium*). If melted rosin be run into cold water contained in shallow tanks, and a supply of cold water be kept up until the rosin has solidified, a pale yellow product is obtained, called *Flockton's Patent Rosin.*

Properties.—Rosin is compact, solid, brittle, almost odourless and tasteless, with a smooth shining fracture, becomes electric by friction, is fusible at a moderate heat, decomposable at a higher temperature, yielding among other products a volatile oil (Luscombe's *rosin oil*), and an inflammable gas (Daniell's *rosin gas*), and burning in the air with a yellow smoky flame. It is insoluble in water, but soluble in alcohol, ether, and the volatile oils. With wax and the fixed oils it unites by fusion; with the caustic alkalis it unites to form a *resinous soap* (the *alkaline resinates*, principally the *pinates*). Heated with concentrated sulphuric or nitric acid mutual decomposition takes place.

Yellow rosin is opaque and yellow, or yellowish-white. Its opacity is owing to water, with which it is incorporated. By continued fusion this is got rid of, and the rosin then becomes transparent (*transparent rosin*). *Brown rosin* or *colophony* is more or less brown and transparent.

Composition.—Rosin is a compound or mixture of *pinic acid* (principally) *colophonic acid* (variable in quantity), *sylvic acid* (a small quantity), and traces of *an indifferent resin.* (Unverdorben, in Gmelin, *Hand. d. Chim.* ii. 520.)

1. Pinic Acid.—May be regarded as an oxide of oil of turpentine. It is soluble in cold alcohol of sp. gr. 0·883. The solution forms a precipitate (*pinate of copper*) on the addition of an alcoholic solution of acetate of copper. *Pinate of magnesia* dissolves with difficulty in water. The ultimate composition of pinic acid (the essential constituent of rosin) is as follows:

	Dumas.			*Liebig.*	
	Atoms.	*Eq. Wt.*	*Per Cent.*	*Atoms.*	*Eq. Wt.*
Carbon	20	120	78·9	20	120
Hydrogen	16	16	10·5	15	15
Oxygen	2	16	10·5	2	16
Pinic Acid	1	152	99·9	1	151

2. Colophonic Acid.—(*Colopholic Acid.*)—Formed by the action of heat on pinic acid, and, therefore, the quantity of it contained in rosin varies according to the heat employed. Rosin

owes its brown colour to it. It is distinguished from pinic acid by its greater affinity for salifiable bases, and its slight solubility in alcohol. (Berzelius, *Traité de Chim.* t. v. p. 489.)

3. SYLVIC ACID.—Is distinguished from Pinic Acid by its insolubility in cold alcohol of sp. gr. 0·883. Dumas regards it as isomeric with Pinic acid. Its formula according to Trommsdorff is C^{20} H^{16} O^5. and according to Rose C^{20} H^{16} O^2.

4. INDIFFERENT RESIN.—Is soluble in cold alcohol, oil of petroleum, and oil of turpentine. It forms with magnesia a compound readily soluble in water.

PHYSIOLOGICAL EFFECTS.—Not being used internally, its effects when swallowed are scarcely known. It is probable, however, that they are of the same kinds as those of common turpentine, though very considerably slighter. In the horse it acts as a useful diuretic, in doses of five or six drachms. (Youatt, *The Horse*, in the *Libr. of Useful Knowl.*) Its local influence is mild. "It may be considered," says Dr. Maton, (Lambert's *Pinus*,) "as possessing astringency without pungency."

USE.—Powdered rosin has been applied to wounds to check hemorrhage, and is occasionally used for this purpose in veterinary practice. But the principal value of rosin is in the formation of plasters and ointments, to which it communicates great adhesiveness and some slightly-stimulant properties.

1. CERATUM RESINÆ, L. (U. S.), *Unguentum Resinosum*, E.; *Unguentum Resinæ albæ*, D., *Yellow Basilicon* or *Basilicon Ointment*, offic.—(Resin; Wax, of each, lb. j.; Olive Oil, f℥xvj. Melt the Resin and the Wax together with a slow fire; then add the Oil, and press the Cerate, while hot, through a linen cloth, *L.*—The *Edinburgh College* orders of Resin, ℥v., Axunge, ℥viij., Bees' wax, ℥ij. Melt them together with a gentle heat, and then stir the mixture briskly while it cools and concretes. [This is also the formula of the U. S. P.] —The *Dublin College* directs of Yellow Wax, lb. j., White Resin, lb. ij., prepared Hogs' Lard, lb. iv. Make an ointment, which, while hot, should be strained through a sieve).—A mildly stimulant, digestive, and detergent application to ulcers which follow burns, or which are of a foul and indolent character, and to blistered surfaces to promote a discharge.

2. EMPLASTRUM RESINÆ, L. (U. S.) *Emplastrum Resinosum*, E., *Emplastrum Lithargyri cum Resinâ*, D.—Has been already described.

2. *Pix Burgun'dica*, E. D.—*Burgundy Pitch.*

Pix abietina, *L.*—(Pix Abietis, U. S.)

PREPARATION.—True Burgundy pitch is prepared by melting common Frankincense (*Abietis resina*, L., *Thus*, D.) in hot water, and straining through a coarse cloth. By this process part of the volatile oil and the impurities are got rid of. The substance sold as Burgundy pitch in the shops is rarely prepared in this way, but is fictitious. Its principal constituent is rosin, rendered opake by the incorporation of water, and coloured by palm oil. One maker of it informed me that he prepared it from old and concrete American turpentine.

PROPERTIES.—Genuine Burgundy pitch is hard, brittle when cold, but readily taking the form of the vessel in which it is kept. It softens by the heat of the hand, and strongly adheres to the skin. Its colour is yellowish white; its odour is not disagreeable; its taste slightly bitter. Fictitious Burgundy pitch is usually of a fuller yellow colour than the genuine, and has a somewhat less agreeable odour.

COMPOSITION.—Consists of *resin* principally, and a small quantity of *volatile oil*.

PHYSIOLOGICAL EFFECTS.—Its effects are similar to those of the other terebinthate resins. In activity it holds an intermediate station between common turpentine and rosin, being considerably less active than the first, and somewhat more so than the last of these substances. Its local action is that of a mild irritant. In some persons it excites a troublesome vesiculo-pustular inflammation. (Rayer, *Treat. on Diseases of the Skin*, by Dr. Willis, p. 366.)

Uses.—It is employed as an external agent only, spread on leather, forming the well-known *Burgundy pitch plaster* (*emplastrum picis burgundicæ*), which is applied to the chest in chronic pulmonary complaints, to the loins in lumbago, to the joints in chronic articular affections, and to other parts to relieve local pains of a rheumatic character. It acts as a counter-irritant or revulsive.

EMPLASTUM PICIS, L. E. *Plaster of Pitch.*—(Burgundy Pitch, lb. ij.; Resin of the Spruce Fir, [Thus] lb. i.; Resin; Wax, of each, ℥iv.; Expressed Oil of Nutmeg, ℥j.; Olive Oil; Water, of each, f℥ij. Add first the Resin of the Spruce Fir, then the Oil of Nutmegs, the Olive Oil, and the Water, to the Pitch, Resin, and Wax, melted together. Lastly, mix them all, and boil down to a proper consistence.—*L.* The formula of the *Edinburgh College* is as follows:—Burgundy Pitch, lb. iss.; Resin and Bees' Wax, of each, ℥ij: Oil of Mace, ℥ss; Olive Oil, f℥j.; Water, f℥j. Liquefy the Pitch, Resin, and wax, with a gentle heat; add to the other articles; mix them well together, and boil till the mixture acquires a proper consistence).—Stimulant and rubefacient: used in the same cases as the simple Burgundy Pitch.

(3. *Pix Canadensis*, U. S.)

[*Canada Pitch, Hemlock Pitch. The prepared concrete juice of the Abies Canadensis. Mich.*—As a substitute for Burgundy Pitch, this article is employed in the United States, over which it has the advantage of being in a state of purity. It is the product of the

Abies Canadensis, or *Hemlock Spruce*, a large tree attaining a height of seventy or eighty feet, with a circumference of six or nine feet. The leaves are six or eight lines long, very narrow, flat, and downy at their expansion. The cones are a little larger than the leaves, oval, pendulous, and situated at the extremity of the branches.

This species of Abies is solely a native of North America, and belongs to the coldest regions of the continent, beginning to appear about Hudson's Bay. In the vicinity of Lake St. John and near Quebec, the forests are filled with it, and it is found in all the northern states. It prefers high situations, and those the most humid and gloomy.

The wood of this tree is of little value; the bark contains a large amount of tannin, and is used in the tanneries where the oak is scarce.

Hemlock resin does not flow from the bark by incision, but is invariably the result of spontaneous exudation from knots or excrescences, the heat of the sun bringing it to the surface; and it is always obtained from old trees or those approaching decay. The proportion of trees from which any resin can be procured is not more than one in a hundred. Mr. Ellis (*Journ. of Pharm.* vol. ii. p. 20,) informs us that the mode of obtaining it is as follows: "Trees are selected upon whose bark the resin is incrusted, which are easily designated by a streak of a dark brown colour on one side of the tree, from near the top to the bottom. These are cut down, and the bark, upon which the resin has hardened, stripped off and thrown into a kettle containing water, with weights placed upon it to prevent its floating. By boiling the water, the resin is melted and rises to the surface, is skimmed off, and thrown into cold water. It is then put into a coarse linen bag and submitted to a second ebullition, treating it as in the former instance, which deprives it of many of its impurities."

The quantity from good sized trees is from six to ten pounds, the average from four to five. The colour of it as it exudes is nearly white; it hardens immediately and changes to yellow, brown, and sometimes nearly black. Hemlock resin is in masses, very brittle. It is a resin in combination with a small quantity of volatile oil. It is heavier than water, sp. gr. 1·034. The odour is peculiar and unlike turpentine. To purify it, it should be melted and strained.

From its adhesiveness and stimulating properties it affords a plaster which is equal to that made with Burgundy Pitch, if not superior. It may be employed for the same purposes.—J. C.]

4. Pix Liquida and Pix Solida—Tar and Pitch.

1. *Pix Liquida*, L. E. D. (U. S.)—*Vegetable Tar.*

History.—This is the πίττα of Theophrastus, (*Hist. Plant.* lib. ix. cap. ii. and iii.) the πίσσα ὑγρα (*liquid pitch*), or κῶνος, of Dioscorides, (lib. 1, cap. xciv.) and the *pix liquida* of Pliny. (*Hist. Nat.* lib. xxiv. cap. 24, ed. Valp.)

Preparation.—The process now followed seems to be identical with that practised by the Macedonians, as described by Theophrastus. It is a kind of *distillatio per descensum* of the roots and other woody parts of old pines. As now carried on in Bothnia, it is thus described by Dr. Clarke (*Travels in Scandinavia*, part 3, p. 251; see also Duhamel, *Traité des Arbres*):—"The situation most favourable to the process is in a forest near to a marsh or bog, because the roots of the fir, from which tar is principally extracted, are always most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank or sloping hill; and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, to prevent the volatile parts from being dissipated, which, by means of a heavy wooden mallet and wooden stamper, worked separately by two men, is beaten down, and rendered as firm as possible about the wood. The stack of billets is then kindled, and a slow combustion of the fir takes place, without flame, as in working charcoal. During this combustion the tar exudes, and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged, and ready for immediate exportation."

Commerce.—Tar is brought to this country in barrels, each holding 31½ gallons: twelve barrels constitute a *last*. The quantities imported in the years 1830 and 31, were as follows (*Parliamentary Return of Imports and Exports* for 1830 and for 1831):

Countries from whence Imported.	1830.		1831.	
	Lasts.	*Barrels.*	*Lasts.*	*Barrels.*
Russia	9,675	6	7,779	6
Sweden	580	8	1,086	1
Norway	88	7	22	6
Denmark	307	7	439	9
Germany	17	6	—	—
United States of America	1,521	7	1,243	2
Isles of Guernsey, Jersey, Alderney, and Man (Foreign Goods)	14	8	1	0
Total	12,206	1	10,572	0

Properties.—It is a dark brown, viscid, semi-liquid substance, which preserves during a long period its softness. It is soluble in alcohol, ether, and the oils both fixed and volatile. Submitted to distillation, it yields an acid liquor (*pyroligneous acid*), and a volatile oil (*oil of tar*); the residue in the still is *pitch*. *Oil of tar* is brownish, and consists of oil of turpentine, impregnated with pyrogenous oil and resin.

Composition.—Vegetable tar consists of *several pyrogenous resins*, combined with *acetic acid*, of *colophony*, *oil of turpentine*, and *pyrogenous oil*. The liquidity of tar is owing to the two last-mentioned constituents, which hold the resins in solution. (Berzelius, *Traité de Chim.* t. vi. p. 680.)

Physiological Effects.—The effects of tar are analogous to those of tur-

pentine, but modified by the presence of acetic acid and the pyrogenous products. Locally it acts as a stimulant, and, when applied to chronic skin diseases and indolent ulcers, it frequently induces a salutary change in the action of the capillary and secerning vessels, evinced by the improved quality of the secretions, and the rapid healing of the sores. In such cases it is termed detergent, digestive, or cicatrisant. Swallowed, it acts as a local irritant and stimulant, becomes absorbed, and stimulates the secreting organs, especially the kidneys, on which it operates as a diuretic. Slight (Wibmer, *Wirk. d. Arzneim.* Bd. iv. S. 215,) states that a sailor swallowed a considerable quantity of liquid tar which caused vomiting, great lassitude, and violent pain in the bowels and kidneys. The urine was red, and, as well as the other evacuations, had the odour of tar. The head and the pulse were unaffected. The *vapour of tar*, inhaled, acts as a stimulant and irritant to the bronchial membrane, the secretion of which it promotes.

Uses.—Tar is rarely employed *internally*. It has, however, been administered in chronic bronchial affections, and in obstinate skin diseases.

The *inhalation of tar vapour* was recommended by Sir Alexander Crichton[1] in phthsis; but at best it proves only a palliative, and it frequently, perhaps generally, fails to act even thus, and in some cases occasions a temporary increase of cough and irritation. (Dr. Forbes' Transl. of Laennec's *Treat. on Diseases of Chest.* p. 365.) In chronic laryngeal and bronchial affections, it has more chance of doing good. (Trousseau and Pidoux, *Traité de Thérap.* t. i. p. 459.) The mode of using tar fumigation I have before described.

Applied *externally* tar is used in various forms of obstinate skin diseases, especially those which affect the scalp, lepra, &c.

Administration.—Internally, tar is administered in the form of pills made up with wheat flour, or in that of electuary, with sugar. It may be taken to the extent of several drachms daily.

1. AQUA PICIS LIQUIDÆ, D., *Tar Water*.—(Tar, Oij.; Water, Conj. j. [*wine measure*]. Mix, stirring with a stick for quarter of an hour; then, as soon as the tar subsides, strain the liquor, and keep it in well-stoppered jars).—Tar water has the colour of Madeira wine, and a sharp empyreumatic taste. It consists of water holding in solution acetic acid, and pyrogenous oil and resin. Notwithstanding the high eulogies passed on it by Bishop Berkeley,[2] tar water is now rarely employed. It is occasionally administered in chronic catarrhal and nephritic complaints, to the extent of one or two pints daily. As a wash in chronic skin diseases, especially those affecting the scalps of children, I have frequently seen it used, and sometimes with apparent benefit.

2. UNGUENTUM PICIS LIQUIDÆ, L. E. D. (U. S.); *Tar Ointment*.—(Tar, Mutton-Suet, of each, lb. j. Melt them together, and press through a linen cloth [a sieve, *D.*] The *Edinburgh College* takes of Tar ℥v., and Bees' Wax ℥ij.; melt the wax with a gentle heat, add the tar, and stir the mixture briskly, while it concretes on cooling.)—Its principal use is as an application to ring-worm of the scalp and scalled head; in which it sometimes succeeds, but more frequently fails, to cure. It is now and then applied to foul ulcers.

3. OLEUM PICIS LIQUIDÆ; *Oleum Pini rubrum; Oil of Tar*.—This is obtained by distillation from tar. It is a reddish, limpid fluid, having the odour of tar. By re-distillation it may be rendered colourless, and then becomes very similar to oil of turpentine. It is occasionally used as an application to ring-worm of the scalp and scalled head. Swallowed in a large dose it has proved fatal. (*Lancet* for 1832-3, vol. ii. p. 598; also March 8th, 1834.)

1 *Pract. Observ. on the Treatment and Cure of several varieties of Pulm. Consump. and on the Effects of the Vapour of boiling Tar in that Disease*, 1823.
2 *Siris: A Chain of Phil. Reflex. and Inq. concerning Tar Water*; a new edition. Lond. 1744.

2. *Pix ni'gra*, L.—*Black Pitch.*

(Pix arida, *E.*)

History.—This is the πίσσα ξηρὰ (*dry pitch*) of Dioscorides, (lib. i. cap. 97,) which, he says, some call παλίμπισσα (*pitch boiled again*).

Preparation.—When vegetable tar is submitted to distillation, an acid liquor (*pyroligneous acid*) and a volatile oil (*oil of tar*) pass over: the residuum in the still is *pitch* (*pix nigra*, L.)

Properties.—At ordinary temperatures it is a black solid, having a brilliant fracture. It softens at 99° F. and melts in boiling water. It dissolves in alcohol and in solutions of the alkalis and of the alkaline carbonates.

Composition.—Pitch is composed of *pyrogenous resin* and *colophony;* but principally of *pyretine*. (Berzelius, *Traité de Chim.* t. vi. p. 680.)

Physiological Effects.—Made into pills with flour or any farinaceous substance, pitch may be taken to a great extent, not only without injury, but with advantage to the general health. It affords one of the most effectual means of controlling the languid circulation, and the inert and arid condition of the skin. (Bateman, *Synopsis of Cutaneous Diseases*, p. 53, 6th ed.) As a local remedy it possesses great adhesiveness, and when applied to wounds and ulcers acts as a stimulant and digestive.

Uses.—Bateman (*op. cit.*) speaks favourably of the internal use of pitch in *ichthyosis*. It has been employed also in other obstinate skin diseases. But the principal use of pitch is in the form of ointment, as an application to cutaneous affections of the scalp.

Administration.—Dose from grs. x. to 3j. made into pills with flour. The unpleasant pitchy flavour of the pills is materially diminished by keeping them for some time.

UNGUENTUM PICIS NIGRÆ, L.; *Unguentum Basilicum nigrum* vel *Tetrapharmacum*.—(Black Pitch, Wax, Resin, of each ℥ix.; Olive Oil, f℥xvj. Melt them together, and press through a linen cloth).—Stimulant and digestive; used in the obstinate cutaneous eruptions of the scalp. (Vide *Unguentum Picis liquidæ*.)

4. JUNIP'ERUS COMMU'NIS, *Linn.* L. E. D.—COMMON JUNIPER.

Sex. Syst. Diœcia, Monadelphia.

(Cacumina; Fructus, *L.* Cacumina; Fructus; Oleum, *E.* Cacumina; Baccæ, *D.*)

(Juniperus, U. S. Fruit.)

History.—It is very questionable whether this shrub is mentioned in the Old Testament, though its name occurs in several places. (*Job*, ch. xxx. v. 4; 1 *Kings*, ch. xix. v. 4, in our translation.) The fruit, called by the Greeks ἀρκευθίς, and used by Hippocrates in some disorders of females, was the produce of a species of *Juniperus:* either *J. communis*, which Dr. Sibthorp (*Prod. Fl. Græcæ*) found growing on Olympus and Athos; or *J. phœnicia*, which is very common in Greece and the islands of the Archipelago, and whose fruit is yellowish, but has the size, form, and powers of that of the common juniper.

Botany. **Gen. Char.**—*Diœcious*, rarely *monœcious*. Males:—*Catkins* ovate; the *scales* verticillate, peltato-pedicellate. *Anthers* four to eight, unilocular. Females:—*Catkins* globose; the three concave scales united. *Stigma* gaping. *Galbulus*, composed of the united and fleshy scales, and containing three triquetrous, osseous *seeds*.

Sp. Char.—*Leaves* three in a whorl, mucronate, spreading or imbricated, longer than the galbulus.

A bushy *shrub*. *Leaves* evergreen, numerous, linear, pungent, glaucous on the upper side, dark green beneath. *Flowers* axillary, sessile, small; the *males* discharging a copious cloud of yellow pollen; *females* green, on scaly stalks. *Fruit* commonly called *a berry*, but is in reality that kind of cone called by

botanists a *galbulus*, which has fleshy, coalescent carpella, whose heads are much enlarged. It requires two seasons to arrive at maturity.

Two varieties (some botanists consider them to be distinct species) are described.

α. *J. communis*, Smith.—*Stem* erect. *Leaves* spreading. *Fruit* scarcely more than half the length of the leaves.

β. *J. nana*, Smith.—*Stem* procumbent. *Leaves* imbricated. *Fruit* nearly as long as the leaves.

Hab.—North of Europe. Indigenous, growing on hills and heathy downs, especially where the soil is chalky. It flowers in May.

Description.—In this country the *fruit* and *tops*, on the continent the *wood* also are officinal.

Juniper berries (*baccæ juniperi*), as the dried fruit of the shops is commonly termed, are about the size of a pea, of a blackish-purple colour, covered by a glaucous bloom. They are marked—superiorly, with a triradiate groove, indicating the adhesion of the succulent carpella—inferiorly with the bracteal scales, which assume a stellate form. They contain three seeds. Their taste is sweetish, with a terebinthinate flavour; their odour is agreeable and balsamic.

Juniper tops (*cacumina* seu *summitates juniperi*) have a bitter, terebinthinate flavour, and a balsamic odour.

Juniper wood (*lignum juniperi*) is obtained either from the stem or root; it evolves a balsamic odour in burning, and, by distillation with water, yields volatile oil. On old stems there is sometimes found a resinous substance (*resina juniperi; sandaraca germanica*).

Commerce.—Juniper berries are imported in bags and barrels from Rotterdam, Hamburgh, Leghorn, Trieste, and other European ports. In 1838, duty (2s. *per cwt.*) was paid on 5896 *cwts.*

Composition.—Juniper berries were analyzed in 1822 by Trommsdorff, (Gmelin's *Handb. d. Chem.* ii. 1330,) and in 1831 by Nicolet. (Thomson's *Org. Chem.* p. 899.) Trommsdorff obtained *volatile oil* 1·0, *wax* 4·0, *resin* 10·0, *a peculiar species of sugar with acetate and malate of lime* 33·8, *gum with salts of potash and lime* 7·0, *lignin* 35·0, *water* 12·9 (*excess* 3·7).

1. Oil of Juniper (see p. 181).
2. Resin.—Is green, according to Trommsdorff. Nicolet obtained it in the crystallized state, and found it to consist of C^5 H^2 O^1.
3. Wax.—Is brittle. Consists, according to Nicolet, of C^{13} $H^{5\frac{1}{2}}$ O^4.
4. Sugar.—Is crystallizable, and analogous to grape sugar, according to Trommsdorff. But Nicolet describes it as being like molasses.

Physiological Effects.—Juniper berries and tops are analogous in their operation to the terebinthinate substances. Three ounces of the berries act on the larger herbivorous animals as a diuretic. (Moiroud, *Pharm. Vêtér.*) On man, also, these fruits operate on the urinary organs, promoting the secretion of urine, to which they communicate a violet odour. (Cargillus, in Ray. *Hist. Plant.* t. ii. p. 1412.) In large doses they occasion irritation of the bladder, and heat in the urinary passages. Piso (Murray, *App. Med.*) says, their continued use causes bloody urine. They promote sweat, relieve flatulency, and provoke the catamenia. Their activity is principally dependent on the volatile oil which they contain; and which, according to Mr. Alexander's experiments, (*Experimental Essays*, p. 149, 1768,) is, in doses of four drops, the most powerful of all the diuretics. (See his *Table*, at p. 97, vol. i.)

Uses.—Juniper berries or oil are but little used in medicine. They may be employed either alone or as adjuncts to other diuretic medicines, *in dropsical disorders* indicating the employment of renal stimuli. Van Swieten (*Commentaries* Eng. ed. 12mo. vol. xii. p. 431,) speaks favourably of their use in mild cases of ascites and anasarca. *In some affections of the urino-genital apparatus*, juniper may be employed with advantage. Thus, in mucous discharges (as gonorrhœa, gleet, leucorrhœa, and cystirrhœa), it may be used under the

same regulations that govern the employment of copaiva and the terebinthinates. Hecker (*Anweisung d. vener. Krankh.* quoted by Voigtels, *Arzneim.* Bd. 2, Abt. 2, S. 510,) praised it in the first stage of gonorrhœa.

Juniper has been advised in some other diseases; but I do not think it necessary to enumerate them.[1]

ADMINISTRATION.—The dose of the *berries* is one or two drachms, triturated with sugar. The *infusion* (prepared with an ounce of the berries and a pint of boiling water) is a more convenient mode of exhibition: the dose is f℥iv. every four hours.

1. OLEUM JUNIPERI, L. E. D.; *Oil of Juniper.*—It is obtained by submitting the fruit, tops, or wood, to distillation with water. The full-grown green fruit yields more than the ripe fruit; for, in the act of ripening, a portion of the oil becomes converted into resin. It is limpid, transparent, nearly colourless, and lighter than water. It has the odour of the fruit, and an aromatic, balsamic taste. It dissolves with difficulty in alcohol. According to Blanchet, it consists of two isomeric oils: one colourless, and more volatile; a second coloured, and less volatile. Both, when agitated with a solution of salt, form crystalline hydrates. The composition of oil of juniper is analogous to that of oil of turpentine, being C^{10} H^8.

The oil is, perhaps, the best form for exhibiting juniper. The dose is two to six drops, either in the form of pill, or diffused through water by the aid of sugar and mucilage.

2. SPIRITUS JUNIPERI COMPOSITUS, L. E. D.; *Compound Spirit of Juniper.*—(Juniper berries, bruised, ℥xv. [lb. j. *E. D.*]; Caraway, bruised; Fennel, bruised, of each ℥ ij. [℥iss. *E. D.*]; Proof Spirit, Cong. j. [Ovij. *E.*]; Water, Oij. [as much as may be convenient, *D.*] Mix; then, with a slow fire, let a gallon distil, *L.*—The *Edinburgh* and *Dublin* Colleges order the fruit to be macerated in the spirit [for two days, *E.*; for twenty-four hours, *D.*], the water then added, and [seven pints, *E.*, a gallon, *D.* of] the spirit distilled).—This preparation, when sweetened, may be regarded as an officinal substitute for *genuine Hollands* and *English Gin* (see vol. i. p. 324), both of which compounds are flavoured with juniper. It is used as an adjunct to diuretic mixtures. The dose is f℥ij to f℥iv.

5. JUNIP'ERUS SABI'NA, *Linn.* L. E. D.—COMMON SAVIN.

Sex. Syst. Diœcia, Monadelphia.

(Cacumina recentia et exsiccata, *L.*; Tops, E.; Folia, *D.*)

(Sabina, U. S.)

HISTORY.—This is the βράθυς of Dioscorides, (lib. i. cap. 104,) the *sabina* of Pliny. (*Hist. Nat.* lib. xxiv. cap. 61, ed. Valp.) Both these writers notice the two varieties of this plant.

BOTANY. **Gen. Char.**—Vide *Juniperus communis.*

Sp. Char.—*Leaves* ovate, convex, densely imbricated, erect, decurrent, opposite; the oppositions pyxidate. (*Bot. Gall.*)

A small, bushy *shrub.* *Branches* closely inverted by the very small, glandular *leaves.* *Galbulus* round, purple, somewhat smaller than that of Juniper communis.

Two varieties are distinguished (Nees and Eberm. *Handb. der Med. pharm. Botan.*):

α. J. Sabina cupressina.—*Leaves* acute, more spreading, three lines long.
β. J. Sabina tamariscifolia.—*Leaves* shorter, almost appressed and obtuse.

Hab.—Midland and southern parts of Europe; Asiatic Russia. Cultivated in gardens in this country. Flowers in April.

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1 Consult on this subject, Vogt. *Lehrb. d. Pharmakodyn.*; Richter, *Arzneimittell*; and Sundelin, *Spec. Heilmittell.*

Description.—The officinal parts of the plant are the *tops* (*cacumina; summitates*), which consist of the young branches with their attached leaves. They have, in the fresh state (*cacumina recentia*), a strong, peculiar, heavy odour, especially when rubbed; and a nauseous, resinous, and bitter taste. The dried tops (*cacumina exsiccata*) are yellowish green, and less odorous than the fresh ones.

Composition.—Some experiments on the composition of savin were made by Berlisky. (Trommsdorff's *Journ.* viii. 1, 94.) In 1837 an analysis of this plant was made by a young chemist of the name of Gardes. (*Journ. de Chim. Méd.* t. iii. p. 331, 2nde Sér.) The constituents are, *Volatile oil*, *Resin*, *Gallic acid*, *Chlorophylle*, *Extractive*, *Lignin*, and *Salts of Lime*.

Oil of Savin, (see p. 183.)

Chemical Characteristics.—An aqueous infusion of savin is yellowish, has the odour and bitter taste of the herb, and forms a soluble green compound (*gallate? of iron*) on the addition of sesquichloride of iron, but is unchanged by a solution of gelatin. Oxalate of ammonia causes, in the infusion, a white precipitate (*oxalate of lime*). Alcohol acquires a green colour when digested with the tops; on the addition of water to the alcoholic tincture some *resin* is separated. By distillation with water, both the fresh and dried tops (but especially the first) yield *volatile oil*.

Physiological Effects, *α. On Animals.*—Savin acts on animals as an acrid poison. Orfila (*Toxicol Gén.*) applied two drachms of the powder to an incised wound in the leg of a dog; inflammation and infiltration of the limb took place, and death occurred in about thirty-six hours. Four drachms introduced into the stomach of a dog, and the œsophagus tied, caused death in thirteen hours; the stomach was bright red, and the rectum a little inflamed. Orfila infers that its effects depend principally on its absorption, and its action on the nervous system, the rectum, and the stomach. A drachm of *oil of savin* was given by Hillefield (Wibmer, *Wirk. d. Arzneim u. Gifte.* Bd. iii. H. 1, p. 191,) to a cat. It caused a flow of saliva, anxiety, frequent discharge of urine, dulness, trembling, and, in an hour and a quarter, bloody urine. The animal having been strangled, the bladder was found contracted, with some coagulated blood contained in its cavity.

β. On Man.—Oil of savin, the active principle of the herb is a powerful local irritant. When appiied to the skin, it acts as a rubefacient and vesicant. On wounds and ulcers, its operation is that of an acrid (not chemical) caustic. Swallowed in large doses, it occasions vomiting, purging, and other symptoms of gastro-intestinal inflammation. In its operation on the system generally, it is powerfully stimulant. "Savin," says Sundelin, (*Heilmittellehre*, Bd. ii. S. 180, Auf. 3^{tte},) "operates not merely as irritants generally do, as a stimulant to the arterial system, but it also eminently heightens the vitality of the venous system, the circulation in which it quickens. It next powerfully stimulates the absorbing vessels and glands, the serous, the fibrous, and the mucous membranes, and the skin. It operates as a specific excitant and irritant on the kidneys, and yet more obviously on the uterus. The increased secretion of bile and the augmented volume of the liver, both of which conditions have sometimes been observed after the copious and long-continued use of savin, appear to be connected with its action on the venous system." Mohrenheim (Murray, *App. Med.* vol. i. p. 59,) mentions the case of a woman, 30 years of age, who swallowed an infusion of savin to occasion abortion. Violent and incessant vomiting was induced. After some days she experienced excruciating pains, which were followed by abortion, dreadful hemmorrhage from the uterus, and death. On examination, the gall-bladder was found ruptured, the bile effused in the abdomen, and the intestines inflamed. The popular notion of its tendency to cause abortion, leads, on many occasions, to the improper use of savin; and the above is not a solitary

instance of the fatal consequences thereof. A fatal case of its use as an emmenagogue is recorded by Dr. Dewees. (*Compend. Syst. of Midwifery*, pp. 133-4.) That it may frequently fail to provoke premature labour is shown by the case, related by Fodéré, (*Méd. Lég.*) of a woman, who, in order to produce abortion, took every morning, for twenty days, one hundred drops of this oil, and yet went her full time, and brought forth a living child. It ought to be well known that in those cases in which it may succeed in causing miscarriage, it can only de so at the risk of the woman's life. Vogt (*Pharmakodyn,*) says, that it has a tendency to induce an apoplectic state in the fœtus. The emenagogue power of savin is fully established. Perhaps the observations of Home (*Clinical Experiments*, p. 419,) are the most satisfactory of any on this subject, confirmed as they are by the reports of many other accurate observers.

Uses.—Savin is not much used internally; but in cases of amenorrhœa and chlorosis, depending on or accompanied by a torpid condition or deficient action of the uterine vessels, it may be given as a powerful uterine stimulant. In such cases it proves a most efficient remedy. According to my own observation, it is the most certain and powerful emmenagogue of the whole materia medica. My experience of it therefore, confirms the statements of Home. (*Clinical Experiments.*) Though I have employed it in numerous cases, I never saw any ill effects result from its administration. Of course its use is contra-indicated where irritation of the uterus, or indeed of any of the pelvic viscera, exists.

In chronic rheumatism, with a languid circulation in the extreme vessels, Chapman (*Elem. of Therap.*) speaks in very high terms of it. It has been used as an anthelmintic.

As a topical agent, savin is frequently employed, mostly in the form of the cerate, to make *perpetual blisters*. Equal parts of savin and verdigris, in powder, form one of the most efficacious applications for the removal of venereal warts. The powder, an infusion, or the expressed juice of the plant, is occasionally applied to warts, to old and indolent ulcers, and in cases of psora and tinea.

Administration.—By drying, savin loses part of its volatile oil, and hence the *powder* is not the best preparation of it. It is, however, sometimes given in doses of from five to fifteen grains. A *decoction* and *extract* are also objectionable preparations, on account of the heat employed in making them. An *infusion* may be prepared by digesting 3i. of the fresh herb in f℥viii. of boiling water: the dose is one or two tablespoonsful. The *oil* is by far the most convenient and certain preparation of savin, and is the one which I always employ. A *conserve* of the fresh leaves is sometimes used.

1. OLEUM SABINÆ, E. D. (U. S.); *Oil of Savin.*—This is obtained by submitting the fresh tops to distillation with water. It is a limpid, almost colourless liquid, having the unpleasant odour of the plant, and a bitter, acrid taste. Its sp. gr. is 0·915. Its composition is analogous to that of oil of turpentine, being $C^{10}H^8$. The dose, as an emmenagogue, is from two to six drops, diffused in a mucilaginous or oleaginous mixture.

2. CERATUM SABINÆ, L. E. (U. S.); *Unguentum Sabine*, D., *Savin Ointment.*—(Savin [fresh, *E.*; the leaves stripped from their stalks, *D.*], bruised, lb. i. [lb. ss., *D.*]; Wax, lb. ss.; Lard, lbs. ii. Mix the savin in the lard and wax melted together, then press through a linen cloth. The *Edinburgh* and *Dublin* colleges boil them [in the lard only, *D.*] together, until the leaves are crisp).—The boiling is considered objectionable on account of the loss of a portion of the oil. The colour of this cerate should be fine green, and its odour that of the plant. [The U. S. Pharmacopœia directs Savine, in powder, two ounces; Resin Cerate, a pound. Mix the savine with the cerate previously softened.] Savin cerate is used as a dressing to blistered surfaces, to produce what is termed a *perpetual blister*. It is preferred to the ceratum cantharidis as being less acrid, and not liable to cause strangury. It is sometimes applied to seton tapes, to increase the discharge from setons.

ANTIDOTES.—In a case of poisoning by savin herb or its oil, the first indication is to remove the poison from the stomach and bowels. Opiates and demulcent drinks should then be given. The warm bath may be advantageously employed. Blood-letting should be resorted to, if the inflammatory symptoms indicate, and the condition of system permit it.

OTHER MEDICINAL PRODUCTS OF CONIFERÆ.

1. GEMMÆ SEU TURIONES ABIETIS.—The leaf-buds of the Norway Spruce Fir (*Abies excelsa*), as well as of the Silver Fir (*Abies Picea*), are used on the continent, in the form of decoction or beer; or, with the woods of guaiacum and sassafras, and juniper berries, in the form of tincture (*tinctura pini composita*, Ph. Bor.) They are employed in scorbutic, rheumatic, and gouty complaints.

2. ESSENTIA ABIETIS.—*Essence of Spruce* is prepared by boiling the young tops of some coniferous plant (in America, those of *Abies nigra*, or *Black Spruce*, are used) in water, and concentrating the decoction by evaporation. "It is a thick liquid, having the colour and consistence of molasses, with a bitterish, acidulous, astringent taste." (*United States Dispensatory.*) It is used in the preparation of spruce beer.

3. CEREVISIA ABIETIS.—*Spruce Beer* is thus prepared:—"Take of Essence of Spruce, *half a pint;* Pimento, bruised; Ginger, bruised; Hops, of each, *four ounces;* Water, *three gallons.* Boil for five or ten minutes; then strain, and add, of warm water, *eleven gallons;* Yeast, *a pint;* Molasses, *six pints.* Mix, and allow the mixture to ferment for twenty hours." (*United States Dispensatory.*) It is sometimes taken as an agreeable and wholesome drink in summer. It is diuretic and anti-scorbutic, and is, in consequence, employed in long sea-voyages as a preventive of scurvy.

4. JUNIPERUS VIRGINIANA, Linn., the *Red Cedar* (the wood of which is used for black-lead pencils) is used in the United States as a substitute for savin.

5. SANDARACH or JUNIPER RESIN.—The resin called *sandarach* (*sandaraca*), or *gum juniper* (*gummi juniperi*), is imported from Mogadore. It is the produce of *Callitris quadrivalvis*, Vent. (*Thuja articulata*, Desf.) Though sold by chemists and apothecaries, it is not employed in medicine. It is used in the manufacture of varnishes. Its powder is *pounce.*

6. The fruit of the Common Yew, TAXUS BACCATA, is poisonous. In one case (that of a child) it caused vomiting, convulsions, purple lips, dilated pupil, and death in less than four hours. (*Lancet*, Dec. 10, 1836.)

ORDER XXIII.—BALSAMACEÆ, *Lindley.*—THE LIQUIDAMBAR TRIBE.

BALSAMIFLUÆ, *Blume.*

Though this order yields no officinal substance contained in the British pharmacopœias, yet the two balsamic oleo-resins, *liquidambar* and *liquid storax* (especially the latter) are frequently met with in the shops, and, therefore, require to be noticed.

1. BALSAM OF LIQUIDAMBAR (*Balsamum Liquidambar*, T. W. C. Martius; *Liquidambar*, Guibourt; *Copalm balsam*).—This is procured in Mexico and Louisiana by making incisions into the stem of *Liquidambar Styraciflua.* The *liquid balsam* (*fluid liquidambar*, or *oil of liquidambar*, Guib.) is transparent, amber-yellow, has the consistence of a thick oil, a balsamic odour, and an aromatic, acrid, bitter taste. The *solid balsam* (*soft* or *white liquidambar*, Guibourt; *white balsam of Peru*, Auctor.) is a soft, almost opake, solid, very similar in appearance to concrete turpentine. Its odour is similar to, though weaker, than the liquid balsam. Its taste is balsamic and sweetish. Bonastre analyzed a very fluid sample, recently received from America, and found it to consist of—*Volatile oil* 7·0, *semi-concrete matter* 11·1, *benzoic acid* 1·0, *crystalline matter soluble in water and alcohol* 5·3, *yellow colouring matter* 2·05, *oleo-resin* 49·0, *styracin* 24·0, loss 0·55. The volatile oil consists, according to Henry, of C^{10} H^{7}. Styracin is a fusible, crystalline substance, soluble in boiling alcohol, and composed, according to Henry, of C^{11} H^{5} O^{2}. The effects and uses of liquidambar are similar to those of other balsamic substances. The dose of it is from ten to twenty grains.

2. LIQUID BALSAM OF STORAX (*Styrax liquidus*, officin).—This is said to be procured from the *Liquidambar Altingia*, Blume, (*Altingia excelsa*, Noronha), a native of Java, where it is called *Ras-sama-la* (*Rasamalla* or *Rosa-mallas*, Auct.) But on referring to the books of a wholesale druggist, I find that all the storax (liquid and solid), which has been imported into this country during the last seven years, came from Trieste; and from this circumstance Dr. Lindley, suspects that the liquid storax of the shops is the produce of *Liquidambar orientale*, a native of Cyprus, and other parts of the east of Europe; but there is no reason to believe that liquid storax is obtained in Europe. Petiver (*Phil. Trans.* vol. xxvi. p. 44) says, that the tree which yields it is the *Rosa mallus*, and grows in Cobross, an island at the upper end of the Red Sea, near Cadess, which is three days' journey from Suez. The bark of this tree is re-

moved annually, and boiled in salt water until "it comes to a consistence like birdlime;" it is then separated, put in barrels (each holding 420 lbs.), and sent to Mocha, by way of Judda. Under the name of *storax*, I have met with two liquids:

α. A pellucid liquid, having the consistence and tenacity of Venice turpentine, a brownish yellow colour, a sweetish storax-like odour, different to that of liquidambar. A few particles of bran or saw-dust are intermixed with it. It was sold to me as *balsam* or *balsam storax*, and I was informed that it had been imported in jars, each holding 14 lbs. It agrees with the *pure* or *fine liquid storax* of Hill, the *styrax liquida finissima* of Alston. Professor Guibourt, to whom I sent a sample, regards it as a balsam of liquidambar, somewhat thickened by age.

β. The second kind is the *common liquid storax* of the shops; the *impure* or *coarse liquid storax* of Hill; and doubtless is the variety referred to by Petiver. It is imported in casks, holding about 4 cwt. each. It is opaque, of a gray colour, has the consistence of birdlime, and the odour of storax, but frequently intermixed with an odour of naphtha. The substance met with in the shops and sold to perfumers under the name *Strained Storax* (*Styrax colatus*) is prepared from this variety of liquid storax, by heating it until the water is evaporated, and then straining it. During the process it evolves a very fragrant odour. The impurities are stones, sand, &c. No complete analysis of liquid storax has been made. The following substances, however, are contained in it:—*Volatile oil, benzoic acid, resin, styracin, matter soluble in boiling alcohol* (wax?) *fragments of bark, and earthy matter. Oil of Storax* consists of C^2 H, or some multiple of this. *Styracin* is a crystallizable resin, composed of C^{24} H^{11} O^2. The effects and uses of liquid storax are similar to those of other balsamic substances (vide vol. i. p. 201). Its dose is from ℈i. to ʒi.

Order XXIV.—SALICACEÆ, *Lindley*.—THE WILLOW TRIBE.

SALICINEÆ, *Richard*.

Essential Character.—*Flowers* unisexual, either monœcious or diœcious, amentaceous. *Stamens* distinct or monadelphous; *anthers* two-celled. *Ovary* superior, one or two-celled; *ovules* numerous, erect, at the base of the cell, or adhering to the lower part of the sides; *style* one or none; *stigmas* two. *Fruit* coriaceous, one or two-celled, two-valved, many-seeded. *Seeds* either adhering to the lower part of the axis of each valve, or to the base of the cell, comose; *albumen* none; *embryo* erect; *radicle* inferior.—*Trees* or *shrubs*. *Leaves* alternate, simple, with deliquescent primary veins, and frequently with glands; *stipules* deciduous or persistent. (Lindley).

Properties.—The astringency possessed by most willow barks is referrible to tannic acid. The bitterness and tonic properties depend on salicine, populine, or some uncrystallizable principle.

SA'LIX, *Linn*.—WILLOW.

Salix Caprea, *E. D.*, and S. fragilis and S. alba, *D.*

Sex. Syst., Diœcia, Diandria.

(Cortex e speciebus salicis diversis: cortex salicis, *offic.*)

History.—Dioscorides (lib. i. cap. 136,) speaks of the astringent qualities of the Ἰτέα, or Willow (*? Salix alba*), which was employed in medicine by the ancients. For a long series of years it fell into disuse, but was again brought into notice in 1763 by the Rev. Mr. Stone, (*Phil. Trans.* vol. liii. p. 195,) who published a paper on the efficacy of the bark of *Salix alba*, as a remedy for agues.

Botany. **Gen. Char.**—*Flowers* diœcious, or rarely monœcious, amentaceous; *scales* imbricated: a *gland* surrounding the stamens or ovary. Males:—*Stamens* two to five, usually two, sometimes the two united into one, and then the anther is four-celled. Females:—*Seeds* comose; the *radicle* inferior. (*Bot. Gall.*)

Species.—Sir J. E. Smith (*Engl. Flora*, iv.) mentions sixty-four indigenous species of Salix; but pharmacological and botanical writers are not agreed as to which species possesses the most medicinal power. The best practical rule to follow is this:—Select those whose barks possess great bitterness, combined with astringency. The following are those which are in the greatest repute:

1. Sa'lix Russellia'na, Smith; *the Bedford Willow*.—*Leaves* lanceolate, tapering at each end, serrated throughout, very smooth. *Footstalks* glandular or leafy. *Germen* tapering, stalked, longer than the scales. *Style* as long as the stigmas (Smith).—A *tree*. In marshy woods, wet meadows, &c., in various parts of Britain. Flowers in April and May. Its bark abounds in tannic acid. On account of its astringency, Sir J. E. Smith regards it as the most valuable

officinal species; and he observes, that if it has occasionally disappointed medical practitioners, they probably chanced in such cases to give the *S. fragilis*.

2. Sa'lix al'ba, Linn. D.; *the Common White Willow.*—*Leaves* elliptic-lanceolate, pointed, serrated, silky on both sides; the lowest serratures glandular. *Stamens* hairy. *Germen* smooth, almost sessile. *Stigmas* deeply cloven. *Scales* rounded (Smith).—A tall *tree*. River-sides, moist woods, &c., in various parts of Britain. Flowers in May. Its bark, called *cortex salignum* or *cortex anglicanum* of some writers, is astringent, but less so than that of the preceding species.

3. Sa'lix Ca'prea, Linn. E. D.; *Great Round-leaved Willow.*—*Stem* erect. *Leaves* roundish-ovate, pointed, serrated, waved; pale and downy beneath. *Stipules* somewhat crescent-shaped. *Catkins* oval. *Germen* stalked, ovate, silky. *Stigmas* nearly sessile, undivided. *Capsules* swelling (Smith).—A *tree*. Indigenous, very common; growing in woods and hedges. Flowers in April.

4. Sa'lix frag'ilis, Linn. D.; *The Crack Willow.*—*Leaves* ovate-lanceolate, pointed, serrated throughout, very smooth. *Footstalks* glandular. *Germen* ovate, abrupt, nearly sessile, smooth. *Scales* oblong, about equal to the stamens and pistils. *Stigmas* cloven, longer than the style (Smith).—A *tree*. Indigenous: about the banks of rivers. Flowers in April and May.

5. Sa'lix pentan'dra, Linn.; *Sweet Bay-leaved Willow.*—This species is officinal in the Prussian Pharmacopœia, and is preferred by Nees Von Esenbeck to all other species. Its bark is the *cortex salicis laureæ* of some pharmacologists.

6. Sa'lix purpu'rea, Linn.; *Bitter Purple Willow.*—This species deserves notice on account of the intense bitterness of its bark.

Description.—Willow bark (*cortex salicis*) varies, in its appearance and qualities, according to the species and the age of the tree from which it is procured. In the dried state, it is usually quilled and odourless. It should have a bitter and astringent taste.

Composition.—The bark of *Salix alba* was analyzed by MM. Pelletier and Caventou, (*Journ. de Pharm.* t. vii. p. 123,) who obtained the following results:—*Bitter yellow colouring matter*, *green fatty matter*, similar to that found in cinchona, *tannin*, *resinous extract*, *gum*, *wax*, *woody fibre*, and a *magnesian salt*, containing an organic acid.

These celebrated chemists failed to isolate *salicin*, which must have been contained in their bitter yellow colouring matter, either mixed or combined with some other matter. Their resinous extract is probably identical with what Braconnot calls *corticin*.

1. Tannic Acid.—This is the astringent principle of willow bark. Sir H. Davy (*Elem. of Agricult. Chem.* p. 83, 4th. ed.) gives the following as the quantities of tannin [impure tannic acid], in the bark of two willows:

	480 lbs. of bark.	lbs. of tannin.
Leicestershire Willow	[*Salix Russelliana*] large size	33
Common Willow	[*Salix* ——?] large	11

2. Salicin.—See p. 187.

Chemical Characteristics.—A decoction of the bark, made with distilled water, is coloured dark green (*tannate of iron*) by sesquichloride of iron; but, made with spring water, dark purple. Solution of gelatin produces a precipitate (*tannate of gelatin*) in the decoction; but tincture of nutgalls causes no turbidness. A strong decoction of willow bark, containing much salicin, is reddened by concentrated sulphuric acid.

Physiological Effects.—Willow bark possesses both bitterness and astringency. It belongs, therefore, to the *astringent tonics*, whose effects have been already noticed (vol. i. p. 189). It is less apt to disturb the stomach than cinchona, but its tonic and febrifuge powers are less than the latter. Vogt (*Pharmakodynamik*, Bd. 1, S. 658,) ascribes to it balsamic properties.

Uses.—It has been employed as an indigenous substitute for cinchona. The indications for its use, therefore, are the same as those for the latter. It is given in intermittents, dyspeptic complaints accompanied with, or dependent on, a debilitated condition of the digestive organs, passive hemorrhages, chronic mucous discharges, in the stage of convalescence after fever, and as an anthelmintic. As a local astringent, the powder or infusion is sometimes employed; but there are many more efficient remedies of this kind.

Administration.—The dose of the *powder* is 3ss. to 3i. The *infusion* or *decoction* (prepared with 3j. of the bark, and Oj. of water) may be given in doses of from f3j. to f3iij.

SALICIN.—Discovered by Buchner (*Journ. de Pharm.* xvi. 242,) in 1828. Has been found in about fourteen species of *Salix* and eight species of *Populus*. (Herberger, *Pharmaceutisches Central-Blatt für* 1838, S. 848.) It has been detected in the bark, leaves, and flowers. Herberger obtained 250 grs., Merck 251 grs., from 16 ounces of the bark and young twigs of *Salix Helix*: Erdmann, however, procured, by another process, 300 grs. from the bark of *Salix pentandra*. (Herberger, *Pharmuceutisches Central-Blatt. für* 1838, S. 752.) Merck's process for obtaining it, as stated by Liebig, (Turner's *Chemistry*, 7th ed. p. 816,) is as follows:

"Dried or fresh willow bark is cut small, and exhausted by repeated boiling with water. The decoctions are concentrated, and while boiling treated with litharge till the liquor appears nearly colourless. The dissolved oxide of lead is removed, first by sulphuric acid, afterwards by sulphuret of barium, and, after the separation of sulphuret of lead, evaporated, when salicin crystalizes; and is purified by repeated solution and crystallization (Merck). From willow bark, which is fresh and rich in salicin, it may be obtained by cautious evaporation of the cold aqueous infusion (Merck). The oxide of lead removes from the solution gum, tannin, and extractive matter, which would impede the crystallization of the salicin. It also combines with the salicin, forming a kind of salt, which is decomposed by the sulphuric acid and sulphuret of barium. If the latter be carefully added, neither sulphuric acid nor baryta remain in the solution; and the sulphuret of lead, which separates, acts as a decolourizing agent."

Salicin crystallizes in silky needles and laminæ. It is white, very bitter, inodorous, neutral to vegetable colours, fusible at 230° F., and combustible at a higher temperature. It is much more soluble in boiling than in cold water; it is also soluble in alcohol, but not so in ether or the volatile oils. It is not precipitated by any agent. If oil of vitriol be added to it, it becomes blood-red (owing to the formation of *rufin*,[1] C^{14} H^{7} O^{5}) and dissolves in the acid. Hydrochloric acid and dilute sulphuric acid convert it into grape sugar and a white tasteless powder (*saliretine*, C^{30} H^{16} O^{8} = C^{30} H^{15} O^{7} + Aq.) Chlorine gas renders an aqueous solution of salicin turbid, and causes the deposition of a yellow crystalline powder (composed of C^{42} H^{25} C^{4} O^{22}). By submitting a mixture of salicin, bichromate of potash, oil of vitriol, and water, to distillation, we obtain *saliculous acid* (also called *saliculic acid*, *hydruret of salicule*, *hydruret of spiroyle*, or *oil of spiræa*), the formula of which is C^{14} H^{5} O^{3} + Aq.

Salicin has been repeatedly subjected to analysis.

	Atoms.	*Eq. Wt.*	*Per Ct.*	*Mulder.*[2]	*Paria.*[3]	*Erdmann and Marchond.*[4]	*Pelouze and J. Gay-Lussac.*[5]
Carbon	42	252	55·14	55·13	55·04	55·09	55·49
Hydrogen	29	29	6·25	6·19	6·39	6·32	6·38
Oxygen	22	176	38·51	38·68	38·57	38·59	38·13
Salicin	1	457	100·00	100·00	100·00	100·00	100·00

Salicin possesses tonic properties analogous to disulphate of quinia, than which it is less liable to irritate the stomach. It may be employed in dyspepsia, intermittents, and other diseases for which cinchona and disulphate of quinia are

[1] *Rufin* is also formed by the action of oil of vitriol on *phlorodzine* (see Mulder in the *Pharm. Central-Blatt für* 1839. S. 864). *Rutilin*, a brown resinous body composed of C^{28} H^{12} O^{4} + SO^{3} is also formed by the action of sulphuric acid on salicin (*Ibid.*) *Veratria* (see p. 100) and *Piperin* are also reddened by oil of vitriol.

[2] *Pharmaceutisches Central-Blatt für* 1839, S. 452.

[3] *Ibid.* S. 369.

[4] *Ibid. für* 1838, S. 926.

[5] *Ann. de Chim. et de Phys.* xlvii. 5.

usually exhibited. In the event of the latter becoming scarce, salicin would prove an exceedingly valuable substitute. The dose of it is from 10 to 30 grains. It may be given in powder mixed with sugar, or dissolved in some aromatic water. (Blom. *Beobacht. ü. Beitr. ü. die Salicine.* Potsdam, 1835.) Its quickest action in intermittents is said to be obtained when it is given in powder. (*Lond. Med. Gaz.* Feb. 28, 1840.)

Order XXV.—CUPULIFERÆ, *Richard.*—THE OAK TRIBE.

Corylaceæ. *Mirbel.*

Essential Character.—*Flowers* unisexual: males, amentaceous; females aggregate or amentaceous. *Males:*—*Stamens* five to twenty, inserted into the base of the scales, or of a membranous calyx, generally distinct. *Females:*—*Ovaries* crowned by the rudiments of a superior calyx, seated with a coriaceous involucre (*cupule*) of various figure, and with several cells and several ovules, the greatest part of which are abortive; *ovules* twin or solitary, pendulous; *stigmas* several, subsessile, distinct. *Fruit* a bony or coriaceous, one-celled nut, more or less inclosed in the involucre. *Seeds* solitary, one, two, or three, pendulous: *embryo* large, with plano-convex, fleshy cotyledons, and a minute superior radicle.—*Trees* or *shrubs*. *Leaves* with stipules, alternate, simple, often with veins proceeding straight from the midrib to the margin (*Lindley*).

Properties.—The prevailing quality of this order is astringency, owing to the presence of tannic acid.

1. QUER'CUS PEDUNCULA'TA, *Willd. L. E.*—THE COMMON BRITISH OAK.

Quercus Robur, *Linn. D.*

Sex. Syst. Monœcia, Polyandria.

(Cortex, *L. D.* The Bark, *E.*)

History.—The oaks (*Quercus* of botanists) were held sacred by the Greeks, Romans, Gauls, and Britons. They are mentioned in the Old Testament. (*Isaiah*, ch. i. v. 29, 30.) Both Dioscorides and Galen were acquainted with their astringent qualities. "Every part of the oak," says Dioscorides, (lib. i. cap. 142,) "but especially the liber, possesses an astringent property."

Botany.—**Gen. Char.** Monœcious. Male Flowers:—*Catkins* lax and pendulous. *Perianth* lacerated. *Stamens* five to ten. Female Flowers:—*Involucre* scaly; the *scales* numerous, imbricated; combined with a coriaceous, hemispherical cup. *Perianth* six-lobed, adnate to the ovary. *Ovary* three-celled; two of the cells abortive. *Stigmas* three. *Nut* (*galls* or *acorn*) one-celled, one-seeded, surrounded at the base by the cupule (*acorn-cup*). (*Bot. Gall.*)

Sp. Char.—*Leaves* deciduous, shortly-stalked, oblong-obovate, deeply sinuate; their sinuses rather acute, lobes obtuse. *Fruits* two or three upon a long peduncle. (*Hooker.*)

A large and handsome *tree*, remarkable for its longevity. *Twigs* round, smooth, grayish-brown. *Leaves* bright green, furnished with a single midrib sending off veins into the lobes. *Male flowers* yellowish; *females* greenish, tinged with brown.

Hab.—Indigenous, growing in woods and hedges. Flowers in April. It is found in most European countries.

Barking.—In the spring, the barks of trees contain more astringent matter, and are more readily separated from the wood. The usual time for barking the oak is from the beginning of May to the middle of July. The barkers make a longitudinal incision with a mallet furnished with a sharp edge, and a circular incision by means of a barking bill. The bark is then removed by the peeling-irons, the separation being promoted, when necessary, by beating the bark with the square end of the mallet. It is then carefully dried in the air, by setting it on what are called lofts or ranges, and is afterwards stacked. (Loudon's *Encyclop. of Agricult.*, 3d ed. p. 658-9.)

Description.—Oak bark (*cortex quercûs*) consists of pieces of from one to two feet long, which vary in their appearance according to the age of the stem

or branch from which they have been taken. The bark of young stems is thin, moderately smooth, covered externally with a silvery or ash-gray cuticle, and is frequently beset with lichens. Internally it is, in the fresh state, whitish; but, when dried, brownish, red, and fibrous. The bark of old stems is thick, very rough externally, cracked, and wrinkled, and is of inferior quality.

Composition.—According to Braconnot (*Ann. de Chim. et de Phys.* t. 50, p. 381), oak bark contains—*Tannic acid, tannates of lime, magnesia, potash,* &c. *gallic acid, uncrystallizable sugar, pectin,* and *lignin.*

1. Tannic Acid.—The quantity of tannin [impure tannic acid] obtained by Davy (*Elem. of Agricult. Chem.* p. 83, 4th ed.) from oak bark is as follows:

480 *lbs. of*	*Tannin afforded.*
Entire bark of middle-sized oak, cut in spring	29 lbs.
" coppice oak	32
" oak cut in autumn	21
White interior cortical layers of oak bark	72

Biggins (Pfaff, *Syst. d. Mat. Med.* Bd. ii. S. 207,) obtained 30 parts of tannin from the bark of an oak felled in winter, while the same weight of the bark of an oak felled in spring yielded him 108 parts.

2. Gallic Acid.—This contributes to the astringency of oak bark. It is formed probably by the action of the air on the tannic acid.

Chemical Characteristics.—Decoction of oak bark reddens litmus, and becomes dark blue or purple (*tannate of iron*) on the addition of sesquichloride of iron. A solution of gelatin causes a precipitate (*tannate of gelatin*) with it. It is somewhat remarkable, however, that a solution of emetic tartar causes no precipitate with the decoction. [If alcohol be added to the decoction, concentrated to the consistence of a syrup, it causes the precipitation of *pectin.* A decoction, rendered alkaline by a fixed alkali, deposits a gelatinous matter (*pectic acid*) on the addition of acetic acid. *Braconnot.*]

Physiological Effects.—The effects of oak bark are similar to those of other vegetable astringents containing tannic acid, and have been already described (see vol. i. pp. 188, 189).

Uses.—The principal value of oak bark, in medicine, arises from its astringent property. Thus we employ a decoction of it as a gargle in relaxed conditions of the uvula, and in chronic inflammatory affections of the throat; (Cullen, *Mat. Med.* vol. ii. p. 45,) as a wash, in flabby, ill-conditioned, or bleeding ulcers; as an injection in leucorrhœa, in piles, and in prolapsus of the uterus or rectum; as an internal astringent in old diarrhœas, in the last stage of dysentery, in alvine hemorrhages, &c. Poultices made of powdered oak bark have been applied with benefit to mortified parts. (Barton, *Collect. towards a Mat. Med. of the United States.*) Mr. Lizars (*Ed. Med. and Surg. Journ.* July, 1832) states that he has obtained "wonderful success" in the cure of reducible herniæ by bathing the groin (the hernia having been previously reduced) three or four times daily with a warm inspissated decoction of oak bark, and then applying a truss. The practice, however, is not a new one. (See the references in Plouquet's *Literatura Medica*, t. ii. p. 297.)

The inhalation of finely-powdered oak bark is said to have proved very beneficial in supposed cases of pulmonary consumption. (Eberle, *Treat. on Mat. Med.* vol. i. p. 268, 2d ed.) I have already noticed (vol. i. p. 158) the inspiration of impalpable powders of other astringents as a remedy for phthisis. Connected with this, the popular opinion of the exemption of operative tanners from phthisis pulmonalis deserves to be mentioned. Dr. Dods, (*Lond. Med. Gaz.* vol. iii. p. 497,) who has paid some attention to this subject, concludes, that the popular notion is correct; and he ascribes the exemption to "the inhalation of that peculiar aroma, or volatile matter, which is constantly arising from tan-pits during the process of tanning with bark." Hitherto, however, no sufficient evidence has been advanced to prove that tanners are exempt from the disease.

As a tonic, oak bark has been employed in medicine, but it is much inferior

to the cinchona. Baths made of a decoction of this substance have been used by Dr. Eberle in the intermittents of very young children with benefit; and Dr. Fletcher (of Virginia) has recommended the same remedy in tabes mesenterica. (Eberle, *op. cit.* vol. i. pp. 267, 268.) The decoction, powder, and extract, have been taken internally in intermittents, but they are very apt to irritate the stomach. Dr. Cullen (*Mat. Med.* vol. i. p. 45) says, that both by itself and joined with chamomile flowers, he has prevented the paroxysms of intermittents.

ADMINISTRATION.—Dose of the *powder* from half a drachm to one or two drachms.

1. DECOCTUM QUERCŪS, L. E. D.; *Decoction of Oak Bark.*—(Oak bark, bruised, ℥x. [℥i. *D.*]; Water [distilled, *L.*] Oij. [*wine measure* D.] Boil down to a pint, and strain.)—Used as a local astringent for various purposes, in the form of gargle, injection, or lotion. Administered internally in doses of f℥ii. to f℥vi.. Sometimes employed as a bath, especially for children.

2. EXTRACTUM QUERCŪS, D.; *Extract of Oak Bark.*—(Obtained by evaporating a decoction.)—Rarely employed in medicine. May be given internally as an astringent, in the dose of from ten grains to a drachm.

2. QUER'CUS INFECTO'RIA, *Olivier, L. E. D.*—THE GALL, OR DYER'S OAK.

Sex. Syst. Monœcia, Polyandria.

(Gallæ; Gemmæ morbidæ, *L.* Gallæ; Excrescences, *E.* Gallæ, *E.*) (Gallæ, U. S.)

HISTORY.—Hipprocrates employed the nutgall (σηκὶς) as an astringent, both internally and externally. (*Ed. Fœs.* pp. 609, 267, &c.) Dioscorides (*lib.* i. cap. 146) describes it as the fruit of the oak; and the same error is found in the works of comparatively recent writers, as of Pomet. (*Hist. of Drugs*, Engl. Transl. 1712.) Mr. Lambert (*Trans. of the Linn. Soc.* vol. xvii. p. 445) declares the celebrated *Mad Apples* (*Mala insana* seu *Poma Sodomitica*) to be galls of the *Quercus infectoria;* but he is certainly in error when he says they "are identical with those of commerce." His drawing of them disproves this statement.

BOTANY. **Gen. Char.**—Vide *Quercus pedunculata.*

Sp. Char. — *Leaves* ovate-oblong, sinuate-dentate, very smooth, deciduous. *Fruit* sessile, very long. (Olivier, *Voy. dans l'Empire Ottom.* t. ii. p. 64.)

Small tree or *shrub*, from four to six feet high. *Stem* crooked. *Leaves* on short petioles, with a few short mucronate teeth on each side. *Acorn* two or three times as long as the cupules.

Hab.—Asia Minor, from the Bosphorus to Syria, and from the Archipelago to the frontiers of Persia.

FORMATION OF NUTGALLS.—The Hymenopterous insects of the tribe called *Gallicolæ*, or *Diploleparicæ*, (Cuvier, *Règne Animal*, t. v. p. 290,) are furnished with a *terebra*, or borer, by means of which they are enabled to perforate the foliaceous or cortical parts of plants for the purpose of depositing their eggs, along with an acrid liquor, in the wound thus made. The irritation thereby produced gives rise to an influx of the juices of the plant to the wounded part, and an excrescence is formed, which is termed *a gall* (*galla*). Here the insect undergoes its transformations: the egg produces the larva (or maggot), which feeds on the juices of the plant, and is changed into the pupa. This afterwards becomes the perfect insect (*imago*), and, perforating the gall, escapes from its prison-house.

The external form and appearance of these productions are very constant, when formed by the same insect, on the same part of the same plant; but the galls of different species of vegetables, as well as those of the same species, produced by a different insect, vary considerably. There is reason for believing that the form and appearance of the gall is determined more by the insect than

by the plant; for we sometimes have on the same oak two kinds of galls, of very dissimilar appearance, produced by different insects.

As familiar instances of galls, I may mention, first, the red carbuncular protuberances in the leaves of *Salix Helix*. The gall of the Sweet Briar or Eglantine (*Rosa rubiginosa*) is called *Bedeguar*, or the *Sweet Briar Sponge*, and will be noticed hereafter. Another well-known indigenous gall is the *Oak Apple*, produced on *Quercus pedunculata*. It is usually spheroidal, but of variable size; commonly, however, not exceeding one or two inches in diameter. Its texture is spongy. It has been employed, on account of the tannic acid which it contains, as a substitute for nutgalls in dyeing.

The gall of the *Quercus infectoria* is the *nutgall* of the shops. It is produced by the *Cynips Gallæ tinctoriæ*. Olivier (*op. cit.*) says, that this insect lives on the Quercus infectoria only.

On the sides and at the ends of the branches and shoots of this tree, the female makes a puncture and deposits her egg. An excrescence is soon formed, within which the larva is developed, which is changed first into the pupa, and then into the imago. As soon as the perfect insect is produced, it eats its way out. If we examine those galls from which the animal has escaped, we observe externally a circular hole, of about a line in diameter, leading to a canal of from $2\frac{1}{2}$ to $3\frac{1}{2}$ lines long, which passes to the centre of the gall. But in those galls in which the insect has not put off its pupa state, we find neither an external hole nor an internal canal. Those galls from which the insect has escaped are commonly longer, lighter coloured, and less astringent: they are termed *white galls*.

Commerce.—Nutgalls are imported principally from Turkey: hence their name of *Turkey Galls* (*Gallæ turcicæ*). They usually come from Constantinople, but sometimes from Smyrna. Those brought from Aleppo are the produce of Mosul (*Aleppo* or *Mosul Galls*), and are the best. *Smyrna Galls* are not so heavy, are lighter coloured, and contain a larger admixture of white galls than those brought from Aleppo. *East India Galls* are brought from Bombay. Ainslie (*Mat. Indica*, vol. i. p. 145,) thinks, "that the greater part of the galls found in Indian bazaars grows in Persia, and are brought to the peninsula by Arab merchants."

Description.—In commerce three kinds of galls are distinguished, viz. *black* or *blue*, *green*, and *white*. But there is no essential distinction between the two first.

1. *Black* or *Blue Nutgalls* (*Gallæ nigræ* seu *cæruleæ*); *Green Nutgalls* (*Gallæ virides*).—These are gathered before the insect has escaped, and are called by the natives *Yerli*. They vary from the size of a pea to that of a hazel-nut, and have a grayish colour. The smallest have a blackish-blue tint, and are distinguished by the name of *black* or *blue galls*, while the larger and greener varieties are called *green galls*. Externally they are frequently tuberculated, but the surface of the tubercles and of the intervening spaces is usually smooth. Their texture is compact, but fragile. They have no odour, but a styptic and powerfully astringent taste.

2. *White Galls* (*Gallæ albæ*).—These are for the most part gathered after the insect has escaped, and hence they are perforated with a circular hole. They are larger, lighter coloured (being yellowish or whitish), less compact, less heavy, and less astringent. They are of inferior value.

Composition.—Nutgalls were analyzed by Sir H. Davy, (*Phil. Trans.* 1830,) who obtained the following results:

Matter soluble in water = 37; viz.	Tannin	26·0
	Gallic acid, with a little extractive	6·2
	Mucilage and matters rendered insoluble by evaporation	2·4
	Carbonate of lime and saline matter	2·4
Matter insoluble in water, (*lignin*)		63·0
Good Aleppo Nutgalls		100·0

1. Tannic Acid (*Acidum Tannicum; Acidum Quercitannicum*).—The substance formerly described in chemical works by the name of *tannin*, is tannic acid mixed with some foreign matters, from which it is very difficult to free it.

When extracted from nutgalls by ether, in the percolation or displacement apparatus, (see vol. i. p. 326) as recommended by Pelouze, (*Ann. de Chim. et de Phys.* liv.) this acid presents itself as a non-crystalline, white solid, sometimes having a yellowish tinge. 100 parts of nutgalls yield from 36 to 40 parts of tannic acid.

The following are the essential characteristics of this substance:—It has an intensely astringent taste, and produces with a solution of gelatin, a white precipitate (*tannate of gelatine*); with a solution of sesquisalt of iron, a deep blue compound (*tannate of iron*); and with solutions of vegetable alkalis, white precipitates (*tannates*), slightly soluble in water, but very soluble in acetic acid. The mineral acids also cause precipitates with concentrated solutions of tannic acid, as do the alkalis and their carbonates. Gelatinous alumina rapidly absorbs tannic acid from its solution, and forms an insoluble compound with it.

Tannic acid is composed of $C^{18}\ H^{5}\ O^{12} = C^{18}\ H^{5}\ O^{9} + 3$ aq.; consequently its equivalent or atomic weight is 212.

Tannic acid is a very powerful astringent. Given to dogs to the extent of 12 grains it caused constipation. One of the animals being killed, the intestinal mucous membrane was found dry, and the fæcal matter hard, and collected in the colon. In doses of two grains and a half it produced constipation in the human subject. (Cavarra, *Lond. Med. Gaz.* vol. xx. p. 171.) To the presence of this acid the vegetable astringents principally owe their medicinal activity (vide vol. i. pp. 188 and 189). It has been employed in hæmorrhages, (from the lungs, uterus, and rectum), and in profuse mucous discharges (diarrhœa, pulmonary catarrh, leucorrhœa, and gonorrhœa). It may administered in doses of three grains, in the form of pills or solution. It presents but few advantages over the astringent extracts.

2. Gallic Acid (*Acidum Gallicum*).—Though we obtain 20 per cent. of gallic acid from nutgalls, these excrescences contain very little of it,—at least in the free state; our produce being principally the result of the decomposition of the tannic acid. Nay, Pelouze thinks that even the small quantity of gallic acid which does exist in nutgalls is formed by the decomposition of the tannic acid during or subsequent to the process of drying these bodies.

The conversion of tannic into gallic acid is effected, according to Pelouze, by the agency of the air, the oxygen of which is absorbed, while an equal volume of carbonic acid is evolved. One atom of tannic acid and eight atoms of oxygen contain the elements of two atoms of gallic acid, four atoms of carbonic acid, and two atoms of water.

	Carb. atoms.	*Hyd.* atoms.	*Oxyg.* atoms.
1 atom Tannic acid consists of	18	8	12
8 atoms Oxygen of the air	0	0	8
Total.....	18	8	20

	Carb- atoms.	*Hyd.* atoms.	*Oxyg.* atoms.
2 atoms Gallic acid consist of	14	6	10
4 atoms Carbonic acid.....	4	2	8
2 atoms Water.....	0	2	2
Total.....	18	8	20

When the air is excluded no gallic acid is formed.

The production of gallic acid may also be accounted for by supposing that it is a constituent of tannic acid. Thus, three atoms of tannic acid contain the elements of six atoms of gallic acid and two atoms of pyrogallic acid.

Pure gallic acid is a colourless, crystallizable acid, with an acidulous and styptic taste. It produces a deep blue colour with the sesquisalts of iron, in which circumstance it agrees with tannic acid; but it differs from the latter acid in not precipitating gelatin or the vegetable alkaline salts. To detect gallic acid mixed with tannic acid, the latter is to be previously removed from its solution by immersing in it a piece of skin depilated by lime. The tannic acid is absorbed. The gallic acid may then be detected by the salts of iron.

Gallic acid consists of $C^{7}\ H^{3}\ O^{5}$; hence its equivalent or atomic weight is 85. When heated to 410° or 420° F., it gives out carbonic acid, and is resolved into *pyrogallic acid* ($C^{6}\ H^{3}\ O^{3}$). If the heat is raised to 480° F., both water and carbonic acid are evolved, and *metagallic acid* ($C^{12}\ H^{3}\ O^{3}$ + aq.) is produced.

The effects and uses of gallic acid have been before noticed (vol. i. p. 189.)

3. Ellagic Acid (*Acidum Ellagicum*).—Discovered by Braconnot, who named it ellagic acid, from the French word for a gall (*galle*) spelt backwards. It is obtained from galls in the process for making gallic acid, and hence is probably a product, and not an educt. It is a white, insipid powder, which becomes of a blood-red colour on the addition of nitric acid. It consists of $C^{7}\ H^{3}\ O^{4} + \text{Aq.} = C^{7}\ H^{3}\ O^{5}$; hence the equivalent or atomic weight of the hydrated acid is 85.

Chemical Characteristics.—Infusion of nutgalls reddens litmus paper, forms an inky compound (*tanno-gallate of iron*) on the addition of a sesquisalt of iron, and a yellowish white precipitate (*tannate of gelatin*) with a solution of gelatin. If a piece of skin, depilated by lime, be immersed in the infusion, and

agitated with it from time to time, all the tannic acid is absorbed, the filtered liquor striking a blue colour (*gallate of iron*) with the sesquisalts of iron, but giving no precipitate with a solution of gelatin. Infusion of galls forms precipitates (*metallic tannates* or *tanno-gallates*) in many metallic solutions. (See the table given in Mr. Brande's *Manual of Chemistry*, p. 1106, 5th ed.)

Physiological Effects.—As nutgalls contain a larger portion of tannic acid than any other known vegetable production, they possess in the highest degree the properties of an astringent (vide vol. i. p. 188).

Uses.—The following are the principal uses of nutgalls:

1. *As a tonic in intermittents.*—Notwithstanding Poupart's favourable report of the use of galls in these cases, they scarcely deserve notice, as we have in arsenic, cinchona, and sulphate of quina, much more effective and certain febrifuges.

2. *As an astringent in hemorrhages*, especially passive alvine hemorrhages.

3. *In chronic mucous discharges*, as old diarrhœas.

4. *As a chemical antidote.*—Nutgalls may be given in poisoning by ipecacuanha, emetina, the organic alkalis generally, and those vegetable productions whose activity depends on an organic alkali, as opium, white hellebore, colchicum, nux vomica, &c. Their efficacy arises from the tannic acid, which combines with the vegetable alkali to form a tannate possessing less activity than the other salts of these bases; perhaps because of its slight solubility. Nutgalls are recommended as an antidote in cases of poisoning by emetic tartar, but I very much doubt their efficacy.

5. *As a topical astringent.*—Nutgalls are applicable in any cases requiring the topical use of a powerful vegetable astringent. Thus, in the form of gargle, in relaxation of the uvula; as an injection, in gleet and leucorrhœa; as a wash, in flabby ulcers, with profuse discharge; *prolapsus ani* seu *vaginæ;* in the form of ointment, in piles, &c.

Administration.—The dose of the *powder* is from ten to twenty grains. The *infusion* is prepared with four drachms of nutgalls and six ounces of water: the dose is from f℥ss. to f℥ii. or, in cases of poisoning by the vegetable alkalis, f℥iv.

Besides the following officinal formulæ for the use of galls, others have been published by Mouchon. (*Gaz. des Hôp. Civ. et Milit.* 13 Avril, 1837.)

1. TINCTURA GALLÆ, L. (U. S.); *Tinctura Gallarum*, E. D.; *Tincture of Galls.*—(Galls, bruised, ℥v. [℥iv. *D.* (U. S.)]; Proof Spirit, Oij. [*wine measure, D.*] [Distilled Alcohol, Oij., U. S.] Macerate for fourteen [seven, *D.*] days, and filter. "This tincture may be prepared either by digestion or percolation, as directed for tincture of capsicum, *E.*)—A powerful astringent. Dose from f℥ss. to f℥ij. Diluted with water, it forms a very useful and convenient astringent gargle and wash. Its principal use is as a chemical test, especially for the salts of iron.

2. UNGUENTUM GALLARUM, D.; *Ointment of Galls.* [*Unguentum Gallae*, U. S.]—(Galls, in very fine powder, ℥i.; Lard, ℥iij. Mix them.)—[Galls, in powder, one ounce; Lard, seven ounces; U. S.]—Astringent. Mixed with zinc ointment it is applied to piles after the inflammatory stage is passed. The above is Dr. Cullen's formula; but Mr. B. Bell (*Syst. of Surgery*,) recommends an ointment composed of equal parts of powdered galls, and hog's lard or butter, in external hemorrhoidal swellings.

3. UNGUENTUM GALLÆ COMPOSITUM, L.; *Unguentum Gallæ et Opii*, E.; *Compound Ointment of Galls.*—(Galls, in very fine powder, ℥ij.; Opium, powdered, ℥ss. [℥i. *E.*]; Lard, ℥ij. [℥i. *E.*] Mix.)—An excellent astringent application to *blind piles* (*i. e.* piles without hemorrhage) and prolapsus ani. The opium diminishes the pain which the galls might otherwise occasion, where the hemorrhoidal tumors are very sensible. From ℥ss. to ℥i. of camphor is frequently added to this ointment.

OTHER MEDICINAL CUPULIFERÆ.

Quercus Tinctoria, or the *Black Oak* is a native of America. (Officinal, U. S.) Its bark, called *quercitron*, is used by dyers. In the United States it is employed medicinally, but it is said to be disposed to irritate the bowels. [The Q. alba is also officinal in U. S. P.]

Fig. 177.

Quercus Suber.

2. Quercus Suber, or the *Cork Oak*, is a native of the northern parts of Africa, and of the southern parts of Europe, particularly of France, Spain, and Portugal.

Although no medical agent is obtained from it, yet the important pharmaceutical uses of its cortical portion must be my excuse for noticing it.

According to Mohl, (*Lond. and Edinb. Phil. Mag.* 1838, vol. xii. p. 53,) the bark of a young branch of Quercus Suber consists of four distinct layers. 1st, an exterior layer or *epidermis*, 2dly, *colourless cellular tissue*, 3dly, *green parenchyma*, and 4thly, the *liber* or fibrous layer. When the branches are from three to five years old, the epidermis cracks by distension, and the second layer enlarges on the inner side by the deposition of new layers. These constitute *cork*. (See also Dutrochet, *Comptes Rendus*, t. iv. p. 48, Paris, 1838.) It falls naturally every eight or nine years, but for commercial purposes is usually removed one or two years before this period. That season of the year is selected when the bark adheres the most firmly to the wood, in order that the cork may be raised without endangering the separation of the liber from the alburnum. By this precaution, the trees are not at all injured by the corking process; nay, they are said to be more healthy and vigorous than when the cork is allowed to accumulate on their stems. The trees yield these crops from the age of 15 to 150 years.

To remove the cork, an incision is made from the top to the bottom of the tree, and a transverse circular incision at each extremity; the cork is then stripped off. To flatten it, a number of layers are piled up in a pit of water, and loaded with weights to keep them down. Subsequently they are dried, and in that state exported. Our supply is principally derived from Spain and Portugal. To close the transverse pores, cork is charred.

The physical properties of cork are too well known to need description. Its leading character is elasticity. In this respect it is similar to the wood of *Anona palustris*, called *cork wood*. When thin slices of cork are examined by the microscope, they present a cellular appearance.

When cork has been deprived of all its soluble matters by successive digestions in water and alcohol, it differs but little from ordinary cork: it is, however, then termed *Suberin*. This suberin is analogous in its nature to lignin; but, as it yields a peculiar substance (*suberic acid*, composed of C^8 H^6 O^3), when treated by nitric acid, it has been regarded as a distinct principle. Suberic acid is also a product of the action of nitric acid on oleic, margaric, and stearic acids. Raspail contends that suberin is only lignin undeprived of some of its foreign matters, such as wax, resin, &c.

By distilling suberate of lime, Bossingault obtained an oleaginous substance, which has been denominated *suberone*.

The soluble principles of cork are *gallic acid*, some *gallates*, *resin*, a *waxy-like substance*, *colouring matter*, &c.; hence the impropriety of employing cork in closing vessels containing chalybeate liquids, as the iron is part absorbed by the cork.

Cork was formerly employed in medicine. Reduced to powder, it was applied as a styptic: hung about the necks of nurses, it was thought to possess the power of stopping the secretion of milk; lastly, burnt cork, mixed with sugar of lead and lard, has been used as an application to piles.

3. The large capsules or acorn-cups of Quercus Ægilops are imported from the Levant, under the name of *Velonia*. They are astringent, and are employed by dyers.

4. A saccharine substance exudes from the leaves of Quercus Mannifera in Kurdistan. (Lindley, *Botanical Register*, May and June, 1840.)

Order XXVI.—ULMACEÆ, *Mirbel*.—THE ELM TRIBE.

Essential Characters.—*Flowers* hermaphrodite or polygamous, never in catkins. *Calyx* divided, campanulate, inferior, irregular. *Stamens* definite, inserted into the base of the calyx; erect in æstivation. *Ovary* superior, two-celled; *ovules* solitary, pendulous; *stigmas* two, distinct. *Fruit* one or two-celled, indehiscent, membranous, or dupraceous. *Seed* solitary, pendulous; *albumen* none, or in very small quantity; *embryo* straight or curved, with foliaceous cotyledons; *radicle* superior. *Trees* or *shrubs*, with scabrous, alternate, simple, deciduous leaves, and stipules (Lindley).

Properties.—Elm bark is tonic and astringent.

ULMUS CAMPESTRIS, *Linn. L. D.*—THE COMMON SMALL-LEAVED ELM.

Sex. Syst. Pentandria, Digynia,

(Cortex, *L.* Cortex interior, *D.*)

History.—Dioscorides (lib. i. cap. 111,) speaks of the astringent property of elm bark.

Botany. **Gen. Char.**—*Flowers* hermaphrodite. *Calyx* campanulate, four to five-toothed, coloured, persistent. *Stamens* three to six. *Ovary* compressed. *Stigmas* two. *Fruit* (a samara) suborbicular, with a broad membranous margin. (*Bot. Gall.*)

Sp. Char.—*Leaves* doubly serrated, rough. *Flowers* nearly sessile, four-cleft. *Fruit* oblong, deeply cloven, naked. (Sir J. E. Smith.)

A large *tree*, with rugged *bark*. By the latter character it is readily distinguished from *Ulmus glabra*, which has a smooth, dark, lead-coloured bark.

Hab.—Southern parts of England. Flowers in March or April.

Description.—The officinal part of the elm is the inner cortical portion, or *liber*. To obtain it, the *bark* should be separated from the tree in spring; and, after the epidermis and a portion of the external cortex have been removed, the *liber* should be quickly dried.

As met with in the shops, the *inner elm bark* (*cortex ulmi*) consists of thin, tough pieces, which are inodorous, and have a brownish-yellow colour, and a mucilaginous, bitter, very slightly astringent taste.

Composition.—According to Rinck, (Geiger, *Hand. d. Pharm.*) 100 parts of elm bark contain: *Resin* 0·63, *gum* and *mucus* 20·3, *impure gallic acid* (tannin ?) 6·5, *oxalate of lime* 6·3 (?), *chloride of sodium* (?) 4·6.

1. Tannic acid.—Davy (*Phil. Trans.* 1803, p. 233) states, that 480 grs. of elm bark yielded 13 grs. of tannin.

2. Ulmic Acid: *Ulmin.*—On many trees, especially the elm, there is not unfrequently observed a substance, which was supposed to be a morbid production. When dried it consists of a mucilaginous matter, and carbonate or acetate of potash. By the combined agency of the air and the carbonate, the organic matter is altered in its properties, and is converted into a brown substance, which combines with the potash. This brown matter has been termed *ulmin*, or *ulmic acid*. It may be formed, artificially, by a variety of processes; as by heating a mixture of wood and potash, by the action of sulphuric acid on vegetable matters, and by other methods.

Chemical Characteristics.—Infusion of elm bark becomes green (*tannate of iron*) on the addition of a sesquisalt of iron, and forms a precipitate (*tannate of gelatin*) with a solution of gelatin.

Physiological Effects.—The effects of elm bark are those of a mild astringent tonic, containing a considerable quantity of mucilage, which gives it a demulcent property. Hence, in the classification of Richter (*Arzneimitt.* Bd. 1,) it is arranged as a *mucilaginous astringent*. The decoction, taken in full doses, accelerates the pulse, and acts as a diaphoretic and diuretic.

Uses.—Lysons (*Medical Transactions*, vol. ii. p. 203) recommended the decoction of this bark in cutaneous eruptions; and Dr. Lettsom (*Medical Memoirs*, p. 152) found it successful in ichthyosis. It has now fallen almost into disuse. It has been employed as a cheap substitute for sarsaparilla. (Jeffreys, *Cases in Surgery*, Lond. 1820.)

Administration.—Used only in the form of decoction.

DECOCTUM ULMI, *L. D.*; *Decoction of Elm Bark.*—(Fresh Elm Bark, bruised, ℥ijss. [℥ij. *D.*]; Distilled Water, Oij. [*wine measure*, D.] Boil down to a pint, and strain).—Formerly given in skin diseases, now fallen into disuse. Dose, f℥iv. to f℥vi. three or four times a day.

OTHER MEDICINAL ULMACEÆ.

Dr. M'Dowall, of Virginia, has proposed the bark of *Ulmas fulva* for bougies, tents, catheters, &c. (*Brit. and For. Med. Review*, July, 1838, art. *Elm Bark Surgery*, p. 259.) [The bark of this is used as a demulcent and is officinal in U. S. P.]

Order XXVII.—URTICACEÆ, *Endlicher*.—THE NETTLE TRIBE.

Urticeæ, *Jussieu*.

Essential Character.—*Flowers* small, greenish, monœcious or diœcious, solitary, amentaceous, or surrounded by a monophyllous involucrum. *Calyx* monosepalous, three to five-lobed, persistent. *Stamens* definite, inserted into the base of the calyx. *Ovary* simple, free; *styles* two or one, bifurcate. *Fruit* an achenium, surrounded by the persistent calyx, solitary, or inserted into the dilated fleshy receptacle. *Seeds* pendulous, with or without albumen. *Embryo* straight, curved, or spiral. *Radicle* generally superior.—*Herbs* or *trees* usually with hispid and spathulate *leaves*. *Flowers* capitate or racemose. (*Bot. Gall.*)

Properties.—Variable.

1. HU'MULUS LU'PULUS, *Linn. L. E. D.*—THE COMMON HOP.

Sex. Syst. Diœcia, Pentandria.

(Strobili exsiccati, *L.* (Humulus, U. S.) Catkin, *E.* Strobili siccati, *D.*)

History.—This plant is probably the *Lupus salictarius* of Pliny. (*Hist. Nat.* lib. xxi. cap. 1, ed. Valp.) Its culture was introduced into this country from Flanders, in the reign of Henry VIII. (Beckmann, *Hist. of Invent.* vol. iv. p. 340.)

Botany. **Gen. Char.**—*Diœcious*. Males:—*Calyx* five-partite. *Stamina* five. Females:—*Strobiles* consisting of large, persistent, concave scales [bracts], having a single flower in the axilla of each. *Ovary* one. *Styles* two. *Seed* one, with an arillus. *Embryo* spirally contorted. (*Bot. Gall.*)

Sp. Char.—The only species.

Perennial. *Stems* annual, long, weak, and climbing, scabrous. *Leaves* petiolate, three to five-lobed, serrated, veiny, rough. *Flowers greenish yellow*.

Hab.—Thickets and hedges in many parts of Europe. Indigenous [?]. Flowers in July.

Cultivation.—The female plant is cultivated in several counties in England, especially Kent, Sussex, Surrey, Worcestershire, and Herefordshire. The third year after planting it generally comes into full bearing. *Stacking* or *setting the poles* is performed in April or May. The *gathering* or *picking* takes place in September. The cones are dried in kilns, and are then packed in hempen sacks, called *bags* or *pockets*. This operation is called *bagging*. (Loudon's *Ency. of Agricult.*)

Description.—The aggregate fruits of the Humulus Lupulus are strobiles or catkins (*strobili* seu *amenta lupuli*), in commerce termed *hops*. They consist of scales, nuts, and lupulinic glands or grains. The *scales* are the enlarged and persistent bracts, which inclose the nuts: they are ovate, membranous, and at their base glandular. The *nuts* (achenia) are small, hard, nearly globular, and covered with aromatic, superficial, globose glands. The *lupulinic glands* or *grains* commonly termed *yellow powder* or *lupulin*) are the most important parts of the strobiles. By thrashing, rubbing, and sifting, Dr. Ives (*Journ. of Science*, vol. xi. p. 205,) procured 14 ounces from six pounds of hops; and he therefore concluded that dry hops would yield about a sixth part of their weight of these grains. They are usually mixed with sand. They are rounded, of a cellular texture, golden yellow, and somewhat transparent. They are sessile, or nearly so. The common centre, around which the cells are arranged, has been called the *hilum*. By drying they lose their spherical form. Placed in water they give out an immense number of minute globules. Under other circumstances they become ruptured, and allow an inward envelope to escape. According to Turpin (*Mém. de l'Acad. Roy. des Science*, t. xvii. p. 104, 1840; see also Raspail, *Chim. Org.*)

Fig. 178.

Dried Lupulinic grain, with its hilum (magnified).

they consist of *two vesicles*, one inclosing the other. The inner one contains *globules*, *an aromatic oil*, and *a gas*. He also states, that in the bubbles of the disengaged gas, an immense number of crystals are formed.

Composition.—Payen, Chevallier, and Pelletan, (*Journ. de Pharm.* t. viii. p. 209; and *Journ. de Chim. Méd.* t. ii. p. 527,) analyzed the scales and lupulinic grains. Dr. Ives (*Journ. of Science*, vol. xi. p. 205,) also examined the latter.

Lupulinic Grains

Payen, Chevallier, and Pelletan's Analysis.		Ives's Analysis.	
Volatile oil	2·00	Tannin	4·16
Bitter principle (Lupulite)	10·30	Extractive	8·33
Resin	50 to 55·00	Bitter principle	9·16
Lignin	32·00	Wax	10·00
Fatty, astringent, and gummy matters, osmazome, malic and carbonic acid, several salts (malate of lime, acetate of ammonia, chloride of potassium, sulphate of potash), &c.	traces.	Resin	30·00
		Lignin	38·33
	99·30		100·00

Scales.

Payen, Chevallier, and Pelletan's Analysis.
Astringent matter.
Inert colouring matter
Chlorophylle.
Gum.
Lignin.
Salts (of potash, lime, and ammonia, containing acetic, hydrochloric, sulphuric, nitric, &c. acids).
The scales usually contain a portion of lupulinic matter, from which it is almost impossible to free them.

1. Volatile Oil of Hops.—Resides in the lupulinic grains. Obtained by submitting these, or hops which contain them, to distillation with water. Its colour is yellowish, its odour that of hops, its taste acrid. It is soluble in water, but still more so in alcohol and ether. Its sp. gr. is 0·910. By keeping, it becomes resinified. It is said to act on the system as a narcotic. The water which comes over, in distillation, with the oil, contains acetate of ammonia, and blackens silver; from which circumstance the presence of sulphur is inferred.

2. Bitter Principle of Hops: *Lupulite; Lupuline.*—Is procured by treating the aqueous extract of the lupulinic grains, united with a little lime, with alcohol. The alcoholic tincture is to be evaporated to dryness, the residue treated with water, and the solution evaporated. The residue, when washed with ether, is lupulite. It is uncrystallizable, yellowish white, very bitter, soluble in 20 parts of water, very soluble in alcohol, and slightly so in ether. The aqueous solution froths by agitation; it forms no precipitate with either tincture of nutgalls or acetate of lead. Lupuline contains no nitrogen. It is devoid of the narcotic property of the oil. In small doses it is said to have caused loss of appetite and diminished digestive power; but a repetition of the experiment is very desirable.

3. Resin.—Is of a golden yellow colour, and becomes orange-yellow by exposure to the air. It is soluble in both alcohol and ether. It appears to be the oil changed into resin, partly by oxidizement.

Chemical Characteristics.—A decoction of hops reddens litmus, owing to the presence of free acid. Sesquichloride of iron strikes an olive-green colour (*tannate of iron*). A solution of gelatin renders the filtered decoction turbid (*tannate of gelatin*). Chloride of barium occasions with it a white precipitate (*sulphate of baryta*). Oxalate of ammonia also causes a white precipitate (*oxalate of lime*).

Physiological Effects.—The odorous emanations (vapour of the volatile oil) of hops possess narcotic properties. Hence a pillow of these cones promotes sleep, as I have several times witnessed. Moreover, we are told that stupor has occasionally been induced in persons who have remained for a considerable time in hop warehouses.

The lupulinic grains are aromatic and tonic. They appear also to possess soothing, tranquillizing, and, in a light degree, sedative and soporific properties. But the existence of any narcotic quality has been strongly denied by Dr. Bigsby, (*Lond. Med. Rep.* vol. iv. p. 287,) Magendie, (*Formulaire*,) and others. "I have tried, at different times," says Magendie, "both the lupuline [lupulinic grains] in substance, and its different preparations, on animals, but I have never observed that it is a narcotic, although this property is one which is most strikingly displayed in experiments on animals." Dr. Maton (*Observations on Humulus Lupulus*, by A. Freake, 2d ed.) found that it allayed pain, produced sleep, and reduced the frequency of the pulse from 96 to 60 in twenty-four hours.

Both infusion and tincture of hops are mild but agreeable aromatic tonics. They sometimes prove diuretic, or, when the skin is kept warm, sudorific. Their sedative, soporific, and anodyne properties, are very uncertain.

Uses.—A pillow of hops (*cervicale* seu *pulvinus*, *pulvinar lupuli*) is occasionally employed in mania, and other cases in which inquietude and restlessness prevail, and in which the use of opium is considered objectionable. In hop countries it is a popular remedy for want of sleep. The benefit said to have been obtained from it by George III., for whom it was prescribed by Dr. Willis, in 1787, brought it into more general use.

Hops are given internally to relieve restlessness consequent upon exhaustion and fatigue, and to induce sleep in the watchfulness of mania, and of other maladies: to calm nervous irritation; and to relieve pain in gout, arthritic rheumatism, and after accouchement. Though they sometimes produce the desired effect, they frequently fail to give relief. Dr. Maton used it, with good effect, as an anodyne in rheumatism.

As a tonic it is applicable in dyspepsia, cachectic conditions of the system, or any other maladies characterized by debility.

Hops have been applied, topically, in the form of fomentation or poultice, as a resolvent or discutient, in painful swellings and tumours. Freake employed an ointment, composed of lard and the powder of the hop, as an anodyne application to cancerous sores. (*Op. cit.* p. 13; see also *Annals of Medicine*, vol. ii. p. 403.)

But the principal consumption of hops is in the manufacture of beer and ale, to which they communicate a pleasant, bitter, and aromatic flavour, and tonic properties, while by their chemical influence, they check the acetous fermentation. Part of the soporific quality of beer and ale is ascribable to the hops used in the manufacture of these beverages.

Administration.—The best preparation of hops, for internal use, is the yellow powder (*lupulinic grains* or *lupulin.*) The *infusion* and *tincture* are less eligible modes of exhibition. The *extract* is still more objectionable. *Well-hopped beer* is a convenient mode of administering hops, when fermented liquors are not contra-indicated.

1. INFUSUM LUPULI, L. (U. S.); *Infusion of Hops.*—(Hops, ʒvj. (ʒss. U. S.); Boiling Distilled Water, Oj. Macerate for four hours, in a vessel lightly covered, and strain).—Dose fʒj. to fʒij.

2. TINCTURA LUPULI, L.; *Tinctura Humuli*, D. *Tincture of Hops.*—(Hops, ʒvj. [ʒv. *D.*]; Proof Spirit, Oij. Macerate for fourteen days, and strain).—Dose fʒss. to fʒij.

3. EXTRACTUM LUPULI, L. E.; *Extractum Humuli*, D. *Extract of Hops.*—(Hops, lb. ss. [lb. j. *E.*]; Boiling Distilled Water, *Conj.* ij. [Conj. j. *E.*] Macerate for twenty-four hours, then boil down to a gallon [Oiv. *E.*], and strain the liquor while hot; lastly, evaporate [in the vapour bath, *E.*] to a proper consistence. The directions of the Dublin College are nearly the same as those of the Edinburgh College).—Dose, gr. v. to ℈j. Whatever virtue this preparation possesses is owing to the bitter principle of lupulite.

4. LUPULINA, *Yellow powder; Lupulinic Grains* or *Glands.*—(Separated from the strobiles by rubbing and sifting).—Dose, grs. vj. to grs. xii. taken in the form of powder or pills.

5. TINCTURA LUPULINÆ; *Tinctura of Lupulin*, E. (U. S.)—(Take any convenient quantity of hops, recently dried; separate by friction and sifting the yellowish brown powder attached to the scales. Then take of this powder, ʒv.; and of rectified spirit, Oij.; and prepare the tincture by percolation or digestion, as directed for tincture of capsicum. *Ph. Ed.*)—Dose, ʒss. to ʒij.

2. MO'RUS NI'GRA, *Linn. L. D.*—THE COMMON MULBERRY.

Sex. Syst. Monœcia, Tetandria.

(Fructus, L., Baccæ, *D.*)

History.—The mulberry (μορέα) is mentioned by Hippocrates, (*De victûs ratione*, lib. ii. p. 360, ed. Fœs,) "Mora calefaciunt et humectant ac alvo secedunt," says the Father of Physic. Dioscorides (lib. i. cap. 180,) also speaks of the mulberry.

Botany. **Gen. Char.**—Monœcious. *Catkins*, unisexual. *Calyx* four-lobed; the lobes concave. *Stamens* four, alternate with the segments of the calyx. *Ovary* free. *Stigmas* two. *Seeds* one in two, covered by the pulpy calyx. (*Bot. Gall.*)

Sp. Char.—*Leaves* cordate, ovate, lobed, or unequally dentate; rough and thickish. *Fruit* dark purple. (*Bot. Gall.*)

A small *tree*, with rugged bark. *Flowers* greenish. "*Fruit*, consisting of the female flowers, become fleshy and grown together, inclosing a dry membranous pericarp." (Lindley.)

Hab.—Native of Persia and China. Cultivated for its fruit. Flowers in May.

Description.—The fruit is usually called *a berry*, (*bacca mori nigræ*), but is, in fact, that kind called by botanists *a sorosis*. Its odour is peculiar and agreeable; its taste is peculiar, pleasant, acidulous, and sweet. The juice is dark violet red.

Composition.—The fruit has not been analyzed. Its principal constituents are *violet-red colouring matter*, *tartaric acid*, *sugar*, *woody fibre*. The root has been analyzed by Wackenroder (Gmelin's *Handb. d. Chem.* 2, 1324).

Physiological Effects.—Mulberries are alimentary in a slight degree; they allay thirst, diminish febrile heat, and, in large quantities, prove laxative.

Use.—They are employed as an agreeable aliment, and are well adapted to check preternatural heat, and relieve thirst in fevers, but are objectionable when a tendency to diarrhœa exists. They owe their retention in the Pharmacopœia to their colour and flavour.

SYRUPUS MORI, L.; *Syrup of Mulberries.*—(Juice of mulberries, strained, Oj.; Sugar, lb. ijss. Dissolve the sugar in the mulberry juice with a gentle heat, and proceed in the same manner as directed for Syrup of Lemons.)—Used as a colouring and flavouring substance. Its acidity prevents its being used with alkalis, earths, or their carbonates.

Fig. 178.

Morus nigra.

Fig. 179.

Ficus Carica.

3. FI'CUS CAR'ICA, *Linn., L. E. D.*—THE COMMON FIG.

Sex. Syst. Polygamia, Triœcia, *Linn.*; Polygamia, Diœcia, *Willd.*; Diœcia, Triandria, *Pers.*

(Fici: fructus siccus, *L.*—Fici: the dried fruit, *E.*—Fructus siccatus, *D.*) (Ficus, U. S.)

History.—In the Old Testament we are informed that Hezekiah (who lived 600 years before Christ) used figs as a topical application to a boil. (*Isaiah*, xxxviii. v. 21.)

Botany. **Gen. Char.**—Monœcious. *Flowers* numerous, pedicellated, inclosed within a fleshy receptacle, which is umbilicated, and nearly closed at the apex, hollow within. *Calyx* three to five-lobed: lobes acuminate. *Male flowers* near the umbilicus. *Stamens* three to five. *Ovary* free (Desf.); semi-adnate (Gærtn.) *Style* one. *Stigmas* two. *Drupe* or *utricle* one-seeded, sunk into the pulpy receptacle. *Coat* of the nut fragile, crustaceous. (*Bot. Gall.*)

Sp. Char.—*Leaves* cordate, palmate; scabrous above, pubescent beneath. (*Bot. Gall.*)—A small *tree*. Flowers in June. *Receptacle* green. At the base of each receptacle are two or three bracteal scales.

Hab.—Native of Asia and South of Europe.

Description.—Figs (*fici* seu *caricæ*) constitute that kind of collective fruit called, by Mirbel, a *syconus*. They consist of fleshy, hollow, pyriform receptacles, within which are numerous, small, seedlike bodies (*achenia*, Lindley; *utricles*, Auctor). In the unripe state they contain an acrid and bitter juice, but which, when they are ripe, is replaced by sugar. Ripe figs are dried in the sun or in ovens, and are afterwards packed in drums and baskets, in which they are imported. As met with in the shops they are more or less compressed, are covered with a whitish, saccharine efflorescence, have a brownish or yellowish colour, and are somewhat translucent. They have a peculiar and agreeable odour, and contain a sweet, viscid pulp, in which are the achenia. *Turkey* or *Smyrna figs* are the largest, most juicy, and sweetest: hence they are sometimes termed *fat figs* (*caricæ pingues*): they are distinguished into *pulled* and *flat*. Of 20,406 *cwts.* of figs, imported in 1830, no less than 18,801 came from Turkey. (*Parliam. Return.*)

Composition.—Bley (Zenker's *Naturgeschichte der vorzügl. Handelspfl.*) analyzed Smyrna figs, and obtained the following result:—*Sugar of figs* 62·5, *fatty matter* 0·9, *extractive with chloride of calcium* 0·4, *gum with phosphoric acid* 5·2, *woody fibre* and *seeds* [achenia] 150·0.

Physiological Effects.—Figs are nutritive, emollient, demulcent, and laxative. In the fresh state they are both agreeable and wholesome: when dried, as we receive them, they readily disorder the stomach and bowels, and occasion flatulence, griping, and mild diarrhœa.

Uses.—In those countries where they are plentiful, figs are used as food. Here they are chiefly employed as a dessert. Internally they are given in the form of demulcent decoctions (as the *decoctum hordei compositum*, L. D.) in pulmonary and nephritic affections. As laxatives they are sometimes taken with the food, to relieve habitual constipation, and enter into the composition of *Confectio Sennæ*, L. (U. S.) (*Electuarium Sennæ*, E.) Roasted or boiled, and split open, they are employed as suppurative cataplasms in gum-boil, &c.

4. DORSTE'NIA CONTRAJER'VA, *Linn. L.; and* DORSTENIA BRASILIEN'SIS, *Lam.*

Sex. Syst. Tetandria, Monogynia.

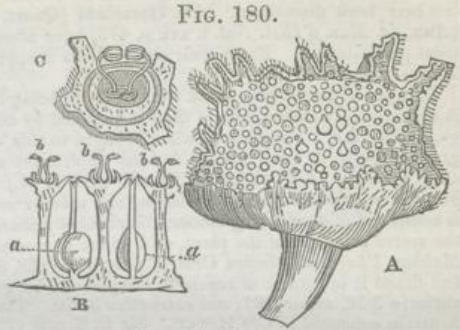
(Dorstenia Contrajerva.—Radix. *L.*) (Contrajerva, U. S.)

History.—The earliest notice of this plant is that by Monardes, (Clusius, *Exoticorum*, p. 311,) who states that the word *Contrayerva* is the Indian Spanish term for alexipharmic or counter-poison. In 1581 Clusius (Clusius, *Exoticorum*, p. 83) received from Sir Francis Drake a root which he called, after the donor, *Drakena radix*, and which has been supposed to be contrayerva root.

Botany. **Gen. Char.**—Monœcious. *Flowers* arranged upon a fleshy receptacle, usually flat and expanded, and extremely variable in form: *males* on the

surface of the receptacle, two-lobed, fleshy, diandrous: *females* immersed in the receptacle, also two-lobed in most species. *Ovary* one to two-celled, with a single suspended ovule in each cell. *Style* one. *Stigma* two-lobed. *Achenia* lenticular, imbedded in the fleshy receptacle; from which they are projected with elasticity when ripe. — Dwarf *herbaceous* plants with scaly rhizomata. (Lindley).

FIG. 180.



Dorstenia Contrajerva.

A, Entire receptacle.
B, Section of ditto.
a, Female flowers.
b, Male ditto.
C, Male flower in its superficial hollow.

Species. 1. *D.* **Contrajer'va**, Linn. L.—Caulescent; *stem* covered with spreading green, scaly stipules. *Leaves* palmate; the lobes lanceolate, acuminate, coarsely serrated. and gashed, occasionally almost pinnatifid. *Receptacle* on a very long stalk, quadrangular, wavy, or plated (*Lindley*). A native of New Spain, Mexico, Peru, Tobago, St. Vincent's. (*Willd.*) The root of this is not met with in commerce.

2. *D.* **Brasiliensis**, Lam.—A native of Jamaica, Brazil, and Trinidad. This yields the contrayerva root usually met with in the shops.

DESCRIPTION.—The contrayerva root (*radix contrajervæ*), usually found in the shops, is imported from the Brazils. It consists of an ovoid or oblong rootstock, terminating, inferiorly, in one or several long, tapering, more or less curved, root fibres. From the sides of the rootstock also arise numerous slender fibres. Externally the colour is yellowish-brown. The odour of the root is peculiar, but aromatic. The taste is warm, bitterish, slightly acrid.

I have also found another kind of contrayerva root in the shops. The rootstalk is smaller, cylindrical, blackish-brown, with fewer fibres. The receptacle and leaves are attached; the latter are reniform. Is this the *Drakena radix* of Clusius?

COMPOSITION.—The root has not been analyzed. It contains, according to Geiger, (*Handb. d. Pharm.*,) *volatile oil*, *bitter extractive*, and *starch*. To which may be added *resin*, *free acid*, and *woody fibre*.

PHYSIOLOGICAL EFFECTS.—Stimulant, tonic, and diaphoretic. Its operation is very analogous to that of serpentary root, between which and the rhizome of the sweet flag it deserves to be arranged. The root of the *Dorstenia brasiliensis* often proves emetic. (De Candolle, *Essai sur les Propriétés Méd.*)

USES.—Obsolete, or nearly so. It has been employed in fevers of a low type, and in other diseases requiring a mild, stimulant, and diaphoretic treatment.

ADMINISTRATION.—The dose of the root in *powder* is ℈j. or ʒss. The *infusion* (prepared by digesting ʒiv. in fʒvj. of boiling water) may be given in doses of fʒj. or fʒij. The *pulvis contrajervæ compositus* (composed of powdered contrayerva root ʒv. and prepared shells lb. iss.) is no longer officinal.

OTHER MEDICINAL OR POISONOUS URTICACEÆ.

1. ANTIARIS TOXICARIA is the celebrated *Antsjar* or *Upas* poison tree of Java, rendered notorious principally in consequence of certain gross falsehoods concerning it, about the year 1780, by a person of the name of Foersch, said to have been a surgeon in the service of the Dutch East India Company. Malefactors, says this person, when they receive sentence of death, are offered the chance of life, if they will go to the Upas-tree for a box of poison; and although every precaution is taken to avoid the injurious influence of the emanations of the tree, yet of 700 criminals who went to collect the poison, scarcely two out of twenty returned. Foersch

further adds, that for fifteen or eighteen miles around this tree no living animal of any kind has ever been discovered.[1] Dr. Horsefield (*Quart. Journ.* vol. ii. p. 331) and M. Leschinault (*Ann. du Mus. d'Hist. Nat.* t. xvi. p. 476) have shown that the above statements are for the most part fabulous. From their observations it appears that the *true poison tree* of Java is the *Antiaris toxicaria*.[2]

It is one of the largest forest trees of Java, being from 60 to 100 feet high. The milky juice is collected by incision, and is then inspissated by boiling along with the juice of arum, galanga, onions, &c. The poison, when brought to this country, is found to be a thick fluid, of a grayish-brown or fawn colour, and an unpleasant odour. It consists, according to Pelletier and Caventou, (*Ann. Chim. et Phys.* t. xxvi. p. 44,) of *a peculiar elastic resin, slightly soluble gummy matter analogous to bassorin*, and *a bitter matter soluble in water*. This bitter matter is composed of *a colouring matter* absorbable by charcoal, *an undetermined acid*, and *anthiarin*, the active principle of the plant, and which is precipitable by tincture of galls. More recently, Mulder (*Pharmaceutisches Central-Blatt für* 1838, S. 511) has submitted this juice to analysis, and found it to consist of *vegetable albumen* 16·14, *gum* 12·34, *antiar-resin* 20·93, *myricin* 7·02, *antiarin* 3·56, *sugar* 6·31, and *extractive* 33·70. The antiar-resin was composed of C^{16} H^{12} O. Antiarin consisted of C^{14} H^{10} O^{5}. Sir B. Brodie (*Phil. Trans.* for 1811,) says, the poison renders the heart insensible to the stimulus of the blood. Magendie and Delile (Orfila, *Toxicol. Gén.*) found that besides acting on the brain and spinal marrow, it proved emetic. According to Andral, it causes convulsions with alternations of relaxation.

2. Artocarpus.—The *Artocar'pus inci'sa*, or *Bread-fruit tree*, and the *A. integrifo'lia* or *Jak fruit*, deserve notice on account of their important alimentary uses. *Artocarpus incisa* is a native of the islands of the Pacific and of the Moluccas. Its fruit is to the inhabitants of Polynesia what corn is to the people of other parts of the world. *Artocarpus integrifolia* is cultivated throughout southern India, and all the warmer parts of Asia. Its fruit forms a very considerable article of food in Ceylon. (For a full description of these plants, by Dr. Hooker, see *Botan. Magaz.* vol. ii. N. S.)

Fig. 181.

Artocarpus incisa.

Fig. 182.

Cannabis sativa.

3. Cannabis sativa; *Common Hemp.*—Herodotus (*Melpomene*, lxxiv. and lxxv.) mentions the hemp plant, and states that the Scythians, who cultivated it, made themselves garments of it. He also adds that they threw the seeds on red-hot stones, and used the perfumed vapour thereby obtained as a bath, which excited from them cries of exultation. This I presume refers to the intoxicating properties of its smoke. The hemp may have been, as Dr. Royle (*Illustrations of the Botany of the Himalayan Mountains*, p. 334,) suggests, the "assuager of grief" or the *Nepenthes* (Νηπενθές) of which Homer (*Odyssey*, iv. verse 220) speaks. It is known in India as the "increaser of pleasure," the "exciter of desire," the "cementer of friendship," the "causer of a reeling gait," the "laughter mover," &c.[3]

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[1] See the translation of Foersch's paper in Burnett's *Outlines of Botany*, 552: also *Penny Mag.* vol. ii. p. 321.

[2] For a very elaborate account of this tree, by M. I. J. Bennett, see Dr. Horsefield's *Plantæ Javanicæ rariores*, p. 52.

[3] Royle, *op. supra cit.*; also Dr. O'Shaughnessy *On the Preparation of the Indian Hemp or Gunjah*. Calcutta, 1839.

The plant which grows in India and has been described by some botanists (Rumphius, *Herbarium Amboinense*, vol. v. t. 77,) under the name of *Cannabis indica* does not appear to me to possess any specific differences from the common hemp. Roxburgh (*Flora Indica*, vol. iii. p. 772,) and most other distinguished botanists have accordingly considered it identical with the *Cannabis sativa* of Linnæus and Willdenow. Mr. Anderson, of the Chelsea Garden, has pointed out to me, as one distinguishing character, that the *C. indica* branches from the ground up to within two feet of the top; whereas common hemp grows three or four feet before it branches. The fruit also of *C. indica* is smaller, and rounder. I have carefully compared *C. indica* (both that grown in the Chelsea Garden, and that contained in Dr. Wallich's Herbarium in the possession of the Linnean Society) with the *C. sativa* in Linnæus's collection, and I cannot discover any essential distinction between them. The male plants appear to me to be in every respect the same.[1] In the female plants, the flowers of *C. indica* were more crowded than those of common hemp.

The parts employed, in Asia, for the purpose of intoxication are as follows:

α. Churrus or the concreted resinous exudation from the leaves, slender stems, and flowers. "In Central India and the Saugor territory and in Nipal, Churrus is collected during the hot season in the following singular manner: men clad in leathern dresses run through the hemp-fields brushing through the plant with all possible violence; the soft resin adheres to the leather, and is subsequently scraped off and kneaded into balls, which sell from five to six rupees the seer. A still finer kind, the *Momeea* or waxen Churrus, is collected by the hand in Nipal, and sells for nearly double the price of the ordinary kind. In Nipal Dr. M'Kinnon informs me, the leathern attire is dispensed with, and the resin is gathered on the skin of the naked coolies. In Persia, it is stated by Mirza Abdul Razes that the Churrus is prepared by pressing the resinous plant on coarse cloths, and then scraping it from these and melting it in a pot with a little warm water. He considers the Churrus of Herat as the best and most powerful of all the varieties of the drug. (O'Shaughnessy, *op. supra cit.* p. 6.)

β. Gunjah. This is the dried hemp plant which has flowered, and from which the resin has not been removed. It is sold in the Calcutta bazaars for smoking chiefly, in bundles of about two feet long and three inches in diameter, each containing twenty-four plants.

γ. Bang, Subjee, or *Sidhee.* This consists of the larger leaves and capsules without the stalks.

The leaves of common hemp have been submitted to analysis by Tscheepe, (Gmelin, *Hand. d. Chemie*, Bd. ii. S. 1324,) by Schlesinger, (*Pharmaceutisches Central-Blatt für* 1840, S. 490,) and by Bohlig, (*Pharmaceutisches Central-Blatt für* 1840, S. 490.) The results of the two former of these are as follows:

Tscheepe.		*Schlesinger.*	
Chlorophylle.	} Green fecula.	Bitter matter	1·25
Gluten.		Chlorophylle soluble in ether	4·75
Phosphate Lime.		Chlorophylle soluble in alcohol	9·375
Brown extractive.		Green resinous extractive	5·0
Sweetish bitter extractive.		Colouring matter	10·15
Brown gum.		Gummy extract	19·45
Lignin.		Malate of lime with extractive	6·775
Soluble albumen.		Extractive	6·875
Salts of ammonia, potash, lime, and magnesia.		Vegetable albumen	8·0
Alumina.		Lime, Magnesia, and Iron	9·5
Silica.		Lignin	12·0
		Loss	6·875
Leaves of Cannabis sativa.		Leaves dried at 200 degrees F.	100·000

The most important constituents, in a medicinal point of view, are probably *volatile oil* and *resin.* Bohlig failed to detect a trace of any organic basic matter. The *volatile oil of hemp* has hitherto been procured in such small quantities that its properties are but imperfectly known. When the dried plant is distilled with a large quantity of water, traces of the oil pass over, and the distilled liquor has the powerful narcotic odour of the plant. The *resin of hemp* (*cannabin*) is soluble in alcohol and ether. It has a warm, bitterish, acrid taste, and a fragrant and narcotic odour.

Dr. O'Shaughnessy gave ten grains of Nipalese churrus dissolved in spirit to a middling-sized dog:—"In half an hour he became stupid and sleepy, dozing at intervals, starting up, wagging his tail as if extremely contented, he ate some food greedily, on being called to he staggered to and fro, and his face assumed a look of utter and helpless drunkenness. These symptoms lasted about two hours, and then gradually passed away; in six hours he was perfectly well and lively."

The general effects on man, as stated by Dr. O'Shaughnessy, from his own observations, are alleviation of pain (mostly), remarkable increase of appetite, unequivocal aphrodisia, and

[1] This agrees with a remark in the *Hortus Cliffortianus*, "Quod mas in Horto Malabarico exhibitus nostra sit planta nullum dubium detur; fœmina autem parum recedit foliis ternatis, tamen et ejusmodi plantas in sole macro apud nos observamus non infrequenter."

great mental cheerfulness. Its more violent effects were delirium of a peculiar kind, and a cataleptic state. These effects are so remarkable that I shall quote some cases by way of illustration.

"At two P. M. a grain of the resin of hemp was given to a rheumatic patient. At four P. M. he was very talkative, sang, called loudly for an extra supply of food, and declared himself in perfect health. At six P. M. he was asleep. At eight P. M. he was found insensible, but breathing with perfect regularity, his pulse and skin natural, and the pupils freely contractile on the approach of light. Happening by chance to lift up the patient's arm, the professional reader will judge of my astonishment," observes Dr. O'Shaughnessy, "when I found that it remained in the posture in which I placed it. It required but a very brief examination of the limbs to find that the patient had by the influence of this narcotic been thrown into that strange and most extraordinary of all nervous conditions, into that state which so few have seen, and the existence of which so many still discredit—the genuine *catalepsy* of the nosologist" (vol. i. p. 178). "We raised him to a sitting posture, and placed his arms and limbs in every imaginable attitude. A waxen figure could not be more pliant or more stationary in each position, no matter how contrary to the natural influence of gravity on the part. To all impressions he was meanwhile almost insensible. He continued in this state till one A. M. when consciousness and voluntary motion quickly returned.

"Another patient who had taken the same dose fell asleep, but was roused by the noise in the ward. He seemed vastly amused at the strange aspect of the statute-like attitudes in which the first patient had been placed. On a sudden he uttered a loud peal of laughter, and exclaimed that four spirits were springing with his bed into the air. In vain we attempted to pacify him; his laughter became momentarily more and more uncontrollable. We now observed that the limbs were rather rigid, and in a few minutes more his arms and legs could be bent, and would remain in any desired position. He was removed to a separate room, where he soon became tranquil, his limbs in less than an hour gained their natural condition, and in two hours he experienced himself perfectly well and excessively hungry."

Dr. O'Shaughnessy was kind enough to send me from Calcutta specimens of *Gunjah*, *Nipalese Churrus*, and *an alcoholic extract of Gunjah*. The two former only came to hand. I have submitted them to experiment both on animals and man, and have given specimens of them to medical friends for trial, but their effects have hitherto proved comparatively slight. Whether this be owing to the preparations having undergone some deterioration in their passage, or to the comparative phlegmatic temperament of the English, I know not. My experiments on animals were made in the lecture-room of the London Hospital before the students of the materia medica class; and the trials on the human subject were made in the wards of the Hospital. The following are brief notices of some of the experiments:

Expt. 1. Ten grains of *Churrus* in fine powder were given to a small terrier with his food. In fifteen minutes he appeared somewhat drowsy. In fifty-five minutes, when left quiet, he would sleep as he sat, and nod forward or to the side, so as nearly to fall. When roused, however, he appeared quite well, but when left alone soon fell asleep again. One of the students (Mr. Porter) took charge of him for the remainder of the day, and reported that he fell asleep, but presented no other symptom.

Expt. 2. One drachm of *Churrus* in fine powder was given to a large cat, but no effects were observed.

Expt. 3. My colleague, Mr. Curling, to whom I had given some *Churrus*, informs me that 69 grs. were given, in 16 hours, to a tetanic patient on board the hospital ship the Dreadnought, without any obvious effect.

Expt. 4. Four grains of an alcoholic extract of Gunjah were given to a girl, aged 14, in the London Hospital, affected with a convulsive disorder partaking of the characters of both chorea and hysteria. She was troubled with a spasmodic action of the diaphragm, and had been for several days and nights without sleep. About half an hour after taking the third four-grain dose the spasms entirely ceased, and the patient complained of vertigo and headache. The pupils were not perceptibly affected. The pulse was 93, soft and regular. She fell into a tranquil sleep, in which she remained several hours. When she awoke she had no spasms, but complained of headache and vertigo. The pupils were dilated and the skin moist. On raising her up to take another pill she complained of great faintness, and broke out into a profuse perspiration. The faintness having subsided she again sat up, when the pulse suddenly rose from 93 to 130. Some days afterwards convulsive movements appeared in other muscles. The extract was again resorted to, but its effects were never more than palliative, and notwithstanding the dose was increased to thirty grains twice, and even thrice, it ceased to produce any obvious effect. The extract never appeared to affect her appetite, which was all through good.

Expt. 5. A scruple of the green alcoholic extract of *Cannabis indica* grown at the Chelsea Garden was dissolved in about a fluidrachm of spirit, and thrown into the peritoneal sac of a middle-sized dog, but no effect was observed.

Expt. 6. Two drachms of the powder of the female plant of *Cannabis indica*, grown at Chelsea, were given to a small dog, but no effect was observed.

I have also tried the alcoholic extract of Gunjah, prepared at Madras, and sent me by my

late pupil Mr. T. Brydon; but have failed with it also to produce the remarkable effects observed by Dr. O'Shaughnessy. I have seen weakness in the hind extremities of a cat caused by it, so as to prevent her taking her customary leap on to a wall to escape. This effect was observed 24 hours after the exhibition of the medicine, which did not appear to produce any other result.

The preparations of hemp are used in India for the purpose of intoxication. They are employed in the form of beverages, smoke, or confection. There are seven or eight makers of *Majoon* or hemp confection in Calcutta. Dr. O'Shaughnessy has described the method of making it as followed by the proprietor of a celebrated place of resort for hemp-devotees in Calcutta.

Dr. O'Shaughnessy has suggested the employment of Indian hemp in rheumatism, tetanus. hydrophobia, and cholera, and has published some cases illustrative of its beneficial effects. In the case of hpdrophobia it alleviated the patient's suffering, though it did not save him.

The preparations used by Dr. O'Shaughnessy were the extract and tincture.

α. Extractum Cannabis. Alcoholic or Resinous Extract of Indian Hemp.—This is prepared by boiling the rich adhesive tops of the dried Gunjah in rectified spirits until all the resin is dissolved. "The tincture thus obtained is evaporated to dryness in a vessel placed over a pot of boiling water. The extract softens at a gentle heat, and can be made into pills without any addition." (O'Shaughnessy). In hydrophobia from ten to twenty grains of the resin, in soft pills, are to be chewed by the patient, and repeated according to the effect.

β. Tinctura Cannabis.—Dr. O'Shaughnessy directs three grains of the extract to be dissolved in one drachm of proof spirit. Dose, in tetanus, ʒj. every half hour, until the paroxysms cease, or catalepsy is induced; in cholera, ten drops every half hour.

4. PARIETARIA OFFICINALIS, or *Common Wall-pellitory*, is a common indigenous plant, which was formerly in great repute as a diuretic and lithontriptic. By some practitioners it is still highly esteemed. It is used in calculus and other urinary affections, and also in dropsies. The expressed juice may be taken in doses of one or two fluidounces. Or the decoction (prepared by boiling ℥j. of the herb in a pint of water) may be substituted. The extract and distilled water have also been used. On account of the nitre which the plant contains, the extract is said to take fire in making it. (Withering, *Arrangement of British plants*, vol. ii. p. 237, 7th edit.)

ORDER XXVII.—PIPERACEÆ, *Kunth.*—THE PEPPER TRIBE.

ESSENTIAL CHARACTER.—*Flowers* naked, hermaphrodite, with a bract on the outside. *Stamens* definite or indefinite, arranged on one side, or all round the ovary; to which they adhere more or less; *anthers* one or two-celled, with or without a fleshy connective; *pollen* smooth. *Ovary* superior, simple, one-celled, containing a single erect *ovule; stigma* sessile, simple, rather oblique. *Fruit* superior, somewhat fleshy, indehiscent, one-celled, one-seeded. *Seed* erect, with the embryo lying in a fleshy sac, placed at that end of the seed which is opposite the hilum, on the outside of the albumen.—*Shrubs* or *herbaceous plants. Leaves* opposite, verticillate, or alternate, in consequence of the abortion of one of the pair of leaves, without *stipules. Flowers* usually sessile, sometimes pedicellate, in spikes which are either terminal or axillary; or opposite the leaves (Lindley).

PROPERTIES.—Fruits remarkable for their hot taste, and acrid and stimulant properties. These qualities they owe to the presence of an acrid oil and resin.

1. PIPER NI'GRUM, *Linn. L. E. D.*—THE BLACK PEPPER.

Sex. Syst. Diandria, Trigynia.

(Baccæ, *L.*—Dried unripe Berries, *E.*—Semina, *D.*)

(Piper, U. S.)

HISTORY.—The ancient Greeks were acquainted with pepper (πέπερι); their knowledge of which must have been derived, directly or indirectly, from the Hindoos. Hippocrates (*de morb. mul.* &c.) employed it in several diseases. Pliny (*Hist. Nat.* lib. xii. cap. 14, ed. Valp.) notices its uses as a condiment, and expresses his astonishment that it should have come into general use, since it has neither flavour nor appearance to recommend it.

BOTANY.—**Gen. Char.**—*Spadix* covered with flowers on all sides. *Flowers* hermaphrodite, rarely dicœcious, each supported by a scale. *Stamina* two or more, *Ovarium* with one, solitary, erect *ovule. Stigma* punctiform, obtuse, or split. *Berry* one-seeded. *Embryo* dicotyledonous [monocotyledonous, *Blume*], inverted (Blume). (*Enum. Plant. Javæ*, p. 64.)

Sp. Char.—*Stem* shrubby, radicant, climbing, terete. *Leaves* ovate or ellipti-

cal, acuminate, occasionally somewhat oblique, subcordate, five to seven-nerved, coriaceous, smooth, recurved at the margin, glauco-greenish beneath. *Spadices* shortly pedunculated, pendulous. *Fruits* distinct (Blume). (*Op. cit.*)

Stem eight to twelve feet long, jointed, dichotomous. *Fruit* at first green, then red, afterwards black.

FIG. 183.

Piper nigrum.

According to Dr. Roxburgh (*Fl. Indica*, vol. i. p. 153,) *Piper trioicum* is cultivated, and yields excellent pepper.

Hab.—Cultivated in various parts of India and its islands (Roxburgh); also in the West Indies.

PREPARATION.—When any of the berries on a spadix change from green to red, the whole are considered fit for gathering; for if they are allowed to become fully ripe, they are somewhat less acrid, and, moreover, easily drop off. When collected they are spread out, and dried in the sun, and the stalks separated by hand-rubbing. They are afterwards winnowed. (Marsden, *History of Sumatra*, 2d. ed. p. 137.) The dried and shrivelled berries constitute *black pepper* (*piper nigrum*).

White pepper (*piper album*) is prepared from the best and soundest grains, taken at their most perfect stage of maturity. These being soaked in water, swell and burst their tegument, which is afterwards carefully separated, by drying in the sun, hand-rubbing, and winnowing. (Marsden, *op. cit.*)

COMMERCE.—The pepper countries extend from about the longitude of 90° to that of 115° E., beyond which no pepper is to be found; and they reach from 5° S. latitude to about 12° N., where it again ceases. The following estimate of the production of pepper is drawn up by Mr. Crawford. (M'Culloch, *Dict. of Comm.*)

Production of Pepper.	*lbs.*
Sumatra (west coast)	20,000,000
Do. (east do.)	8,000,000
Islands in the Straits of Malacca	3,000,000
Malay peninsula	3,733,333
Borneo	2,666,667
Siam	8,000,000
Malabar	4,000,000
TOTAL	50,000,000

In the year 1838, the number of pounds of pepper which paid duty (1*s.* per lb.) was 2,169,438. In 1842, 2,271,174 lbs. paid duty. Pepper is usually imported in bags.

DESCRIPTION.—*Black pepper* (*piper nigrum*) is round, covered externally with a brownish-black, corrugated layer (the remains of the succulent portion of the berry), which may be readily removed by softening it in water. Internally we have a hard, whitish, spherical, smooth seed, which is horny externally, but farinaceous internally. The finest kind of black pepper is called *shot pepper*, from its density and hardness. *Fulton's decorticated pepper* is black pepper deprived of its husk by mechanical trituration. It is sometimes bleached by chlorine. (Brande, *Dict. of Mat. Med.*) The taste of pepper (both of nucleus and covering) is acrid and hot. *White pepper* (*piper album*) is the fruit deprived of the external fleshy portion of the pericarp. The grains are larger than those of black pepper, spherical, whitish, and smooth, horny externalty; internally they are farinaceous, or hollow in the centre. They are less acrid and pungent than black pepper.

COMPOSITION.—In 1819, Oersted discovered *piperin* in black pepper. In 1821, black pepper was analyzed by Pelletier. (*Ann. de Chim. et de Phys.* xvi. 344.) In 1832, white pepper was analyzed by Lucä. (Schwartze, *Pharm. Tabellen.*)

Black pepper (Pelletier.)	
Acrid soft resin.	
Volatile oil.	
Piperin.	
Extractive.	
Gum.	
Basssorin.	
Starch.	
Malic acid.	
Tartaric acid.	
Potash, calcareous, and magnesian salts.	
Woody fibre.	
Black Pepper.	

White Pepper (Lucä.)	
Acrid resin	16·60
Volatile oil	1·61
Extractive, gum, and salts	12·50
Starch	18·50
Albumen	2 50
Woody fibre	29·00
Water and loss	19·29
White pepper	100 00

Lucä found no *piperin* in white pepper; but Poutet (*Journ de Pharm.* t. vii.) subsequently detected it. Probably, therefore, in Lucä's analysis, the piperin was contained in the resin.

1. Resin of Pepper (*resina piperis*).—This is a very acrid substance, soluble in alcohol and ether, but not so in volatile oils. It possesses in high perfection the acrid properties of pepper. Dissolved in ether, it was employed by Dr. Lucas, in intermittents, and in two out of three cases with success. (Dierbach, *Neuest. Entd. in d. Mat. Med.* Bd. I, S. 252, 1837.)

2. Volatile Oil of Pepper (*oleum piperis*).—When pure this is colourless; it has the odour and taste or pepper. Its sp. gr. is 0·9932 (Lucä). Its composition is C^{10} H^{8}. It absorbs hydrochloric acid in large quantity, but does not form a crystalline compound with it. According to Meli, (Dierbach, *op. cit.*,) it possesses the same febrifuge properties as piperin, perhaps because it retains some of the latter principle. It has been used in some forms of dyspepsia depending on general debility.

3. Piperin.—This substance was discovered by Oersted in 1819, but was more accurately examined by Pelletier in 1821. It exists in black, white, and long pepper, and also in cubebs.

It is a crystalline substance, the crystals being rhombic prisms, with inclined bases. It fuses at 212° F., is insoluble in cold water, and is only very slightly soluble in boiling water. Its best solvent is alcohol; the solution throws down piperin when water is added to it. Ether dissolves it, but not so readily as alcohol. Acetic acid likewise is a solvent for it.

Piperin, when pure, is white; but, as met with in commerce, it is usually straw-yellow. It is tasteless and inodorous. It was at first supposed to be an alkali; but Pelletier has shown that it possesses no analogy with vegetable alkalis, and that it is related to the resins. With strong sulphuric acid it forms a blood-red liquid. Nitric acid colours it first greenish-yellow, then orange, and afterwards red. The action of hydrochloric acid is similar.

Its formula, according to Regnault, is C^{34} H^{19} N O^{6}.

Piperin has been recommended and employed by Meli and several other physicians (Dierbach, *Neuest. Entd. in d. Mat. Med.* B. i. S. 176, 1828) as a febrifuge in intermittent fevers. It is said to be more certain and speedy, and also milder in its action, than the cinchona alkalis. Moreover, we are told it might be procured at a cheaper rate than sulphate of quinia. Its dose is about six or eight grains in powder or pills. Sixty grains have been taken in twenty-four hours, without causing any injurious effects. Mali considers two or three scruples sufficient to cure an intermittent. Magendie (*Formulaire*) proposes it in blennorrhagia, instead of cubebs.

Physiological Effects.—Pepper is one of the acrid spices whose general effects have been already noticed (see vol. i. p. 183). Its great acridity is recognised when we apply it to the tongue. On the skin it acts as a rubefacient and vesicant. (Richard, *Dict. de Méd.* t. xvii. p. 307.) Swallowed, it stimulates the stomach, creates a sensation of warmth in this viscus, and, when used in small doses, assists the digestive functions, but, if given in large quantities, induces an inflammatory condition. Thirty white pepper-corns, taken for a stomach complaint, induced violent burning pain, thirst, and accelerated pulse, which continued for three days, until the fruits were evacuated. (Wibmer, *Arzneim. u. Gifte*, Bd. iv. S. 220.) Wendt, Lange, and Jager, (quoted by Wibmer, *op. cit.* S. 119,) have also reported cases in which inflammatory symptoms supervened after the use of pepper. On the vascular and secerning systems pepper acts as a stimulant. It accelerates the frequency of the pulse, promotes diaphoresis, and acts as an excitant to the mucous surfaces. On one of my patients (a lady) the copious use of pepper induces burning heat of skin, and a few spots of the *Urticaria evanida* usually on the face. "I have seen," says Van Swieten, (*Commentaries*, vol. v. p. 57, Engl. Transl.,) "a most ardent and dangerous fever raised in a person who had swallowed a great quantity of beaten pepper." It has long been regarded as a stimulant for the urino-

genital apparatus. The opinion is supported by the well-known influence of the peppers over certain morbid conditions of these organs. Moreover, the beneficial effect of pepper in some affections of the rectum leads us to suspect that this viscus is also beneficially influenced by these fruits.

Uses.—It is employed as a condiment, partly for its flavour, partly for its stimulant influence over the stomach, by which it assists digestion. As a gastric stimulant it is a useful addition to difficultly-digestible foods, as fatty and mucilaginous matters, especially in persons subject to stomach complaints from a torpid or atonic condition of this viscus. Infused in ardent spirit it is a popular remedy for preventing the return of the paroxyms of intermittent fevers, given shortly before the expected attack. The practice is not recent, for Celsus (lib. iii. cap. 12) advises warm water with pepper to relieve the cold fit. The febrifuge power of this spice has been fully proved, in numerous cases, by L. Frank; (*Journ. Complém. du Dict. des Scienc. Med.* t. viii. 371;) Meli, (*Journ. Complém. du Dict. des Scienc. Méd.* t. xiii. p. 124,) Riedmüller (Dierbach), and others; though Schmitz (*Rust's Magaz.* Bd. xvi.) denies it. Barbier (*Traité Elém. de Mat. Méd.* 2d. ed. t. ii. p. 57) says, that in some instances, where large doses were exhibited, death occurred in consequence of the aggravation of a pre-existent gastritis. It has been employed in gonorrhœa as a substitute for cubebs. In relaxed uvula, paralysis of the tongue, and other affections of the mouth or throat requiring the use of a powerful acrid, pepper may be employed as a masticatory. In the form of ointment it is used as an application to tinea capitis. Mixed with mustard it is employed to increase the acridity of sinapisms.

Administration.—The dose of black pepper (either of corns or powder) is from five to fifteen grains; the powder may be given in the form of pills.

1. CONFECTIO PIPERIS NIGRI, L. E.: *Electuarium Piperis*, E. *Confection of Black Pepper.*—(Black Pepper; Elecampane-root [Liquorice-root in powder, *E.*] of each, lb. j.; Fennel seeds, lb. iij.; Honey; White Sugar, of each, lb. ij. Rub the dry ingredients together to a very fine powder. The *London College* keeps this in a covered vessel, and directs the Honey to be added when the Confection is to be used. But the *Edinburgh and Dublin Colleges* order the Honey to be added immediately after the dry ingredients have been mixed.)—This preparation is intended to be a substitute for a quack medicine, called "*Ward's Paste*," which has obtained some celebrity as a remedy for fistulæ, piles, and ulcers about the rectum. Its efficacy doubtless depends on the gentle stimulus it gives to the affected parts. Sir B. Brodie (*Lectures* in *Lond. Med. Gaz.* vol. xv. p. 746,) observes, that severe cases of piles are sometimes cured by it; and he thinks that it acts on them topically, the greater part of the paste passing into the colon, becoming blended with the fæces, and in this way coming into contact with the piles, on which it operates as a local application, much as *vinum opii* acts on the vessels of the conjunctiva in chronic opthalmia. In confirmation of this view, he mentions the case of a patient attended by Sir Everard Home, who was cured by the introduction of the paste into the rectum. Confection of black pepper is adapted for weak and leucophlegmatic habits, and is objectionable where much irritation or inflammation is present. The dose of it is from one to two or three drachms twice or thrice a day. "It is of no use," says Sir B. Brodie, "to take this remedy for a week, a fortnight, or a month: it must be persevered in for two, three, or four months." As it is apt to accumulate in and distend the colon, gentle aperients should be exhibited occasionally during the time the patient is taking the confection.

2. UNGUENTUM PIPERIS NIGRI, D., *Ointment of Black Pepper.*—(Prepared Hog's Lard, lb. i.; Black Pepper, reduced to powder, ℥iv. Make an ointment.)—Formerly in vogue for the cure of tinea capitis.

2. PI'PER LONG'UM, *Linn. L. E. D.*—THE LONG PEPPER.

Sex. Syst. Diandria, Trigynia.

(Fructus immaturus exsiccatus, *L.*—Dried Spikes, *E.*—Semina, *D.*)

BOTANY. **Gen. Char.**—Vide *Piper nigrum.*

Sp. Char.—*Stem* shrubby, climbing. Lower *leaves* ovate-cordate, three to five-nerved; upper ones on short petioles, oblong, acuminate, oblique, and somewhat cordate at the base, obsoletely four to five-nerved and veined, coriaceous, smooth, grayish-green beneath, *Peduncles* longer than the petiole. *Spadices* almost cylindrical (Blume). (*Enum. Fl. Javæ*, p. 70.)

Hab.—India. Found wild among bushes, on the banks of water-courses, up towards the Circar mountains. It flowers and bears fruit during the wet and cold seasons (Roxburgh). It is cultivated in Bengal, and in the valleys amongst the Circar mountains. The root and thickest parts of the stems, when cut into small pieces and dried, form a considerable article of commerce all over India, under the name of *Pippula moola.*

DESCRIPTION.—When fully grown, but yet unripe, the spadices are gathered and dried by exposure to the sun. They are then packed in bags for sale.

As met with in commerce, *long pepper* (*piper longum*) is grayish-brown, cylindrical, an inch or more in length, having a mild aromatic odour, but a violent pungent taste.

COMPOSITION.—This pepper was analyzed by Dulong in 1825. (*Journ. de Pharm.* t. xi. p. 52.) The following are the substances he obtained from it:—*Acrid fatty matter* (resin?), *volatile oil*, *piperin*, *nitrogenous extractive*, *gum*, *bassorin*, *starch*, *malates and other salts.*

The VOLATILE OIL OF LONG PEPPER is colourless, and has a disagreeable odour and an acrid taste.

PHYSIOLOGICAL EFFECTS AND USES.—The effects of long pepper are analogous to those of black pepper. Cullen (*Mat. Med.* vol. ii. p. 209,) and Bergius (*Mat. Med.* Ed. 2da, t. i. p, 29) consider it less powerful; but most other pharmacologists are agreed on its being more acrid. Medicinally it may be employed in similar cases. It is used principally for culinary purposes. It is a constituent of several pharmacopœial preparations.

3. PI'PER CUBE'BA, *Linn. L. E. D.*—THE CUBEB PEPPER.

Sex. Syst. Diandria, Trigynia.

(Baccæ; cubebæ, *L.*—Fruit, *E.*—Fructus, *D.*)

(Cubeba, U.S.)

HISTORY.—It is uncertain when the cubebs of our shops were first introduced into medicine, or who first alludes to them. There does not appear to be any foundation for the opinion that the ancient Greeks were acquainted with them. "Many, indeed, pretend that the *Carpesion* (καρπήσιον) of Galen is our cubeb, and that the *round pepper* of Theophrastus, the *pepper* of Hippocrates, were all names for them; but this is a conjecture founded on a very bad basis. The Arabians are at the head of these blunders. Serapion has translated all that Galen says of carpesion into his chapter of cubeb, and attributed all its virtues to it, and has even added every thing to the account that Dioscorides has left us of the *Ruscus.* Avicenna is also in the same error, and calls the carpesium *cubeb;* and from these authors Actuarius and the other Greeks have collected their accounts. It is plain from all this, that either the carpesium of the Greeks and the cubeb of the Arabians are the same things, or else that the Arabians have been guilty of confounding different things in a strange manner together: if the latter be the case, there is no judging of any thing from what they say; and if the former, it is very evident that our cubebs are not the same with theirs—that is, with the carpesium of Galen; for he expressly assures us that this was not a fruit or seed, but, as he tells us, a kind of slender woody twig,

resembling in smell and virtues the root of the valerian. Nothing is more evident than that the carpesium, therefore, was either a fibrous root, or the small twigs and branches of a climbing plant, not a round small fruit. If the Arabians, therefore, were acquainted with our cubebs at all, it appears that, not knowing what the carpesium and ruscus were, they ignorantly attributed the virtues ascribed by the Greeks to these medicines to these fruits." (Hill, *Hist. of the Mat. Med.* p. 473.)

Cubebs were in use in England 500 years ago, for in 1305 Edward I. granted to the corporation of London the power of levying a toll of one farthing a pound on this article in its passage over London Bridge. (*Liber Niger Scaccarii*, vol. i. p. *478; also *The Chronicles of London Bridge*, p. 155.)

BOTANY. **Gen. Char.**—Vide *Piper nigrum*.

Sp. Char.—*Stem* shrubby, terete, climbing. *Leaves* petiolate, oblong or ovate-oblong, acuminate, rounded or oblique cordate at the base, nerved, coriaceous, smooth. *Peduncles* almost equal to the petiole. *Berries* with elongated peduncles (Blume). (*Enum. Fl. Javæ*, p. 70.)

Dr. Blume says that the cubebs of the shops are the fruit of *P. caninum*, which has a smaller and shorter-stalked fruit, having a distinct anise flavour, and less pungency than the fruit of P. Cubeba; but Dr. Lindley (*Flora Medica*) observes, that he cannot perceive any difference in the flavour of the dried fruit of P. Cubeba and of the cubebs sold in the London shops. P. Cubeba is readily distinguishable from P. caninum by the leaves being coriaceous, smooth, and shining, with the veins proceeding from the side of the midrib, not from its base.

Hab.—Java and the Prince of Wales's Island.

DESCRIPTION.—The dried unripe fruit of this plant constitutes the *cubebs* (*cubebæ* vel *piper caudatum*) of the shops.

In appearance, cubebs resemble black pepper, except that they are lighter coloured, and are each furnished with a stalk two or three lines long, and from which circumstance they have received their name *caudatum*. The cortical portion of cubebs (that which constituted the fleshy portion of the fruit) appears to have been thinner and less succulent than in black pepper. Within it is a hard spherical seed, which is whitish and oily. The taste of cubebs is acrid, peppery, and camphoraceous; the odour is peculiar and aromatic.

COMPOSITION.—Three analyses of cubebs have been made: one by Trommsdorf, in 1811 (Schwartz, *Pharm. Tabell.*); a second by Vauquelin, in 1820 (*Ann. Phil.* 2d Series, vol. iii. p. 202); and a third by Monheim, in 1835. (*Journ. de Pharm.* xx. 403.)

Vauquelin.	
1. Volatile oil, nearly solid.	
2. Resin like that of copaiva.	
3. Another coloured resin.	
4. A coloured gummy matter.	
5. Extractive.	
6. Saline matter.	
Cubebs.	

Monheim.	
1. Green volatile oil	2·5
2. Yellow volatile oil	1·0
3. Cubebin	4·5
4. Balsamic resin	1·5
5. Wax	3·0
6. Chloride of sodium	1·0
7. Extractive	6·0
8. Lignin	65·0
Loss	15·5
Cubebs	100·0

1. ESSENTIAL OIL OF CUBEBS.—(See p. 212.)

2. RESIN OF CUBEBS.—Vauquelin has described two resins of cubebs: one is green, liquid, acrid, and analogous, both in odour and taste, to balsam of copaiva; the other is brown, solid, acrid, and insoluble in ether.

3. CUBEBIN (*Piperin*).—From cubebs is obtained a principle to which the term *cubebin* has been applied. It is very analogous to, if not identical with, piperin. Cassola, a Neapolitan chemist, (*Journ. de Chim. Méd.* t. x. p. 635,) says, it is distinguished from the latter principle by the fine crimson colour which it produces with sulphuric acid, and which remains unaltered for twenty or twenty-four hours: moreover, Cubebin is not crystallizable.

Monheim, (*op. cit.*) however, declares Cubebin to be identical with piperin, and that it is combined with a soft acrid resin. In this state it is soluble in ether, alcohol, the fixed oils, and acetic acid; but it is insoluble in oil of turpentine and dilute sulphuric acid. It fuses at 68° F.

Dr. Görres (Dierbach, *Neuesten, Entd. in d. Mat. Med.* S. 253, 1837) gave cubebin, in both

acute and chronic gonorrhœa, to the extent of one drachm, four times daily. But he premised the use of phosphoric acid.

4. Extractive Matter of Cubebs.—Vauquelin says, the extractive matter of cubebs is analogous to that found in leguminous plants. It is precipitable by galls, but not by acetate of lead.

Physiological Effects.—Cubebs belong to the acrid species, already (vol. i. p. 181,) noticed. Their sensible operation is very analogous to that of black pepper. Taken in moderate doses, they stimulate the stomach, augment the appetite, and promote the digestive process. In larger quantities, or taken when the stomach is in an irritated or inflammatory condition, they cause nausea, vomiting, burning pain, griping, and even purging. These are their local effects. The constitutional ones are those resulting from the operation of an excitant,—namely, increased frequency and fulness of pulse, thirst, and augmented heat. It probably stimulates all the mucous surfaces, but unequally so. In some instances, cubebs give rise to an eruption on the skin, like urticaria. Not unfrequently they cause headache; and occasionally disorder of the cerebro-spinal functions, manifested by convulsive movements or partial paralysis, as in a case related by Mr. Broughton. (*Lond. Med. Gaz.* vol. i. p. 405.)

Cubebs appear to exercise a specific influence over the urino-genital apparatus. Thus they frequently act as diuretics, and at the same time deepen the colour of, and communicate a peculiar aromatic odour to, the urine. Their stimulant operation on the bladder is well illustrated by a case related by Sir Benjamin Brodie. (*Lond. Med. Gaz.* vol. i. p. 300.) A gentleman, labouring under chronic inflammation of the bladder, took fifteen grains of cubebs, every eight hours, with much relief. Being anxious to expedite his cure, he, of his own accord, increased the dose to a drachm. This was followed by an aggravation of the symptoms: the irritation of the bladder was much increased, the mucus was secreted in much larger quantity than before, and ultimately the patient died,—"his death being, I will not say occasioned," adds Sir Benjamin, "but certainly very much hastened, by his imprudence in overdosing himself with cubebs."

Three drachms of cubebs caused in Pül (*Arzneim ü. Giften.* Bd. iv. S. 217,) nausea, acid eructations, heat in the pit of the stomach, headache, uneasiness, and fever.

Uses.—The principal use of cubebs is in the treatment of *gonorrhœa*. They should be given in as large doses as the stomach can bear, in the early part of the disease; for experience has fully proved that in proportion to the length of time gonorrhœa has existed, the less amenable is it to the influence of cubebs. In some instances an immediate stop is put to the progress of the malady. In others, the violent symptoms only are palliated; while in many (according to my experience in most) cases no obvious influence over the disease is manifested. The presence of active inflammation of the urethra does not positively preclude the use of cubebs, though I have more than once seen them aggravate the symptoms. Mr. Jeffreys (*Observ. on the Use of Cubebs, or Java Pepper, in the Cure of Gonorrhœa*, 1821,) thinks the greatest success is met with in the more inflammatory forms of the disease. Cubebs have been charged with inducing swelled testicle; but I have not observed this affection to be more frequent after the use of cubebs than when they were not employed. Mr. Broughton (*Med. Chir. Trans.* vol. xii. p. 99,) gave them to fifty patients, and in forty-five they proved successful. Of these only two had swelled testicle. The explanation of the *methodus medendi* is unsatisfactory. Sir A. Cooper (*Lancet*, vol. iii. p. 201, 1824,) thinks that cubebs produce a specific inflammation of their own on the urethra, which has the effect of superseding the gonorrhœal inflammation. The occasional occurrence of a cutaneous eruption from the use of cubebs deserves especial attention, as I have known it to create a suspicion of secondary symptoms.

Cubebs have been recommended in gleet and leucorrhœa. (Dr. Orr. *Ed. Med. Journ.* vol. xviii. p. 318.) In abscess of the prostate gland, twenty or thirty grains of cubebs, taken three times a day, have in many cases appeared to do good. (Sir B. Brodie, *Lond. Med. Gaz.* vol. i. p. 396.) They seemed to give a gentle stimulus to the parts, and to influence the disease much in the same way that Ward's Paste operates on abscesses and fistulæ, and ulcers of the rectum. In cystirrhœa also they have occasionally proved serviceable in small doses. (Sir B. Brodie, *Lond. Med. Gaz.* p. 300.) In piles, likewise, they are given with advantage. (Sir B. Brodie, *Lond. Med. Gaz.* vol. xv. 747.)

The efficacy of cubebs in mucous discharges is not confined to the urino-genital mucous membrane. In catarrhal affections of the membrane lining the aerian passages, it proves exceedingly useful, especially when the secretion is copious and the system relaxed.

Formerly cubebs were employed as gastric stimulants and carminatives in dyspepsia, arising from an atonic condition of the stomach. They have also been used in rheumatism. The Indians macerate them in wine, and take them to excite the sexual feelings.

ADMINISTRATION.—Cubebs, in the form of *powder*, are given in doses varying from ten grains to three drachms. In affections of the bladder and prostate gland the dose is from ten grains to thirty grains. In gonorrhœa, on the other hand, they should be administered in large doses. Mr. Crawford (*Hist. of the Indian Archipelago*, vol. i. p. 465,) says, that in Malay countries they are given in doses of three drachms, six or eight times during the day.

1. OLEUM CUBEBÆ, E. (U. S.); *Volatile Oil of Cubebs*,—(Prepared by grinding the fruit, and distilling with water). By distillation, cubebs yield about 10·5 per cent. of a transparent, slightly-coloured (when pure, colourless), volatile oil, which is lighter than water (sp. gr. 0·929), and has the cubeb odour, and a hot, aromatic, bitter taste. It is composed of carbon and hydrogen, in the same relative proportion as in oil of turpentine; but its formula is C^{15} H^{12}.

By keeping, it sometimes deposits crystals (*cubeb stereoptene* or *cubeb camphor*), the primary form of which is the rhombic octohedron. (Brooke, *Ann. Phil.* N. S. vol. v. p. 450.) Their odour is that of cubebs; their taste, at first, that of cubebs and camphor, afterwards cooling. They are fusible at 133° F. soluble in alcohol, ether, and oils, but are insoluble in water. Their composition is C^{16} H^{14} O, so that they are the hydrate of the oil of cubebs. Oil of cubebs is an excellent and most convenient substitute for the powder. The dose of it, at the commencement of its use, is ten to twelve drops. This quantity is to be gradually increased as long as the stomach will bear it. In some instances, I have given it to the extent of a fluidrachm for a dose. It may be taken suspended in water by means of mucilage, or dropped on sugar. *Gelatinous capsules of cubebs*, containing the oil of cubebs, are prepared by Mr. Willdenow. The mode of preparing these will be described when noticing the gelatinous capsules of copaiva. A combination of oil of cubebs and oil of copaiva forms a very useful medicine in some cases of gonorrhœa.

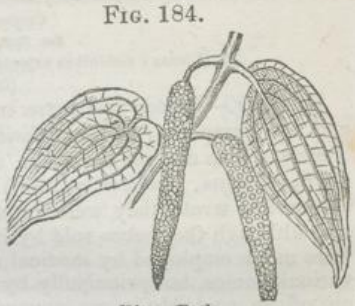
On the continent, a preparation, called the *oleo-resinous extract of cubebs*, is used. It is prepared by adding the oil to the resinous extract of cubebs, which is prepared by digesting the cake left after the distillation of the oil in alcohol, and distilling off the spirit. (*Journ. de Pharm.* t. xiv. p. 40.)

2. TINCTURA CUBEBÆ, L.; *Tinctura Piperis Cubebæ*, D. *Tincture of Cubebs*.—(Cubebs, ʒv. [ʒiv. *D.*;] Rectified [Proof, *D.*] Spirit, Oij. [*wine measure*, D.] Macerate for fourteen days, and filter).—Dr. Montgomery (*Observ. on the Dubl. Pharm.* p. 439, Lond.) says, "I have found this tincture cure gonorrhœa both speedily and satisfactorily." The dose of it is one or two drachms, three times a day.

OTHER NON-OFFICINAL PIPERACEÆ.

The Piper Betle is extensively used by the Malays and other nations of the East, who consider it as a necessary of life. The mode of taking it in Sumatra consists simply in spreading on the *sirih* (the leaf of the Piper Betle) a small quantity of *chunam* (quick-lime prepared from calcined shells) and folding it up with a slice of *pinang* or Areca nut. From the mastication there proceeds a juice which tinges the saliva of a bright red, and which the leaf and nut, without the lime, will not yield. This hue being communicated to the mouth and lips, is esteemed ornamental, and an agreeable flavour is imparted to the breath. The juice is usually, but not always, swallowed. To persons who are not habituated to this composition, it causes giddiness, astringes and excoriates the mouth and fauces, and deadens for a time the faculty of taste. Individuals, when toothless, have the ingredients previously reduced to a paste, that they may dissolve without further effort. (Marsden, *Hist. of Sumatra*, 3rd ed. p. 281.)

Fig. 184.



Piper Betle.

Order XXVIII.—EUPHORBIACEÆ, *Juss.*—THE EUPHORBIUM TRIBE.

Essential Character.—*Flowers* monœcious or diœcious. *Calyx* monosepalous; the segments definite, sometimes none, very often increased on the inside by various squamiform or glandular appendages. *Stamens* indefinite, or generally definite, distinct [or monadelphous]; sometimes inserted into the centre of the flower, beneath the rudiments of the pistil. *Anthers* two-celled; the cells sometimes distinct, dehiscing longitudinally on the outer side. *Ovary* superior, sessile, or stipitate, two to three or many-celled; the cells arranged in a circle around the central placenta. *Ovules* solitary or in pairs; suspended from the inner angle beneath the apex. *Styles* as many as the cells; either distinct, or united, or none. *Stigmas* single and compound or many-lobed. *Capsule* of two to three distinct bivalved cells, which often burst elastically. *Seeds* solitary or twin, with an arillus, and attached above to the central placenta. *Embryo* surrounded by a fleshy albumen; cotyledons flat; radicle superior.—*Herbs* or *Shrubs* generally lactescent. *Leaves* mostly stipulate, alternate, or rarely opposite. *Flowers* axillary or terminal, usually with bracts; bracts in some cases large and involucriform. (*Bot. Gall.*)

Some of the Euphorbiaceæ are succulent (as *Euphorbia meloformis*, and *E. antiquorum*, figs. 185 and 186), and have a considerable resemblance to Cacteaceæ, from which they may in general be distinguished by the presence of an acrid milky juice. However, the genus *Mammillaria* (of the family Cacteaceæ) possesses a milky juice.

Fig. 185.

Euphorbia meloformis.

Fig. 186.

Euphorbia antiquorum.

Properties.—Acridity is the leading quality of the plants of this family. Some species also possess a narcotic property and depress the action of the heart. The acridity resides in the milky juice. In some plants the acrid principle is volatile, as in *Hippomane Mancinella* and *Croton Tiglium*: in the last-mentioned species it is of an acid nature. Some poisonous species, by roasting, are deprived of this volatile principle, and thereby become esculent. In some cases the acrid principle is fixed, as in the substance called, in the shops, "gum" *euphorbium*.

Some euphorbaceous plants are devoid of acridity, or possess it in a very slight degree only. Von Buch (Nees and Ebermaier, *Med. Pharm. Bot.* Bd. i. S. 355,) says, the branches of Euphorbia balsamifera contain a mild sweet juice, which is eaten by the inhabitants of the Canary Isles. The aromatic tonic bark of the Croton Cascarilla is another exception to the very general acridity of euphorbiaceous plants.

This acrid juice pervades various parts of the plants; in the stem it resides principally in the cortical portion. "M. Berthollet has recorded a remarkable instance of the harmless quality of the sap in the interior of a plant, whose bark is filled with a milky proper juice of a poisonous nature. He described the natives of Teneriffe as being in the habit of removing the bark from the *Euphorbia canarienses*, and then sucking the inner portion of the stem in or-

der to quench their thirst, this part containing a considerable quantity of limpid and non-elaborated sap." (Henslow, *Botany*, *in Lardner's Cyclop.* p. 217.)

1. CRO'TON TIG'LIUM, *Lamarck*, L. E. D.—THE PURGING CROTON.

Croton Jamalgota, *Hamilton*.
Sex. Syst. Monœcia, Monadelphia.
(Oleum e seminibus expressum, *L. D.*—Expressed Oil of the Seeds, *E.*)
(Oleum Tiglii, U. S.)

HISTORY.—Croton seeds are mentioned by Avicenna, (lib. 2ndus, cap. 219,) and by Serapion, (*De Simplicibus*, cccxlviii.) under the name of *Dend* or *Dende*. The earliest European describer of them is Christopher D'Acosta, in 1578, (Clusius, *Exoticor.* p. 292,) who terms them *pini nuclei malucani*. When Commeline wrote, they were known in the shops by the name of *cataputia minor*, although they were sold by itinerants as *grana dilla* or *grana tilli*. They were much employed by medical men in the 17th century, and were known by various names, but principally by that of *grana tiglia*. They, however, went out of use, probably in consequence of the violence and uncertainty of their operation. Their re-employment in modern practice is owing partly to the notices of them by Dr. White and Mr. Marshall, in the first edition of Dr. Ainslie's work, (*Materia Medica of Hindostan*, 1813,) but principally to the introduction of the oil, in 1819, by Dr. Conwell.[1]

BOTANY. **Gen. Char.**—*Flowers* monœcious, or very rarely diœcious. *Calyx* five-parted.—Males: *petals* five; *stamens* ten or more, distinct. Females: *petals* none; *styles* three, divided into two or more partitions. *Capsule* tricoccous (Adr. de Jussieu).

Sp. Char.—Arboreous. *Leaves* oblong-ovate, acuminate, slightly serate, smooth. *Stamina*, fifteen, distinct. Each cell of the fruit filled by the seed.

A middle-sized *tree*, from 15 to 20 feet high. *Bark* smooth, ash-coloured. *Leaves* sometimes cordate, and with two flat round glands at their base; when young covered on both surfaces, but especially the lower one, with minute stellate hairs. At the base of the leaves are two flat round glands. *Raceme* terminal, erect, simple. *Petals* of male flower white.

Hab.—Continent of India, islands forming the Indian Archipelago, and Ceylon.

The CROTON PAVANA (Hamilton, *Trans. Linn. Soc.* vol. xiv. 257,) is said also to yield tiglium or croton seeds. It is distinguished from C. Tiglium by having only ten stamina, and by the seeds being much smaller than the cells in which they are placed. C. Pavana is a native of Ava, north-eastern parts of Bengal? Amboyna?? Dr. Hamilton thinks it is the *Granum Moluccum* of Rumphius.

DESCRIPTION.—*Croton seeds* (*semina tiglii* seu *semina crotonis; grana tiglii; purging nuts* of some authors), in size and shape are very similar to castor seeds. Viewed laterally, their shape is oval or oval-oblong: seen from either extremity, they have a rounded or imperfectly quadrangular form. Their length does not exceed six lines; their thickness is 2½ to 3 lines; their breadth, 3 or 4 lines. Sometimes the surface of the seeds is yellowish, owing to the presence of an investing lamina (epidermis?) The testa is dark brown, or blackish, and is marked with the ramifications of the raphé. The endocarp, or internal seed-coat, is thin, brittle, and of a light colour. It incloses a yellowish oily albumen, which envelopes the embryo, whose cotyledons are foliaceous or membranous. The seeds are without odour; their taste is at first mild and oleaginous, afterwards acrid and burning. When heated they evolve an acrid vapour.

According to Dr. Nimmo, (*Quarterly Journal of Science*, vol. xii. p. 65,) 100 parts consist of—

[1] *Recherch. sur les Propr. méd. et l'Emploi en Méd. de l'Huile de Croton Tiglium.* 1824.—For further historical details consult Professor H. H. Wilson's paper in the *Transactions of the Med. and Phys. Society of Calcutta*, vol. i. p. 249.

Shell or seed-coats	36
Kernel, or nucleus	64
	100

Composition.—Croton seeds were analyzed by Brandes, (Gmelin, *Hanb. d. Chem.* Bd. ii. S. 1320,) with the following results:

Volatile oil	traces.
Fixed oil, with *crotonic acid*, and an alkaloid (*crotonin*)	17·00
Crotonates and colouring matter	0·32
Brownish yellow resin, insoluble in ether	1·00
Stearine and wax	0·65
Extractive, sugar, and malates of potash and lime	2·05
Starchy matter, with phosphate of lime and magnesia	5·71
Gum, and gummoin	10·17
Albumen	1·01
Gluten	2.00
Seed-coats, and woody fibre of the nucleus	39·00
Water	22·50
Croton seeds	101·41

1. Volatile Oil of Croton Seeds.—This is but imperfectly known, traces only of it having been obtained. Brandes regards it as extremely acrid, and thinks that by the united agencies of air and water it is converted into crotonic acid; for the distilled water of the seeds becomes more acid by keeping.

2. Fixed Oil of Croton Seeds.—This also is but imperfectly known. It must not be confounded with the croton oil of the shops, which is a mixture of this and other constituents of the seeds. Fixed oil of croton seeds is, probably, a combination of crotonic and other fatty acids with glycerine.

3. Crotonic Acid. (*Jatrophic Acid.*)—Though this acid exists in the free state in the seed, yet an additional quantity of it is obtained when the oil is saponified. It is a volatile, very acrid, fatty acid, which congeals at 23° F., and when heated a few degrees above 32° F., is converted into vapour, having a strong nauseous odour, and which irritates the eyes and nose. It has an acrid taste, and acts as a powerful local irritant. It is to this acid that the cathartic and poisonous qualities of croton oil are principally referrible. Pelletier and Caventou think that it is not sufficiently energetic to be the sole active principle. It unites with bases forming a class of salts called Crotonates, which are inodorous. The Crotonate of Ammonia precipitates the salts of lead, copper, and silver, white; and the sulphate of iron, yellow. Crotonate of Potash is crystalline, and dissolves, with difficulty, in alcohol. Crotonates of Barytes is soluble in water; but Crotonate of Magnesia is very slightly soluble only in this liquid.

4. Crotonin.—The alkali which Brandes found in these seeds, and to which he gave the name of *Crotonin*, appears to be identical with the *Tiglin* of Adrien de Jussieu. It is crystalline, has an alkaline reaction, is fusible and combustible with flame, leaving a carbonaceous residuum. It is insoluble in water, dissolves very slightly only in cold, but easily in hot, alcohol. If sulphuric or phosphoric acid be added to the spirituous solution, small prisms (sulphate or phosphate of crotonin?), decomposable by heat, are obtained by slow evaporation. Soubeiran (*Nouv. Traité de Pharm.* t. ii. p. 103,) thinks that crotonin is a combination of magnesia with a fatty acid.

5. Resin.—Is brown and soft; and has a disagreeable odour, on account, doubtless, of the oil which it retains. It is soluble in alcohol, but insoluble in ether and in water. The alkalis dissolve it by separating a whitish matter. It contributes to the purgative properties of croton oil.

Physiological Effects. 1. **Of the Seeds.** *a. On Animals generally.*—Croton seeds are powerful local irritants or acrids, causing inflammation in those living parts with which they are placed in contact. Orfila (*Toxicol. Gén.*) found that three drachms being introduced into the stomach of a dog, and the œsophagus tied to prevent vomiting, caused death in three hours; and, on examination of the body, the alimentary canal was found to be in a state of inflammation. In another experiment, a drachm caused death under the same circumstances. A drachm, also, applied to the cellular tissue of the thigh, was equally fatal. A dose of from twenty to thirty grains of the powder of the kernel given to the horse causes, in six or eight hours, profuse watery stools, and is recommended by some veterinarians as a purgative; but the uncertainty of its operation, and the griping and debility which it occasions, are objections to its use. (Youatt, *the Horse*, in *Library of Useful Knowledge.*) Lansberg (Wibmer, *Arzneim. ü. Gifte*, Bd. ii. S. 222) found that twenty of the seeds killed a horse, by causing gastro-enteritis. The pulse was frequent, small, and soft.

β. *On Man.*—In the human subject, a grain of croton seed will frequently produce full purgation. Mr. Marshall (Ainslie, *Mat. Indica*, vol. i. p. 104) says that this quantity, made into two pills, is about equal in power to half a drachm of jalap, or to six grains of calomel. The operation, he adds, is attended with much rumbling of the bowels; the stools are invariably watery and copious. Dr. White recommends the seeds to be torrefied, and deprived of their seed-coats, before employing them. (Ainslie, *Mat. Indica*, vol. i. p. 104.) Dr. Wallich informed me that the labourers in the Calcutta Botanic Garden were in the habit of taking one of these seeds as a purgative, but that on one occasion this dose proved fatal.

The seed-coats, the embryo, and the albumen, have each in their turn been declared to be the seat of the acrid principle: I believe the remarks which I shall have to make with respect to the seat of the acridity of castor-oil seeds, will apply equally well to that of croton seeds. The following is a case of poisoning by the inhalation of the dust of the seeds:

Thomas Young, aged 31, a labourer in the East India warehouses, was brought into the London Hospital on the 8th of December, 1841, labouring under symptoms of poisoning by the inhalation of the dust of croton seeds. He had been occupied about eight hours in emptying packages of these seeds, by which he was exposed to their dust. The first ill effects observed were loss of appetite, then a burning sensation in the nose and mouth, tightness at his chest, and copious lachrymation, followed by epigastric pain. Feeling himself getting worse he left the warehouse, but became very giddy and fell down insensible. Medical assistance was procured, an emetic was administered, stimulants were exhibited, and he was wrapped in warm blankets. When he became sensible he complained of his mouth being parched, and that his throat was swelling. He was then removed to the hospital. On his admission he appeared in a state of collapse, complained of burning pain at the stomach, in the throat, and in the head, and of swelling and numbness of his tongue. The epigastrium felt hot and tense, the pupils were dilated, the breathing short and hurried, the countenance distressed, pulse 85, surface cold. He stated that his tongue felt too large for his mouth, and appeared to be without feeling, and he had bitten it two or three times to ascertain whether there was any sensation in it. On examination, however, no change could be observed in the size or appearance of the tongue or parts about the mouth. Hot brandy and water were given to him, and he was put into the hot bath with evident relief. He continued in the hospital for several days, during which time he continued to improve, but still complained of epigastric pain. It deserves notice that his bowels were not acted on, and on the day following his admission several doses of castor-oil were given to him.

It would be interesting to know whether the seeds of Croton Pavana are equally active with those of Croton Tiglium; and, also, whether the seeds of both species are found in commerce.

2. **Of the Oil.** α. *On Animals generally.*—On vertebrated animals (horses, dogs, rabbits, and birds), it acts as a powerful local irritant or acrid. When taken internally, in moderate doses, it operates as a drastic purgative; in large doses, as an acrid poison, causing gastro-enteritis. Moiroud (*Pharm. Vétér.* p. 272) says, that from twenty to thirty drops of the oil are, for the horse, equal to two drops for man; and that twelve drops injected into the veins cause alvine evacuations in a few minutes. Thirty drops, administered in the same manner, have caused, according to this veterinarian, violent intestinal inflammation and speedy death. A much less quantity (three or four drops) has, according to Hertwich, (Wibmer, *Arzneim. ü. Gifte*, Bd. ii. S. 218,) terminated fatally when thrown into the veins. After death the large intestines have been found to be more inflamed than the small ones. Flies, which had eaten some sugar moistened with the oil of croton, died in three or four hours—the wings being paralyzed or immoveable before death.

β. *On Man.*—*Rubbed on the skin* it causes rubefaction and a pustular or vesicular eruption, with sometimes an erysipelatous swelling of the surrounding parts. When rubbed into the abdomen, it sometimes, but not invariably, purges. Rayer (*Treat. on Diseases of the Skin*, by Dr. Willis, p. 367) mentions a case in which thirty-two drops rubbed upon the abdomen produced purging, large vesicles, swelling and redness of the face, with small prominent, white, crowded

vesicles on the cheeks, lips, chin, and nose. *Applied to the eye*, it gives rise to violent burning pain, and inflammation of the eye and face. In one case it produced giddiness. (Dierbach, *Neuesten Entd. in d. Mat. Med.* 1837, p. 201.) Ebeling obtained relief by the application of a solution of carbonate of potash. *Swallowed in small doses*, as of one or two drops, it usually causes an acrid burning taste in the mouth and throat, and acts as a drastic purgative, giving rise to watery stools, and frequently increasing urinary secretion. Its operation is very speedy. Frequently it causes evacuations in half an hour: yet it is somewhat uncertain. Sometimes six, eight, or even ten drops, may be given at a dose, without affecting the bowels. In moderate doses it is less disposed to cause vomiting or purging than some other cathartics of equal power. Mr. Iliff, (*Lond. Med. Rep.* vol. xvii.) however, observes that it produces nausea and griping more frequently than has been supposed.

The following is the only case, with which I am acquainted, of poisoning by an *excessive dose* of croton oil:—A young man, aged 25, affected with severe typhoid fever, swallowed by mistake two and a half drachms of croton oil. At the end of three quarters of an hour the skin was cold, and covered with cold sweats; the pulse and action of the heart scarcely perceptible; respiration difficult; the points of the toes and fingers, the parts around the eyes and the lips, blue, as in malignant cholera; abdomen sensible to the touch; but no vomiting. In an hour and a half there were excessive and involuntary alvine evacuations; sensation of burning in the œsophagus; acute sensibility of the abdomen; skin colder; respiration and circulation difficult; the cyanosis extended over the whole body; the skin became insensible; and death occurred, with some of the symptoms of asphyxia, four hours after the poison was swallowed. No lesion was found in the gastric membrane. The intestines presented ulcerations, such as are characteristic of typhus fever. (*Journ. de Chim. Méd.* t. v. p. 509, 2de Sér.)

In comparing croton oil with other violently acrid purgatives, we find it distinguished by its speedy operation, the great depression of the vascular system, as well as the general feeling of debility which it produces, and by the uncertainty of its operation.

Uses.—The value of croton oil as an internal remedial agent depends principally on two circumstances: first, its powerful and speedy action as a drastic cathartic, by which it is adapted for obviating constipation, or for operating on the bowels as a counter-irritant; and, secondly, on the smallness of the dose, which in practice presents many advantages. These circumstances render it peculiarly applicable in cases requiring powerful and speedy catharsis, and in which the patient cannot swallow, or does so with extreme difficulty, as in *trismus*, *coma*, and *some affections of the throat*; or where he will not swallow, as in *mania*. In all such cases the oil may be dropped on the tongue. *In obstinate constipation*, whether from the poison of lead, or from other causes, it has sometimes succeeded where other powerful cathartics had been tried in vain. It is especially serviceable where the stomach is irritable, and rejects more voluminous purgatives; and it is of course objectionable in all inflammatory conditions of the digestive tube. In stercoraceous vomiting with other constitutional symptoms of hernia, but without local evidence of displacement, and where the stomach rejected the ordinary senna draught, I have known oil of croton prove most effectual. *In torpid conditions of the intestinal canal, in tendency to apoplexy, in dropsy* unconnected with inflammation, *in paralysis*—in a word, in any cases in which a powerful and speedy intestinal irritant is required, either for the purpose of evacuating the canal merely, or for acting as a revulsive or counter-irritant, and thereby relieving distant parts, croton oil is a very useful, and on many occasions, most valuable cathartic. In employing it, two cautions are necessary: it must be avoided, or at least used with great caution, in extreme debility; and it is improper in inflammatory affections of the digestive

organs. The great drawback to its use is its uncertainty. In one case it acts with extreme violence: in another, it scarcely produces any effect. *In the diseases of children*, where a powerful purgative is required, croton oil has been administered, on account of the minuteness of the dose, and the facility of its exhibition. In hydrocephalus, and other head affections of children, I have several times used it where other cathartics had failed, or where extreme difficulty was experienced in inducing the patients to swallow the more ordinary remedies of this class. In some of these it has disappointed me. In the case of a child of four years of age, affected with incipient hydrocephalus, I gave six doses, of one drop each, of the oil without any effect. *In uterine obstructions* (chlorosis and amennorrhœa) it has occasionally proved serviceable. *In tape-worm* it has been recommended; but I have no experience of its efficacy.

Rubbed on the skin, croton oil has been employed to produce rubefaction and a pustular eruption, and thereby to relieve diseases of internal organs, on the principle of counter-irritation, before explained (Bamberger, *De Olei crotonis externe adhibiti efficacia*, Berol. 1833) (see vol. i. p. 153). *Inflammation of the mucous membrane lining the air-passages, peripneumonia, glandular swellings, rheumatism, gout*, and *neuralgia*, are some of the diseases against which it has been applied in this way, and doubtless frequently with benefit. It is sometimes used in the undiluted form, but more commonly with twice or thrice its volume of olive oil, oil of turpentine, soap liniment, alcohol, ether, or some other convnient vehicle. But, in all the cases just enumerated, it has never appeared to me to present any advantage over many other counter-irritants in common use, as emetic tartar; while the chance of causing purging is, in some cases, an objection to its use; and its greater cost sometimes precludes its employment on a large scale in pauper establishments. Frictions with it on the abdomen have been used to promote alvine evacuations; but it frequently fails to produce the desired effect. To promote the absorption of the oil in these cases, it should be dissolved in ether or alcohol, and the frictions are to be assiduously made.

Administration.—*Croton Seeds* are rarely or never used in this country. Their farina may, however, be given in doses of a grain or two.

CROTONIS OLEUM, E.; *Tiglii Oleum*, L.; (*Oleum Tiglii*, U. S.); *Croton Oil.*—This is the expressed oil of the seeds. It is imported from the East Indies, principally from Madras, but in part from Bombay. I am informed by an oil presser at Calcutta that it is prepared like castor oil, except that it is strained instead of being boiled. In shelling the seeds the women often suffer severely with swelling of the face, &c. Croton oil is also expressed in England. Souberain (*Nouveau Traité de Pharmacie*, t. ii. p. 54, 2de ed.) obtained from one kilogramme [2 lbs. 8 oz. 84 grs. *Troy*] of seeds 270 grammes [about 4170 grs. *Troy*] of oil; of which 146 grammes [about 2255 grs. *Troy*] were procured by pressure, and 124 grammes [1915 grs. *Troy*] by alcohol. As met with in English commerce, it is yellowish-brown or amber-coloured, and has an unpleasant odour and an acrid taste. It reddens litmus, and is soluble in alcohol. It consists, according to Dr. Nimmo, (*op. supra. cit.*,) of

An acrid matter	4·5
Bland fixed Oil	5·5
Croton Oil	10·0

The *acrid matter* is extracted from croton oil by alcohol. The alcoholic solution reddens litmus, and, when dropped into water, causes a cloudiness. Dr. Nimmo supposed this acrid matter to be of a resinous nature; but the investigations of Pelletier and Caventou, and Brandes, have shown that it is a mixture of *crotonic acid* and *crotonin* [and *resin* ?]. According to Mr. Twining (Dierbach, *op. cit.*) there are two kinds of croton oil met with in commerce. One is dark-yellow and thickish; the other is straw-coloured. The first is the most ener-

getic. These oils may, perhaps, be obtained from different plants; the one from Croton Tiglium, the other from Croton Pavana.

The following are the characteristics of the goodness of the oil, according to the Edinburgh College:

When agitated with its own volume of pure alcohol and gently heated, it separates on standing, without having undergone any apparent diminution.

Croton oil is exhibited in doses of one, two, or three drops. In some instances it is simply placed on the tongue, as in coma, tetanus, mania, &c.; or it may be taken in a teaspoonful of syrup. These methods of administering it are objectionable, on account of the acrid taste produced. The usual mode of employing it is in the form of pill, made with conserve of roses or bread-crumb. Some have employed it in the form of emulsion, flavoured with some carminative oil or balsamic substance; but the burning of the mouth and throat, to which it gives rise, is an objection to its use.

α. *Tinctura Crotonis; Tincture of Croton.* This is prepared by digesting the seeds, or dissolving the oil in rectified spirit. Soubeiran's formula is one drop of croton oil and half a drachm of rectified spirit.

β. *Sapo Crotonis; Croton Soap.* This is prepared with two parts of croton oil and one part of soap-boiler's ley. It is in fact a crotonate of soda. A croton soap is sold by Mr. Morson, of Southampton Row, Russell Square. It may be used as a purgative, in doses of from one to three grains. It has been said that the alkali diminishes the acrimonious property of the oil without affecting its cathartic powers—a statement, however, which is highly improbable.

γ. *Linimentum Crotonis; Croton Liniment.* This is prepared by mixing one part of croton oil with five parts of olive oil. Rubbed repeatedly on the skin it occasions redness and a pustular eruption. It is used as a counter-irritant.

Antidotes.—In a case of poisoning by the seeds or oil, the first object is to remove the oil from the stomach. Mild, demulcent, and emollient drinks, are then to be given. Alkaline substances have been recommended as chemical antidotes, but their efficacy is not proved. Full doses of opium will be necessary to check the diarrhœa. To relieve a failing circulation, ammonia and brandy may be given, and the warm bath employed. To combat the inflammatory symptoms, blood-letting may be used, if the condition of the vascular system permit its employment.

2. CRO'TON ELEUTE'RIA, *Swartz*, *E.*—THE SEA-SIDE BALSAM OR SWEET-WOOD.

Sex. Syst. Monœcia, Monadelphia.

(Cascarilla. Bark probably of Croton Eleuteria and possibly of other species of the same genus, *E.*)

(Cascarilla, U. S.)

History.—Cascarilla or Eleutheria bark was first mentioned by Stisser in 1686, (*de machinis furmiductoriis*, Hamburgh, 1686,) at which time it was used in this country, mixed with tobacco, for smoking. In 1754 Catesby (*Nat. Hist. of Carolina, Florida, and the Bahama Islands*,) noticed and figured a plant, which, he said, grew plentifully on most of the Bahama Islands, and yielded Cascarilla bark, or, as he called it, "The Ilatheria bark, *La* Chacrilla." This plant is generally supposed to be the *Croton Cascarilla*, Linn. (C. *lineare*, Jacq.); and several reasons led me, at one time, (see *Lond. Med. Gaz.* vol. xx. p. 489,) to think that it might be the source of the cascarilla bark of the shops —an opinion also entertained by Wood. (*United States Dispensatory.*) Dr. Lindley (*Fl. Med.* p. 179,) adduced several reasons for believing that the *Croton Eleuteria* was the true species, as Drs. Wright and Woodville had already asserted. The subsequent receipt, by Dr. Lindley, of specimens of the plant, from Mr. Lees, of the Bahama Islands, has fully confirmed the accuracy of Dr.

Lindley's opinion. The *Croton Cascarilla*, Don, *L.* (*C. Pseudo-China*, Schiede,) yields Copalchi (not Cascarilla) bark.

Botany. **Gen. Char.**—See *Croton Tiglium*.

Sp. Char.—*Leaves* ovate, acuminate, quite entire, smooth, beneath silvery, with scales. *Racemes* compound axillary. *Stem* arborescent (Swartx). *Fl. Ind. occ.*)

Branches and *twigs* angular, somewhat compressed. *Leaves* stalked, alternate, with a short, but obtuse point. *Flowers* monœcious, subsessile. Males: —*petals* whitish; *stamens* ten to twelve. *Ovary* roundish: *styles* three, bifid; *stigmas* obtuse. *Capsule* roundish, minutely warted, not much bigger than a pea, with three furrows, three cells, and six valves. (*Op. cit.*)

Hab.—The Bahama Islands, Jamaica.

Description.—*Eleutheria* or *cascarilla bark* (*cortex eleuteriæ* seu *cascarillæ*) is in the form of fragments, or quills, of about one or two, more rarely three or four, inches long, the fragments being thin, and usually curved both longitudinally and transversely, the quills varying in size from that of a writing pen to that of the little finger. The bark is compact, hard, moderately heavy, and has a short resinous fracture, not fibrous or splintery, as in cinchona barks. Some of the pieces are partially or wholly covered with a whitish, rugous epidermis, cracked both longitudinally and transversely. The cortical layers are of a dull brown colour. The taste of this bark is warm, spicy, and bitter; its odour is peculiar, but agreeable. When burned, it evolves a pleasant odour (which has been compared by Pfaff to that of vanilla or amber when heated), on which account it is a constituent of *fumigating pastiles*.

Fee (*Essai sur Cryptogames*, 1824,) has enumerated no less than forty-three species of lichens found on this bark. With one exception (*Parmelia perlata*, which I have never seen on cascarilla), every one of these lichens has an adherent, crustaceous, amorphous thallus. A very common species is *Lecidea Arthonioides*, Fée: the thallus of which is very white, and the apothecia minute, round, and black.

Commerce.—It is imported from Nassau, in New Providence (one of the Bahama Islands). Of sixteen imports, which I have been enabled to trace since 1833 in the bills of entry, eight were from Nassau, three from Belize, and two from Lima; the others were from European ports. Some of these probably were returned goods. Those from Belize may perchance be the produce of the Bahamas. 4,579 lbs. paid duty (one penny per lb.) in 1838. In 1840, 14,490 lbs. paid duty.

Composition.—Cascarilla bark was analyzed by Trommsdorff, (Gmelin, *Handb. d. Chem.* ii. 1319,) who obtained from it the following substances:—*Volatile Oil* 1·6, *bitter resin* 15·1, *gum* and *bitter matter with trace of chloride of potassium* 18·7, *woody fibre* 65·6. Meissner (Gmelin, *Handb. d. Chem.* ii. 1819,) detected in the ashes of the bark the *oxide of copper*. Brandes (*Berl. Jahrb.* xxiii.) has announced the existence of a peculiar alkaline substance (*cascarillina*).

1. Volatile Oil of Cascarilla.—It possesses the odour and taste of the bark. Its sp. gr is 0·938. Its colour is variable, sometimes being greenish, at others yellow or blue. It consists of two oils, one boiling at 344°, and which contains no oxygen (its formula probably being $C^{10}H^{8}$); the other less volatile and oxygenated. Nitric acid converts it into a yellow, pleasant smelling resin. By distillation with water the bark yields about 1-120th of its weight of this oil.

2. Resin.—Separated from the alcoholic tincture of the cascarilla by the addition of water. It is reddish brown; has a balsamic, slightly bitter, not astringent taste; and, when thrown on hot coals, evolves an agreeable odour.

3. Extractive.—Has a bitter, but not balsamic, taste. Its watery solution reddens litimus, and is unchanged by either ferruginous solutions or tincture of nutgalls.

Chemical Characteristics.—The sesquichloride of iron deepens the colour of the infusion of cascarilla. The tincture of nutgalls causes turbidness, and

at the end of twenty-four hours a very slight precipitate. The alcoholic tincture deposits some resin on the addition of water.

Physiological Effects.—Cascarilla bark belongs to the *aromatic bitters*. before noticed (vol. i. p. 189.) That is, it produces the combined effect of an aromatic and of a moderately powerful tonic; but it does not possess any astringency. Some pharmacologists place it with aromatics, others with tonics. Cullen, (*Mat. Med.*) though at one time uncertain as to which of these classes it belonged, ultimately classed it with the tonics. Krauss (*Heilmittellehre*, S. 401,) states, that moderate doses give rise, in very susceptible, especially in sanguine subjects, to narcotic effects; but though I have frequently employed it, I never observed an effect of this kind. Mixed with tobacco and used for smoking, it is said to cause giddiness and intoxication. (*United States Dispensatory.*)

Uses.—Cascarilla has been employed as a substitute for cinchona; and, although it is inferior to the latter in tonic and febrifuge qualities, its aromatic quality frequently enables it to sit easily on the stomach, without causing either vomiting or purging, which, in irritable affections of the alimentary canal, cinchona is apt to produce. In this country it is principally employed in those forms of dyspepsia requiring an aromatic stimulant and tonic. It is also used in cases of debility generally; and in chronic bronchial affections, to check excessive secretion of mucus. In Germany, where it is a favourite remedy, it is used in many other cases; such as low nervous fevers, intermittents, the latter stages of diarrhœa, and dysentery.

Administration.—The *powder* may be given in doses of from ten grains to half a drachm; but it is a less agreeable form than the infusion.

1. INFUSUM CASCARILLÆ. L. E. D. (U. S.); *Infusion of Cascarilla.*—(Cascarilla bark, bruised ʒiss. [ʒss. *D.*]; Boiling [distilled, *L.*] Water, Oj. [Oss. *wine measure*, *D.*] Macerate for two hours in a vessel lightly covered, and strain [through linen or calico, *E.*]).—[Cascarilla, bruised, ℥; Boiling Water, Oj. U. S.]—A light and aromatic bitter tonic. It is a good vehicle for acids and alkalis. The tincture of cascarilla is usually joined with it. Dose from fʒi. to fʒii.

2. MISTURA CASCARILLÆ COMPOSITA, L; *Compound Mixture of Cascarilla.*—(Infusion of Cascarilla, fʒxvii.; Vinegar of Squill, fʒi.; Compound Tincture of Camphor, fʒii. Mix).—Said to be useful in chronic affections of the mucous membranes of the lungs. Dose, from fʒi. to fʒiss. twice or thrice a day.

3. TINCTURA CASCARILLÆ, L. E. D.; *Tincture of Cascarilla*, (Cascarilla bark, bruised [in moderately fine powder, *E.*], ʒv. [ʒiv. *D.*]; Proof Spirit Oij., [*wine measure*, *D.*] Macerate for fourteen [seven, *D.*] days, and filter, *L.* ("Proceed by perlocation or digestion, as afterwards directed for tincture of cinchona," *E.*)—Generally employed as an adjunct to tonic and stomachic infusions. Dose, from fʒi. to fʒii.

3. RIC'INUS COMMU'NIS, *Linn. L. E. D.*—THE CASTOR-OIL PLANT, OR PALMA CHRISTI.

Sex. Syst. Monœcia, Monadelphia.

℈ (Oleum e seminibus expressum, *L.* Expressed oil of the seeds, *E.* Oleum e seminibus, *D.*) (Oleum Ricini, U. S.)

History.—The castor-oil was known in the most ancient times. Caillaud found the seeds of it in some Egyptian sarcophagi, supposed to have been at least 4000 years old. (*Dict. Univ. de Mat. Méd.* t. vi.) Whether this is, as some persons imagine, (see Dr. Canvane's *Dissertation on the Oleum Palmæ Christi*, 2nd ed. Lond. 1769,) the plant alluded to in the Bible, (*Jonah*, ch. iv. 6,) and which, in our translation is called the *gourd*, I cannot pretend to decide. The pious fathers, Jerom and Augustin, differed so much in their opinions as to what was the particular plant meant in the passage just referred to, that

from words, we are told, they proceeded to blows! (Harris, *Nat. Hist. of the Bible.*)

The ancient Greeks were acquainted with the Ricinus, for both Herodotus (*Euterpe*, 94,) and Hippocrates (*De Nat. Mulieb.* p. 573, ed. Fœs.) mention it; the latter employed the root in medicine. Dioscorides (lib. iv. cap. 164,) calls it the Κίκι or Κρότων. It was termed Κρότων by the Greeks, and *Ricinus* by the Romans, on account of the resemblance of its seeds to a little insect bearing these names, which infests dogs and other animals, and whose common name in English is the *tick*.

Botany. Gen. Char.—*Flowers* monœcious. *Calyx* three to five, parted, valvate. *Petals* none. *Filaments* numerous, unequally polyadelphus; cells of the *anther* distinct, below the apex of the filament. *Style* short; *stigmas* three, deeply bipartite, oblong, coloured, feathery; *ovary* globose, three-celled, with an ovule in each cell. *Fruit* generally prickly, capsular, tricoccous. *Trees*, *shrubs*, or *herbaceous* plants, sometimes becoming arborescent. *Leaves* alternate, palmate, pellate, with glands at the apex of the petiole. *Flowers* in terminal panicles, the lower male, the upper female; all articulated with their peduncles, and sometimes augmented by bi-glandular bracts (*Lindley.*)

Sp. Char.—*Leaves* peltato-palmate; the lobes lanceolate, serrated. *Stem* herbaceous, pruinose. *Stigmas* three, bifid at the apex. *Capsule* covered with spines. (*Bot. Gall.*)

The *stems* of plants growing in this country are round, greenish or reddish-brown, and blue pruinose, and branched. *Leaves* on long round petioles, eight or ten lobed. A large scutelliform gland on the petiole, near its junction with the lamina. *Filaments* capillary, branched. *Stigmas* reddish. *Capsules* supported on stalks, which are somewhat longer than the capsules themselves.

Fig. 187.

Ricinus communis.

Hab.—India. When cultivated in Great Britain, Ricinus communis is an annual, seldom exceeding three or four feet high; but in other parts of the world it is said to be perennial, arborescent, and to attain a height of fifteen or twenty feet. Dr. Roxburgh (*Fl. Indica*, vol. iii. p. 689,) says, that in India several varieties are cultivated, "some of them growing to the size of a pretty large tree, and of many years' duration." Clusius (*Exoticorum*, p. 299,) saw it in Spain with a branched trunk as thick as a man's body, and of the height of three men. Belon (*Observ.* lib. i. cap. 18,) also tells us that in Crete it endures for many years, and requires the use of ladders to mount it. Ray (*Hist. Plant.* vol. i. p. 166,) found it in Sicily as large as our common alder trees, woody, and long-lived; but it has been a question with botanists whether these arborescent and other kinds are mere varieties of, or distinct species from, the ordinary Ricinus communis.

The following (varieties or distinct species) are enumerated by Nees and Ebermaier (*Handb. d. Med. Pharm. Botan.*) as common in gardens, and as distinguished principally by the colour and pruinose condition of the stem—characters which, however uncertain in other cases, appear here to be constant.

1. Ricinus africanus (Willd.)—Stem not pruinose, green, or on one side reddish. The fruit-racemes abbreviated, the fruit-stalk longer than the capsule. Seeds attenuated on one side, marbled gray and yellowish-brown. [Arborescent. Cultivated in Bengal.] (Hamilton, *Linn. Trans.* vol. xiv.)

2. Ricinus macrophyllus (H. Berol.)—Nearly allied to the foregoing: stem quite green, not pruinose. Fruit racemes elongated, fruit-stalk shorter than the fruit.

3. Ricinus leucocarpus (H. Berol.)—Stem pale green, white pruinose. Fruit-stalk as long as the fruit. The unripe fruit and prickles almost quite white.

4. Ricinus lividus (Willd.)—Stem, petiole, and midrib, purple red, not pruinose. Nearly allied to R. africanus, and, like this, more woody and perennial. [Arborescent. Cultivated in Bengal.] (Hamilton.)

5. Ricinus viridis (Willd.)—Stem pale green, blue pruinose, by which it is distinguished from R. macrophyllus. Seeds somewhat smaller, more oval, marked with white and fine brown. [Herbaceous. Cultivated in Bengal.] (Hamilton.)

Description.—*Castor seeds* (*semina ricini*, seu *sem. cataputiæ majoris*) are oval, somewhat compressed, about four lines long, three lines broad, and a line and a half thick: externally, they are pale gray, but marbled with yellowish brown spots and stripes. The seed-coats consist, according to Bischoff, (*Handb. d. Bot. Term.* pp. 508, 510, and 512, tab. xl. fig. 1875,) of a smooth external coat (*epidermis seminalis*). 2dly, a difform, hard *testa*, consisting of two layers, an external, thick, and dark brown one, and an internal one, thinner and paler. 3dly, a *cuticula nuclei* or *membrana interna*. The fleshy tumid *cicatricula stomatis* (also termed *strophiola*) is very evident at the upper end of the seed; beneath it is a small *hilum*, from which passes downwards the longitudinal *raphé*. (Bischoff, *op. cit.* p. 515, &c. tab. xli. fig. 747.) The *chalaza* is colourless. (Bischoff, *op. cit.* p. 518, ab. xliii. fig. 1901.) The *nucleus* of the seed consists of oily *albumen*, and an *embryo*, whose cotyledons are membranous or foliaceous.

Composition.—The only analysis of these seeds, as yet published, is that of Geiger. (*Handb. d. Pharm.* Bd. ii. S. 1671.) The following are his results:

a. Seed coats	Tasteless resin and extractive	1·91	23·82
	Brown gum	1·91	
	Ligneous fibre	20·00	
b. Nucleus of the seeds	Fatty oil	46·19	69·09
	Gum	2·40	
	Caseum (albumen)	0·50	
	Ligneous fibre with starch? (hardened albumen?)	20·00	
Loss (moisture)			7·09
Castor seeds			100·00

1. Volatile acrid principle. (*? Ricinic and Elaïodic acids*).—This principle is not mentioned by Geiger, and its existence has been doubted or denied by others. But the following as well as other facts establish, in my opinion, its presence:—First, Guibourt (*Journ. de Chim. Méd.* t. i. p. 111,) experienced a feeling of dryness of the eyes and throat, in consequence of having been exposed to the vapour arising from a vessel in which bruised castor seeds and water were boiling. Secondly, Planche obtained a permanent odorous principle, by distilling a mixture of water and castor oil. Bussy and Lecanu (*Journ. de Pharm.* t. xiii. p. 80,) ascribe the occasional acridity of the oil to the production of fatty acids, by the action of the air on it.

The acrid principle (whatever its nature may be) appears to reside in both the *albumen* and *embryo* of the seeds. Jussieu (quoted by De Candolle, *Essai sur les Propr. des Plantes*, p. 263,) and some others have asserted that it resided exclusively in the embryo; while Boutron-Charlard and Henry, jun. (*Journ. de Pharm.* t. x. p. 466,) declared the albumen to be the exclusive seat of it. But any unprejudiced person may soon satisfy himself by tasting separately the embryo and albumen, that both parts possess acridity. Dierbach (quoted by Nees and Ebermaier, *Handb. de Med.-pharm. Botan.*) states that in the fresh seeds the innermost seed-coat contains the acrid principle. If this be correct, it is most remarkable that the same coat, when dry, contains none.

2. Fixed Oil; Castor Oil (Oleum Ricini, *L. E. D.*) (U. S.) *Preparation.*—The following are the modes of preparing castor oil in India, America, and Jamaica. At *Calcutta* castor oil is prepared as follows:—the fruit is shelled by women; the seeds are crushed between rollers, then placed in hempen cloths, and pressed in the ordinary screw or hydraulic press. The oil thus procured is afterwards heated with water in a tin boiler until the water boils, by which the mucilage or albumen is separated as a scum. The oil is then strained through flannel and put into canisters. Castor seeds are distinguished according to the country yielding them. Two principal kinds are known, the large and the small nut; the latter yields the most oil. (Private information from an oil-presser of Calcutta.) Ainslie (*Materia Medica*, vol. i. p. 256,) describes the method of preparing the oil in India by coction. The best East Indian Castor Oil is sold in London as cold drawn.—*In the United States* the cleansed seeds are gently heated in a shallow iron reservoir, to render the oil liquid for easy expression, and then compressed in a powerful screw-press, by which a whitish oily liquid is obtained, which is boiled with water in clean iron boilers, and the impurities skimmed off as they rise to the surface. The water dissolves the mucilage and starch, and the heat coagulates the albumen, which forms a whitish layer between the oil and water. The clear oil is now removed, and boiled with a minute portion of water until aqueous vapours cease to arise: by this process an acrid volatile matter

is got rid of. This oil is put into barrels and in this way is sent into the market. Good seeds yield about 25 per cent. of oil. (*United States Dispensatory.*)—*In Jamaica* the bruised seeds are boiled with water in an iron pot, and the liquid kept constantly stirred. The oil, which separates, swims on the top, mixed with a white froth, and is skimmed off. The skimmings are heated in a small iron pot, and strained through a cloth. When cold, it is put in jars or bottles for use. (Wright, *Med. Plants of Jamaica*, in *Lond. Med. Journ.* vol. viii.)

Physical properties and varieties.—Castor oil is a thickish fluid oil, usually of a pale yellow colour, with a slightly nauseous odour and a mild taste. It is lighter than water, its sp. gr. being, according to Saussure, 0·969 at 55° F. When cooled down to about 0°, it congeals into a transparent yellow mass. By exposure to the air it becomes rancid, thick, and ultimately congeals, without becoming opaque, and hence it is called a *drying oil.* When heated to a little more than 500° F. it begins to decompose.

α. East Indian Castor Oil is the principal kind employed in this country. It is imported from Bombay and Calcutta. It is an oil of exceedingly good quality (both with respect to colour and taste), and is obtained at a very low price. It is procured from Ricinus communis and R. lividus.

β. West India Castor Oil I am not well acquainted with, not having been able to procure authentic samples of it.

γ. American or *United States Castor Oil* is, for the most part imported from New York. All the samples, which I have examined, have been of very fine quality, and, in my opinion, had a less unpleasant flavour than the East Indian variety. Our druggists object to it, on the ground of its depositing a white substance (*margaritine*) in cold weather—a circumstance which has led some persons to imagine it had been mixed with olive oil.

δ. I have seen one sample of *Castor Oil from New South Wales.* It was of a very dark colour.

Solubility.—In absolute alcohol, and in pure sulphuric ether, castor oil is completely soluble. In this respect it agrees with palm oil, but disagrees with all the ordinary fixed oils. Hence alcohol has been proposed as a means of detecting adulteration of castor oil, the adulterating oil not being soluble in alcohol. [Castor oil "is entirely dissolved by its own volume of alcohol." *Ph. Ed.*] Stoltze (Gmelin, *Handb. d Chemie,*) says benzoic acid promotes the solution of castor oil in rectified spirit.

Commerce.—Castor oil is imported in casks, barrels, hogsheads, and duppers.[1] The duty on it is 1s. 3d. per cwt. Of 393,191 lbs. imported in 1831, there came from the East Indies 343,373 lbs., from British Northern Colonies of America 25,718 lbs., from the United States 22,669 lbs., and from the British West Indies 1047 lbs. (*Parliamentary Returns* for 1831.)

Composition.—The following is the *ultimate* composition of castor oil:

	Saussure.	*Ure.*
Carbon	74·178	74·00
Hydrogen	11·034	10·29
Oxygen	14·788	15·71
Castor oil	100·000	100·000

The *proximate* constituents have not been accurately determined. As by saponification castor oil yields three fatty acids (*ricinic*, *elaïodic*, and *margaritic acids*) and glycerine, analogy leads us to infer that it is a compound of three fatty salts, respectively composed of glycerine and one of these acids; but hitherto, however, these salts have been imperfectly separated. They may be provisionally denominated *ricinine* (ricine), *elaïodine*[2] (ricino-oleine), and *margarnitine* (ricino-stearine). Ricinine is regarded as the ricinate of glycerine; elaïodine, as elaïodate of glycerine; and margaritine, as margaritate of glycerine. All these salts are soluble in alcohol. As margaritic acid constitutes only 0·002 of the products of saponification, it follows that castor oil contains but a small portion of margaritine. By distillation these salts undergo decomposition. By the action of hyponitrous acid, castor oil yields a peculiar fatty matter called *palmine*, which is analogous to, but not identical with, elaïdine.

Products of Saponification.	*Products of Distillation.*	*Product of the Action of Hyponitrous Acid.*
100 parts of Castor oil yielded:	(Average of two experiments:)	
1. Fatty acids (viz. *ricinic*, *elaïodic*, and *margaritic acids*) 94	1. Distilled liquid 33·5	
Glycerine 8	(*a.*) Water.	
	(*b.*) Acetic acid.	
	(*c.*) Volatile oil.	Palmin (yielding by saponification, and, therefore, probably consisting of, *palmic acid* and *glycerine*).
	(*d.*) Fatty acids (*ricinic*, *elaïodic*, [and *margaritic?*] acids.)	
	2. Solid residuum 63·0	
	3. Loss (inflammable gas) 3·5	
Total 102	Castor oil 100·0	

[1] I am informed that *duppers* are made of gelatine (prepared by boiling cuttings of skins) moulded in earthen moulds.

[2] The student must be careful not to confound *elaïodine* with the fat described under the name of elaïdine.

α. *Volatile Oil.*—This oil, obtained by distillation, is analogous to *acroleine*. It is to be separated from acetic acid by washing with water, and from the fatty acids by distillation with water. It is limpid and colourless, has a peculiar odour, an acrid taste, and a sp. gr. of 0·815. It is soluble in alcohol and ether, but is insoluble in a solution of potash. By long-continued exposure to a temperature of 23° F. it becomes crystalline.

β. *Fatty acids* (*Ricinic, Elaïodic, and Margaritic acids*).—These are very acrid, soluble in alcohol, ether, and a weak aqueous solution of potash. They unite with bases to form salts. The saline compounds formed by the union of these acids with potash, soda, magnesia, and lead, are soluble in alcohol: those with potash and soda are also soluble in water.

αα. *Ricinic acid* is crystalline, solid at ordinary temperatures, and fusible at 72° F. Its crystallized hydrate consists of *carbon* 73·56, *hydrogen* 9·86, and *oxygen* 16·58. Formula C^{35} H^{31} O^{6} (Laurent).

ββ. *Elaïodic* or *Ricino-oleic acid* is a yellow-coloured liquid at 32° F.; but at many degrees below it becomes crystalline.

γγ. *Margaritic* or *Ricino-stearic acid* crystallizes in pearly scales. It is distinguished from the two preceding acids by its high fusing point, by its partial decomposition when submitted to distillation, and by the insolubility of the margaritate of magnesia in alcohol. The crystallized hydrate consists of *carbon* 70·5, *hydrogen* 10·91, and *oxygen* 18·59. Formula C^{35} H^{31} O^{6} (Laurent).

γ. *Solid residuum of distillation.*—Pale yellow, elastic, gelatiniform, odourless, tasteless, combustible, solid. It is insoluble in alcohol, ether, and the oils (both fixed and volatile).

δ. *Palmine.*—A solid odorous fat formed by the action of hyponitrous acid on castor oil. By saponification it yields *palmic acid* and glycerine.

ε. *Œnanthylic Acid.*—By the action of nitric acid on castor oil, Mr. Tilly obtained, besides suberic and lipinic acids, a peculiar acid called *œnanthylic acid*, whose formula is C^{14} H^{13} O^{3} + Aq.

Physiological Effects.—**1. Of Castor Seeds.**—These seeds possess considerable acridity. Bergius (*Mat. Med.* t. ii. p. 823, ed. 2nda.) states, that a man masticated a single seed at bed-time: the following morning he was attacked with violent vomiting and purging, which continued the whole day. Lanzoni also states that the life of a woman was endangered by eating three grains of the seeds. (Marx, *Die Lehre von d. Giften.* i. 128.) More recently, a girl, 18 years of age, was killed by eating "about twenty" seeds: the cause of death was gastro-enteritis. (*Lond. Med. Gaz.* vol. xix. p. 944.)

2. Of Castor Oil.—α. *On Animals generally* castor oil acts as a laxative or mild purgative. Large animals, as the horse, require a pint or more for a dose; smaller ones need only a few ounces. (Moiroud, *Pharm. Véter.* p. 280.) Mr. Youatt, however, declares this oil to be both uncertain and dangerous in the horse. (*The Horse*, in *Libr. of Useful Knowledge*, pp. 212 and 387.)

β. *On Man.*—*Injected into the veins*, castor oil gripes and purges, and causes a nauseous oily taste in the mouth (Dr. E. Hale, in Begin's *Traité de Thérapeutique*, p. 114): hence it would appear to have a specific influence over the mucous lining of the alimentary canal. *Swallowed* to the extent of one or two ounces, it usually acts as a mild but tolerably certain purgative or laxative, without producing any uneasiness in the bowels. "It has this particular advantage," says Dr. Cullen, (*Mat. Med.*) "that it operates sooner after its exhibition than any other purgative I know of, as it commonly operates in two or three hours. It seldom gives any griping, and its operation is generally moderate—to one, two, or three stools only." It not unfrequently occasions nausea, or even vomiting, especially if somewhat rancid; in many cases, I believe, rather from its disgusting flavour than from any positively emetic qualities.

It has been stated by continental writers that castor oil is most unequal in its action, at one time operating with considerable violence, at another with great mildness; but I have never found it so, nor is it usually considered to be so in this country. I can, however, readily believe that a difference in the mode of its preparation, especially with reference to the heat employed, may materially affect its purgative property.

When castor oil has been taken by the mouth, it may be frequently recognized in the alvine evacuations; but it presents itself under various forms, "sometimes resembling caseous flakes, or a soap-like scum, floating on the

more fluid part of the dejection: occasionally it has been arranged in a form not unlike branches of grapes, or more nearly of hydatids of a white colour; more generally, however, it is found mixed up with the fæces as a kind of emulsion, and in some few instances it has been discharged under the form of solid tallow-like masses. (Mr. Golding Bird, *Lond. Med. Gaz.* vol. xv. p. 225.) Mr. Brande (*Dict. of Mat. Med.*) says, in one case it was discharged from the bowels in the form of indurated nodules, which were at first regarded as biliary concretions. A remarkable case is mentioned by Dr. Ward, of a woman on whom this oil does not act as a purgative, but exudes from every part of her body. (*Lond. Med. Gaz.* vol. x. p. 377.)

Uses.—Castor oil is used to evacuate the contents of the bowels in all cases where we are particularly desirous of avoiding the production of abdominal irritation (especially of the bowels and the urino-genital organs). The principal, or I might say the only, objection to its use in these cases, is its nauseous taste. The following are the leading cases in which we employ it:

1. *In inflammatory affections of the alimentary canal*, as enteritis, peritonitis, and dysentery, a mild but certain purgative is oftentimes indicated. No substance, I believe, answers the indication better, and few so well, as castor oil.

2. *In obstructions and spasmodic affections of the bowels*, as intussusception, ileus, and colic, especially lead colic, this oil is the most effectual evacuant we can employ.

3. *After surgical operations about the pelvis or abdomen*, (for example, lithotomy, and the operation for strangulated hernia), as well as after *parturition*, it is the best and safest purgative.

4. *In inflammatory or spasmodic diseases of the urino-genital organs*, inflammation of the kidneys or bladder, calculous affections, gonorrhœa, stricture, &c., castor oil is a most valuable purgative.

5. *In affections of the rectum*, especially piles, prolapsus, and stricture, no better evacuant can be employed.

6. *As an anthelmintic* for tape-worms, castor oil was first employed by Odier. Arnemann, however, has shown that it possesses no peculiar or specific vermifuge properties.

7. *As a purgative for children* it has been used on account of its mildness, but its unpleasant taste is a strong objection to its use.

8. *In habitual costiveness*, also, it has been recommended. Dr. Cullen observed that if castor oil be frequently repeated, the dose might be gradually diminished; so that persons who, in the first instance, required half an ounce or more, afterwards needed only two drachms.

Administration.—The dose of castor oil for children is one or two teaspoonsful; for adults, from one to two or three tablespoonsful. To cover its unpleasant flavour some take it floating on spirit (especially gin), but which is frequently contra-indicated; others on coffee, or on peppermint or some other aromatic water; or it may be made into an emulsion by the aid of the yolk of egg or mucilage.

4. EUPHOR'BIA, *Linn.*; AN UNDETERMINED SPECIES YIELDING EUPHORBIUM, *E.*

Euphorbia officinarum, *L.* Euphorbia canariensis, *D.*

Sex. Syst. Dodecandria, Trigynia. *Linn.*; Monœcia, Monandria, *Smith*,

(Euphorbium; gummi-resina. *L. D.* Concrete resinous juice, *E.*)

History.—The saline waxy-resin, called in the shops *gum euphorbium*, is said both by Dioscorides (lib. iii. cap. 96) and Pliny (*Hist. Nat.* lib. xxv. cap. 38, ed. Valp.) to have been first discovered in the time of Juba, King of Mauritania; that is, about, or a few years before, the commencement of the Christian æra. Pliny says that Juba called it after his physician, Euphorbus; and that he wrote a volume concerning it, which was extant in Pliny's time. Salmasius,

however, states that this is mentioned by Meleager the poet, who lived some time before Juba.

Botany. **Gen. Char.**—*Flowers* collected in monœcious heads, surrounded by an involucrum, consisting of one leaf with five divisions, which have externally five glands alternating with them. *Males* naked, monandrous, articulated with their pedicel, surrounding the female, which is in the centre. *Females* naked, solitary. *Ovarium* stalked. *Stigmas* three, forked. *Fruit* hanging out of the involucrum, consisting of three cells, bursting at the back with elasticity, and each containing one suspended seed (Lindley).

Sp. Char.—*Branches* channelled, with four, rarely five, angles, armed with double, straight, spreading, dark, shining *spines*.

These specific characters are taken from the branches found mixed with the euphorbium of commerce. They agree with the description and figure of *Tithymalus aizoides lactifluus* seu *Euphorbia canariensis* of Plukenet. (*Almagest. Bot.* vol. ii. p. 370.) From the *E. canariensis* of Willdenow and of some other botanists, this plant is distinguished by its straight spines. On examining the *E. canariensis* at the Kew Garden, I find as many of the spines straight as uncinate. But the diameter of the stems, and even of the young shoots, is greater than that of the stems found in the euphorbium of commerce. The species which most closely agrees with the latter in the size of the stems, the number of angles, and the number and direction of the spines, is *Euphorbia tetragona*. This species has mostly square stems; though some of the larger stems are somewhat channelled. The dried stems found in the euphorbium of commerce appear to be uniformly channelled. The *E. officinarum* has many angles: the *Dergmuse* of Jackson (*Account of Morocco*, 3d ed. p. 134) has many scolloped angles. *Euphorbia antiquorum* (fig. 186) has been said to yield euphorbium, but the statement is denied by both Hamilton (*Trans. of the Linn. Soc.* vol. xiv.) and Royle. (*Bot. of the Himalayan Mountains*, p. 328.)

Hab.—Africa, in the neighbourhood of Mogadore?

Extraction.—Euphorbium is thus procured. The inhabitants of the lower regions of the Atlas range make incisions in the branches of the plant, and from these a milky juice exudes, which is so acrid that it excoriates the fingers when applied to them. This exuded juice hardens by the heat of the sun, and forms a whitish yellow solid, which drops off in the month of September, and forms the euphorbium of commerce. "The plants," says Mr. Jackson, (*op. cit.*) "produce adundantly once only in four years; but this fourth year's produce is more than all Europe can consume." The people who collect it, he adds, are obliged "to tie a cloth over their mouth and nostrils to prevent the small dusty particles from annoying them, as they produce incessant sneezing."

Properties.—Euphorbium consists of irregular, yellowish, slightly friable tears, usually pierced with one or two holes, united at the base, and in which we find the remains of a double aculeus. These tears are almost odourless; but their dust, applied to the olfactory membrane, acts as a powerful sternutatory. Their taste is at first slight, afterwards acrid and burning.

When heated, euphorbium melts, swells up imperfectly, evolves an odour somewhat like that of Benzoic acid vapour, takes fire, and burns with a pale flame. Alcohol, ether, and oil of turpentine, are its best solvents; water dissolves only a small portion of it.

Composition.—Euphorbium has been the subject of several analyses; namely, in 1800, by Laudet (Gmelin, *Handb. d. Chem.*); in 1809, by Braconnot (*Ann. Chim.* lxviii. 44); in 1818, by Pelletier (*Bull. de Pharm.* iv. 502); and by Mühlman (Gmelin, *op. cit.*); in 1819, by Brandes (*Ibid.*); and more recently by Drs. Buchner and Herberger (Christison, *Treatise on Poisons*).

Pelletier's Analysis.

Resin	60·8
Wax	14·4
Bassorin	2·0
Malate of Lime	12·2
Malate of potash	1·8
Water and loss	8·8
Euphorbium	100·0

Brandes' Analysis.

Resin	43·77
Wax	14·93
Caoutchouc	4·84
Malate of Lime	18·82
Malate of potash	4·90
Sulphates of potash and lime, and phosphate of lime	0·70
Water and loss	6·44
Woody fibre	5·60
Euphorbium	100·00

Resin is the active ingredient of euphorbium. It coincides in many of its properties with ordinary resins: thus, it is reddish-brown, hard, brittle, fusible, soluble in alcohol, ether, and oil of turpentine, and somewhat less so in oil of almonds. Its leading and characteristic property is intense acridity. It differs from some resins in being slightly soluble only in alkalis. It is a compound of two resinous substances.

α. One resinous substance is soluble in cold alcohol. Its formula, according to Mr. Johnston, (*Phil. Trans.* 1840, p. 365,) is C^{40} H^{31} O^{8}.

β. The other resinous substance is insoluble in cold alcohol. The mean of Rose's analyses (Poggendorff's *Annalen*, xxxiii. 52,) of it gives as the composition of this resin, *carbon* 81·58, *hydrogen* 11·35, and *oxygen* 7·07.

Physiological Effects. α. *On Animals generally.*—Euphorbium acts on horses and dogs as a powerful acrid substance, irritating and inflaming parts with which it is placed in contact, and by sympathy affecting the nervous system. When swallowed in large quantities, it causes gastro-enteritis (two ounces are sufficient to kill a horse); when applied to the skin, it acts as a rubefacient and epispastic. Farriers sometimes employ it as a substitute for cantharides, for blistering horses, but cautious and well-informed veterinarians are opposed to its use.

β. *On Man.* The leading effect of euphorbium on man is that of a most violent acrid; but under certain circumstances a narcotic operation has been observed. When *euphorbium dust is inhaled, and also applied to the face*, as in grinding this drug, it causes sneezing, redness and swelling of the face, and great irritation about the eyes and nose. To prevent as much as possible these effects, various contrivances are adopted by different drug-grinders; some employ masks with glass eyes; others apply wet sponge to the nose and face; while some cover the face with crape. The pain and irritation, I am informed, are sometimes very great. Individuals who have been exposed for some time to the influence of this dust, suffer with headache, giddiness, and ultimately become delirious. All the workmen of whom I have inquired (and they comprise those of three large firms, including the one alluded to by Dr. Christison), agree that these are the effects of euphorbium. An old labourer assured me that this substance produced in him a feeling of intoxication: and I was informed at one drug-mill of an Irish labourer who was made temporarily insane by it, and who, during the fit, insisted on saying his prayers at the tail of the mill-horse.

Insensibility and convulsions have been produced by euphorbium. The only instance I am acquainted with is the following:—A man was engaged at a mill where euphorbium was being ground, and remained in the room longer than was considered prudent. Suddenly he darted from the mill-room, and ran with great velocity down two pairs of stairs. On arriving at the ground-floor or yard he became insensible, and fell. Within five minutes I saw him; he was lying on his back, insensible, and convulsed; his face was red and swollen; his pulse frequent and full; and his skin very hot. I bled him, and within half an hour he became quite sensible, but complained of great headache. He had no recollection of his flight down stairs, which seems to have been performed in a fit of delirium.

When *powdered euphorbium is applied to the skin*, it causes itching, pain, and inflammation, succeeded by vesication.

When *swallowed*, it causes vomiting and purging, and, in large doses, gastro-enteritis, with irregular hurried pulse and cold perspirations.

Uses.—Notwithstanding that it is still retained in the Pharmacopœia, it is rarely employed in medicine. It was formerly used as an *emetic* and *drastic purgative* in dropsies; but the violence and danger of its operation have led to its disuse. Sometimes it is employed as an *errhine* in chronic affections of the eyes, ears, or brain; but its local action is so violent that we can only apply it when largely diluted with some mild powder, as starch or flour.

Mixed with turpentine or Burgundy pitch (or rosin), it is employed in the form of plaster, as a *rubefacient*, in chronic affections of the joints. As a *vesicant*, it is rarely employed. As a *caustic*, either the powder or alcoholic tinc-

ture (*Tinctura Euphorbii*, Ph. Bor. prepared by digesting euphorbium 3j. in rectified spirit, Oj.) is sometimes employed in carious ulcers.

Antidote.—In a case of poisoning by euphorbium, emollient and demulcent drinks, clysters (of mucilaginous, amylaceous, or oleaginous liquids), and opium, should be exhibited, and blood-letting and warm baths employed. In fact, as we have no chemical antidote, our object is to involve the poison in demulcents, to diminish the sensibility of the living part by opium, and to obviate the inflammation by blood-letting and the warm bath. If the circulation fail, ammonia and brandy will be required.

5. JAN'IPHA MAN'IHOT, *Kunth*, *E.*—THE CASSAVA OR TAPIOCA PLANT.

Jatropha Manihot, *Linn.*
Sex Syst. Monœcia, Monadelphia.
(Fecula of the root; Tapioca, *E.*) (U. S.)

History.—Tapioca (Tipioca) is mentioned by Piso (*Hist. Nat. Brazilicæ*, p. 52-4) in 1648. The terms Janipha and Manihot are Indian appellations.

Botany. **Gen. Char.**—*Flowers* monœcious. *Calyx* campanulate, five-parted. *Petals* none. *Stamens* ten; filaments unequal, distinct, arranged around a disk. *Style* one. *Stigmas* three, consolidated into a rugose mass (A. de Jussieu).

Sp. Char.—*Leaves* palmate, five to seven-parted, smooth, glaucous beneath; segments lanceolate, quite entire. *Flowers* racemose (Hooker). (*Bot. Mag.* t. 3071.)—*Root* large, thick, tuberous, fleshy, and white; containing an acrid, milky, highly poisonous juice. *Flowers* axillary.

Hab.—Brazil.

Fig. 188.

Janipha Manihot.

Extraction.—The tuberous root consists principally of starch and a white milky poisonous juice. It is rasped and pressed to separate the juice, which deposits a fecula; this, when washed and dried in the air without heat, is termed *Moussache* (from *mouchaco*, a Spanish word, signifying *boy* or *lad*), or *Cipipa*, and for some years past has been imported into France from Martinique, and sold as arrow-root. (Guibourt, *Hist. des Drog.* t. ii. p. 466, 3me éd.) I believe it to be identical with the *Brazilian Arrow-root* of English commerce. When this fecula has been prepared by drying on hot plates, it acquires a granulur character, and is then termed *Tapioca*.

The compressed pulp is dried in chimneys, exposed to the smoke, and afterwards powdered. In this state it constitutes *Cassava powder*, or *Farine de Manioc*. If it be granulated by agitating it in a heated iron pan until incipient tumefaction, it is called *Couaque* or *Couac*. Lastly, when dried or baked into cakes on plates of iron or clay, it constitutes *Cassava* or *Cassada bread*.

Properties.—Two kinds of tapioca are imported. One is in the form of small lumps or granules, and is the ordinary tapioca of the shops: the other is a white amylaceous powder.

1. **Granular Tapioca, or Tapioca** commonly so called, is imported from Bahia and Rio Janeiro. It occurs in irregular small lumps or grains, which are partially soluble in cold water, the filtered solution yielding a blue colour with iodine. When these grains are mixed with water, and examined by the microscope, they are found to consist of entire and broken particles. The entire ones appear either circular or mullar-shaped, with very distinct and marked hilums (see fig. 189). But when they are made to roll over, the apparently rounded ones are then seen to be mullar-shaped, so that their rounded appearance arose from viewing them end.

Fig. 189.

Particles of Tapioca as seen by the microscope.

ways. Sometimes the mullar-shaped particles have a contracted base. At times, instead of the flat end of the mullar, we have two faces meeting at an oblique angle, so that the particles are like the third of a sphere. The base of the mullar is not, I think, really flat, but hollow. The hilum is surrounded by rings, and cracks in a stellate form.

2. **Tapioca Meal: Brazilian Arrow root:—Moussache or Cipipa.**—Imported from Rio Janeiro. It is white and pulverulent. When examined by the microscope, the particles seem identical with those of the common or granular tapioca.

Composition.—Tapioca has not been analysed. Its composition is doubtless analogous to that of other amylaceous matters.

Chemical Characteristics.—The filtered cold infusion is coloured blue by tincture of iodine, showing that tapioca is partially soluble in cold water. In boiling water tapioca becomes tremulous, gelatiniform, transparent, and viscous. Submitted to prolonged ebullition in a large quantity of water, it leaves an insoluble residue, which precipitates. This residue, diluted with water, and coloured with iodine, appears under the microscope to consist of mucous flocks, and to have no resemblance to the primitive ingredient.

Physiological Effects. *α.* **Of the Recent Juice.**—The milky juice is a powerful acrid or acro-narcotic poison; and to this the root owes its poisonous properties. The symptoms which it gives rise to, when swallowed, are pain and swelling of the abdomen, vomiting and purging, giddiness, dimness of sight, syncope, and rapid diminution of the powers of life. (Sloane's *Jamaica*, vol. i. p. 131, and vol. ii. p. 363.) The scrapings of the fresh root are successfully applied to ill-disposed ulcers. (Wright, *Med. Plants of Jamaica.*) The root is used to catch birds, which, by eating it, lose the power of flying. (Martius, in Wibmer, *Arzneim ü Gifte*, Bd. iii. S. 273.) The poisonous principle of the root may be destroyed or dissipated by heat, fermentation, &c. Hence it is either very volatile or readily decomposable. Guibourt (*Hist. des Drog.* t. ii. p. 455, 3me éd.) says it appears to be of the nature of hydrocyanic acid.

β. **Of the Fecula (Tapioca) of the Root.**—When the root has been deprived of its poisonous principle, it becomes highly nutritious. Of the preparations of it before referred to, the only one met with in this country is the fecula (*Tapioca*). This is both highly nutritious and easy of digestion. Its local action is emollient and demulcent.

Uses.—Made into puddings, tapioca is employed as a dietetical substance. Boiled in water or milk, and flavoured with sugar, spices or wine, according to circumstances, it is used as an agreeable, nutritious, light, easily digestible article of food for the sick and convalescent. It is devoid of all irritating and stimulating properties.

OTHER MEDICINAL EUPHORBIACEÆ.

1. Croton Pseudo-China, Schiede (*Croton Cascarilla*, Don, Ph. L.) grows in the vicinity of Jalapa, at Actopan, and in the district of Plau del Rio, in the province of Vera Cruz, Mexico. Its bark, called *Quina Blanca*, or *Copalche bark*, has been confounded with both cinchona and cascarilla barks. In 1817 a quantity of it was carried to Hamburgh as *Cascarilla de Trinidad de Cuba*. In 1827 no less than 30,000 lbs. of the same bark were sent from Liverpool to Hamburgh as genuine cinchona, but it was soon recognized to be a bark nearly allied to cascarilla, and by those on board the vessels coming from Para was declared to be *Quina, dit Copalchi*. Subsequently the minister, Von Altenstein, procured some of it from Mexico, under the name of *Copalche;* and in 1829 the plant yielding it was declared by Dr. Scheide to be a species of Croton, which he called Pseudo-China. Mr. Don (*Ed. New Phil. Journ.* xvi. 368,) mistook it for cascarilla bark. Copalche bark, in its form, size of the quills, and general appearance, very much resembles what our druggists call Ash Cinchona bark; but its cascarilla-like flavour instantly distinguishes it. A sample of it was given to me as a Cinchona bark.

From cascarilla bark it is distinguished by the length of the quills, their colour, and the absence of transverse cracks.[1]

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[1] For further details, consult Guibourt, *Hist. des Drog.*; and Goebel and Kunze, *Pharm. Waarenkunde.*

2. Jatropha Curcas is a native of South America and of Asia. Its fruit is the *nux cathartica americana* or *nux barbadensis* of some writers. Its seeds, which are occasionally met with in the shops, are called *physic nuts* (*semina ricini majoris*, or *gros pignon d'Inde*). Pelletier and Caventou analyzed them under the name of Croton seeds, (*Journ. de Pharm.* t. xv. p. 514,) and extracted from them a volatile acrid acid, called *jatrophic acid* (see p. 220). Mr. Bennett (*Lond. Med. Gaz.* ix. 8,) swallowed four seeds, and experienced a very unpleasant burning sensation in the stomach and bowels, with nausea, which, after an interval of nearly two hours, terminated in vomiting: their purgative effects followed soon afterwards, and were mild; the sickness had then nearly passed away, but the burning sensation continued for some time longer. In large doses they are energetic poisons.

The oil *Oleum Jatrophæ Curcadis* seu *Oleum infernale*) is analogous in its properties to croton oil. It is occasionally used as a drastic purgative. In India it is used for lamps.

3. Euphorbia Lathyris, or *Caper Spurge*, is an indigenous biennial. It is mentioned as an officinal substance in the Paris *Codex*. Its milky juice is violently acrid. In a case of poisoning by the seeds, narcotic symptoms were also present. (Christison, *Treatise on Poisons.*) The oil *Oleum Euphorbiæ Lathyridis*), extracted from the seeds, may be employed as an indigenous substitute for croton oil. The dose of it is from three to ten drops. (Dierbach, *Neuest. Entd. in d. Mat. Med.* S. 76, 1837; Bailly, *Lancet*, June 10th, 1826.)

4. Euphorbia Ipecacuanha is a native of the United States of America, in whose Pharmacopœia, it is mentioned. It is emetic and purgative. As an emetic it is given in doses of from ten to fifteen grains. (*United States Dispensatory.*) [The root of the *E. corrollata*, large flowering spurge, is also employed for the same purposes.]

5. The juice of Crozophora tinctoria becomes, under the united influence of air and ammonia, blue. Linen impregnated with this blue dye is called *rag turnsole* (*bezetta cærulea*): it is a test for acids, which redden it, but it is not used in this country. It must not be confounded with litmus. (*Vide* p. 42.)

Order XXX.—ARISTOLOCHIACEÆ, *Lindley*.—THE BIRTHWORT TRIBE.

Aristolochieæ. *Jussieu.*

Essential Character.—*Flowers* hermaphrodite. *Calyx* adherent to the ovary [*i. e.* superior], monosepalous; the limb three-lobed or tubular, and irregularly dilated at the upper part; valvate in æstivation. *Stamens* definite, generally in ternary numbers, free and distinct or adherent to the style and stigma, and epigynous. *Ovary* three to six-celled; *style* short; *stigma* divided. *Capsule* or *berry* coriaceous, three to six celled, many seeded; the *placentas* lateral. *Embryo* very small, at the base of a cartilaginous albumen.—Usually climbing *herbs* or shrubs, with alternate, simple, petiolated *leaves*. (*Bot. Gall.*)

Properties.—Not important. The roots possess stimulant properties, owing to the presence of volatile oil. Some of them are acrids. Bitter extractive renders them somewhat tonic.

ARISTOLO'CHIA SERPENTA'RIA, *Linn.* L. E. D.—THE VIRGINIAN SNAKE-ROOT.

Aristolochia officinalis, *Nees* and *Ebermaier.*
Sex. Syst. Gynandria, Hexandria.
(Radix, *L. D.*—The Root, *E.*)
(Serpentaria, U. S.)

History.—The first writer who distinctly mentions *Virginian snake-root*, or *snake-weed*, is Thomas Johnson, an apothecary of London, in his edition of Gerarde's Herbal, published in 1633.

Botany.—**Gen. Char.**—*Calyx* tubular, ventricose at the base, dilated at the apex, and extended into a ligula. *Anthers* six, subsessile, inserted on the style. *Stigma* six-lobed. *Capsule* six-angled, six-celled. (*Bot. Gall.*)

Sp. Char.—*Stem* flexuous, ascending. *Leaves* cordate, acuminate, on both sides pubescent. *Peduncles* nearly radical, unifloral. Lip of the *calyx* lanceolate. (*Beschr. offic. Planzen*).

Hab.—North America.

Collection and Properties.—The root (*radix serpentariæ*) is collected in Western Pennsylvania and Virginia, in Ohio, Indiana, and Kentucky. (*United States Dispensatory.*) It is imported in bales, usually containing about 100 lbs. As met with in the shops, it consists of a tuft of long, slender, yellowish, or brownish fibres, attached to a long contorted head or caudex. The odour is aromatic, the taste warm and bitter.