

With some persons the ether is apt to disagree, and for such the alcoholic tincture is preferred. *Whitlaw's ethereal tincture*, used by Dr. Elliotson, consisted of Lobelia, lb. j.; rectified spirit, Oiv.; spirit of nitric ether, Oiv.; spirit of sulphuric ether, ℥iv. Macerate for fourteen days, in a dark place. (*Lancet*, June 3, 1837.)

[As has been stated, page 385, heat injures the activity of lobelia, when its active principle is in a free state, and though combined with a weak acid in the plant, boiling is found to impair the activity of the decoction, hence in making preparations which require heat, some acid, as the acetic, should be associated with it. A VINEGAR OF LOBELIA may be prepared by treating four ounces of lobelia by displacement, with two pints of diluted acetic acid. With vinegar of lobelia, a *syrup* may be made in the same manner as syrup of squills.

By treating the powdered seeds with eight parts of diluted alcohol, containing 1 per cent. of acetic acid, a preparation is obtained possessing the activity of lobelia in a concentrated form (Proctor).—J. C.]

OTHER MEDICINAL LOBELIACEÆ.

LOBELIA SIPHILITICA, a native of the United States, possesses emetic, cathartic, and diuretic properties. It derived its name siphilitica from its supposed efficacy in syphilis, as experienced by the North American Indians, who considered it a specific in that disease, and from whom the secret of its use was purchased by Sir W. Johnson. (Woodville, *Med. Bot.* vol. i. p. 178.) Its antisiphilitic powers appear to have no foundation in fact. (Pearson, *Observ. on Various Art. of the Mat. Med.* p. 70.) The root was the part used: it was given in the form of decoction.

ORDER L.—COMPOSITÆ, De Candolle.

SYNANTHEREÆ, Richard; MUTISACEÆ, CICHORACEÆ, ASTERACEÆ, and CYNARACEÆ, Lindley.

ESSENTIAL CHARACTER.—*Calyx* gamosepalous; the tube adherent to the ovary; the limb generally degenerated into a pappus, or sometimes into a scaly corona, or entirely abortive. *Pappus* simple, pilose, ramose, or plumose; stipitate by the prolongation of the tube beyond the ovary or sessile. *Corolla* inserted into the upper part of the tube of the calyx, gamopetalous; the nerves in the tube being directed towards the sinuses; in appearance five, but really ten; which then proceed from the sinuses, along the margins of the lobes, to the apex, where they inosculate [*neuramphipetalous*.] *Tube* various in length; in the regular corolla, often funnel-shaped. *Lobes* generally five, valvate in æstivation. *Corolla* regular or irregular; the regular, of five equal lobes (*tubular corolla*); the irregular two-lipped (*bilabiate corolla*) or strap-shaped, five-dentate (*ligulate corolla*). *Stamens* generally five; in the female florets wanting, or rudimentary. *Filaments* adnate to the tube of the corolla; distinct or monadelphous; articulated near the apex, the upper portion acting as a connective. *Anthers* erect; connected in the tube, which is perforated by the style (*syngenesious* or *synantherous*). *Pollen* rough or smooth, globose or elliptical. *Ovary* adherent to the calyx, one-seeded. *Style* generally terete and bifid at the apex; the branches (commonly called *stigmas*) more or less free; flat above, convex beneath. *Stigmatic glands* (*true stigmas*) ranged in a double row along the upper margin of the branches of the style, more or less prominent: the upper portion of the style, in hermaphrodite flowers, provided with hairs, which collect the pollen. *Fruit* consisting of an achene and calyx closely connected, and inclosing the embryo; the achene one-celled, articulated on the receptacle, generally sessile; rostrate or not rostrate at the apex. *Seed* attached to the base of the fruit by a very short funiculus. Inner portion of the *spermoderm* (*endopleura* of De Cand., *albumen* of Lessing) diaphanous, pierced by the bifid funiculus. *Embryo* erect, with a short, straight, inferior radicle, and an inconspicuous plumule. *Florets* collected into dense heads (*capitules*); either all hermaphrodite (*homogamous*) or the outer ones female or neuter, the inner being hermaphrodite or male (*heterogamous*); or the capitules are entirely composed of florets of distinct sexes (*monœcious, dioecious, heterocephalous*). *Capitules* with the florets sometimes all tubular (*discoïd* or *flosculous*); sometimes all ligulate (*ligulate* or *semi-flosculous*); sometimes the central florets are tubular, while those of the ray are ligulate (*radiate*). *Involucre* of one or many rows of more or less united scales, surrounding the receptacle which is formed by the concretion of the extremities of the peduncles; either covered with chaffy scales (*paleaceous*) or naked (*epaleaceous*); sometimes the receptacle is indented with pentagonal hollows (*areolated*) or the margins of these are slightly raised (*alveolated*) or fringed (*fimbriated*).—*Herbs* or *shrubs* (rarely *trees*), forming almost a tenth part of the vegetable kingdom. *Leaves* simple, alternate, or opposite (Macreight, condensed from De Candolle).

PROPERTIES.—Variable. A bitter principle pervades most species; this communicates tonic properties. The laxative and anthelmintic qualities possessed by some of the species may,

perhaps, depend on the same principle. Volatile oil is frequently present: it communicates aromatic, carminative, diaphoretic, and, in some cases, acrid properties. Bitter matter and volatile oil are often associated in the same plant. A few of the compositæ are narcotic.

TRIBE I.—EUPATORIACEÆ.

I. TUSSILA'GO FAR'FARA, Linn. L. D.—COLTSFOOT.

Sex Syst. Syngenesia, Polygamia superflua.

(Folia et Flores, D.)

HISTORY.—This is the *βύχιον* of Hippocrates (*Opera*, p. 523 and 829, ed. Fœs.) and Dioscorides, (lib. iii. cap. 126.) By the Greeks and Romans it was smoked, to relieve obstinate cough (see p. 312).

BOTANY. **Gen. Char.**—*Head* many-flowered, heterogamous; *florets* of the ray females, in many rows, very narrowly ligulate; of the disc males, few in number, tubular, with a campanulate five-toothed limb. *Receptacle* naked. *Involucral scales* in about one row, oblong, obtuse. *Anthers* scarcely tailed. *Styles* of the disc inclosed, abortive; of the ray bifid, with taper arms. *Achene* of the ray oblong-cylindrical, smooth; of the disc abortive. *Pappus* of the ray in many rows; of the disc in one row, consisting of very fine setæ (De Cand.)

Sp. Char.—The only species.

Rhizome creeping horizontally. *Leaves* cordate, angular, toothed, downy beneath. *Scape* clothed with imbricated scaly bracts, usually one-flowered. *Heads* appearing before the leaves. *Flowers* yellow.

Hab.—Indigenous. Various parts of Europe and Asia. Flowers in March and April.

DESCRIPTION.—The herb and flowers (*herba et flores farfara seu tussilaginis*) have a bitterish mucilaginous taste. The dried leaves are odourless, but the flowers retain a slight odour. The watery infusion becomes green (*tannate of iron*) on the addition of sesquichloride of iron.

COMPOSITION.—No analysis of the plant has yet been made. *Mucilage*, *bitter extractive*, *tannic acid*, *colouring matter*, *salts*, and *woody fibre*, are the principal constituents.

PHYSIOLOGICAL EFFECTS.—The effects are not very obvious: they may be regarded as emollient, demulcent, and very slightly tonic.

USES.—Employed as a popular remedy in pulmonary complaints (chronic coughs especially.)

ADMINISTRATION.—The *decoction* (prepared by boiling ℥j., or ℥ij. of the plant in Oj. of water to Oj.) may be taken in doses of ℥℥ij. or ℥℥iij., or ad libitum.

(2. EUPATORIUM PERFOLIATUM, Linn.)

Sex Syst. Syngenesia. Equalis.

Eupatorium U. S. Thoroughwort. Tops and Leaves.

[**Gen. Char.**—*Calyx* simple or imbricated. Oblong. *Style* long and semibifid. *Receptacle* naked. *Pappus* pilose, or more commonly scabrous. *Seed* smooth and glandular, quinquestriate (Nuttall).

Sp. Char.—*Stem* villous. *Leaves* connate, perfoliate, oblong, becoming gradually narrower, serrate, rugose, tomentose beneath (Beck).

The common names for this plant are *Boneset*, *Thoroughwort*, *Indian Sage*, and *Ague Weed*.

It has a horizontal, crooked root, which is perennial. The stem is erect, round, hairy, simple at the base, and trichotomously divided above; from two to four feet high, of a grayish-green colour. The leaves in pairs are opposite, decussating each other, connate, perfoliate, broad at base, and tapering to a point, serrate, scabrous above, and tomentose beneath. The flowers are in a dense, depressed corymb, white.

Boneset is exclusively an inhabitant of North America. It is abundant in

low grounds, and the margins of streams; sometimes in the greatest profusion. It flowers in the month of August, and continues in bloom until late in October.

The dried herb, composed of the leaves, stems and flowers, is brought into the market in bundles; this is the best form in which it comes. The *Shakers* at Lebanon, New York, are in the habit of preparing packages of the leaves and flowers by pressure, but from the moisture necessary to communicate the compact form, the packages become mouldy in their interior. The odour of *Boneset* is agreeable, and the taste is exceedingly bitter.

This drug appears to have been known to the aborigines of America; the first settlers of the country are said to have derived their knowledge of it from them. Long before it attracted the attention of medical men, it was used as a febrifuge. A number of indications can be fulfilled by this article, as it is a tonic, a diaphoretic, and emetic, according to the mode of administration; as a tonic, it is employed in powder or cold effusion, and is a mild and agreeable bitter in debility of the stomach, as in some forms of dyspepsia, or in cases of general debility; as a diaphoretic, it is used in warm infusion, in small doses, as an ounce or two, repeated at intervals. It is frequently given with advantage with this indication in colds, commencing catarrhs, and rheumatism; indeed, the success attending this treatment in a rheumatism fever which prevailed several years ago in the New England States, which was called break-bone fever, has given rise to the title of *Boneset*. As an emetic, the quantity used is larger, and the infusion used should be warm; it may be employed for this purpose as a substitute for the infusion of chamomile.

The dose of the powder is ℥j. The infusion may be made in the proportion of ℥i. to Oj. of water, and a decoction may be prepared of similar proportions, but has no advantage over the infusion.—J. C.]

TRIBE II.—ASTEROIDEÆ.

3. INULA HELENIUM, Linn. L. D.—ELECAMPANE.

Sex. Syst. Syngenesia, Polygamia superflua.

(Radix, L. D.)

(Inula, U. S. Sec. List.)

HISTORY.—This is the *ἐλάγιον* of Hippocrates (*Nat. Mul.* p. 572, ed. Fœs.) and of Dioscorides (lib. i. cap. 27).

BOTANY. Gen. Char.—*Head* many-flowered, heterogamous; *florets* of the ray females, in one row, sometimes by abortion sterile, usually ligulate, rarely somewhat tubular and trifid; those of the disc hermaphrodite, tubular, five-toothed. *Involucre* imbricated in several rows. *Receptacle* flat or somewhat convex, naked. *Anthers* with two setæ at the base. *Achene* without a beak, tapering, or in *I. Helenium*, four-cornered. *Pappus* uniform, in one row, composed of capillary, roughish setæ. (De Cand.)

Sp. Char.—*Stem* erect. *Leaves* dentate, velvety-tomentose beneath, acute; the radical ones ovate, greatly attenuated into petioles; those of the stem semi-amplexicaul. *Peduncles* few, one-headed, corymbose at the apex. (De Cand.)

Root perennial, thick, branching. *Stem* three to five feet high. *Leaves* large, serrated, veiny. *Heads* terminal. *Flowers* bright-yellow.

Hab.—Indigenous. Various parts of Europe. Flowers in July and August.

DESCRIPTION.—The dried root (*radix helenii* seu *emule*) of the shops consists of longitudinal or transverse slices, which are yellowish-gray, and have an aromatic or camphoraceous smell, and a warm bitter taste. Iodine colours the root brown. Sesquichloride of iron produces, in the infusion, a green colour (*tannate of iron*).

COMPOSITION.—The root has been analysed by John, (Gmelin, *Handb. d. Chem.* ii. 1288,) by Funcke, (*Trommsdorff's Journal*, xviii. I. p. 74,) and by

Schulz. (*Berl. Jahrb. d. Pharm.* 1818, p. 251.) The constituents, according to John, are—*volatile oil* a trace, *elecampane-camphor* 0.3 to 0.4, *wax* 0.6, *acid soft resin* 1.7, *bitter extractive* 36.7, *gum* 4.5, *inulin* 36.7, *woody fibre* 5.5, *oxidized extractive with coagulated albumen* 13.9; besides salts of *potash, lime, and magnesia*.

1. HELENIN.—*Elecampane-camphor*.—Colourless, prismatic, crystals, heavier than water, fusible, volatile, very soluble in ether, oil of turpentine, and boiling alcohol, but insoluble in water. Nitric acid converts it into resin (*nitrohelenin*). Its formula, according to Dumas, is $C^{14} H^9 O^2$; according to Gerhart, (*Pharmaceutisches Central-Blatt für 1840*, p. 309,) $C^{15} H^{10} O^2$. Its composition, therefore, is closely allied to that of creasote.

2. RESIN.—Brown, fusible in boiling water, and soluble both in alcohol and ether. When warm it has an aromatic odour. Its taste is bitter, nauseous, and acrid.

3. INULIN (*Alantin* and *Menyanthin*, Trommsdorff; *Elecampin*, Henry; *Dahlin* and *Datiscin*, Payen).—An amylaceous substance, organized, according to Raspail, like common starch. It is very slightly soluble in cold water, but very soluble in boiling water, from which it is deposited as the solution cools. It is slightly soluble in boiling alcohol. Iodine gives it a yellow tint: this distinguishes it from ordinary starch. Its formula is $C^{12} H^{10} O^{10}$. In combination with lead it loses an atom of water, and becomes $C^{12} H^9 O^9$.

4. BITTER EXTRACTIVE. In this resides the tonic property of elecampane.

PHYSIOLOGICAL EFFECTS.—An aromatic tonic. It acts as a gentle stimulant to the organs of secretion, and is termed diaphoretic, diuretic, and expectorant. Large doses cause nausea and vomiting. It was formerly supposed to possess emmenagogue properties. In its operation it is allied to sweet-flag (see p. 77) and senega.

USES.—It is rarely employed now by the medical practitioner. It has been used in pulmonary affections (as catarrh), attended with profuse secretion and accumulation of mucus, but without febrile disorder or heat of skin. In dyspepsia, attended with relaxation and debility, it has been administered with benefit. It has also been employed in the exanthemata to promote the eruption.

ADMINISTRATION.—Dose of the *powder*, ℞j. to ℥ij.; of the *decoction* (prepared by boiling ℥ss. of the root in Oj. of water), ℥j. to ℥ij.

TRIBE III.—SENECIONIDEÆ.

4. ANTHEMIS NOBILIS, Linn. L. E. D.—COMMON CHAMOMILE.

Sex. Syst.—Syngenesia, Polygamia superflua.

(Flores simplices, L.—Flowers, E.—Flores, D.)

(Anthemis, U. S.)

HISTORY.—The ἀνθίσις of Dioscorides (lib. iii. cap. 154,) is *Anthemis Chia*. (*Prodr. Fl. Græcæ*, vol. ii. p. 189.)

BOTANY. *Gen. Char.*—*Head* many-flowered, heterogamous; *florets* of the ray female, in one row, ligulate (rarely none, or somewhat tubular); of the disc hermaphrodite, tubular, five-toothed. *Receptacle* convex, oblong, or conical; covered with membranous paleæ between the flowers. *Involucre* imbricated, in a few rows. Arms of the *style* without appendages at the apex. *Achene* tapering or obtusely four-cornered, striated or smooth. *Pappus* either wanting or a very short, entire, or halved membrane; sometimes auriculate at the inside. (De Cand.)

Sp. Char.—*Stem* erect, simple, ramose, downy-villose. *Leaves* downy, sessile, pinnatisect; segments split into many linear-setaceous lobes. *Branches* flowery, naked, one-headed at the apex. Scales of the *involucre* obtuse, hyaline, at the margin. Paleæ of the *receptacle* lanceolate, pointless, somewhat shorter than the floret, slightly eroded at the margin. (De Cand.)

Roots shiny, with long fibres. *Stems* in a wild state prostrate, in gardens more upright, a span long, hollow, round. *Flowers* of the disc yellow; of the ray white. *Receptacle* convex.

Anthemis nobilis flore pleno, De Cand. *Double Chamomile*.—In this variety, the yellow tubular florets of the disc are entirely or partially converted into white ligulate florets.

Sir J. Smith (*Eng. Fl.* vol. iii. p. 457.) speaks of the *discoid variety*, destitute of rays, as being more rare. It ought perhaps, he adds, to be preferred for medicinal use.

Hab.—Indigenous; on open gravelly pastures or commons. Perennial. Flowers from June to September. Cultivated at Mitcham and other places, for the London market.

DESCRIPTION.—The floral heads (*flores chamæmeli romani seu anthemidis nobilis*) have a strong and peculiar odour, and a bitter aromatic taste. When fresh, they exhibit a strong and peculiar fragranciness when rubbed. They should be dried in the shade. The *single flowers* (*flores simplicis*, Ph. L.) are to be preferred, as they have the largest yellow discs, in which the volatile oil resides. The large *double flowers* (*chamæmelum flore pleno*, Lewis; *chamæmelum nobili flore multiplici*, C. Bauhin), however, are usually the most esteemed: but as their yellow discs containing the oil are small, or scarcely any, they contain less volatile oil.

COMPOSITION.—These flowers have not yet been analyzed. The most important constituents are *volatile oil*, *bitter extractive* and *tannic acid*.

1. VOLATILE OIL (see p. 393).

2. BITTER EXTRACTIVE.—The bitter principle of chamomiles is soluble in both water and alcohol.

3. TANNIC ACID.—The cold watery infusion of the flowers is darkened by sesquichloride of iron, and forms a precipitate with gelatine.

Freudenthal (Gmelin, *Handb. d. Chem.* ii. 1292) analysed the dried flowers of the *Common Wild Chamomile*, (*Matricaria Chamomilla*), and found them to consist of *volatile oil* 0.28, *resin* 7.89, *bitter extractive* 8.57, *gum* 7.39, *bitartrate of potash* 5.31, *phosphate of lime* 0.97, *woody fibre, soluble albumen, water*, and loss 69.6.

PHYSIOLOGICAL EFFECTS.—Chamomiles produce the effects of the *aromatic bitter tonics* before alluded to (vol. i. p. 189): their aromatic qualities depend on the volatile oil, their stomachic and tonic qualities on bitter extractive and tannic acid. In large doses they act as an emetic.

USES.—Chamomiles are an exceedingly useful stomachic and tonic in *dyspepsia*, with a languid and enfeebled state of stomach and general debility. As a remedy for *intermittents*, though they have gained considerable celebrity, they are inferior to many other medicines. The oil is sometimes used to relieve *flatulency, griping, and eructation*; and the warm infusion is employed as an *emetic*.

ADMINISTRATION.—The *powder* is rarely employed, on account of the inconvenient bulk of the requisite quantity, and its tendency to excite nausea.—Dose grs. x. to ʒss. or more. The *infusion* is the more elegant preparation: this, as well as the *extract* and *oil*, are officinal. *Fomentations of Chamomile flowers* consist of the infusion or decoction, and are used quite hot; but they present no advantage over water of the same temperature. *Flannel bags filled with chamomiles and soaked in hot water* are useful topical agents for the application of moist warmth, on account of their retention of heat.

1. INFUSUM ANTHEMIDIS, L. E. (U. S.) *Infusum Chamæmeli*, D.; *Infusion of Chamomile*; *Chamomile Tea*.—(Chamomile, ʒv. (ʒss. U. S.) Boiling [distilled] Water, Oj. Macerate for ten [twenty, E.] minutes [twenty hours, D.] in a lightly-covered vessel, and strain [through linen, D.].—It is taken warm, to excite gentle vomiting, or to promote the operation of an emetic. The cold infusion is usefully employed as a domestic stomachic bitter and tonic in *dyspepsia*.—Dose of the cold infusion, fʒj. to fʒij.; of the warm infusion, *ad libitum*.

2. EXTRACTUM ANTHEMIDIS, E.; *Extractum Chamæmeli*, D.; *Extract of Chamomile*.—(Chamomile, lb. j.: boil it with a gallon of water down to four pints; filter the liquid hot; evaporate in the vapour-bath to a due consistence, E.)—One hundred weight of the flowers yields about forty-eight pounds of extract. The volatile oil is dissipated during the preparation. The extract is a bitter stomachic and tonic. It is generally used as a vehicle for the exhibition

of other tonics in the form of pills. Conjoined with the oil of chamomile, we can obtain from it all the effects of the recent flowers.—Dose, grs. x. to ℥j.

3. OLEUM ANTHEMIDIS, L. E.; *Oleum Chæmæmeli Romani*; *Oleum Chæmæmeli*; *Oil of Chamomile*; *Oil of the Roman Chamomile*. (Obtained by submitting the flowers to distillation with water.)—One hundred weight of flowers yields from ℥iss. to ℥ij. of oil. The oil of the shops is frequently brought from abroad, and is probably the produce of another plant (*Matricaria Chamomilla*). Oil of chamomile when first drawn is pale blue, but by exposure to light and air it becomes yellow or brownish. Lewis (*Mat. Med.*) says it is yellow, with a cast of greenish or brown. Its sp. gr. is 0.9083. When fresh, its odour is strong and peculiar, and its taste pungent and nauseous. It is stimulant and antispasmodic. It is a frequent addition to tonic and cathartic pills; it communicates stimulant qualities to the former, and is believed to check the griping caused by the latter. It is occasionally exhibited in the form of elæosaccharum.—Dose, ℥j. to ℥v.

5. ANACYCLUS PYRETHRUM, De Cand. E.—PELLITORY OF SPAIN.

Anthemis Pyrethrum, L. D.

(*Radix, L. D.—Root, E.*)

(*Pyrethrum, U. S. Sec. List.*)

HISTORY.—Dioscorides (lib. iii. cap. 86) was acquainted with *πέρεθρον*, and speaks of its use in toothache. The word *pyrethrum* is mentioned once only by Pliny. (*Hist. Nat.* lib. xxviii. cap. 42, ed. Valp.)

BOTANY. Gen. Char.—*Head* many-flowered, heterogamous. *Florets* of the ray female, sterile, ligulate or somewhat so, very rarely tubular; of the disc hermaphrodite, with five callous teeth. *Receptacle* conical or convex, paleaceous. *Involucre* in few rows, somewhat campanulate, shorter than the disc. All the *corollas* with an obcompressed, two-winged, exappendiculate tube. *Style* of the disc, with exappendiculate branches. *Achene* flat, obcompressed, bordered with broad, entire wings. *Pappus* short, irregular, toothletted, somewhat continuous with the wings on the inner side. (De Cand.)

Sp. Char.—*Stems* several, procumbent, somewhat branched, pubescent. *Radical leaves*, expanded, petiolated, smoothish, pinnatisect; the segments pinnatifid, with linear subulate lobes; the cauline leaves sessile. *Branches* one-headed. *Involucral scales* lanceolate, acuminate, brown at the margin. *Receptacle* convex, with oblong-obovate, obtuse paleæ. (De Cand.)

Root fusiform, fleshy, very pungent, and when fresh, producing a sensation of extreme cold, followed by heat when handled. *Florets* of the ray white on the upper side; purplish beneath; of the disc yellow.

Hab.—Barbary, Arabia, Syria, and perhaps Candia.

DESCRIPTION.—The root (*radix pyrethri*) is imported from the Levant packed in bales. It consists of inodorous pieces, about the length and thickness of the little finger, covered with a thick brown bark, studded with black shining points, breaking with a resinous fracture, and presenting internally a radiated structure. When chewed it excites a pricking sensation in the lips and tongue, and a glowing heat. None has been imported since 1836, when duty (6d. per lb.) was paid on 420 lbs.

COMPOSITION. It was analyzed by John, (Gmelin, *Handb. d. Chem.* ii. 1292,) by Gautier, (*Journ. de Pharm.* iv. 49,) by Parisel, (*Ibid.* xix. 251,) and lastly by Koene. (*Ann. de Chim. Phys.* lix. 327.) Parisel obtained *acid matter (pyrethrin)* 3, *inulin* 25, *gum* 11, *tannin* 0.55, *colouring matter* 12, *lignin* 45, *chloride of potassium* 0.79, *silica* 0.85, and *iron* a trace.

PYRETHRIN; Acid Principle; Resin.—In this resides the activity of the root. It exists in greater abundance in the bark than in the wood. It is brown, soft, has a burning acrid taste, is insoluble in water, but soluble in ether and alcohol; still more so in acetic acid, and the oils (volatile and fixed). Koene says, pyrethrin consists of three substances:

- a.* A brown acrid resin, soluble in alcohol, insoluble in water or caustic potash.
β. An acrid brown fixed oil, soluble in potash.
γ. A yellow acrid oil, soluble in potash.

PHYSIOLOGICAL EFFECTS.—Pellitory is an energetic local irritant. Applied to the skin it acts as a rubefacient.

USES.—Scarcely ever employed internally. Its principal use is to yield a tincture for the relief of toothache. As a masticatory and sialogogue it is chewed in some rheumatic and neuralgic affections of the head and face, and in palsy of the tongue. In relaxation of the uvula it is occasionally employed in the form of gargle. It was formerly employed internally as a gastric stimulant.

ADMINISTRATION.—Dose, as a masticatory, 3ss. to 3j.; *Tinctura pyrethri* (composed of pyrethrum, water, of each, one part; rectified spirit, five parts) is used to relieve toothache.

6. ARTEMISIA ABSINTHIUM, L. E. D.—COMMON WORMWOOD.

Sex. Syst. Syngenesia, Polygamia superflua.

(Herb, E.—Summitates florentes, D.)

(Absinthium, U. S.)

HISTORY.—In all probability this plant is the *ἀλβύθιον* of Hippocrates (*Opera*, pp. 491, 587, &c. ed. Fœs.) and Dioscorides. (Lib. iii. cap. 26.) The term *wormwood* occurs several times in our translation of the Old Testament (*Deut.* xxix. 18; *Prov.* v. 4); but the plant meant would appear to be both bitter and poisonous.

BOTANY.—*Gen. Char.*—*Heads* discoidal, homogamous or heterogamous. *Florets* of the ray in one row, usually female and three-toothed, with a long bifid protruding style; of the disc five-toothed, hermaphrodite, or by the absorption of the ovary, sterile or male. *Involucral* scales imbricated, dry, scarious at the edge. *Receptacle* without palæ, flattish or convex, naked or fringed with hairs. *Achene* obovate, bald, with a minute epigynous disc. (De Cand.)

Sp. Char.—An erect *undershrub*. *Leaves* silky, hoary, tripinnatisect; the segments lanceolate, somewhat dentate, obtuse. The *heads* small, racemose-paniculate, globose, nodding. Exterior scales of the *involucre* somewhat silky, linear, lax; interior ones rounded, scarious, somewhat naked. (De Cand.)

Herb covered with silky hoariness, intensely bitter, with a strong peculiar odour. *Stems* numerous, about a foot high. *Leaves* rather greener on the upper side; lower ones on long footstalks; upper on shorter, broader, somewhat winged ones. *Florets* pale yellow, or buff.

Hab.—Indigenous; in waste grounds. Perennial. Flowers in August.

DESCRIPTION.—The dried herb with flowers, or the tops (*herba seu summitates absinthii*), have a whitish-gray appearance, a soft feel, a strong aromatic and somewhat unpleasant odour, and an extremely bitter aromatic taste. The cold watery infusion becomes grayish, olive-green, and turbid (*tannate of iron*) on the addition of sesquichloride of iron.

COMPOSITION.—This plant has been analyzed by Kunsemüller, (Pfaff, *Mat. Med.* iv. 334,) by Braconnot, (*Bull. de Pharm.* v. 549,) and by Haynes. (Geiger, *Handb. d. Pharm.* ii. 1509.) The extract was examined by Leonardi. (*Journ. de Pharm.* xiv. 620.) Braconnot found *volatile oil* 0.15, *green resin* 0.50, *bitter resin* 0.233, *albumen* 1.250, *starch* 0.133, *azotized matter* having little taste, 1.333, *bitter azotized matter* 3.0, *woody fibre* 10.833, *absinthate of potash* 0.917, *nitrate of potash* 0.333, *sulphate of potash and chloride of potassium* traces, *water* 61.2.

1. VOLATILE OIL (*Oleum Absinthii*).—Green, sometimes yellow or brownish oil, having a strong odour of wormwood, and an acrid, bitter, peculiar taste. Its sp. gr. is 0.972. Nitric acid colours it green, then blue, afterwards brown.

2. BITTER PRINCIPLE (*Absinthin*).—Caventou (*Journ. de Chim. Méd.* t. iv. p. 556,) obtained what he calls the *pure bitter principle* by precipitating an infusion of wormwood by acetate of

lead, and separating the excess of lead by sulphuretted hydrogen. The liquor was then evaporated to dryness, and the extract digested in alcohol mixed with ether; and the solution abandoned to spontaneous evaporation. The product was a very bitter matter, in brown ramifications. By heat no crystalline sublimate could be obtained.

3. ABSINTHIC ACID.—May be precipitated, according to Braconnot, from the watery infusion of wormwood by acetate of lead. It is very acid, uncrystallizable, and deliquescent. It does not precipitate the solutions of the nitrates of lead, mercury, and silver; but causes flocculent precipitates when dropped into barytes or lime-water. *Absinthate of ammonia* crystallizes in quadrilateral prisms, insoluble in alcohol.

4. SALT OF WORMWOOD (*Sal Absinthii*).—This is impure carbonate of potash obtained by incinerating wormwood.

PHYSIOLOGICAL EFFECTS.—*In moderate doses* it produces the ordinary effects of the *aromatic bitter tonics* (see vol. i. p. 189). Its bitter principle becomes absorbed: hence the flesh and milk of animals fed with it are rendered bitter. Borrich (*Act. Hafn.* vol. ii. p. 165,) says that the milk rendered bitter by it proves noxious to the infant.

Large doses irritate the stomach and excite the vascular system. A specific influence over the nervous system, characterized by headache, giddiness, &c. has been ascribed to it. (See Lindestolpe, in Murray, *App. Med.*; and Kraus, *Heilmittell.* p. 422.) This has usually been supposed to depend on the volatile oil; but a similar power has been assigned to the bitter principle.

USES.—Wormwood is but little employed in medicine. It is adapted for dyspepsia occurring in debilitated and torpid constitutions. It was at one time celebrated for the cure of intermittents; but it has been superseded by other and more powerful febrifuges. It is said to be efficacious as an anthelmintic, but is very rarely employed as such.

ADMINISTRATION.—Dose of the *powder*, ℥j. to ʒj.; of the *infusion* (prepared by macerating ʒj. of the dried herb in Oj. of boiling water), ℥ʒj. to ℥ʒij.

EXTRACTUM ARTEMISIÆ ABSINTHII, D. *Extract of Common Wormwood*.—(Prepared in the usual way from the tops of wormwood, by water.)—It possesses the bitterness of the plant, but is devoid of the odour, flavour, and aromatic qualities dependent on the volatile oil. It is stomachic and tonic.—Dose, gr. x. to ℥j.

7. ARTEMISIA MOXA, *De Cand.*—MOXA-WEED.

Sex. Syst. Syngenesia, Polygamia superflua.

(Folia; Moxa).

HISTORY.—The *moxa* is a small mass (usually cylindrical or pyramidal) of combustible vegetable matter, employed for effecting cauterization (*moxybustion* of Percy) (*Dict. Sc. Méd.* xxxiv. 474). It has long been known that the Chinese and Japanese prepared it from a species of *Artemisia*. (Loureiro, *Fl. Cochinchinensis*, ii. 492; Thunberg, *Voyages au Japon*, &c. iv. 74.) The Dublin College has adopted *A. chinensis* and *A. indica* as yielding it. But Dr. Lindley (*Fl. Méd.* 463) says it is from the *A. Moxa*, *De Cand.*, and not from *A. chinensis*, that it is prepared; and Dr. Roxburgh (*Fl. Ind.* iii. 420) observes, that the *A. indica* has none of the soft white down on the under side of its leaves, of which *moxa* is made in Japan and China.

BOTANY. *Gen. Char.*—See *Artemisia Absinthium*.

Sp. Char.—Shrubby. *Leaves* hoary, becoming naked, bipinnatisect; segments linear-lanceolate, obtuse. *Heads* middle-sized, globose, drooping, racemose-paniculate. *Scales* of the involucre membranaceo-scariose at the apex. *Corollas* smooth. (*De Cand.*)—An under-shrub.

Hab.—China.

PREPARATION.—The *Chinese* and *Japanese moxa* is said by some to be prepared from the cottony or woolly covering of the leaves of the *Artemisia*. Thunberg, (*op. cit.*) however, states, that in Japan the dried tops and leaves are beat till they become like tow: this substance is then rubbed betwixt the hands

till the harder fibres and membranes are separated, and there remains nothing but a fine cotton.

European moxas are usually made either with cotton-wool (which has been soaked in a solution of nitrate or chlorate of potash) or the pith of the sun-flower (*Helianthus annuus*), which contains naturally nitrate of potash. Their shape is either cylindrical or conical: their size is variable. *Percy's moxas*, prepared by Robinet, are usually found in the London shops. They consist of pith, rolled in cotton, and enveloped in muslin.

PHYSIOLOGICAL EFFECTS.—These are two-fold, *primary* and *secondary*.

1. *Primary Effects*.—The moxa first excites an agreeable sensation of heat. This is speedily followed by pain, which progressively increases until it becomes most severe, and the vitality of the part is destroyed. The parts immediately around the eschar are intensely red. The eschar may be deep or superficial, according to the time the moxa is kept in contact with the skin. The action of the moxa differs from that of the metallic actual cautery in this important particular, that the heat acts slowly, increases gradually, and penetrates to a greater depth.

2. *Secondary Effects*.—These consist in the production of inflammation, by which the eschar is separated, and establishment of suppuration more or less profound, according to circumstances.

USES.—Moxa is employed in the treatment of diseases, on the principle of counter-irritation, before explained (see vol. i. p. 153). This, indeed, has been denied by those (see Boyle, *Treat. on Moxa*, p. 88, 1825) who consider the production of a discharge as the only mode of effecting counter-irritation.

Moxa is adapted for chronic diseases and maladies characterized by lesions of sensation or motion. It is, on the other hand, injurious in all acute inflammatory diseases.

The following is a list of the principal diseases against which moxa has been employed; and for further information respecting them, I must refer the reader to the writings of Larrey, (*Dict. des Scien. Med.*, art. *Moxa*.) Boyle, (*op. supra cit.*) and Wallace, (*Physiol. Enq. resp. Moxa*, 1827,) as the limits and objects of this work do not admit of further details.

1. *Paralysis of the sentient or motor nerves*.—Great benefit has been obtained by the use of moxa in this class of diseases. Amaurosis, deafness, loss of voice and speech, hemiplegia, and especially paraplegia, have been relieved by it.

2. *Painful affections of nerves, muscles, or the fibrous tissues*; as neuralgia, sciatica, lumbago, and chronic rheumatism.

3. *Spasmodic diseases*, either of particular parts, or of the general system; as spasmodic asthma, epilepsy, &c.

4. *Diseased joints and spinal maladies*; as chronic articular inflammation, white swelling, stiff joints, hip-joint disease, curvature of the spine, &c.

5. *Visceral diseases*; as organic diseases of the brain, phthisis pulmonalis, chronic hepatitis and splenitis, &c.

APPLICATION.—In the employment of moxa, two points deserve especial attention: first, the parts proper or otherwise for its use; and secondly, the mode of applying it.

1. *Parts proper or improper for its application*.—The moxa has been applied to nearly every part of the body. Larrey, however, considers the following parts improper for its application:

1. All that part of the skull covered by skin and pericranium only.
2. The eyelids, nose, ears, larynx, trachea, sternum, glandular parts of the breasts, linea alba, and parts of generation.
3. Over the course of superficial tendons, articular prominences, where there is danger of injuring the articular capsules, and projecting points of bone.

2. *Mode of application*.—The moxa is to be set on fire at the summit, and its base is then applied (by a *porte-moxa*, pair of forceps, wire, or other convenient

instrument) to the skin. To prevent the surrounding parts being burnt by sparks, Larrey recommends them to be previously covered with a wet rag, perforated in the centre, to admit the base of the moxa. If the combustion flag, it may be kept up by the breath, blow-pipe, or bellows. After the combustion is over, Larrey recommends the immediate application of liquor ammonia, to repress excessive inflammation and suppuration.

8. TANACETUM VULGARE, Linn. D.—COMMON TANSY.

Sex. Syst. Syngenesia, Polygamia superflua.

(Folia, D)

(Tanacetum, U. S.—Sec. List.)

HISTORY.—Tansy was ordered to be cultivated in gardens by Charlemagne. (Sprengel, *Hist. Rei Herb.*)

BOTANY. Gen. Char.—Heads either homogamous or heterogamous; namely, florets of the ray female, in one row, usually three to four-toothed. *Receptacle* naked, convex. *Involucre* campanulate, imbricated. *Corollas* of the disc four to five-toothed. *Achene* sessile, angular, smooth, with a large epigynous disc. *Pappus* either none, or membranous, coronet-shaped, minute; either entire or equally toothed, or somewhat unequal, being more evident on the external side. (De Cand.)

Sp. Char.—*Stem* herbaceous, erect, smooth. *Leaves* smoothish, bipinnate-partite, the rachis and lobes inciso-serrate. *Corymbus* many-headed. Internal scales of the *involucre* obtuse, scariose at the apex. *Pappus* short, equal, five-lobed. (De Cand.)

Root moderately creeping. *Stems* 1½ to 2 feet high. *Leaves* dark green. *Florets* golden yellow; the marginal ones often wanting.—There are three varieties of it,—the *common*, the *curled* (generally preferred), and the *variegated* (chiefly for ornament).

Hab.—Indigenous; hilly pastures, hedges, road-sides. Cultivated in gardens as a medicinal or pot-herb, or for ornament.

DESCRIPTION.—The herb and flowers (*herba et flores tanaceti*) have a disagreeable, aromatic odour, and a nauseous, strong, aromatic, bitter taste. The infusion is rendered dark green and turbid (*tannate of iron*) by sesquichloride of iron.

COMPOSITION.—Both leaves and flowers have been analyzed by Fromherz and by Peschier. (Gmelin, *Handb. d. Chem.* ii. 1290.) The constituents of the leaves, according to Peschier are *volatile oil, fatty oil, wax or stearine, chlorophyll, bitter resin, yellow colouring matter, tannin with gallic acid, bitter extractive, gum, woody fibre, tanacetie acid.*

1. **VOLATILE OIL** (*Oleum Tanaceti*).—Yellow, sometimes green. Has the peculiar odour of the plant; and a warm, bitter taste. Its sp. gr. is 0.952.

2. **BITTER MATTER.**—This is a substance usually denominated extractive; but, according to Peschier, it is in part resin.

3. **TANACETIC ACID.**—Crystallizable. Precipitates lime, baryta, and oxide of lead. With a solution of acetate of copper it causes a precipitate.

PHYSIOLOGICAL EFFECTS.—Tansy produces the usual effects of the *aromatic bitter tonics* (vol. i. p. 189). “A fatal case of poisoning with half an ounce of oil of tansy is recorded in the *Medical Magazine* for Nov. 1834. Frequent and violent clonic spasms were experienced, with much disturbance of respiration; and the action of the heart gradually became weaker till death took place from its entire suspension. No inflammation of the stomach or bowels was discovered upon dissection.” (*United States Disp.* from the *Am. Journ. of the Med. Sciences*, xvi. 256.)

USES.—The young leaves are occasionally employed by the cook to give colour and flavour to puddings, and in omelets and other cakes. In medicine

the plant is rarely employed by the regular practitioner; but it has been recommended in dyspepsia, intermittents, and gout. (Cullen, *Mat. Med.* ii.) Its principal use, however, is as a vermifuge.

ADMINISTRATION.—*Tansy tea* (prepared by infusing ℥ij. of the herb in Oj. of boiling water) may be taken in doses of from ℥ʒj. to ℥ʒiij. A drop or two of the oil may be added to vermifuge powders and pills. The seeds have been used instead of *semina santonici*.

9. ARNICA, MONTANA, Linn, D.—MOUNTAIN ARNICA.

Sex. Syst. Syngenesia, Polygamia superflua.

(Flores, Folia, et Radix, D.)

(Arnica, U. S. Sec. List.)

HISTORY.—This plant does not appear to have been known to the ancients; at least no undoubted mention of it occurs in their writings.

BOTANY. Gen. Char.—*Head* many-flowered, heterogamous. *Florets* of the ray in one row, female, ligulate; of the disc, hermaphrodite, tubular, five-toothed. *Involucre* campanulate, in two rows, with linear-lanceolate equal scales. *Receptacle* fringed, hairy. *Tube of the corolla* shaggy. Rudiments of sterile *stamens* sometimes remaining in the ligulæ. *Style* of the disc with long arms, covered by down running a long way down, and truncated or terminated by a short cone. *Achene* somewhat cylindrical, tapering to each end, somewhat ribbed and hairy. *Pappus* in one row, composed of close, rigid, rough hairs. (De Cand.)

Sp. Char.—*Radical leaves* obovate, entire, five-rowed; the cauline vases in one or two pairs. *Stem* one to three-headed. *Involucres* rough, with glands. (De Cand.)

Perennial. *Stem* hairy, about one foot high. *Florets* yellow, tinged with brown.

Hab.—Meadows of the cooler parts of Europe, from the sea-shore to the limits of eternal snow.

DESCRIPTION.—The root (*radix arnicæ*) consists of a cylindrical caudex, from two to three inches long, and two or three lines thick, from which many fibres arise. It is brown externally, has a disagreeable yet aromatic odour, and an acrid nauseous taste. The dried flowers (*flores arnicæ*) are yellowish, and have a similar taste and smell to the root. The leaves (*folia arnicæ*) have a like smell.

COMPOSITION.—Pfaff (*Mat. Med.* Bd. iii. S. 210) found in the root *volatile oil* 1.5, *acrid resin* 5.0, *extractive* 32.0, *gum* 9.0, and *woody fibre* 5.5. The root has also been examined by Weissenburger. (Goeble and Kunze, *Pharm. Waarenk.* Bd. ii. S. 177.) Chevallier and Lassaigne (*Journ. de Pharm.* t. v. p. 248) analysed the flowers, and found in them *resin*, *bitter acrid matter* (*cytisin*), *yellow colouring matter*, *gum*, *albumen*, and *gallic acid*. In the ashes were salts of potash, and lime, and silica. Dr. A. T. Thomson (*Lond. Disp.* p. 213, 9th ed.) is of opinion that the igasurate of strychnia (or brucia) exists in the plant.

1. VOLATILE OIL.—The oil obtained from the root, by Pfaff, was yellowish, lighter than water, and had a burning aromatic taste. The volatile oil of the flowers is blue.

2. RESIN (*Arnicin*).—The acidity of the root and flowers resides, according to Pfaff, in the resin, which is soluble in alcohol.

3. EXTRACTIVE MATTER.—According to Chevallier and Lassaigne, this is nauseous, acrid, bitter, and soluble in both water and spirit. They consider it to be analogous to *cytisin*.

PHYSIOLOGICAL EFFECTS. *a. On Animals*.—The effects of the flowers of Arnica on horses have been examined by Viborg. (*Wirk. d. Arzneim. u. Gifte*, j. 231.) An infusion of six drachms of the flowers quickened the pulse, and acted as a diuretic. An infusion, thrown into the veins, caused insensibility.

β. On Man.—Jörg and his pupils have submitted themselves to the influence

of this plant. (*Op. cit.* S. 226.) From their observations, as well as from the testimony of others, arnica appears to possess acrid properties. When swallowed it causes burning in the throat, nausea, vomiting, gastric pains, and loss of appetite. The active principle becomes absorbed, quickens the pulse and respiration, and promotes diaphoresis and diuresis. Furthermore, it appears to exert a specific influence over the nervous system, causing headache, giddiness, and disturbed sleep. Sundelin (*Hand. d. sp. Heilm.* ii. 170, 3^{te} Aufl.) considers it to be closely allied in operation to senega, from which, he says, it differs in its stimulating influence over the nervous system, and in its causing constipation.

USE.—Arnica is indicated in diseases characterized by debility, torpor, and inactivity. It is administered as a stimulant to the general system in various debilitated conditions, and in typhoid fevers; to the nervous system in deficient sensibility, as amaurosis; to the muscular system, in paralysis; to the vascular system and secreting organs when the action of those is languid, and requires to have its energy increased, as in some forms of dropsy, chlorosis, amenorrhœa, asthenic inflammation, &c. Furthermore, it has been also employed empirically, as in diarrhœa, dysentery, &c. It is rarely employed in this country.

ADMINISTRATION.—Dose of the *powder* grs. v. to grs. x.; of the infusion (prepared by macerating ℥ss. in Oj. of water), from ℥ss. to ℥i.

OTHER OFFICIAL SENECIONIDÆÆ.

1. WORMSEED.—The substance kept in the shops under the name of *Wormseed* (*semen santonicum*, *semen cina*, *semen contra*, *semen sementina*, &c.), is erroneously declared by the *Dublin College* to be the seeds (*semina*) of *Artemisia Santonica*. A very superficial examination shows that the substance sold under this name consists, not of seeds, but of broken peduncles, mixed with the calyx and flower-buds. Furthermore, the plant which Dr. Woodville (*Med. Botany*) has denominated *A. Santonica*, is said by De Candolle (*Prodr.* vi. 104) to be *A. maritima*, var. *β. suaveolens*. Martius (*Pharmakogn.*) describes three kinds of wormseed; but I am acquainted with one kind only, which is imported from the Levant (*semen cina levanticum*). It has been analysed by both Trommsdorff and Wackenroder, (Gmelin, *Handb. d. Chem.* ii. 1291,) and found to contain volatile and bitter matter. A crystalline substance called *santonine* (C¹⁰ H⁸ O²) has been obtained from it. It is used as a vermifuge, in doses of from gr. x. to ℥ss., repeated night and morning, and succeeded by a brisk purge.

2. ARTEMISIA VULGARIS or *Mugwort* has been used in epilepsy, infantile convulsion, chorea, hysteria, and amenorrhœa. Judging, however, from its sensible qualities, it can possess but little virtue. Its powder, infusion, and expressed juice, have been administered.

3. GOIZOTIA OLEIFERA, De Cand.; *Verbesina stativa*, Roxburgh; *Rantilla oleifera*, Royle. The fruit of this plant is "called by the Canarese *Nuts Yelloo*, and in Dukhanic, *Ram Tilla*." (Ainslie, *Materia Indica*, vol. ii. p. 256.) They are smooth, nearly four-sided, with the angles rounded and tapering to the base. By expression they yield an oil which is much used for dressing food in Mysore, and as a common lamp oil. (Heyne, *Tracts on India*, p. 49.)

Virey (*Jour. de Pharmacie*, xxiii. 349) says that the grains of this plant are extensively imported into France from Calcutta, under the name *teel* or *till*, on account of the oil which they yield. But the seeds imported into England under the name of *teel seeds* are the produce of *Sesamum orientale* (*Nat. Ord. Pedaliaceæ, Sex. Syst. Didynamia Angiospermia*), a native of India, whose seeds, used in Eastern countries for dietetical purposes, yield a bland fixed oil (*Gingilie oil*), which has been sometimes substituted in England for almond oil. Two kinds of sesamum seeds are known,—one brown or black, the other pale (whitish or yellowish). The first is produced by a variety of *Sesamum* called *kala til*, the second by another variety termed *suffed til*. (Royle, *Illustrations of the Botany of the Himalayan Mountains*, p. 294.)

4. SENECIO JACOBÆA or *Common Ragwort* is a bitter aromatic indigenous plant, formerly in repute for various diseases. (Boerhaave, *Hist. Plantarum*.) It has recently been recommended, on insufficient evidence as I believe, as a remedy for gonorrhœa. (*Lond. Med. Gaz.* N. S. vol. ii. 1840-41.)

[5. The ANTHEMIS COTULA, or wild chamomile, is a native of the United States, and is employed as a substitute for the *A. nobilis*, which it resembles in habit and properties. It has been placed in Sec. List of the U. S. F.]

TRIBE IV.—CYNAREÆ.

10. LAPPA MINOR, *De Cand.*—COMMON BURDOCK OR CLOT-BUR.Arc'tium Lap'pa, *D.**Sex. Syst.* Syngenesia, Polygamia æqualis.(Semina et Radix, *D.*)

HISTORY.—This, according to Sprengel, (*Hist. Rei Herb.* i. 101 and 185,) is the ἀραπίνη of Theophrastus, (*Hist. Plant.* vii. 14,) the ἀραπίων of Dioscorides, (*Hist. Plant.* iv. 107.)

BOTANY. Gen. Char.—*Head* homogamous, many-flowered and equal-flowered. *Involucre* globose; the scales coriaceous, imbricated, close pressed at the base, then subulate, with a horny, hooked, inflexed point. *Receptacle* rather fleshy, flat, with stiff subulate fringes. *Corollas* five-cleft, regular, with a ten-nerved tube. *Stamens* with papillose filaments; the *anthers* terminated by filiform appendages, and with subulate tails at the base. *Stigmas* free at the apex, diverging, curved outwards. *Fruit* oblong, laterally compressed, smooth, transversely wrinkled; the areola at their base scarcely oblique. *Pappus* short, in many rows; the hairs deciduous, filiform, not collected into a ring. (*De Cand.*)

Sp. Char.—*Involucre* smooth; the scales serrulated beyond the middle; smooth at the base only; the inner ones few, not radiating. *Heads* somewhat racemose. (*De Cand.*)

Root tapering, fleshy. *Stem* erect, three feet or more high. *Leaves* stalked, cordate; the radical ones very large, and often slightly toothed. *Florets* purple.

Hab.—Indigenous; waste places and way-sides; common. Flowers in July and August.

PHYSIOLOGICAL EFFECTS.—The *root* and *leaves* have been considered to possess mild resolvent, diaphoretic, and diuretic properties. (Murray, *App. Med.* i. 134.) Lieutaud (*Syn. Prax. Med.* t. i. p. 528, 1770) says, the root promotes the lochial discharge. The *seeds* are diuretic, and, according to Linnæus, (*Mat. Med.*) purgative.

USES.—The root, leaves, and seeds, have been employed as alteratives and resolvents in gouty, rheumatic, calculous, and venereal complaints.

ADMINISTRATION.—The *decoction of the root* (prepared by boiling ʒij. of the recent root in Oij. of water down to Oij.) may be taken to the extent of a pint daily. The dose of the *seeds* is ʒj.

11. CNICUS BENEDICTUS, *Linn. D.*—BLESSED THISTLE.Centaure'a benedic'ta, *Linn.*(Folia, *D.*)

HISTORY.—Sprengel (*Hist. Rei Herb.* i. 102) thinks that this plant is, perhaps, the ἀραπίνη of Theophrastus. (*Hist. Plant.* vi. 4.)

BOTANY. Gen. Char.—*Involucre* ovate; the scales close-pressed, coriaceous, extended into a long, hard, spinous, pinnate appendix; the lateral spines conical and distant. *Corollas* of the ray sterile, slender, almost as long as the disc. *Fruit* longitudinally and regularly striated, smooth; with a broad, lateral areola. *Pappus* triple, as it were, the outer being the horny, very short, crenated margin of the fruit; the intermediate consisting of ten long stiff setæ; the inner of ten short setæ; all the setæ alternating with each other. (*De Cand.*)

Sp. Char.—The only species.

An annual, branched, woolly herb. *Leaves* amplexicaul, somewhat decurrent, nearly entire or deeply pinnatifid. *Heads* terminal, bracteate. *Florets* yellow.

Hab.—South of Europe, the Levant, Persia; introduced into China.

COMPOSITION.—The herb was analysed by Soltmann, (Pfaff, *Mat. Med.* vi. 171,) and the leaves by Morin. (*Journ. Chim. Méd.* iii. 105.) The latter found *volatile oil*, *bitter principle*, *resin*, *chlorophylle*, *fixed oil*, *uncrystallizable sugar*,

gum, albumen, supermalate of lime, several mineral salts, some metallic oxides and traces of sulphur.

1. BITTER PRINCIPLE (*Cnicin*).—A brown, bitter substance, soluble in alcohol, ether, and boiling water; insoluble in fixed oils. Its aqueous solution forms a precipitate on the addition of diacetate of lead. It gives no trace of nitrogen when decomposed by heat.

2. RESIN.—Brownish, insipid, inodorous; very soluble in alcohol and alkaline solution, but is insoluble in ether.

PHYSIOLOGICAL EFFECTS.—The herb is tonic and mildly diaphoretic: its decoction causes vomiting. The seeds are diaphoretic. (Murray, *App. Med.* i. 151-3.

USES.—The cold infusion is employed as a tonic in debilitated conditions of the stomach. Taken warm in bed, the infusion has been given as a sudorific, in various chronic diseases. The decoction has been employed to promote the operation of emetics. (Lewis, *Mat. Med.*)

ADMINISTRATION.—The *infusion* (prepared by digesting ʒss. of the leaves in Oj. of water) is given in doses of from fʒj. to ʒij., as a tonic. The *decoction* (made with double or treble the quantity of leaves) is used in the same dose.

OTHER OFFICINAL CYNARÆÆ.

The flowers of the *CARTHAMUS TINCTORIUS* are imported, for the use of dyers, in flaky masses, from the East Indies and other places, under the name of *Safflower*, or *Bastard Saffron*. They contain two colouring matters—one *yellow*, soluble in water, the other *red* (*carthamin* or *carthamic acid*), soluble in alkaline solutions. Safflower is used to adulterate *hay-saffron*, and in the manufacture of *cake-saffron* (see p. 135). The mode of detecting the fraud has been already pointed out. [It has been introduced into the U. S. P. under the name of *CARTHAMUS*.]

FIG. 206.



Carthamus tinctorius.

TRIBE V.—CICHORACEÆ.

12. TARAXACUM DENS LEONIS, Desf. E.—COMMON DANDELION.

Leont'odon Tarax'acum, Linn. L. D.

Sex. Syst. Syngenesia, Polygamia equalis.

(Radix, L.—Root, E.—Herba et Radix, D.)

(Taraxacum, U. S.)

HISTORY.—As this plant is a native of Greece, (see *Prodr. Fl. Græca*, ii. 129,) it must have been known to the ancients. Sprengel thinks (*Hist. Rei Herb.* i. 100,) that it is ἀράνη of Theophrastus. (*Hist. Plant.* vii. 81.)

BOTANY. Gen. Char.—*Head* many-flowered. *Involucre* double; external scales small, closely pressed, spreading, or reflexed; internal ones in one row, erect; all frequently callous-horned at the apex. *Receptacle* naked. *Achene* oblong, striated, muricate near the small ribs or spinulose at the apex, terminating in a long beak. *Pappose* hairy, in many rows, very white (De Cand.)

Sp. Char.—Quite smooth. *Leaves* unequally and acutely runcinate; the lobes triangular, toothed inwardly. Scales of the *involucre* hornless, the external ones reflexed. *Achenes* muricate at the apex (De Cand.)

Root perennial. *Leaves* numerous, bright shining green. *Scapes* one or more, erect, brittle. *Heads* expanded in the morning and in fine weather only. *Florets* golden yellow.

Hab.—Indigenous; meadows and pastures every where. Flowers all the summer.

DESCRIPTION.—The fresh root (*radix taraxaci*) is tap-shaped, branched, fleshy, abounding in milky juice. Externally it is dull yellow or brownish, internally white. It is without odour: its taste is bitter (especially in the summer). If dug up in the winter the root loses on drying 75 per cent. of water. The cold watery infusion of the dried root deposits a dirty-gray flocculent precipitate on the addition of sesquichloride of iron.

COMPOSITION.—The milky juice of the root has been analyzed by John, (Gmelin, *Hand. d. Chem.* ii, 1827,) who found in it *caoutchouc*, *bitter matter*, traces of *resin*, *sugar*, and *gum*, *free acid*, *phosphates*, *sulphates*, and *hydrochlorates of potash and lime*, and *water*. The root also contains 12 per cent. of *inulin*. Mr. Squire (Brande's *Dict. of Mat. Med. and Pharm.* p. 532,) says, the expressed juice contains *gum*, *albumen*, *gluten*, an *odorous principle*, *extractive*, and a *peculiar crystallizable bitter principle*, soluble in alcohol and water.

The root washed, crushed, and pressed, yields about half its weight of juice. Except in the months of April and May, when it is very aqueous, this juice spontaneously coagulates, and becomes of a fawn-colour. The quantity of extract obtained from the juice varies at different seasons. (Squire, *op. cit.*)

	Juice.	
In January and February.....	4 to 5 lbs.	} yield 1 lb. of extract.
In March.....	6 to 7 lbs.	
In April and May.....	8 to 9 lbs.	
In June, July, and August.....	6 to 7 lbs.	
In September and October.....	4 to 5 lbs.	
In November and December.....	4 lbs.	

It is obvious, then, that the expressed juice is richest in solid constituents in the months of November and December. It is remarkable, however, that the juice possesses the greatest bitterness in the summer months; while in the spring, and late in the autumn, it has a remarkably sweet taste. (Geiger, *Hand. d. Pharm.*) Squire (*op. supra cit.*) considers this change to be effected by the frost.

PHYSIOLOGICAL EFFECTS.—Its obvious effects are those of a stomachic and tonic. In large doses it acts as a mild aperient. Its diuretic operation is less obvious and constant. In various chronic diseases its continued use is attended with alterative and resolvent effects. But where the digestive organs are weak, and readily disordered, taraxacum is very apt to occasion dyspepsia, flatulency, pain, and diarrhœa.

USES.—It is employed as a resolvent, aperient, and tonic, in chronic diseases of the digestive organs, especially hepatic affections; as jaundice, chronic inflammation, or enlargement of the liver, dropsy dependent on hepatic obstruction, and dyspepsia, attended with deficient biliary secretion. In some very susceptible conditions of the stomach, it proves injurious. It has been employed in affections of the spleen, chronic cutaneous diseases, uterine obstructions, &c.

ADMINISTRATION.—It is employed in the form of either *decoction* or *extract*.

1. **DECOCTUM TARAXACI**, E. D. (U. S.); *Decoction of Dandelion*.—(Taraxacum, herb and root, fresh, ℥vij. [℥iv. D.] [℥ij. U. S.]; Water, Oij. [*wine-measure*, D.] Boil together down to a pint, and strain).—Aperient and tonic.—Dose, f℥j. to f℥ij. To increase its aperient property, a saline purgative may be conjoined.

2. **EXTRACTUM TARAXACI**, L. E. D. (U. S.); *Extract of Dandelion*.—(Fresh root of Taraxacum, bruised, lb. ijss. [lb. j. E. (U. S.)]; Boiling Distilled Water, Cong. ij. [Cong. j. E. (U. S.)] Macerate for twenty-four hours, then boil down to a gallon, and strain the liquor while hot; lastly, evaporate to a proper consistence, L.—“Proceed as for the preparation of extract of poppyheads,” E.—The *Dublin College* employed both herb and root).—Extract of taraxacum should be brown, not blackish: its taste is bitter and aromatic: that of the shops is usually more or less sweet. It should be completely soluble in water.—Dose, grs. x. to ʒss.

12. LACTUCA SATIVA, Linn. *L. E. D.*—THE GARDEN LETTUCE.*Sex. Syst.* Syngenesia, Polygamia equalis.(Succus spissatus, *L.*—Inspissated juice of *L. virosa* and *L. sativa*, *E.*—Herba, *D.*)(Lactucarium, *U. S.*)

HISTORY.—The *Σπίδαξ*, or *Lettuce*, was well known to the ancient Greeks and Romans. It is mentioned by Hippocrates (*De diæta*, ii. p. 359; and *De Morb. Mul.* i. 629 and 635,) both as an aliment and medicine. "The sedative powers of *Lactuca sativa*, or Lettuce, were known," observes Dr. Paris, (*Pharmacol.* vol. i. p. 13, 6th ed.) "in the earliest times; among the fables of antiquity, we read that, after the death of Adonis, Venus threw herself on a bed of lettuces, to lull her grief, and repress her desires."

BOTANY. Gen. Char.—*Heads* many or few-flowered. *Involucre* cylindrical, calyculate-imbriate, in two or four rows; outer rows short. *Receptacle* naked, *Achene* plane, obcompressed, wingless, abruptly terminating in a filiform beak (*De Cand.*)

Sp. Char.—*Leaves* not concave, erect, oblong, narrowed at the base, smooth at the keel. *Stem* elongated, leafy (*De Cand.*)

Annual. *Stem* erect, simple below, branched above, one or two feet high, smooth. *Leaves* rounded or ovate, semi-amplexicaul, frequently wrinkled, usually pale-green; varying much in the different varieties. *Flowers* yellow.

Mr. London (*Encycl. of Gardening*, p. 856,) enumerates no less than fourteen varieties cultivated by gardeners for the table. Seven of these are *Cabbage Lettuces* (*Lactuca capitata*), and the others are *Cos Lettuces* (*Lactuca romana*).

Hab.—Native country unknown: perhaps the East Indies. Extensively cultivated in Europe.

PREPARATION OF LACTUCARIUM.—Before the flower-stem shoots up, the plant abounds with a cooling, bland, pellucid juice; afterwards it contains an intensely bitter, milky juice, which resides in the root, cortical portion of the stem and of the branches, and in the involucre. When incisions are made in the flowering-stem, this milky juice exudes. When collected and dried it constitutes *lactucarium* or *lettuce opium*. It is (or was) prepared on a large scale by Mr. Young, of Edinburgh. (*Duncan, Edinb. Dispens.* p. 384, 11th ed.; *Mem. of the Caled. Hort. Soc.* vol. i. 160.)

PROPERTIES.—*Lettuce opium* (*Thridace* seu *Lactucarium*), as found in commerce, occurs in roundish hard masses, of a brown colour, with an opiate smell and a bitter taste. That made in Edinburgh from *L. sativa* occurs in large oval lumps as big as the fist.

The term *lactucarium* has been applied indiscriminately to various and different preparations of *L. sativa* and *virosa*; viz. to the substance above described, to the inspissated expressed juice, and to extracts (watery and alcoholic) obtained from the lettuce. (*Duncan's Edinb. Dispens.*) But the only preparation that I am practically acquainted with, and which I have found in commerce, is the one described in the text.

COMPOSITION.—*Lactucarium* has been analysed by Klink, (*Pfaff Syst. d. Mat. Med.* vi. 504,) by Schrader, (*Gmelin, Handb. d. Chem.* ii. 1286,) by Peschier, (*Dulk, Preuss. Pharm. übers.* i. 625,) by Peretti, (*Pharm. Central-Blatt. für 1831*, S. 467,) and by Buchner. (*Ibid. für 1833*, S. 27.)

Klink's Analysis.		Buchner's Analysis.	
Bitter extractive	55.0	Odoriferous matter	undetermined
Wax	10.0	Lactucin, with colouring matter	18.6
Resin	6.9	Gummy extractive	14.666
Caoutchouc	17.5	Soft Resin, with waxy matter	12.467
Water	15.6	Waxy matter (myricin)	35.100
		Gluten or albumen	19.100
Lactucarium	105.0	Air-dried Lactucarium	99.933

1. **ODOROUS MATTER.**—The nature of this substance has not been determined; it is probably similar to that of the odorous principle of opium. When *lactucarium* is submitted to distillation with water, the odorous principle passes over with the latter.

2. BITTER PRINCIPLE: *Lactucin*.—A saffron-yellow, almost odourless, very bitter, combustible substance. It is very slightly soluble in cold water, readily soluble in alcohol, less so in ether. Infusion of nutgalls renders a solution of it, in very dilute spirit, turbid.

3. EMPYREUMATIC OIL OF LETTUCE.—Dr. Morries (*Ed. Med. and Surg. Journ.* vol. xxxix.) says, the empyreumatic oil of lettuce differs from that of opium only in being more fusible.

A strong though unfounded suspicion appears to have been entertained, that *morphia* was contained in lactucarium. But in none of the before-quoted analyses was it to be found; neither was Caventou (*Journ. de Chim. Méd.* i. 300,) able to detect an atom of either *morphia* or *narcotin* in lactucarium.

CHARACTERISTICS.—The cold aqueous decoction of lactucarium becomes, on the addition of sesquichloride of iron, olive-brown (*tannate? of iron*). Tincture of nutgalls renders the decoction slightly turbid. Heated with lactucarium, colourless nitric acid acquires an orange-yellow tint, and evolves binoxide of nitrogen. The alcoholic tincture of lactucarium becomes slightly turbid on the addition of water.

PHYSIOLOGICAL EFFECTS.—*Lettuce leaves*, eaten as a salad, are easily digested, but they yield only a small portion of nutritive matter. They probably possess, in a very mild degree, soporific properties. The ancients considered them anti-aphrodisiac.

Lactucarium possesses anodyne and sedative qualities: but its powers have, I suspect, been over-rated. Ganzel (*Sundelin, Handb. d. sp. Heilm.* Bd. i. S. 459, 3^{te} Aufl.) states, that ten grains introduced into the cellular tissue of a dog's leg, caused deep sopor, with occasional convulsions, but no dilatation of the pupil. Francois, (*Arch. Gén. de Méd.* Juin 1825, p. 264,) who made a considerable number of trials of it, observes that it contains neither a narcotic nor an intoxicating principle; but that it allays pain, diminishes the rapidity of the circulation, and, in consequence, reduces the animal heat, and places the patient in a condition more favourable to sleep. Its *modus operandi* is different from that of opium; for the latter substance accelerates the pulse, and produces either delirium or stupor. It is more allied to *hyoscyamus*, from which, according to Fisher, (*Lond. Med. Gaz.* xxv. 863,) it is distinguished by its power of directly diminishing sensibility, being preceded by irritation of the nervous system. A more extended experience of the use of lactucarium, however, is requisite to enable us to form accurate conclusions as to the precise nature and degree of its powers.

USES.—*Lettuce leaves* are employed at the table as a *salad*. As they appear to possess slight hypnotic properties, they may be taken with advantage at supper, to promote sleep. Galen, (*De aliment facult.* lib. ii. cap. 40,) who in his old age was troubled with watchfulness, was relieved by the use of lettuce at night. On the other hand, prudence points out the propriety of abstaining from the use of this plant, if there be any tendency to apoplexy.

Lactucarium is employed as an anodyne, hypnotic, antispasmodic, and sedative, where opium is considered objectionable, either from peculiarities on the part of the patient or from the nature of the disease. Thus it may be used where there is morbid excitement of the vascular system, in which condition opium is usually contra-indicated. But though it is free from several of the inconveniences which attend the use of opium, yet it is much less certain in its operation. It may be given with advantage to allay cough in phthisis and other pulmonary affections (*Duncan, Observ. on Pulm. Consump.* 1813); to relieve nervous irritation and watchfulness in febrile disorders in which opium is not admissible. Dr. Rothamel (*Dierbach, Neuest. Entd. in d. Mat. Med.* S. 118, 1837) has employed it with success in different kinds of fevers, inflammations, exanthemata, profluviae, cachexies, and painful and peculiar nervous disorders. Vering (*Ibid.* S. 119) found it especially useful in spasm of the uterus; and Angelot gave it to repress seminal discharges.

ADMINISTRATION.—The usual dose is from grs. iij. to grs. v.; but it has been given in very much larger quantities. According to Trousseau and

Pidoux, (*Traité de Thérap.* i. 260,) four drachms have been taken during the day.

1. **TINCTURA LACTUCARII, E.**; *Tincture of Lactucarium*.—(Lactucarium, in fine powder, $\bar{\text{z}}\text{iv}$.; Proof Spirit, Oij. This tincture is best prepared by percolation, as directed for tincture of myrrh; but may also be prepared by digestion with coarse powder of lactucarium).—Each $\text{f}\bar{\text{3}}\text{j}$. of this tincture contains grs. vi. of lactucarium.—Dose from $\text{ʒ}\text{xxx}$. to $\text{f}\bar{\text{3}}\text{j}$.

2. **TROCHISCI LACTUCARII, E.**; *Lozenges of Lactucarium*.—(To be prepared with lactucarium in the same proportion and in the same manner as the Opium Lozenge).—Each lozenge weighs ten grains, and contains nearly one-sixth of a grain of lactucarium.

13. LACTUCA VIROSA, Linn., E. D.—STRONG-SCENTED LETTUCE.

Ser. Syst. Syngenesia, Polygamia equalis.
(The inspissated Juice, E.—Folia, D.)

HISTORY.—According to Sprengel, (*Hist. Rei Herb.* i. 185,) this is the Ἐπίδαξ ἀγγία of Dioscorides (lib. ii. 166); but Dr. Sibthorp (*Prodr. Fl. Græcæ*, ii. 126) suggests that *Lactuca Scariola* was the plant referred to by Dioscorides.

BOTANY. Gen. Char.—See *Lactuca sativa*.

Sp. Char.—*Stem* erect, round; the base smooth or prickle-bristle-pointed; the apex paniced. *Leaves* horizontal, prickle-bristle-pointed at the keel, acutely denticulate, obtuse, at the base arrow-shaped; the lower ones sinuate. *Achenes* striated, nearly shorter than the beak (De Cand.)

Herb abounding in fetid milky juice. *Root* tap-shaped. *Stem* two to four feet high. *Leaves* distant. *Florets* yellow.

Hab.—Indigenous; about hedges, old walls, and borders of fields; not uncommon. Biennial. Flowers in August and September.

PREPARATION OF LACTUCARIUM.—The lactucarium prepared by Mr. Duncan, of Edinburgh, is obtained from this plant, which yields about three times as much as *L. sativa*. This kind of lactucarium occurs in distinct tears or lumps, which are seldom larger than a pea.

COMPOSITION.—The milky juice of this plant was analyzed by Klink, (Pfaff, *Mat. Med.* iv. 509,) who found in it resin 7.5, wax 8.75, caoutchouc 22.5, matters soluble in water (bitter principle, gum, albumen, lactucic acid, lactucates of lime and magnesia, and nitrate of potash) 51.25, water 10. Buchner (*Pharm. Centr.-Blatt für 1833*, S. 29) examined the lactucarium obtained from this plant.

The LACTUCIC ACID has considerable resemblance to oxalic acid, from which it is distinguished by its producing, with ammonia and a solution of chloride of iron, a green precipitate; with sulphate of copper, a brown one; and with magnesia a difficultly soluble salt.

The ODOROUS AND BITTER PRINCIPLES are similar to those of *Lactuca sativa* (see p. 403).

PHYSIOLOGICAL EFFECTS.—The experiments of Orfila (*Toxicol. Gén.*) on dogs, show that this plant possesses narcotic qualities; but its powers are not very great. A solution of the extract thrown into the veins, caused heaviness of head, slight drowsiness, feebleness of the hind extremities, difficult and frequent respiration, slight convulsive movements, and death. Glaser (Wibmer, *Wirk. d. Arzn. u. Gift.* Bd. iii. S. 200) considers it to possess acrid properties. On Wibmer, two grains of the extract caused sleepiness and headache.

USES AND ADMINISTRATION.—See *Lactucarium*, (p. 404.)

OTHER USEFUL CICHORACEÆ.

CICHO'RUM IS'TYRUS: *Wild Succory, Chicory, or Wild Endive.*—An indigenous plant, known to Theophrastus, Dioscorides, and Pliny. It is extensively cultivated in Belgium, Holland, and Germany. The blanched leaves are sometimes employed at the table as a substitute for endive. (*Cichorium Endivia*). The constituents of the leaves are *extractive, chlorophylle,*

sugar, albumen, woody fibre, and salts (as nitre). The root (*radix cichorii*) is fleshy and spindle-shaped, like the carrot. It has an analogous composition to the leaves. Waltl says it contains *inulin*. An infusion of the root, mixed with syrup, becomes thick; forming the *gomme sacchochicorine* of Lacarterie. The root, when cut, dried, roasted (*roasted chicory*; *radix cichorii torrefacta*), and ground (*chicory coffee*), is used as a substitute for, or to adulterate, coffee. (For the mode of preparation, see *Ann. de Chim.* lix. 307.) The dried root is extensively imported. It is roasted in heated iron cylinders which are kept revolving. Chicory-coffee yields a perfectly wholesome beverage, but which wants the fine flavour for which genuine coffee is so renowned. It is extensively adulterated with roasted peas, beans, damaged grain, coffee husks, &c. Venetian red or Armenian bole is used for colouring. The medicinal properties of *Cichorium Intybus* are analogous to those of *Taraxacum Dens-leonis*. The fresh root is tonic, and, in large doses, aperient. It has been used in chronic, visceral, and cutaneous diseases, usually in the form of decoction.

ORDER LI.—VALERIANACEÆ, Lindley.—THE VALERIAN TRIBE.

VALERIANEÆ, De Candolle.

ESSENTIAL CHARACTER.—Tube of the *calyx* adnate to the ovary; the limb various, either dentate or partite, or changed into a pappus, which is at first involute, afterwards expanded. *Corolla* tubular, funnel-shaped; usually five-lobed, rarely three or four-lobed; lobes obtuse; tube equal or gibbous, or calcarate at the base. *Stamens* adnate by their *filaments* to the tube of the corolla; free at the apex; alternate with the lobes of the corolla; five (the type), four, three, two, or solitary; *anthers* ovate, bilocular. *Style* filiform; *stigmas* two or three, free or cohering. *Fruit* membranous, or somewhat nucamentaceous, indehiscent, crowned) at least when young, with the limb of the calyx, either three-celled (two cells being empty, or one-celled. *Seeds*, in the fertile cell or fruit, solitary, pendulous, exalbuminous; *embryo* erect, with a superior radicle and two flat cotyledons (De Cand.)—Annual or perennial herbs, rarely at the base somewhat shrubby. *Roots* of the perennial species odoriferous. *Leaves* opposite, without stipules. *Flowers* cymose-corymbose.

PROPERTIES.—The roots of the perennial species are highly odoriferous. They possess nervine and antispasmodic properties, and have been used in epilepsy (see *Valeriana officinalis*.) Their odour is for the most part disagreeable.

VALERIANA OFFICINALIS, Linn. E. D.—GREAT WILD VALERIAN.

Valeriana officinalis (sylvestris), L.

Sex. Syst. Triandria, Monogynia.

(*Radix*, L. D.—*Root*, E.)

(*Valeriana*, U. S.)

HISTORY.—The earliest writer who notices this plant is Fuchsius. The *opō* of Dioscorides (lib. i. cap. x.) is not the *Valeriana sylvestris*, as Hoffman supposed, but the *V. Dioscoridis*. (Smith, *Fl. Græcæ*, Sibth. t. 33.)

BOTANY. *Gen. Char.*—Limb of the *calyx* involute during flowering, then unrolled into a deciduous pappus, consisting of many plumose setæ. Tube of the *corolla* obconical or cylindrical, equal at the base or gibbous, without a spur; limb obtusely five-cleft, rarely three-cleft. *Stamens* three. *Fruit* indehiscent; when ripe one-celled, one-seeded. (De Cand.)

Sp. Char.—Smoothish, erect. *Stem* furrowed. *Leaves*, all, or nearly so, pinnatised; the segments, seven or eight pairs, lanceolate, serrate. *Corymbus* at length, somewhat paniced. *Fruit* smooth. (De Cand.)

Root tuberous. *Stem* from two to four feet high. *Leaflets* coarsely serrated, those of the radical leaves broadest, approaching to ovate; but there is no remarkably large terminal leaflet. *Corolla* roseate or white.

Several varieties of this species are described. Dufresne mentions four:

α. *V. excelsa*.—The largest kind; above six feet high.

β. *V. latifolia seu media*.—The commonest kind; usually from two to four feet high. Both grow in marshy places.

γ. *V. tenuifolia*.—Of this there appears to be two sub-varieties:

αα. *V. officinalis* (*sylvestris*), Ph. L. *V. officinalis* α foliis angustioribus, Woodville. *V. Sylvestris major montana*, Bauhin.—In this sub-variety the root is more odoriferous, and is, therefore, preferred for medicinal use. The stem does not exceed two feet in height. The caulinar leaves are very narrow, and often entire.

ββ. *V. pratensis*.—Grows in marshy places at Heidelberg, near the Rhine.

δ. *V. lucida*.—Cultivated in botanical gardens, at Paris.

Hab.—Wet places in most parts of Europe.

DESCRIPTION.—The root (*radix valerianæ minoris seu sylvestris*) consists of a short, tuberculated rhizome, from which issue numerous round, tapering, root-fibres, which are from two to six inches long, white internally, and, when fresh, grayish or yellowish-white externally, but when dried yellowish-brown. They give origin to other smaller fibres: their odour, both fresh and dry, is strong, very characteristic, and highly attractive to cats; their taste is warm, camphoraceous, slightly bitter, somewhat acrid, and nauseous. Hill (*Mat. Med.*) states that the heaths of Kent and Essex furnish a great deal of it. Loudon (*Encycl. Agricult.* pp. 945 and 1152,) says that it is cultivated for medicinal use at Ashover, in Derbyshire. The roots are dug up in the autumn, when the leaves are decayed.

COMPOSITION.—According to Trommsdorff, (Geiger, *Handb. d. Pharm.* ii. 394,) 100 parts of dry valerian root consists of *volatile oil* 1·2, *peculiar resinous extractive* 12·5, *gummy extractive* 9·4, *soft resin* 6·2, *woody fibre* 70·7.

1. **VOLATILE OIL OF VALERIAN.**—When valerian root is submitted to distillation with water, the distilled products are *water* and *oil*, both of which contain *valerianic acid*. If the acid oil be mixed with carbonate of magnesia, and distilled, the pure oil passes over, and valerianate of magnesia is left in the retort. The pure oil is pale green, or yellowish and limpid; it has a penetrating camphoraceous odour, and an aromatic, bitter, camphoraceous, but not acrid taste. Its sp. gr. is 0·934. According to Bonastre, nitric acid makes it blue, and converts it ultimately into oxalic acid.

2. **VALERIANIC ACID.**—A volatile fatty acid, obtained by adding sulphuric acid to valerianate of magnesia, and distilling. As thus obtained, the acid is in the state of hydrate; but by careful distillation it may be deprived of water. When pure, it is a colourless, limpid, oleaginous liquid. Its odour has considerable analogy with that of the oil; from which, as well as from other circumstances, it is suspected to be formed by the oxidation of the oil. It is liquid at -6° F., boils at 270° , is soluble in 30 parts of water, and in all proportions in alcohol and ether. The anhydrous acid consists, according to Ettling, of C^{19}, H^9, O^3 : its atomic weight, therefore, is 93. Valerianic acid is a product of the action of caustic potash on corn spirit oil (see vol. i. p. 312). All the neutral *valerianates* are soluble.

3. **RESIN.**—Is black, has an acrid taste, and an odour of leather. It is soluble in alcohol, ether, and oils, but not in a solution of soda.

4. **RESINOUS EXTRACTIVE.**—Is soluble in water, but is insoluble in ether and absolute alcohol. It is precipitated from its solution by almost all the metallic solutions.

PHYSIOLOGICAL EFFECTS.—Valerian excites the cerebro-spinal system (see vol. i. p. 185.) Large doses cause headache, mental excitement, visual illusions (scintillation, flashes of light, &c.), giddiness, restlessness, agitation, and even spasmodic movements. Barbier (*Mat. Méd.* ii. 83, 2^{de} éd.) says that a patient in the Hôtel-Dieu d'Amiens, who took six drachms of the root daily, in the form of decoction, awoke up suddenly out of his sleep, and fancied he saw one side of the room on fire. Its operation on the nervous system is also evinced by its occasional therapeutic influence over certain morbid states of this system; whence it has been denominated *nervine* (*nervino-alterative*), *tonic* and *anti-spasmodic*. Furthermore it intoxicates cats (who are very fond of it). Under its influence these animals roll themselves on the ground in "outrageous playfulness," and are violently agitated. However, the before mentioned effects of valerian on the nervous system of man are by no means constant; whence practitioners have lost confidence in it as a remedial agent. "Yet I have met with some," observes Dr. Heberden, (*Comment.* ch. 69,) "whom it threw into such agitations and hurries of spirits, as plainly showed that it is by no means inert." More inconstant still are its effects on the functions of organic life. For while in some cases it has accelerated the pulse, augmented the heat of the body, and promoted the secretions, (See Carminati, *Opusc. Ther.* i. 238; Jörg, *Journ. de Chim. Méd.* vii. 275-6,) in others it has failed to produce these effects. (Trousseau and Pidoux, *Traité de Thérap.* i. 1 and 2.) Large doses often create nausea.

USES.—Valerian may be employed as a nervous excitant, and, where stimulants are admissible, as an antispasmodic. Though formerly in repute, it is now but little used. It has been principally celebrated in *epilepsy*. It came

into use in modern times through the recommendation of Fabius Columna, who reported himself cured by it, though it appears he suffered a relapse. (Murray, *App. Med.* i. 275.) Its employment has found numerous advocates and opponents, (See Copland's *Dict. Med.* i. 808,); but at the present time most practitioners regard it as of very little power. In the few cases in which I have employed it, it has failed to give the least relief. In some of the milder and more recent forms of the disease, neither dependent on any lesion within the cranium, nor accompanied with plethora, it may occasionally prove serviceable. In *chorea*, and other spasmodic affections, it has been used with variable success. I have found temporary benefit from its use in females affected with *hypochondriasis* and *hysteria*. Of its use as a nervous stimulant in the low forms of *fever*, we have but little experience in this country. In Germany, where it is more esteemed, its employment in these cases is spoken highly of. (Richter, *Ausf. Arzneimittell.* iii. 23; Sundelin, *Heilmittell.* ii. 126.)

ADMINISTRATION.—The dose of the *powder* is from ℞j. to ʒj. or even ʒij. Though objected to by some, on account of the quantity of inert woody fibre which it contains, it is, when well and recently prepared, an efficacious form for administration.

1. INFUSUM VALERIANÆ, *Infusion of Valerian*, D. (U. S.).—(Valerian in coarse powder, ʒij.; Boiling Water, ℥ʒvij. [Valerian, ʒss.; Boiling Water, Oj. U. S.] Digest for an hour, and strain the liquor when cold.)—Dose, ℥ʒj. or ʒij. This preparation is somewhat less apt to disturb the stomach than the powder.

2. TINCTURA VALERIANÆ, *Tincture of Valerian*, L. E. D. (U. S.).—(Valerian, bruised, [in powder, D.], ʒv. [ʒiv. U. S.]; Proof Spirit, Oij. Macerate for fourteen [seven, D.] days, and strain, L. "Proceed by percolation or digestion, as for tincture of cinchona," E. The relative proportions of root and spirit used by the *Dublin College* are the same as those of the other Colleges.)—Dose, ℥ʒj. to ℥ʒiv.—Though this preparation possesses the virtues of valerian, it is scarcely sufficiently strong to produce the full effects of the root, without giving it in doses so large as to be objectionable, on account of the spirit contained therein.

3. TINCTURA VALERIANÆ COMPOSITA, L.; *Tinctura Valeriana ammoniata*, E. D. (U. S.); *Ammoniated Tincture of Valerian*.—(Valerian, bruised, ʒv. [ʒiv. U. S.]; Aromatic Spirit of Ammonia [Spirit of Ammonia, E.], Oij. Macerate for fourteen [seven, D.] days, and strain, L.—"Proceed by percolation or by digestion in a well-closed vessel, as directed for tincture of cinchona," E.—The relative proportions of valerian and spirit of Ammonia used by the *Dublin College* are the same as those of the other Colleges.)—Dose, ℥ʒj. to ℥ʒij. The stimulant influence of the valerian is greatly increased, and its therapeutical efficacy oftentimes augmented, by the ammonia in this preparation.

OTHER MEDICINAL VALERIANACEÆ.

FIG. 207.



Nardostachys jatamansi.

1. The root of NARDOSTACHYS JATAMANSI, De Cand. (*Valeriana jatamansi*, Roxburgh) appears from the proofs adduced by Sir W. Jones (*Asiat. Research.* ii. 405; and iv. 109) and Dr. Royle (*Illustr.* 242) to be the *Spikenard* (Νάρδος Ἰνδικός, Dioscorides) (lib. i. cap. 6) of the ancients. It is highly esteemed at the present day throughout the East, both as a perfume and as a stimulant medicine. The root is long, hairy, and tap-shaped. Stems perennial, very short. Branches erect, a few inches high. Leaves obovate-lanceolate. Flowers pale pink, clustered in the axils of the upper leaves. The plant is a native of the mountains of the North of India.

2. VALERIA'NA DIOSCORIDIS, Fl. Græc. is the εου of Dioscorides, and is the strongest of the Valerians. It is a native of Lycia.

ORDER LII.—RUBIACEÆ, *Jussieu*.—THE CINCHONA TRIBE.CINCHONACEÆ, LYGODYSODEACEÆ, and STELLATE OF GALLICEÆ, *Lindley*.

ESSENTIAL CHARACTER.—Tube of the *calyx* adherent to the ovary; limb various, truncated or many-lobed, frequently regular; the lobes as many as those of the corolla, rarely intermixed with accessory teeth. *Corolla* gamopetalous, inserted into the top of the tube of the calyx; lobes usually four to five, rarely three to eight; contorted or valvate in aestivation. *Stamens* as many as, and alternate with, the lobes of the corolla; more or less adnate to the tube of the corolla; *anthers* oval, bilocular, turned inwards. *Ovary* within the calyx to which it coheres, usually two or many-celled, rarely by abortion one-celled, crowned with a fleshy urceolus, from which a single *style* arises. *Stigmas* usually two, distinct, or more or less coherent, rarely many, distinct, or coherent. *Fruit* baccate, capsular, or drupaceous, two or many-celled; the cells one, two, or many-seeded. *Seeds* in the one-seeded cells attached to the apex, or usually at the base: in the many-seeded ones, connected with a central placenta, usually horizontal: *albumen* horny or fleshy, large: *embryo* straight or somewhat curved, in the midst of albumen; the *radicle* terete, turned to the hilum; the *cotyledons* foliaceous. (De Cand.)—*Trees, shrubs, or herbs*. *Leaves* simple, quite entire, opposite, or rarely verticillate, with stipules. *Flowers* arranged variously, rather unisexual by abortion.

PROPERTIES.—The roots often abound in colouring matter, and hence are used in dyeing; as some of those belonging to the genera *Rubia*, *Gardenia*, *Hedyotis*, *Genipa*, *Galium*, *Asperula*, *Palicourea*, *Oldenlandia*, &c. Many roots possess emetic properties, as those of *Cephaelis*, *Psychotria*, *Richardsonia*, *Spermacoe*, *Manelia*, *Chiococca*, &c.

The barks are often bitter, astringent, and somewhat aromatic; and are eminently distinguished for their tonic, febrifuge, and antiperiodic qualities, as those of *Cinchona*, *Exostema*, *Coutarea*, *Cosmibuena*, *Remija*, *Hymenodictyon*, *Pinkneya*, &c.

The important use of the torrefied albumen of *Coffea arabica* is well known. It is probable that the albumen of other species possesses analogous properties: that of *Psychotria herbaeca* has been used for similar purposes.

1. CINCHONA, *De Candolle*.—SEVERAL SPECIES YIELDING PERUVIAN BARK.

C. cordifolia, *lanceifolia*, and *oblongifolia*, *L. D.*—*C. condaminæ*, *micrantha*, and other undetermined species, *E.*

Sex. Syst. Pentandria, Monogynia.

(Cortex, *L. D.*—*Cinchona coronæ*; *Cinchona cinerea*; *Cinchona flava*; and *Cinchona rubra*, *E.*)

(*Cinchona*, U. S. Peruvian Bark.)

(*Cinchona pallida*, Pale Bark. *Cinchona flava*, Yellow Bark. *Cinchona rubra*, Red Bark.)

HISTORY.—The precise period and manner of the discovery of the therapeutic power of cinchona is enveloped in mystery. It is even doubtful whether the Indians knew it previous to the Spaniards. Geoffroy (*Mat. Méd.* ii. 181) says, that the Indians were acquainted with this medicine long prior to the arrival of Columbus; but from the implacable hatred which they conceived against the Spaniards, they kept it secret for many years, until, in fact, an Indian, grateful for some favours received from the Governor of Loxa, imparted to him the secret of this valuable specific. Humboldt, (*Lambert's Illustr.* p. 22,) however, disbelieves these statements; for in Loxa, and other parts far around, he found the natives ranked Cinchona among poisons, and were totally unacquainted with its uses. "In Malacatis only," says he, "where many bark-peelers live, they begin to put confidence in the Cinchona bark." Ulloa (*Voy. de l'Amér.-mérid.* l. 271) also asserted, that the Peruvians were ignorant of the medical uses of cinchona. The traditions, therefore, of the supposed discovery of the remedy by an Indian being cured of an ague by drinking at a pool into which some Cinchona trees had fallen, (Geoffroy, *Introd. ad Mat. Méd.* p. 48,) as well as the more improbable story told by Condamine, (*Mém. Acad. Sc. de Paris*, p. 226, 1738,) of the Indians observing lions ill with ague eating Cinchona bark, must be fabulous. The assertion, says Humboldt, that the great American lion (*Felis concolor*) was subject to fever, is as bold as that made by the inhabitants of the pestilential valley, Gualla Bamba, near Quito, that even the vultures (*Vultur aura*) in their neighbourhood were subject to that disorder. Moreover, in the Cinchona forests, lions are not found, though the puma (*Felis andicola* of Humboldt, the *petit lion du Volcane de Pichincha* of Condamine) has been met 2,500 toises (15,000 feet) above the level of the sea.

Humboldt (*op. cit.* p. 23) tells us of an old tradition, current in Loxa, that the Jesuits having accidentally discovered the bitterness of the bark, tried an infusion in tertian ague, and in this way became acquainted with its valuable properties. This he thinks a much less improbable tradition than that which ascribes the discovery to the Indians. The period when bark was first introduced into Europe is usually stated to be 1640; but Sebastian Badus (quoted by Bergen, *Monogr.* 84) gives an extract from a letter of a Spanish physician, D. Joseph Villerobel, from which it appears that it was imported into Spain in 1632, though no trial was made of it until 1639.

The statement of Condamine, (*op. cit.*) that the Countess of Chinchon, wife of the Viceroy of Peru, brought some bark to Europe on her return from South America, in 1639, is not improbable: and from this circumstance it acquired the names of the *Cinchona Bark* and the *Countess's Powder* (*Pulvis Comitisse*). About ten years afterwards it was brought by the Jesuits to Rome, and by them distributed among the members of the order, who carried it to their respective stations, and used it with great success in agues. Among those most active in promoting its employment was Cardinal de Lugo. In this way it acquired the names *Jesuit's Bark*, *Pulvis Patrum*, *Jesuit's Powder* (*Pulvis Jesuiticus*), *Pulvis Cardinalis de Lugo*, &c. (Geoffrey, *Mat. Med.*) It fell, however, into disuse, but was again brought into vogue, in France, by Sir Robert Talbor, who acquired great reputation for the cure of intermittents by a secret remedy. Louis XIV. purchased his secret (which proved to be Cinchona), and made it public. (Talbor, *English Remedy*, 1682.) Hence it became known in France as *Talbor's Powder*, or the *English Remedy*.

BOTANY. Gen. Char.—*Calyx* five-toothed. *Corolla* hypocrateriform, with a five-parted limb, valvate in æstivation. *Anthers* linear, inserted within the tube, and not projecting, unless in a very slight degree. *Capsule* splitting through the dissepiment into two *cocci* open at the commissure, and crowned by the calyx. *Seeds* girted by a membranous lacerated wing (Lindley).—*Trees* or *shrubs*, with an aromatic, bitter, astringent, eminently febrifuge bark. *Leaves* shortly petioled with plane margins. *Stipules* ovate or oblong, foliaceous, free, deciduous. *Flowers* paniculate-corymbose, terminal, white or roseate-purplish.

Species.—Dr. Lindley mentions twenty-six species; of which twenty-one are well known.

§ 1. *Limb of the corolla stupose. Leaves scrobiculate.*

1. *C. MICRANTHA*, *Fl. Peruv.* ii. 52, t. 194; *Ruiz and Pav. Quinol. Suppl.* p. 1, De Cand. *Prodr.* iv. 354. *C. scrobiculata*, *Humb. and Bonpl. Pl. æquin.* i. p. 165, t. 47; De Cand. *Prodr.* iv. 352.—High, cool, and wooded mountains of Peru, near Chicoplaya, Monzon, the Pueblo de San Antonio de Playa grande, *R. and P.*; forests in the province of St. Jean de Bracamorros, *H. and B.* The last mentioned travellers were told that it also occurs at Chirinas Tabaconas, St. Ignacio, and Tambovapa, Cuchero, Pöppig.

This species yields *Silver* or *Gray Cinchona*. From the young branches is obtained the *Pata de Gallinazo* (Pöppig). Humboldt and Bonpland, as well as Ruiz and Pavon, declare that from *C. scrobiculata* (which Dr. Lindley says is identical with *C. Micrantha*) is obtained *Cascarilla fina*.

2. *C. NITIDA*, *Fl. Peruv.* ii. 50, t. 191. *Cascarillo* officinal, *Ruiz Quinol.* p. 56.—Lofty mountains of the Andes, in groves, in cold situations near Pampamarca, Chacahuassi, Casapi, Casapillo, Cayumba, Sapan, Cuchero, and other districts; also on the mountains in the province of Huamalies, Tarma, and Xauxa, *R. and P.*? Cuchero, Pöppig.

According to Ruiz, this species, like the last, yields *Cascarillo* or *Quino fino*.
3. *C. CONDAMINÆA*, *Humb. and Bonpl. Pl. æq.* i. 33, t. 10. Quinaquina, *Condam.* in *Act. Par.* 1738.—Near Loxa, in the mountains of Cajanuma-Uritusinga, and in those of Boqueron, Villonaco, and Monje: it is also found near Guancabamba and Ayavaca, in Peru. It always grows on micaceous schist, and rises as high as 7,500 feet above the level of the sea, first appearing at the elevation of 5,700 feet; so that it occupies a zone of 1,800 feet, *Humboldt*.

This species yields *Cascarilla fina de Uritusinga*, our *Crown* or *Loxa Bark*.

§ 2. *Limb of the corolla not stupose. Leaves not scrobiculate.*

4. *C. LANCIFOLIA* or *Quina naranjada*, *Mutis, Period. de St. Fè.* *C. angustifolia*, *Pav.*

Quinol. Suppl. xiv. f. a. C. Tunita, Lopez, MSS.—Woods in the kingdom of Santa Fe, *Quinol. Suppl.*

Some years since a very inferior yellow bark, with a whitish epidermis, was imported into London, and was known to our dealers under the name of *New Spurious Yellow Bark*. I sent a specimen of it to Professor Guibourt, who recognised it as the bark described by him as *Quinquina de Carthagène spongieux*. He has subsequently found it to be identical with the *Orange Cinchona* (*Quina naranjada*) of Mutis, lodged in the *Muséum d'Hist. Naturelle de Paris*, by Humboldt. It is, therefore, the produce of *C. lancifolia*.

Bergen found, in Ruiz's collection, a bark said to be the produce of *C. lancifolia* Mutis, and which agreed with the *False Loxa Bark*, Bergen.

5. *C. LUCUMÆFO'LIA*, Pavon. in herb. Lambert. *C. stupea*, Idem.—Loxa, in Peru, Pavon.

The bark, perhaps, forms part of the *Quina fina de Loxa*.

6. *C. LANCEOLA'TA*, Fl. Peruv. ii. 51; iii. t. 223. Cascarillo lampino, Ruiz *Quinol.* 64.—Cold, elevated, mountainous situations, in groves on the Andes, in the districts of Muña, Panas, Pillas, and Cuchero, R. and P. At the distance of fifteen or twenty leagues from the city of Huanuco, Ruiz MSS. Bolivia.

The bark of this species is called *Quina Anteadá*, *Cascarilla Amarilla*, and *Casc. boba de Muña*. Ruiz suspects it to be *Calisaya* bark, i. e. *Yellow Bark* of English commerce.

7. *C. OVALIFO'LIA*, Humboldt and Bonpl. Pl. ay. i. 65, t. 19. *C. Humboldtiana*, R. and P. v. 13, De Cand. Prodr. iv. 353. Loxa, Pavon.—Forests in the province of Cuença, Humb. and Bonpl.

The bark of this species is not much esteemed. It is known as the *White Cinchona* of Mutis.

8. *C. OVA'TA*, Fl. Peruv. ii. 52, t. 195. Cascarillo pallido, Ruiz, *Quinol.* 74.—Close, ill-ventilated groves in the hotter parts of the foot of the Andes, near Pozuzo and Panas, ten leagues from Huanuco, R. and P.

Ash Cinchona was found by Bergen to be identical with the bark of *C. ovata* contained in Ruiz's collection.

9. *C. ROTUNDFO'LIA*, Ruiz and Pavon MSS. in herb. Lambert. Lambert, *Illustr. Cinch.* p. 5.—Loxa, in Quito, Pavon.

Bark unknown.

10. *C. CORDIFO'LIA*, Mutis MSS. Humb. Berl. Mag. d. Naturf. i. 117. S. and C. iii. t. 185.—Mountains of New Grenada, at an elevation of from 5000 to 8000 feet above the sea, Humb.

The bark of this species is the *Quina amarilla* or *Yellow Cinchona* of Mutis, which both Bergen and Guibourt have ascertained to be *Hard Carthagena Bark*. It must not be confounded with the *Yellow Bark* of English commerce, from which sulphate of quina is prepared.

11. *C. PUBES'CENTS*, Vahl. in Act. Hafn. i. 19, t. 2. Lambert's Description, 21, t. 2. *C. purpurea*, Fl. Peruv. ii. 52, 193. Cascarillo morado, Ruiz, *Quinol.* 67.—Groves on the lower parts of the Andes, where it is cool at night, in the districts of Chinchao, Pati, Muña Iscutunam, Casapi, Casapillo, and Chihuamacala, R. and P.; mountain ridges of Panatahuas, Loxa, Jaen, and other provinces; on low hills, Ruiz MSS. Cuchero, Pöppig. Santa Fe.

This species yields the *Cascarilla boba colorada*, which Reichel ascertained to be the *Huamalties Bark* of European commerce.

12. *C. HIRSU'TA*, Fl. Peruv. ii. 51, t. 192. Cascarillo delgado, Ruiz, *Quinol.* 60.—Wooded mountains of the Andes, in high and cool places near Pillas and Acomayo, R. and P., and various other stations in the province of Panatahuas, near Huanuco, 10° south of the line, Ruiz.

It yields a kind of *Cascarilla fina*, formerly employed in medicine, under the name of *Quina delgadilla*, or *delgada*. Dr. Lindley thinks it perhaps forms part of the pure *Yellow Bark* of the shops.

13. *C. GLANDULIF'ERA*, Fl. Peruv. iii. l. t. 324. Cascarillo glanduloso, Ruiz *Quinol. Suppl.* 5. C. Mutisi, β. Lambert's Illustrations, p. 29.—Woody mountains of Peru, near Chicoplaza, R. and P.—Mountains of Panatahuas and Huamalties, and those of Monzon and Chicoplaza, Ruiz, MSS. Cuchero, Pöppig.

Its bark, called *Cascarilla negrilla*, is said by Reichel to be equal to the finest kind of Loxa Bark. It formerly came among the Lima barks.

14. *C. VILLO'SA*, Pavon, MSS. *C. Humboldtiana*, Lamb. Illustrations, 7.—St. Jaen de Loxa, Pavon.

Nothing is known of the bark.

15. *C. ORLONGIFO'LIA*. Lambert, Illustrations, p. 12; not of Mutis.—Jaen de Loxa, Pavon. The bark is quite unknown. The London College, therefore, has no ground for referring Red Cinchona to it.

§ 3. Limb of the corolla smooth, or only downy at the edge.

16. *C. ACUTIFO'LIA*, Fl. Peruv. iii. l. 53, t. 225. Cascarillo de Hoja aguda, R. and P. *Quinol. Suppl.* 8.—Low groves of the Peruvian Andes, in Chicoplaza, by the river Taso, R. and P.

Mountains of the Andes, near Chicoplaya, Monzon, and other places in the provinces of Panatahuas and Huamalies, Ruiz, MSS.

The bark is of a very bad quality for medicinal purposes.

17. *C. MAGNIFOLIA*, Fl. Peruv. ii. 53, t. 196. Cascarillo amarillo, Ruiz, Quinol. 71. *C. caduciflora*, Lamb. Illustr. 11; not of Bonpl. *C. oblongifolia*, Mutis, according to R. and P.; not of Lambert.—Abundant on the mountains of Panatahuas, about Cuchero, Chincayo, Chacahuassi, and Pazuzu, in the low land near torrents, in places fully exposed to the sun, and badly ventilated, R. and P. Cuchero, Pöppig.

The bark is, according to Ruiz, the *Quina roza* of Santa Fé, the *Red Cinchona* of Mutis, which both Bergen and Guibourt have shown to be the *Cinchona nova* of European pharmacologists.

18. *C. CADUCIFLORA*, Bonpl. in Pl. æquinoct. i. 167.—*C. magnifolia*, l. c. 136, t. 39.—Near the town of Jean de Bracamoros, Humb. and Bonpl.

No use is made of the bark.

19. *C. STENOCAEVA*, Lambert, Illustr. 13.—Jaen, in the mountains of Loxa, Pavon.

Bark unknown.

20. *C. MACROCAEVA*, Vahl. in Act. Hafn. i. p. 26, t. 3. Lambert, Descript. 22, t. 3.—*C. ovalifolia*, Mutis MSS. Humb. Berl. Mag. l. c. p. 118.—Loxa, Pavon. Santa Fé, Humboldt; a supposed variety is said to grow about Santa Martha.

Bark unknown.

21. *C. CAEVA*, Pavon. MSS. in herb. Lambert.—*C. Pavonii*, Lambert, Illustr. 8.—Quito, Pavon.

Bark unknown.

* * Species imperfectly known.

Dr. Lindley mentions,—22, *C. dichotoma* (which is said to yield one of the *Quinas finas*); 23, *C. macrocalyx*; 24, *C. crassifolia*; 25, *C. Pelalba*; and 26, *C. Muzonensis*, as species which are imperfectly known.

Von Martius (*Pharm. Central-Blatt für 1831*, S. 181) has described three other species, viz. *C. Bergeniana*, *C. Lambertiana*, and *C. macrocnesia*.

HAB.—The *Cinchona* species inhabit the Andes from 11° N. lat. to 20° S. lat. at varying elevations. It is difficult to assign limits to these elevations, since the statements of Humboldt on this subject are not uniform. Thus the lowest true *Cinchonas* are variously stated, by himself and Kunth, to grow at an elevation of from 200 toises (1200 feet) to 359 toises (2154 feet); while the highest are said to grow from 1487 toises (8922 feet) to 1680 toises (10,080 feet). The temperature of the *Cinchona* districts necessarily varies with their altitude; perhaps the average is about 68° F.

BARK-PEELING.—The mode adopted by the *Cascarilloes*, or bark-peelers, of obtaining cinchona, varies somewhat in different districts.—“The Indians,” says Mr. Stevenson, (*Narrat. of Twenty Years’ Residence in South America*, vol. ii. p. 66, 1825,) “discover from the eminences where a cluster of the trees grow in the woods, for they are easily discernible by the rose-coloured tinge of their leaves, which appear at a distance like bunches of flowers amid the deep-green foliage of other trees. They then hunt for the spot, and, having found it out, cut down all the trees, and take the bark from the branches:” and he adds, “after the Indians have stripped off the bark, they carry it in bundles out of the wood, for the purpose of drying it.” Pöppig (*Compan. to the Bot. Mag.* No. viii. p. 244,) says that the stems are not peeled for three or four days after they are cut down; and that the bark when removed must be speedily dried, or its value is quickly deteriorated. This account of the method of collecting the barks is somewhat different to that given by Mr. Gray from the papers of the late Mr. Arrot, (*Phil. Trans.* 1737-8, vol. xl. pp. 81—86,) who says that the bark is cut from the trees as they stand. According to both Ruiz and Pöppig, the peelers commence their operation about May, when the dry season sets in.

COMMERCE.—*Cinchona* is imported in chests (which are sometimes covered with hides) or serons (packages formed of an ox-hide, sometimes lined by a coarse cloth). The duty is Id. per lb. The quantities imported, and those retained for home consumption, in the years 1827, 1830, and 1831, were as follows: (*Parl. Returns.*)

	1827.	1830.	1831.
Total imported.....	385,690 lbs.	553,290 lbs.	225,678 lbs.
Quantity retained for Home Consumption.....	179,315 lbs.	56,879 lbs.	112,773 lbs.

The quantities on which duty was paid during the last five years are as follows: (*Trade List.*)

In 1835.....	143,187 lbs.	In 1839.....	50,548 lbs.
In 1836.....	116,184 lbs.	In 1840.....	41,438 lbs.
In 1837.....	141,071 lbs.	In 1841.....	81,736 lbs.
In 1838.....	108,502 lbs.		

Cinchona is imported from various ports of the Pacific coast of South America. Arica, Valparaiso, Lima, Callao, and Payta, are the common places of shipment. In consequence of an apprehended danger that the trees yielding bark would be exterminated, the government of Bolivia has prohibited the cutting of bark, in its territory, for five years, commencing January 1st, 1838.¹ This event had long been expected. In 1836 I observed (*Lond. Med. Gaz.* vol. xviii. p. 723,) that, "when we take into consideration the immense consumption of Cinchona bark (Pelletier alone in one year consumed 2000 quintals, equal to 200,000 lbs. of yellow or Calisaya bark, in the manufacture of sulphate of quina); that the trees yielding it are confined to one part of the world, and that no care is taken of their preservation; it is not at all improbable that in a few years this valuable drug may totally disappear from commerce. Indeed, a report has been prevalent among the drug-dealers, that the *Cascarilloes*, or bark-collectors had arrived at the limits of the forests containing the yellow or Calisaya bark, but whether this be true or false, I know not. I am acquainted with one dealer who has laid in a large stock, on the speculation of the truth of this report."

¹ I am indebted to Messrs. Gibbs and Co. of Lime Street, for a copy of this decree. The following is a translation of it:—

"Andrew Santa-Cruz, Grand Citizen, Restorer, and President of Bolivia, General of her Armies, General of Brigade of Colombia, Grand Marshal Pacificator of Peru, Superior Protector of the North and South Peruvian States; decorated with the medals of the Liberators of Quito, of Pichencha, of Junin, and that of the Liberator Simon Bolivar, Grand officer of the Legion of Honor of France, Founder and Chief of the Bolivian Legion of Honor, and the National Legion of Honor of Peru, &c. &c. &c.

Considering.—1st. That the unlimited cutting and exportation of the *Cascarilla* [Cinchona] has occasioned remarkable injury to this country, by its excessive abundance in the European markets;

2dly. That the woods beginning already to be drained, great difficulty is experienced in obtaining it from those which are more distant, causing well-founded fears of the approaching extinction of this specific, for whose preservation and reproduction we ought so carefully to provide;

3dly. That the Congress of 1834, which passed a law for the formation of a society for the prevention of the exportation of *Cascarilla* [Cinchona], said it could have no effect without the Government moderated or suspended its exportation, for which there is a provision in the 13th article of the said law;

4thly. That the opinion publicly manifested by the meeting of the neighbouring proprietors and merchants, as well as by the provisional directive committee of the *Cascarilla* [Cinchona] Society, calls for the suspension of the cutting in the mountains, as the only means of saving this exclusive article of our commerce from approaching ruin:—

Decree.—1st. It is forbidden to cut *Cascarilla* [Cinchona] in the mountains of the Republic, from the date of this decree, it being solely permitted to export that which has been already cut prior to the 1st of August.

2dly. That the extreme time which shall be allowed for the exportation from this Republic, of that which has been already cut, shall be the last day of the month of December in the present year.

3dly. That this prohibition shall endure for five years, counting from the 1st of January, 1838, during which date (or period) no Custom-house shall have the power of granting permits for the exportation of this vegetable.

4thly. The said five years having elapsed, the Government shall make such regulations as shall be judged expedient for the regulation of the cutting and exportation of *Cascarilla* [Cinchona], and for the better guidance of the Society for the exportation of *Cascarilla* [Cinchona].

5thly. Transgressors shall be punished with the fines (or punishments) which the laws inflict upon the exporters of prohibited articles or goods.

6thly. In conformity with the provisions of the fifth article of the law of the 14th of November, 1834, the directive Society is declared to be established.

7thly. The Prefect of the Department shall make a list of the names of all the stock-holders who shall have presented themselves up to this date; considering themselves obliged to draw out, within two years (*in factoria*), ordered in the sixth article of the expressed law, and to deposit with the Republic since 1838, a thousand flacons of mercury at the cost price.

8thly. The Directive Committee of the *Cascarilla* [Cinchona] Society shall be empowered to direct the Governors of the provinces in which this vegetable is produced, in taking every precaution conducive to the accomplishment of this decree.

9thly. The Prefect of the Department is charged with the execution, and the General Minister is to see that it is printed and published.

Given at the Palace of Government in Aysencho,
the 10th of April, 1837, in the 29th Year of Independence."

ANDREW SANTA CRUZ.
MARIANO HENRY CALO.
General Minister.

"If," says Mr. Stevenson, (*Narrative*, vol. ii. p. 66,) "the government of America do not attend to the preservation of the quina, either by prohibiting the felling of the trees, or obliging the territorial magistrates to enforce cutters to guard them from destruction, before a sufficient population will allow of those tracts of woodland becoming personal property, this highly-esteemed production of the new world will be swept from the country."

DESCRIPTION. *α. General Description.*—Before describing the various kinds of cinchona met with in commerce, it will be necessary to offer a few remarks on the general characters of barks (more especially of Cinchona bark). These may be noticed under the following heads:—*cryptogamia* found on, *structure*, *quilling*, *colour*, *taste*, *odour*, and *fracture*, of, cinchona barks.

CRYPTOGAMIA FOUND ON CINCHONA BARKS.—These, especially the Lichens, have been elaborately examined by Fée (*Essai sur les Cryptog.* 1824.) and by Zenker. (Goebel and Kunze, *Pharm. Waarenk.* S. 109.)

α. Musci or *Mosses.*—We frequently find mosses on Cinchona barks; but as they are never met with in fructification, it is almost impossible to determine the genus to which they belong. They are probably species of Hypnum.

β. Lichenes.—These are found in great abundance, especially on *Loxa* or *Crown bark*. We may conveniently arrange them, according to Zenker, in four sections:—Sect. 1. *Coni-lichenes*, or the pulverent lichenes (*Lichenes pulveracei*).—In this section we have the *Hypochinus rubrocinctus* (classed among the Fungi by Fée). I have frequently found it on the finest specimens of quilled yellow bark. Sect. 2. *Cryolichenes*, or the crustaceous lichenes (*Lichenes crustacei*). These frequently put on very beautiful forms, and so colour the surface of the epidermis, that they appear to constitute a part of this coat. In that kind of pale bark usually called *gray*, or *silver*, the surface of the epidermis has a whitish cretaceous appearance, from the presence of various species of Arthonia and Pyrenula. Sect. 3. *Phyllolichenes*, or the foliaceous lichenes (*Lichenes foliacei*).—These are found most abundantly on the *Crown* or *Loxa bark*. The most common species belong to the genera *Parmelia*, *Sticta* and *Collema*. The *P. coronata* is a beautiful species, and one frequently met with. So also the *Sticta aurata*, remarkable for its yellow colour. Sect. 4. *Dendrolichenes*, or the filamentous lichenes (*Lichenes fruticosi*).—The *Usneas* are good examples of this section; they are found in abundance on the crown bark. Two species are met with—*U. florida*, and *U. barbata*; a variety of the latter is curiously articulated.

γ. Hepaticæ.—*Jungermannias* are found on Cinchona barks, but in too broken a condition to determine their species. Fée, however, examined Humboldt's Herbarium, and found four.

δ. Fungi.—As Fungi usually grow on weak or dead trees, their presence on Cinchona bark is a bad characteristic. Very few, however, are met with.

STRUCTURE.—Those barks known to druggists by the name of *coated* barks consist of the following parts:—an epidermis, the rete mucosum, and cortical layers, (the innermost of which is termed the liber.) The epidermis and rete mucosum together form what is technically called the *coat*.

α. Epidermis.—This is the most external portion of the bark, and is variable in its thickness. The barks of commerce are said to be *coated* (*cinchona cum cortice exteriori* of Bergen) when the epidermis is present, but when this is absent, and when also part or the whole of the next layer (rete mucosum) has been removed, such barks are called *uncoated* (*cinchona nuda* of Bergen). As the epidermis is useless, or nearly so, in a medicinal point of view, uncoated barks are to be preferred, since the epidermis increases the weight of the bark, without adding any thing to its real value. In reference to this layer, there are several characters deserving of attention in judging of the quality of the bark: thus Cinchona barks, with a whitish epidermis, are, I believe, for the most part, inferior to those in which this layer is brown. But a whitish coating given to a brown epidermis by some crustaceous lichens must not be mistaken for a genuine white epidermis. The term *warty* or *knotty* (*cinchona nodosa* of Bergen) is applied to those barks in which we observe prominences on the epidermis, corresponding to elevations on the subjacent parts. These are frequently observed in some specimens of red bark, as well as the kind called *Huamalies*. Bark is termed *cracky* or *furrowed* (*cinchona rimosa* of Bergen) when we observe cracks or furrows (the latter may be regarded merely as larger kinds of cracks) on it. When we observe longitudinal or transverse elevations, we say the bark is *wrinkled* (*cinchona rugosa*).

β. Rete mucosum; cellular envelope; medulla externa.—This is a cellular layer, placed immediately beneath the epidermis. It is tasteless, and is of no medicinal value. In old bark (particularly old red bark), it is often much developed: in uncoated bark it is sometimes, though not always, absent.

γ. Cortical layers, or cortex.—These are beneath the rete mucosum, and, in fact, form the essential part of the bark. One layer is formed annually, and hence their number, and consequently the thickness of the bark, depends on the age of the tree from whence it is taken. The last formed layer, that which is the innermost, is termed *liber*. Every one of the cortical

layers has medicinal virtue, but the liber the most. The reason for this will be readily comprehended by reference to the physiology of exogenous plants. The *succus communis* of these plants ascend by the alburnum, or sap-wood, to the leaves, where it undergoes certain changes by the agency of the atmosphere, in consequence of which it is converted into what is called *succus proprius*, the proper juice of the plant, and in which any medicinal activity which the latter possesses usually resides. Now this *succus proprius* descends in the liber: hence this part may always be expected to possess the proper medicinal activity of the tree from whence it is taken.

QUILLING OF THE BARK.—Bark, little or not at all curled, is called in commerce *flat bark* (*cinchona plana*). The absence of the curl arises from one of two circumstances—the age of the stem from which the bark is taken, or the want of flexibility of the bark even in the fresh state. When bark is rolled cylindrically in a quilled form, it is termed *quilled bark* (*cinchona tubulata*). Bergen speaks of several kinds of quilling; namely, the *partially quilled* (*cinchona subconvoluta*), when the two edges of the quill approximate; the *closely quilled* (*cinchona convoluta*), when the edges of the quill over-lap each other, forming a more or less closely rolled up tube; and the *doubly quilled* (*cinchona involuta*), when both edges of the quill are rolled together, so as to form two cylinders, but which, seen from the back, appear as one.

RACTURE.—The transverse fracture of bark furnishes an important character. Bergen admits three kinds of it:—1st, *smooth, even, or short, fracture* (*fractura plana*); 2dly, *resinous fracture* (*fractura resinosa*); and, 3dly, *fibrous fracture* (*fractura fibrosa*). Bark with a resinous fracture is usually to be preferred.

COLOUR, TASTE, and SMELL.—Little need be said of these characters. The same kind of bark often varies in its colour, while several kinds may have the same tint. Moisture usually deepens the colour.

β. Classification.—A botanical classification of the Cinchona barks I hold to be at the present impracticable; and moreover, if it were practicable, it would be, in a commercial and pharmaceutical point of view, useless, since the barks are never accompanied by the other parts of the tree from which the botanical characters are drawn.

A *chemical* classification, I think, cannot be at present attempted with any great chance of success. The arrangements founded on chemical composition, adopted by Goebel (*Pharm. Waarenk.*) and Geiger, (*Handb. d. Chem.*) will be noticed hereafter. Even if a perfect chemical classification of the barks could be effected, it would not be available to ordinary experimentalists.

An arrangement founded on the *physical* characters of the barks will be for the present, perhaps, the most useful, and is the one generally followed.

Von Bergen (*Versuch einer Monographie der China*, Hamburgh, 1826,) admits nine species;¹ viz:

1. *China rubra*, or *Red Bark*.
2. *China Loxa*, or *Crown Bark*.
3. *China Huanuco*, or *Gray or Silver Bark*.
4. *China regia*, or *Yellow Bark* of English Commerce.
5. *China flava dura*, or *Hard Carthagea Bark*.
6. *China flava fibrosa*, *Woody Carthagea Bark*.
7. *China Huamalies*, or *Rusty Bark*.
8. *China Jaen*, or *Ash Bark*.
9. *China Pseudo.Loxa*, or *Bastard Crown Bark*.

Professor Guibourt² has described no less than thirty-seven varieties of Cinchona barks, which he has arranged under five heads, as follows:

1. *Gray Cinchonas*.
2. *Yellow Cinchonas*.
3. *Red Cinchonas*.
4. *White Cinchonas*.
5. *False Cinchonas*.

PROPOSED ARRANGEMENT.—A considerable number of barks have been denominated *cinchona barks*. Of these some are obtained from the genus *Cinchona* De Cand.; others from neighbouring and allied genera. The first are

¹ I am indebted to the kindness of Von Bergen for illustrative examples of these other varieties of cinchona, by which I have been enabled to identify the species with those known in English commerce. *Hist. Abrég. des Drog. simpl.* Paris, 1836.—By an interchange of specimens, M. Guibourt and myself have been able to determine the synonymes of the barks known in English and French commerce.

cinchona barks, properly so called; the second are barks falsely called *cinchonas*. According to De Candolle (*Journ. de Chim. Méd.* viii. 478) no less than eight genera, including forty-six species, have been confounded under the name of *Cinchona*; and the barks of all these species are endowed, more or less, with febrifuge qualities. The genera referred to are *Cinchona*, De Cand, *Buena Pohl* (*Cosmibuena* Ruiz and Pav.), *Remijia* De Cand., *Luculia* Sweet, *Hymenodyction* Wallich, *Exostemma* De Cand, *Danais* Comm., and *Pinkneya* Michaux.

Div. I. *Cinchona* Barks properly so called.

These are barks obtained from the genus *Cinchona* De Cand. Some of them have a brown epidermis, others a whitish one. This character forms the basis of a subdivision of them into two sections.

Sect. 1. *Epidermis normally brown.*

The epidermis of the barks of this section is naturally reddish, brownish, or blackish, cracked and rugous. It frequently has a whitish appearance, owing to the adherent crustaceous lichens. By scraping, however, we readily detect the subjacent brown epidermis, and thereby easily distinguish this lichenoid coat from a white epidermis.

The barks of this section have been divided into *pale* or *gray*, *yellow*, and *red*. As these terms are well understood, it is advisable to retain them.

Class 1st. Pale Barks; *Cinchona pallida*; *Quinquinas gris*, Guibourt.—In English commerce three kinds of *cinchona* bark are comprehended in this class; viz. *crown*, *silver*, and *ash*. To these Guibourt adds a fourth, namely *huamalies*.

Pale barks (*Huamalies cinchona* excepted) possess the following properties:—They always occur in quills, never in flat pieces. Their powder is more or less pale, grayish, or fawn-coloured, and their taste is astringent and bitter. They contain *cinchonina* and *quina*. An infusion of pale bark does not deposit any sulphate of lime on the addition of a solution of the sulphate of soda.

Class 2d. Yellow Bark of English Commerce; *Cinchona flava* Anglic. offic. In English commerce the term *yellow cinchona* is confined to the quilled and flat varieties of *Calisaya* or *regia bark*. The French and German pharmacologists, however, include under this denomination several of the *yellow barks*, with a *white epidermis*, which in England are termed *false* or *spurious yellow barks*. The yellow bark of English commerce occurs in quills or flat pieces, the quills being, on the average, larger and much rougher than the largest quills of pale barks. The texture is more fibrous; and the taste is more bitter, and less astringent, than of pale bark: the powder is orange or fawn yellow. The *Calisaya* or royal yellow contains both *quina* and *cinchonina*, but the first in by far the larger quantity. A strong infusion of this kind of bark produces a precipitate (*sulphate of lime*) on the addition of a solution of the sulphate of soda.

Class 3d. Red Cinchona of English Commerce; *Cinchona rubra* Anglic. offic. Only one kind of red bark is usually found in English commerce. It is met with in both quills and flat pieces: it has a fibrous texture, and a redder colour than either of the foregoing kinds. It contains both *quina* and *cinchonina*. It is very bitter and astringent. Its powder is more or less red.

Sect. 2. *Epidermis whitish (yellowish) and micaceous.*

This section includes *cinchona* barks sometimes called, on the continent, *White Cinchonas* (*Cinchonæ albae*); but which in English commerce are always regarded as *spurious* or *bastard cinchona barks*. They are distinguished by an epidermis which is naturally whitish or pale yellowish, micaceous, smooth, or not cracked, and adherent to the cortical layers. They yield little or no

cinchonia and *quina*. One of them contains a peculiar vegetable alkali (*aricina*).

We may arrange them in three classes corresponding to those of the preceding section.

Class 1. Pale Barks with a whitish epidermis.—This includes a bark found among Loxa or Crown bark, and which has been termed by Guibourt *Loxa White Cinchona*. Some of the young Huamalies barks approach closely to this class (See *Gray Corky Huamalies Bark*).

Class 2. Yellow Barks with a whitish epidermis.—This class includes barks which correspond, and have been confounded, with Calisaya or Royal Yellow Bark. It includes the following barks:—*Hard Cartagena Bark*; *Fibrous Cartagena Bark*; *Cusco Bark*; and *Orange Cinchona of Santa Fè*. To these also must be perhaps added the *White Cinchona* of Mutis.

Class 3. Red Barks with a whitish epidermis. These are barks which correspond and have been confounded with Genuine Red Bark of English commerce. This class includes the following barks: *Red Cinchona of Santa Fè*; and *Red Cinchona with a white and micaceous epidermis*.

Div. II. Barks falsely called Cinchonas.

Under this division have been placed those barks which have been introduced into commerce as Cinchonas, but which are not obtained from any species of *Cinchona*. De Candolle. Their physical characters are for the most part very different from those of the genuine: moreover, they are not known to contain quina, cinchonia, or aricina.

With the exception of *Pitaya Cinchona*, I have never met with any of them in English commerce. The following are those best known, and which I have in my collection:

1. CINCHONA DE SANTA LUCIA; *St. Lucia Bark*; *Quinquina Piton*, or *Q. de Sainte Lucie*, Guibourt; Bark of *Exostema floribundum*, a native of the West India islands.—Its bitter principle is called *Montanin*.
2. CINCHONA CARIBÆA; *Caribbean or Jamaica Bark*; *Quinquina caraïbe*, Guibourt; Bark of *Exostema caribæum*, a native of most of the West India islands and Mexico.
3. CINCHONA [FALSA] PERUVIANA; *Peruvian [false] Cinchona*: *Ecorce de Exostema du Pérou*, Guibourt; Bark of *Exostema peruvianum*, a native of the colder parts of Peru, between the river Chota and the village of Querocotillo.
4. CINCHONA BRASILIANA; *Brazilian Cinchona*; *Ecorce d'Exostema du Brésil*, Guibourt; *Quinquina de Piauhî*; Bark of *Exostema Souzanum*, a native of Brazil.—It yields an organic alkali, called *Esenbeckina*.
5. CINCHONA PITAYA; *Pitaya Cinchona*; *Quinquina bicolore*, Guibourt; bark of an unascertained tree [*Exostema? Malanea racemosa?*].—It has been analyzed by MM. Folchi and Peretti, who discovered a new alkaline principle in it, which they have termed *Pitaina*.
6. CINCHONA DE RIO JANEIRO; *Rio Janeiro Bark*; Bark of *Buena hexandra*.

I. Cinchona Corone, E.—Crown or Loxa Bark.

Cinchona officinalis, D.

(*Cinchona lancifolia*; Cortex, L. D.—Bark of *Cinchona Condaminea*, E.)

(*Cinchona pallida*, U. S.)

SYNONYMES.—*Quinquina de Loxa*, Guibourt. *China Loxa*; *Kron-Chino*, Bergen. *Cortex China fusca*, seu *corona*, s. *de Loxa*, s. *peruvianus*, Goebel.

HISTORY.—Loxa bark, if not the first, was one of the earliest kinds of Cinchona bark introduced into Europe. It was, probably, the bark which Horbius, (Bergen, *Monogr. S.* 313,) in 1693, denominated *Cascarilla della Oja*, but which Condamine more correctly termed *Corteza*, or *Cascara de Loxa*. Some doubt, however, has existed in the minds of pharmacologists, whether the bark known in commerce by the name of Loxa bark, is identical with that formerly called by that name. Hayne (Goebel and Kunze, *Pharm. Waarenk.* i. 36,) has pointed out some differences between the Loxa bark of commerce and a bark found in Humboldt's collection, marked *Quina de Loxa*, and which has been collected from the *C. Condaminea*: the peculiar characteristics of the latter are the warty prominences, the transverse cracks, which do not form rings, the browner tint of the outer surface, and a more astringent taste. In a chest of 120 lbs. of commercial Loxa bark, Goebel found only three ounces of bark corresponding to the description here given of the true Loxa bark.

Loxa bark received the name of *crown bark* in consequence of its use by the royal family of Spain. In October 1804, a Spanish galley, returning from Peru, was taken by our countrymen off Cadiz. Among the treasures found therein were many parcels of Cinchona bark, two sorts of which were distinguished from the others by their external appearance and mode of packing. Two of these chests were marked "*Para la real familie*," i. e. "*For the royal family*," and were lined with sheet iron: they contained fine quills, of thirteen inches long, tied up by means of *bass* into bundles of about three inches in diameter. Von Bergen states, he received from England, in 1824, similar bundles, under the name of *second crown*. The other sort was marked "*Para la real corte*," i. e. "*For the royal court*." (Bergen, *Monogr.* S. 310.)

BOTANY.—Loxa bark is undoubtedly the produce of *C. Condaminea*. Guibourt (*Hist. des Drog.* ii. 55,) examined the young barks of this species, brought by Humboldt, and found them undistinguishable from Loxa cinchona. Furthermore, he found that a specimen of cinchona, sent over by M. Joseph de Jussieu, the colleague of Condamine, as being the bark of the tree described by that celebrated academician, is similar to the crown bark of commerce.

COMMERCE.—Crown or Loxa bark is imported in serons (holding from sixty to ninety lbs.) and in chests (containing about one hundred lbs.)

ESSENTIAL CHARACTER.—Coat thin, firm; cracks numerous, annular, transverse; under surface smooth; colour cinnamon-brown (Bergen).

DESCRIPTION.—Loxa or crown bark is met with in the form of coated quills only, neither flat nor uncoated pieces being known. These quills vary in length from six to fifteen inches; in diameter from two lines to an inch; in thickness from one-third of a line to two lines; they are both singly and doubly quilled. The outer surface or epidermis of this bark is characterised by numerous transverse cracks, which, in the fine and middling quills, are often distant from each other only from one to one and a half lines, and frequently extend completely around the bark in the form of rings, the edges of which, as well as of the shorter cracks, are a little elevated. In some of the fine quills, however, these transverse cracks are hardly visible; but we then observe longitudinal furrows. On the larger quills the transverse cracks are interrupted, and do not form rings, and are not set so closely together. Some of the thicker quills have occasionally almost the roughness of a grater, and occasionally pieces are met with having knots or warts. The colour of the external surface of Crown bark depends principally on that of the crustaceous lichens. Gray, or grayish-brown, may be taken as the predominating tint: the thin quills are mostly slate, ash, or roe-gray. The larger quills vary still more, and, in addition to the colours now mentioned, they are sometimes blackish-gray, even passing, in places, into liver-brown. The inner surface of Loxa bark is smooth, with small irregular longitudinal fibres observed thereon: its general colour is cinnamon-brown. The transverse fracture of small quills is even, but of the larger and coarser ones fibrous. The powder of Loxa bark is of deep cinnamon-brown colour. The odour of this bark is like that of tan; its taste astringent, bitter, and somewhat aromatic.

COMMERCIAL AND OTHER VARIETIES.—The slender, finest, thinnest, and longest quills, with a short transverse fracture, form the *finest* or *pick crown bark* of the (*cortex cinchona corone electus*). A somewhat larger quill, with a silvery appearance of the epidermis, derived from the adherent crustaceous lichens, constitutes the *silvery crown bark*. A similar kind, but in which the external coat has a speckled appearance from the whitish lichens, with the intermediate dark-brown colour of the epidermis, constitutes the *leopard crown bark*.

Huamalties and *white Loxa Cinchona*, found in the serons of pale bark, are the produce of different species of *Cinchona*. The *young Huamalties Cinchona*, sometimes called *Havannah Bark*, constitutes the *rusty crown bark* of some of our dealers. It has scarcely any transverse cracks; and some subvarieties of it are devoid of lichens. Its epidermis is spongy or corky, longitudinally furrowed in an undulatory manner, and of a grayish or brownish gray tint. The *ferruginous Huamalties* of Guibourt is the same bark at a more advanced period of growth. *Huamalties bark* is the produce of *C. micrantha*, and will be described more fully hereafter. *White Loxa Cinchona* has a considerable resemblance to the young *Huamalties bark*, with a whitish epidermis, and will be noticed among the so-called *White Cinchonas*.

COMPOSITION.—Crown bark was analysed by Pelletier and Caventou, (*Journ. de Pharm.* vii. 70,) and by Bucholz. (Gmelin, *Handb. d. Chem.* ii. 1283.)

Pelletier and Caventou's Analysis.

Kinate of cinchonia.
Kinate of lime.
Green fatty matter.
Red cinchonic.
Soluble red colouring matter (tannin).
Yellow colouring matter.
Gum.
Starch.
Lignin.

Gray Cinchona.

Bucholz's Analysis.

Cinchonia	0.26
Kinic acid	1.17
Kinate of lime	1.30
Hard resin (red cinchonic)	9.97
Bitter soft resin	1.56
Fatty matter, with chlorophylle	0.78
Tannin, with some chloride of calcium (?)	5.80
Gum	4.43
Starch	a little
Lignin	74.43

Commercial Loxa Bark..... 99.80

Soubéiran (*Traité de Pharm.* i. 603) states, that one lb. of Loxa bark yields from one and a half to two drachms of sulphate of cinchonia. It is somewhat remarkable, that Von Santen

(Bergen, *Monogr. Tab. zur 5^{ten} Platte*) obtained quina, and but little cinchonia, from Loxa bark, as the following table shows:

One lb. of Loxa Bark.	Sulphate of Quina.	Pure Cinchona.
Fine selected quills.....	5 grs.	—
Moderately thick quills and pieces.....	13 grs.	4½ grs.
Fine and middling quills.....	3 grs.	2½ grs.
Moderately thick pieces.....	21½ grs.	—
Selected thick, heavy pieces, with grater-like bark.....	33½ grs.	—

CRYPTOGAMIA.—The following is Fée's list of the Cryptogamia found on Loxa bark:

LICHENES.—*Opegrapha globosa*; *O. Condaminea*; *Graphis fulgurata*; *Arthonia sinensigraphia*; *A. marginata*; *Glyphis favulosa* (rare); *Chiodecton effusum*; *Pyrenula verrucarioides*; *Ascidium Cinchonarum*; *Lepra flava*; *Lecidea peruviana*; *Lecanora russula*; *L. subfusca*; *id. var. β pulverulenta*; *Parmelia crenulata*; *P. glandulifera*; *Sticta aurata*; *Collema azureum*; and *C. diaphanum*.

2. *Cinchona Huanuco*.—Gray or Silver Cinchona, E.

Cinchona cinerea, E.

(Bark of *Cinchona micrantha*, E.)

SYNONYMES.—*Quinquina de Lima*, Guibourt. *China Huanuco*; *Graue China*, Bergen. *China Huanuco*, Yuanuco, Guanuco, Havane, Goebel. *Cascarilla provinciana*, Pöppig.

HISTORY.—This bark was first known in Spain in 1799. One hundred and eighty chests of it were brought to Santander, in that year, by the frigate *La Veloz*; and Ruiz was appointed to examine the cargo. He found in the chests a thick bark, till then unknown to the botanists of Peru, mingled with the barks of *C. nitida* and *C. lanceolata*, and with those of the species which Tafalla has designated by the term *similar to Calisaya*. (Laubert's *Memoir*, in Lambert's *Illustr. of the Genus Cinchona*, p. 78.) Pöppig (Hooker's *Comp. to the Bot. Mag.* No. viii. p. 244) says, the trade in the barks of Huanuco commenced in 1785; but that in 1815 it almost entirely ceased. The scarcity of yellow bark will be likely again, I should think, to give a fresh impulse to it, as the quality of Huanuco bark is excellent.

BOTANY.—It is unnecessary to detail the speculations of botanists as to the origin of this bark previous to Pöppig's discovery. This celebrated traveller brought to Europe a bark called *cascarilla provinciana*, and which was the produce of *Cinchona micrantha*. Reichel, an apothecary at Hohenstein, examined and carefully compared it with his own collection of cinchona barks, as well as with that of Von Bergen at Hamburg, and declared it to be identical with the *Huanuco* or *Silver Bark* of commerce.

COMMERCE.—It is imported usually in chests containing about 150 pounds, and also, though less frequently, in serons of from 80 to 100 pounds.

ESSENTIAL CHARACTER.—Coat moderately thin, hard; wrinkles longitudinal, predominating; under surface splintery; colour rusty brown (Bergen).

DESCRIPTION.—It always occurs in the form of quills, no flat pieces being known. These quills are larger and coarser than those of Crown bark; the largest even approximating to those of yellow bark, from which they are distinguished by the greater smoothness of their external surface. The length of the quills is from three to fifteen inches; their diameter from two lines to one and a quarter, or even two inches; their thickness one-third of a line to five lines. At the edge of most of the perfect quills we distinctly observe a sharp oblique cut, made probably to loosen the bark. These oblique cuts are rarely found on other barks. The quills are frequently somewhat spirally rolled. We observe on the epidermis transverse cracks, but they do not form rings, as in the Loxa or Crown bark, and their edges are flat. On the thicker quills longitudinal furrows are observed; and in these cases the transverse cracks are frequently wanting. The colour of the epidermis is whitish: in the smaller quills it is a uniform whitish gray, while in the large quills we observe a kind of cretaceous covering. This whitish appearance, from which, indeed, the terms *silver* and *gray* given to this bark are derived, depends on some crustaceous lichens. The structure of the inner surface of this kind of bark is, in the small quills, smooth; in the larger ones fibrous: the colour is rather reddish, or rusty brown, than cinnamon brown. The fracture is even, and resinous; the odour clayish or sweet, and which Bergen says is peculiar to this kind. The taste is astringent, aromatic, and bitter; the powder of a deep cinnamon brown.

COMMERCIAL AND OTHER VARIETIES.—In this country no varieties of Huanuco bark are usually made. Guibourt distinguishes the *gray fine Lima*, the *large* or *white Lima*, and the *gray Huanuco*; to which he also adds, the *gray cinchona resembling the royal yellow bark*.

COMPOSITION.—I am unacquainted with any analysis of this bark. Soubeiran (*Traité de Pharm.* i. 603) states, that one lb. of *Gray Lima Cinchona* yields a drachm and a half of sulphate of cinchonia.

The following are the quantities of pure cinchonia and quina in this bark, according to the undermentioned authorities:

	In one lb. of bark.	
	Cinchona.	Quina.
Von Santen.....	from 74 to 210 grs.	0
Michaelis.....	finest sample..... 50 grs.	32 grs.
	second sample..... 74 grs.	28 grs.
Goebel and Kirst.....	168 grs.	0

CRYPTOGAMIA.—Mosses and Jungermannias are never found on this bark. Folioseous lichens are much more scarce than on Loxa bark. The following is Fee's list of the Cryptogamia:

LICHENES.—*Opegrapha Ruiziana*: *O. Condaminea*: *O. rugulosa*: *O. tumidula*: *Graphis Acharii*: *G. serpentina*: *Arthonia confluens*: *A. divergens*: *A. obtrita*: *Trypethelium variolosum*: *Pyrenula marcida*: *P. myriocarpa*: *P. mollis*: *Verrucaria nitens*: *V. theoplaca*: *Ascidium Cinchonarum*: *Lecidea tuberculosa*.

3. Cinchona Jaen.—Ash Cinchona.

(Bark of *Cinchona ovata*, Fl. Peruv.)

SYNONYMES.—*Quinquina de Loza cendré*, Guibourt. *China Jaen*: *Blasse Ten-China*, Bergen. *China Jaen*, seu *Tena*, s. *Tena*, Goebel. *Blackish Huanuco*, Batka. *Cascarillo pallido*, Ruiz.

HISTORY.—Little is known respecting the history of Ash Cinchona, in consequence, probably, of its being confounded with other kinds of pale bark. It is uncertain, therefore, at what period it was introduced into commerce. Bergen states he found it in an old collection of drugs made in 1770. Virey (*Hist. Nat. des Médic.* p. 210.) refers to it under the name of *pale gray* or *femala Loxa cinchona*; but it does not appear to have been known to the other French pharmacologists until I sent samples of it to Professor Guibourt, who has described it, erroneously I think, as a variety of Loxa bark. (See his *Hist. des Drog.* ii. 533.)

BOTANY.—This kind of cinchona bark agrees with the one described in the *Quinologia* as *cascarillo pallido* (*C. ovata*, Fl. Peruv.); a specimen of which, in Ruiz's collection of barks, was examined by Bergen, (*Monogr.* 319.) and found to be identical with Ash Cinchona.

COMMERCE.—It is usually imported in chests of from 110 to 140 lbs.; but we meet with it also in serons of from 70 to 100 lbs.

ESSENTIAL CHARACTER.—*Coat* thin, light, readily pulverized; *cracks* few; *quills* mostly crooked; *colour* dark cinnamon brown (Bergen).

DESCRIPTION.—This bark is met with in a quilled form only: the quills being of middling size, or somewhat thick; being from 4 to 16 inches long, from $3\frac{1}{2}$ lines to 1 inch in diameter, and from $\frac{1}{2}$ to 2 lines thick. A very remarkable character of this bark is the crookedness of the quills, which are more or less arched and twisted; from which circumstance we may infer the probability of its being obtained from a tree which grows in a damp situation. On the outer or epidermoid surface we observe a few transverse cracks, and some faint longitudinal cracks; but in these respects there is a manifest difference between this and Loxa bark. The colour of the outer surface varies between ash gray, whitish gray, and pale yellow, with blackish or brownish spots. The inner surface is either even or splintery, and of a cinnamon brown colour. The fracture is even or splintery; the odour is tan-like; the taste feebly astringent and bitter; the colour of the powder is cinnamon brown.

COMMERCIAL VARIETIES.—No division of ash cinchona is made by English dealers. Bergen makes two varieties of it, the *pale* and the *dark*: the latter is also called *False Loxa Bark*, or *Dark Ten Cinchona* (*China Pseudo-Loxa*; *Dunkele Ten China*), a bark which has many of the properties of ash cinchona, and which is found mixed with the Loxa bark of commerce. It is principally distinguished from the pale ash cinchona by the irregular longitudinal wrinkles and transverse cracks, and by its darker colour. Guibourt regards it as an inferior kind of Loxa bark. Bergen says it agrees with a bark in the collection of Ruiz, said to be obtained from the *C. lancifolia* of Mutis.

COMPOSITION.—Ash Cinchona has not been analyzed. It appears to be remarkably deficient in cinchona alkalis. Von Santen (Bergen, *Monogr.*) failed to procure either quina or cinchonia from it. Michaelis, and Goebel and Kirst, (*Pharm. Waarenk.* i. 67.) obtained the following quantities of quina and cinchonia from it:—

1 lb. of Bark.	Quina.	Cinchonia.
Michaelis { 1st sort (<i>Cinchona fusca Ten</i>).....	44 grs.	12 grs.
	80 grs.	12 grs.
Goebel and Kirst.....	12 grs.	none.

CRYPTOGAMIA.—Few cryptogamic plants are found on this bark. The following is a list of them, according to Bergen. (*Op. cit.* 318.)

LICHENES.—*Graphis sculpturata*; *Porina granulata*; *Pyrenula verrucarioides*; *Lecanora punicea*; *Parmelia melanoleuca*, and *Usnea florida* & *Cinchona*.

THE DARK ASH CINCHONA (Bergen), of all others, abounds most in lichens. Besides some of the foregoing the following lichens have also been found on it:—*Opegrapha scapella*; *Thelotrema terebratum*; and *Sticta aurata*.

4. *Cinchona Huamalies*.—*Huamalies* or *Rusty Bark*.Bark of *Cinchona purpurea*.

SYNONYMES.—*Quinquina de Huamalies*, and *Q. huamalies ferrugineux*, Guibourt. *China Huamalies*; *Braune China*, Bergen. *China Huamalies*, *Guamalies*, seu *Abomalies*, Goebel. *Braune China*; *China Huamalies*; *China fusca*, Geiger.

HISTORY.—It is not known precisely when this kind of bark first came into Europe. Von Bergen thinks that it probably was introduced simultaneously with *silver bark* at the end of the last or commencement of the present century. In 1803 it was frequently carried direct from Lima to Hamburg. This bark is not used as a distinct kind in this country, and hence most druggists are unacquainted with it; but it is bought by some of our merchants for the foreign markets, especially for Germany.

BOTANY.—The bark of *Cinchona purpurea*, R. and P. (*Cascarilla boba colorado*), brought from South America by Pöppig, was found by Reichel to be identical with the *Huamalies* bark.

COMMERCE.—It is imported in chests, never in serons.

ESSENTIAL CHARACTER.—Coat thin and spongy; longitudinal wrinkles and warts which penetrate to the cortical layers [albuminum, Bergen]; under-surface even; colour rust-brown (Bergen).

DESCRIPTION AND VARIETIES.—This kind of bark presents very different appearances at different ages, so as almost to defy arrangement. Some of the fine quills might readily be mistaken by inexperienced persons for *Crown Bark*, while others greatly resemble *white Loxa bark*. The large flat pieces, on the other hand, I have known mistaken by an experienced dealer for what he termed "flimsy" red bark.

Some of the finer quills (*Huamalies simulating Crown Bark*) greatly resemble those of *Loxa* or *Crown Bark*, but are paler externally, have fewer transverse cracks, are smoother, or finely wrinkled longitudinally, and, when broken, appear nearly white in the interior. Another kind (*Gray-corky Huamalies Bark*) I have frequently found in the *Loxa* Bark of commerce. It occurs in larger quills, which have a whitish or grayish corky or spongy epidermis, which is striated or furrowed longitudinally, and may be removed by the nail. On some of the pieces we observe rusty-coloured warts, which, when numerous, are disposed in irregular longitudinal lines. A flat variety (*White-verrucous Huamalies Bark*) has a whitish epidermis, with large red warts, from which the epidermis has been removed. Another kind (*Rusty Huamalies*; *Quinquina ferrugineux*, Guibourt) is in quills or flat pieces, distinguished by the ochre-red or rusty colour of its outer surface, the presence of warts, arranged for the most part longitudinally, and the almost total absence of transverse cracks.

COMPOSITION.—I am unacquainted with any analysis of this bark. The following are the quantities of *Cinchona* alkalis, according to Von Santen, (Bergen, *Monogr. Platt. v.*) Michaelis, and Goebel, and Kirst. (*Pharm. Waarenk. i. 74.*)

	1 lb. of Bark.	<i>Cinchonia.</i>	<i>Quina.</i>
Von Santen.	1. Fine and Middling-fine quills, and flat pieces (from Cadiz in 1821)	60	0
	2. Thick warty quills, and flat pieces (from ditto)	75	0
	3. Sorts (from Lima in 1803)	60	0
	4. As No. 3 (another chest) rather heavy	48	0
	5. As No. 3 (a third chest) rather light	95	0
Michaelis.	1st sort	0	12
	2d sort	48	28
	3d sort	60	34
Goebel and Kirst (fine and thick quills of commerce)	38	28	

CRYPTOGAMIA.—The following cryptogamic plants are mentioned by Von Bergen as existing on this bark.

LICHENES.—*Opegrapha enteroleuca*; *Graphis duplicata*; *Verrucaria phœa*; *Porina papillata*; *Pyrenula discolor*; *P. mastoidea*; and *P. verrucarioides*; *Lecanora punicea*; *Parmelia melanoleuca*; and *Usnea Florida* & *Cinchona*.

5. *Cinchona Calisaya* seu *Regia*.—*Royal Yellow Bark*.*Cinchona flava*, E. D. (U. S.)(*Cinchona cordifolia*; Cortex, L. D.—*Yellow-Bark*; from an unascertained species of *Cinchona*, E.)

SYNONYMES.—*Quinquina Calisaya* ou *Jaune royal*, Guibourt. *China regia*; *Königs-China*, Bergen. *China regia*; *Cortex China regius*, s. *flavus*, s. *luteus*; *China Calisaya*, Goebel.

HISTORY.—Dr. Relph (*Inq. into the Med. Effic. of Yellow Bark*, 1794) says, that in a letter from a Spanish merchant at Cadiz, dated September 1789, it is observed that the *yellow bark* had only been lately known there. "The first parcel which arrived here was tried at Madrid, and was immediately bought by the King's order for his own use." In 1790 Murray (*App. Med. vi. 178*) first saw it at Franckfort on the Maine. He afterwards received it under the name of *cortex china flavus*; and to prevent confusion he proposed to term it *royal yellow bark* (*cortex china regius flavus*.) Dr. Relph says it was unknown in England till 1793; but this must be an error; for Murray, who died in 1791, had received it from London. It is not improbable that it may be the *amarilla* (*yellow*) *cinchona* mentioned by Arrot (*Phil. Trans. 1737-*

8, vol. xl. No. 446, p. 81—6); by Condamine (*Mém. de l'Acad. Royale des Scien.* 1738, p. 226); and by J. D. Jussieu (*Hist. de la Soc. de Méd.* 1779, p. 252); but this cannot be ascertained now. The term *Calisaya*, applied to this bark in Spain and Portugal, is the name of a province producing the bark. (Humboldt, in Lambert's *Illustr.* p. 53.)

BOTANY.—The species yielding this bark is at present unascertained.

Humboldt and Bonpland (*Pl. Equinox.* i. 66) ascribe the *Quina jaune* (yellow cinchona) to *Cinchona cordifolia*, Mutis. Mr. Lambert (*Illustr.* p. 4) also states that *Quina amarilla Bogotensis* (Bogota yellow cinchona) is produced by *C. cordifolia* Mutis. These statements, I presume, led Hayne, (quoted by Bergen, S. 285,) the compilers of the *Pharmacopœia Londinensis*, 1836, and others, into the error of supposing that the yellow bark of English commerce is identical with the *Quina jaune* of Humboldt and the *Quina amarilla* of Lambert, and that consequently it is the produce of *C. cordifolia*. But Bergen (*Monog.* S. 293) states that the *Quina amarilla* (*C. cordifolia*, Mutis) contained in Ruiz's collection of barks, which he examined, was *China flava dura* (the bark known in England as *hard Carthagena bark*). And Guibourt (*Hist. des Drog.* ii. 79) observes, that "many persons have referred the true *Calisaya* to *C. Cordifolia*, in consequence of Mutis having given the name of yellow bark to the bark of this tree; but the authentic specimens of the yellow bark of Mutis, brought by Humboldt, show that this bark is that known in France under the name of *Carthagena cinchona*."

Ruiz (Laurent's *Memoir* in Lambert's *Illustr.* p. 70) thought it was the bark of *C. lanceolata*; and Dr. Lindley (*Fl. Med.* 417) adopts this notion. But Bergen (*Monog.* S. 285) says he found in Ruiz's collection some specimens of *Quina naranjada* (*C. lancifolia*, Mutis), of *Quina antedada* (*C. lanceolata*, Fl. Peruv.), and of *Quina peruviana* (*C. nitida*, Fl. Peruv.), all of which are very different to our yellow cinchona (royal or *Calisaya* yellow bark). Guibourt (*Hist. des Drog.* p. 80) observes that great differences exist between our yellow cinchona and the orange cinchona (*C. lancifolia*, Mutis).

COMMERCE.—It is imported in serons and chests. The whole serons weigh 125 to 135 lbs.; the thirds, 45 to 50 lbs. The chests contain 150 lbs. I am informed by Messrs. Gibbs and Sons, Contractors for the Cinchonas, that the Yellow Bark is produced in the province of La Paz in Bolivia, in a plain bounded east and west by mountain ridges, and elevated 14 or 15,000 feet above the level of the sea. It is exported from Arica. This information agrees with that received by Dr. Wood, (*United States Dispensatory*), and with the statements of Delondre. (*Journ. de Pharm.* xxi. 505.)

ESSENTIAL CHARACTER.—Coat very thick, brittle; furrows longitudinal; cracks predominating, transverse; under-surface uneven; colour deep cinnamon-brown. (Bergen.)

DESCRIPTION.—In commerce, two varieties are distinguished; the *quilled* and the *flat*.

α. *Quilled yellow bark* (*cinchona regia tubulata* seu *convoluta*).—The quills vary in length from three to eighteen inches; in diameter, from two lines to one and a half or even two inches; in thickness, from half to six or seven lines. Very small quills, however, are rare; those usually met with having a diameter of from one to one and a half inches, and a thickness of from three to six lines. Sometimes they are doubly, though in general they are singly, quilled. The quills are in general coated. On their external surface they are marked by longitudinal wrinkles and furrows, and predominating transverse cracks, which often form complete circles around the quills, and whose edges are usually raised. These furrows and cracks give a very rough character to this kind of bark, by which, indeed, it may be readily distinguished from the large quills of the gray or Huanuco bark. The colour of the epidermis is more or less light gray; in those spots where the epidermis is wanting, the outer surface of the bark is of a brown colour. In other characters the quilled and flat characters agree.

The finest quills are selected for druggists' show-bottles.

β. *Flat yellow bark* (*cinchona regia plana*).—The pieces of this variety are from eight to fifteen or eighteen inches long; from one to three inches broad, and from one to five lines thick. They are but little curved or arched. In general the pieces are uncoated (*cinchona regia nuda*). Sometimes the uncoated pieces are found, by drying, to have become convex on the inner, and concave on the outer side. When the coating is present, it agrees in character with the coated quilled yellow bark already described, in having wrinkles, furrows, and transverse cracks, and in the colour of the epidermis.

The inner surface of both quilled and flat pieces is even, and often almost smooth. On examination, it is seen to consist of fine, closely-set, longitudinal fibres. Its colour is cinnamon-brown; the same colour is also perceived on the outer side of the bark in the places where the coating is removed.

COMMERCIAL AND OTHER VARIETIES.—The only distinctions made in commerce are into *quilled* and *flat yellow cinchona*; the flat being subdivided into the *coated* and the *uncoated*.

The bark, called by Guibourt *Quinquina jaune du roi d'Espagne*, is unknown in English commerce. Guibourt says, that it has an odour like that of tobacco, and that it consists principally of young barks, resembling *Calisaya* or *Royal Yellow Cinchona* (the *Yellow Cinchona* of English commerce). It is the *Cascarilla hoja de Oliva* (*Cinchona nitida*, R. P. ?) of Pöppig?

Mutis's *Orange Cinchona* of Santa Fé I once met with in the docks under the name of *New Spurious Yellow Bark*. This, as well as the *Cusco* and *Carthagena* Barks, sometimes mistaken for the *Royal Yellow bark*, will be noticed among the *White Cinchonas*.

COMPOSITION.—Pelletier and Caventon (*Journ. de Pharm.* vii. 89) found in this bark *superkinate of quina, kinate of lime, red cinchonic, soluble red colouring matter (tannin), fatty matter, yellow colouring matter, lignin, and starch.* In 1827, Pelletier (*Dict. Mat. Méd.* v. 603) consumed 2,000 quintals of this bark in the manufacture of 90,000 ounces (French) of disulphate of quina: this is about three drachms of disulphate for one lb. of bark; Soubeiran (*Traité de Pharm.* i. 603) states that one lb. (French) of *uncoated yellow bark* yields three drachms and from 30 to 50 grains (French) of disulphate of quina; while the same quantity of *coated yellow bark* yields three drachms (French) of the disulphate. I have been informed, by some manufacturers, that an ounce of the disulphate has been obtained from two lbs. of yellow bark; but this is beyond the average produce.

CRYPTOGAMIA.—The following is Fée's list of the cryptogamic plants found on this bark. (*Cours d'Hist. Nat.* ii. 262.)

1. FUNGI.—*Hypochnus rubro-cinctus*; *Triclinum Cinchonarum*.
2. LICHENES.—*Opegrapha peruviana*; *O. Scaphella*; *O. ovata*; *O. rhizocola*; *Graphis cinerea*; *G. cinnabarina*; *Arthonia obtrita*; *Fissurina Dumastii*; *Chiodecton sphaerale*; *Trypethelium verrucosum*; *T. chiodectonoides*; *Pyrenula annularis*; *Porina americana*; *Ascidium Cinchonarum*; *Lepra flava*; *Variolaria amara*; *Lecidea aurigera*; *L. tuberculosa*; *L. soredifera*; *L. punicea*; *Parmelia perlata*; *Sticta macrophylla*; *Collema azureum*; *Solorina vitellina*; *Usnea floridæ et barbata*.
3. HEPATICÆ.—*Jungermannia atrata*.
4. MUSCI.—*Hypnum Langsdorfii*.

6. *Cinchona Rubra*, E. D. (U. S.)—Red Cinchona.

(*Cinchona oblongifolia*; Cortex, L. D.—Red Bark, from an undetermined species, E.)

SYNONYMES.—*Quinquina rouge verruqueux*, and *non-verruqueux*, Guibourt. *China Rubra*; *Rothe China*, Bergen. *China rubra*; *Cortex Chinæ ruber*, Geobel.

HISTORY.—It is probable, as Bergen suggests, that this red bark was known to the earliest travellers in South America, who have noticed the cinchona bark. Arrot, as well as Condamine, speak of a red bark (*colorada*) of the best quality. Dr. Saunders (*Observ. on the super. Efficacy of the Red Peruvian Bark*, p. vi. 1782) states, that in the year 1702 a parcel of bark (which he says was the red kind) was taken on board a Spanish vessel, and a portion of it fell into the hands of a celebrated London apothecary, Mr. D. Pearson. In 1779, another Spanish ship, bound from Lima to Cadiz, was taken by an English frigate, and carried into Lisbon. Her cargo consisted principally of red bark, and was, for the most part, sent to Ostend, where it was purchased at a very low price by some London druggists, who, after some difficulty, contrived to get it introduced into practice.

BOTANY.—The species which yields the red bark is at present unascertained. It has been usually, though erroneously, supposed to be the *Cinchona oblongifolia*, Mutis, which yields a bark called *Quina rosa*, or *Quina Azahar o roja de Santa Fé*; and which was supposed to be our red bark. But Bergen has examined the bark bearing this name in the collection of Ruiz, and finds that it is not our commercial red bark, but the *Quinquina nova* of the French pharmacologists. Moreover, Schrader (who received a piece of the bark of the *Cinchona oblongifolia* from Humboldt) declared it to be a new kind; and Guibourt (*Hist. des Drog.* ii. 89) states, that the red bark of Mutis, which was deposited by Humboldt in the Museum of Natural History of Paris, is not commercial red bark, but *Quinquina nova*. To these statements may be added the testimony of Ruiz and Pavon, and of Humboldt; the two first of which writers state, that the *Quina rosa* is obtained from the *Cinchona oblongifolia*, but they do not know the origin of *Quina colorada* (the red bark of commerce); and Schrader states, that Humboldt declared he did not know the tree that yielded red bark. (Bergen, *Monogr.* S. 268.)

COMMERCE.—Imported in chests; never in serons. Good samples are scarce. I am informed by an experienced dealer, that this bark was formerly imported in much larger sized pieces than are now met with.

ESSENTIAL CHARACTER.—Coat thick, with wrinkles (longitudinal); furrows and warts, but without any important impression on the cortical layers [alburnum, Bergen]. Inner surface uneven; colour brownish-red. (Bergen.)

DESCRIPTION.—Red bark occurs in quills and flat pieces. The quills vary in diameter from two lines to an inch and a quarter; in thickness from one-third to two lines; in length from two to twelve or more inches. The so-called flat pieces are frequently slightly curled: their breadth is from one to five inches; their thickness from one-third to three-quarters of an inch; their length from two inches to two feet. Red bark is usually coated; its outer surface is usually rough, wrinkled, furrowed, and frequently warty. The colour of the epidermis varies: in the thinner quills it is grayish-brown, or faint red-brown; in thick quills and flat pieces it varies from a reddish-brown to a chestnut-brown, frequently with a purplish tinge. As a general rule, it may be said that the larger and coarser the quills and pieces, the deeper the colour. Cryptogamic plants are not so frequent on this as on some other kinds of bark. The rete mucosum is frequently thick and spongy, especially in large flat pieces; much more so than in yellow bark. The inner surface of the bark is, in fine quills, finely fibrous; in large quills

and flat pieces, coarsely fibrous, or even splintery. Its colour increases with the thickness and size of the pieces: thus, in fine quills it is light rusty brown; in thick quills and flat pieces it is a deep reddish or purplish brown. Some of the specimens of red bark, which I have received from Von Bergen, approach yellow bark in their colour. The transverse fracture of fine quills is smooth; of middling quills, somewhat fibrous; of thick quills and flat pieces, fibrous and splintery. The taste is strongly bitter, somewhat aromatic, but not so intense and persistent as that of yellow bark; the odour is feeble, tan-like; the colour of the powder is faint reddish-brown.

COMMERCIAL AND OTHER VARIETIES.—The obvious and common distinction is into *quilled red bark* and *flat red bark*. The warty pieces constitute the *quinquina verruqueux* of Guibourt; the pieces without warts are the *quinquina non-verruqueux* of the same pharmacologist. In the red bark of commerce, we frequently find pieces with a white micaceous epidermis: these, which are probably the produce of a distinct species of Cinchona, constitute the *quinquina rouge à epiderme blanc et micace* (*quinquina Carthagene*, 2d ed.) of Guibourt, (*Hist. des Drog.* ii. 92,) and will be described among the *white cinchonas*.

The quilled red bark, called by Guibourt *red Lima cinchona*; the *flat orange-red cinchona*, and the *pale red cinchona* of the same pharmacologist, are not distinguished in English commerce.

The consumption of red cinchona being very small, but little attention has been paid to it, and no distinctions are made of it, except in the *quilled* and the *flat*; the latter being subdivided into *coated* and *uncoated*.

COMPOSITION.—According to Pelletier and Caventou, (*Journ. de Pharm.* vii. 92,) red bark contains *superkinate of cinchonia*, *superkinate of quina*, *kinate of lime*, *red cinchonic*, *soluble red colouring matter* (tannin), *fatty matter*, *yellow colouring matter*, *lignin*, and *starch*. Soubeiran (*Traité de Pharm.* i. 603,) states, that one lb. of deep-red cinchona yields two drachms of sulphate of quina and one drachm of sulphate of cinchonia; while one lb. of pale red cinchona yields a drachm and a half of the sulphate of quina and one drachm of sulphate of cinchonia.

The following are the quantities of cinchona alkalis obtained from this bark by Von Santen, (Bergen, *Monogr.* Platte 1,) by Michaelis, and by Goebel and Kirst. (*Pharm. Waarenk.* i. 72.)

	Cinchonia.	Sulphate Quina.	Quina.
1. Fine quills of fresh appearance (from Cadiz in 1803) ..	70 grs.	77 grs.	
2. Large, broad, flat pieces, of fresh brownish-red appearance (same chest)	90	15	
3. Middling quills, from their pale appearance probably 20 years older than the previous (from Cadiz in 1819)	97	31	
Von Santen 4. Broad flat pieces, not so thick as No. 2 (same chest as No. 3)	80	30	
5. Middling quills, heavy, old (from London to Hamburgh in 1815: not met with now)	150	11	
6. Thicker, heavier quills (same chest)	184	9	
Thick flat pieces, quills, and fragments (above 80 years in Hamburgh: a pale kind)	20	7	
Michaelis	32	—	64
Goebel and Kirst (flat pieces)	65	—	40

CRYPTOGAMIA.—The following are the cryptogamic plants on red cinchona, according to Fée, (*Cours d'Hist. Nat.* ii. 265):

LICHENES.—*Opegrapha Bonplandi*; *O. farinacea*; *Graphis Acharii*; *G. ezilis*; *G. frumentaria*; *Pyrenula verrucarioides*; *Verrucaria sinapisperma*; *Thelotrema urceolare*; *T. terebratum*; *T. myriocarpum*; and *Lecidea conspersa*.

7. Cinchona Loxa Alba.—White Loxa Bark.

Quinquina blanc de Loxa, Guibourt.

This is found in the *Crown* or *Loxa Cinchona* of commerce; with which it agrees in its general appearance, being essentially distinguished by the whitish epidermis. It has a considerable resemblance to the quilled Huamalies with a whitish epidermis, as also to Carthagena bark.

Mutis's *White Cinchona* is a flat yellowish bark very dissimilar to the preceding. It is said to be the produce of *Cinchona ovalifolia*, and to contain a peculiar alkali called *blanquinine* (see p. 431).

8. Cinchona de Carthagena Dura.—Carthagena Hard Cinchona.

(Bark of *Cinchona cordifolia*.)

SYNONYMES.—*Quinquina de Carthagène, jaune, Guibourt.* *China flava dura*; *Harte gelbe China*, Bergen. *Quina amarilla*, Mutis. *Quina jaune*, Humboldt.

HISTORY.—See *Cinchona de Carthagera fibrosa*.

BOTANY.—This bark is satisfactorily proved (see the evidence at page 422) to be the produce of *Cinchona cordifolia*, Mutis.

COMMERCE.—It is imported in drum-like serons of about 80 lbs. net, or in half chests of about 70 lbs.

ESSENTIAL CHARACTER.—Coat thin and soft, or wanting; longitudinal furrows irregular; under-surface uneven or splintery; colour dull ochre-yellow (Bergen).

DESCRIPTION.—It occurs in fine, middling, and thick quills, and in flat pieces. The quills vary in diameter from three to eight lines, in thickness from half to one and a half lines, in length from five to nine, rarely to fifteen inches. The flat pieces are more or less twisted, arched, or warped (sometimes like pieces of dried horn) in drying, and are from a half to two inches broad, two to seven lines thick, and four to eight, rarely to twelve inches long. The coat, which is usually more or less rubbed off, is thin, soft, somewhat corky, laminated, with irregular longitudinal furrows; transverse cracks and warts are very rare. The epidermis is whitish, yellowish white, or ash gray. In the unwarted we observe, in the outer surface of the cortical layers, irregular longitudinal, but not very deep, furrows. The inner surface is smooth or splintery, frequently hollowed out. The prevailing tint of the cortical layers is usually dull ochre-yellow. The longitudinal fracture (which is with difficulty effected) is uneven, short, and coarse splintery; the transverse fracture is short-splintery. The taste is moderately bitter, and slightly astringent. The powder is cinnamon-coloured.

COMMERCIAL VARIETIES.—No commercial varieties of this are known.

The *Carthagera brown bark* (*Quinquina Carthagera brun*, Guibourt) is probably only a variety. The pieces are twisted, very hard, of a chocolate-brown tint, with a yellowish-white epidermis.

COMPOSITION.—Guibourt says, that the *Carthagera yellow hard cinchona* contains but little cinchonia, and scarcely any quina. The following are the quantities of the cinchona alkalis, according to Von Santen, and Goebel and Kirst:

	One lb. of Bark.	Cinchonia.	Sulphate of Quina.
Von Santen..	{ 1. Quills and flat pieces (from Cadiz in 1814)	30 grs.	32 grs.
	{ 2. Flat pieces (from Curaçao in 1806)	36 grs.	5 grs.
	Goebel and Kirst found 56 grs. of Quina, and 43 grs. of pure Cinchonia.		

The bark analyzed under the name of *Carthagera cinchona*, by Pelletier and Caventou, (*Journ. de Pharm.* vii. 101,) was *Carthagera brown cinchona*, (Guibourt, *Hist. des Drog.* ii. 96.) The constituents were similar to those of *red cinchona*. The resinoid matter was very abundant.

CRYPTOGAMIA.—Very few cryptogamia are found on this bark. The following are those mentioned by Bergen:

LICHENS.—*Trypethelium variolosum*; *Thelotrema bahianum*; *Pyrenula poronoides*; *P. discolor*; *Parmelia melanoleuca*; *Usnea florida* & *Cinchona*.

9. *Cinchona de Carthagera Fibrosa*.—*Carthagera Fibrous Cinchona*.

SYNONYMS.—*Quinquina de Colombie ligneux*, Guibourt. *China flava fibrosa*; *Holzige gelbe China*, Bergen.

HISTORY.—This bark is not distinguished in commerce from the preceding, and its history, therefore, cannot be traced separately.

It is uncertain at what period *Carthagera Cinchona* was introduced into commerce. It may have been contemporaneous with the *Calisaya bark*. Von Bergen says it was first met with at public sales in the year 1805.

BOTANY.—The origin of *Carthagera fibrous bark* is not accurately ascertained. As it is imported in the same parcel with the *Carthagera hard Cinchona*—as both barks appear in commerce together, and closely resemble each other—I suspect they are obtained from the same species, either at different seasons or in different localities.

COMMERCE.—As the preceding kind.

ESSENTIAL CHARACTER.—Coat thin, soft, of moderate thickness,—or rubbed off: under-surface even, but rough to the touch; colour pure ochre-yellow (Bergen).

DESCRIPTION.—The dimensions of the quills and flat pieces, as well as their form, and the appearance of their epidermis, agree with those of the last-mentioned cinchona. The coat is wholly or partially absent, especially in the flat pieces. The rete mucosum is corky, and somewhat soft. Though apparently smooth, the under surface is to the touch finely splintery. The prevailing tint of the cortical layers is ochre-yellow. The very fibrous and splintery fracture (both longitudinal and transverse) especially distinguishes this kind. The taste is at first woody and insipid, then somewhat bitter and astringent. The powder is between cinnamon and ochre-yellow.

COMMERCIAL VARIETIES.—In commerce this and the last-mentioned *Cinchona* are confounded.

The *Quinquina Pitaya*, *Quinquina de la Colombie* or *d'Antioquia* of Guibourt, is closely allied to, if indeed it be not identical with, this bark.

COMPOSITION.—No complete analysis of this bark has yet been made. The following are the quantities of the cinchona alkalis obtained by Von Santen, and by Goebel and Kirst:—

	One lb. of Bark.	Cinchonia.	Sulphate of Quina.
Von Santen	1. Middling fine quills (from Cadiz in 1819).....	30 grs.	11 grs.
	2. Flat pieces (from ditto).....	32 grs.	15 grs.
	3. Ditto (from Curacao in 1806).....	30 grs.	25 grs.
	4. Ditto, thicker (from ditto).....	34 grs.	30 grs.
	5. Ditto, uncoated (from ditto).....	—	30 grs.

Goebel and Kirst obtained 54 grs. of pure Quina, but could detect no cinchonia.

CRYPTOGAMIA.—Very few cryptogamic plants are found on this bark. The following are mentioned by Von Bergen (*Monogr. S. 297*):—

LICHENES.—*Thelotrema bahianum*; *Pyrenula porinoides*; *P. discolor*; *Parmelia melanoleuca*; and *Usnea florida* & *Cinchona*.

10. Cinchona De Cusco.—Cusco Cinchona.

This bark was described in 1830 by Guibourt. (*Journ. de Chim. Méd. vi. 353*.) The flat uncoated pieces may, by inexperienced persons, be mistaken for yellow (Calisaya) bark: but they may be distinguished by sulphate of soda not producing any precipitate in their infusion, whereas it causes a precipitate with the infusion of the yellow (Calisaya) bark. The middling and smaller pieces and quills are in general partially or wholly covered with a whitish, smooth, uncracked epidermis. The rete mucosum is orange-red, and corky. The colour of the inner surface is yellowish cinnamon-brown. Touched by nitric acid, both rete mucosum and cortical layers become of a deeper colour. The only vegetable alkali which Guibourt obtained from Cusco cinchona was cinchonia (about $\frac{1}{3}$ from a pound of bark). The red cinchonic was present in abundance.

Guibourt considers this bark to be identical with the *Arica Bark* (*Écorce d'Arica*) of Pelletier and Coriol. (*Journ. de Pharm. xv. 565*.) But Arica bark is said to become green on the application of nitric acid, and to yield a peculiar alkali termed *aricina*. In 1830, I procured from M. Pelletier a cinchona which he called Arica bark: it is paler than the Cusco cinchona of Guibourt; but, like the latter, is not rendered green by nitric acid.

The *China rubiginosa* of Bergen (*Pharm. Central-Blatt für 1830, 121*), somewhat resembles Carthagen fibrous bark. Guibourt, indeed, says that it is identical with his Cusco cinchona. But my samples do not confirm his statement.

11. Cinchona Aurantiacea De Santa Fé.—Orange Cinchona of Santa Fé.

(Bark of *Cinchona lancifolia*.)

This bark was formerly described by Guibourt as *Carthagen spongy bark* (*Quinquina de Carthagène spongieux*). I have once met with it in England under the name of *new spurious yellow bark*. It was unsaleable, and in a warehouse at the London Docks. Its origin was unknown, until Guibourt found a specimen of it at the Muséum d'Histoire Naturelle of Paris, where it had been deposited by Humboldt as the *orange cinchona* of Mutis (*Cinchona lancifolia*). The cortical layers are excessively fibrous, very slightly bitter, in some pieces almost insipid, and of an orange colour. The largest pieces are semi-cylindrical, 4 or 5 inches broad, three-quarters of an inch thick, above 12 inches long, covered in places with a yellowish-white, smooth, micaceous epidermis, presenting on the outer surface longitudinal cracks. The smaller pieces are an inch and a half broad, and are rough externally from the numerous short cracks (longitudinal and transverse) of the epidermis. Guibourt says, that the epidermis is not cracked, but this statement does not accord with my specimens. Some small quills which I received from this celebrated pharmacologist are tolerably smooth. The orange cinchona of Santa Fé is of little medicinal virtue, though Mutis declared it to be of great value; and his opinions and errors on this and some other topics have unfortunately been adopted by Humboldt. The following observation of this celebrated traveller shows the just estimate formed by, not the ignorance of, the Spanish authorities respecting the value of this bark. "The effect of mercantile cunning went so far, that at the royal command, a quantity of the best orange-coloured cinchona bark, from New Granada, which M. Mutis had caused to be peeled at the expense of the king, was burned, as a decidedly inefficacious remedy, at a time when all the Spanish field-hospitals were in the greatest want of this valuable product of South America." (Humboldt in Lambert's *Illustr. p. 33*.) Soubeiran (*Traité de Pharm. i. 603*), says, 1 lb. of *spongy Carthagen cinchona* (*Quinquina de Carthagène spongieux*) yields from 24 to 36 grains of sulphate of cinchonia; but I suspect he does not allude to this bark.

12. Cinchona Nova.—Mutis's Red Cinchona of Santa Fé.

(Bark of *Cinchona magnifolia*.)

This bark is the *Kina nova* or *Quinquina nova* of the French pharmacologists. The evidence on which it is referred to *C. magnifolia* has been already stated (see p. 423). I have only once met with this bark in London. It had been sent, mixed with several other barks, to a

drug-mill, to be ground to powder. It scarcely resembles any other cinchona barks with which I am acquainted. Guibourt thus describes it (*Hist. des Drog.* ii. 99):—"Bark about a foot long, quilled when small, open or almost flat when larger, having, in general, a perfectly cylindrical form, whence its name of *cinchona* (*quinquina chandelle*). Its epidermis is whitish, thin, smooth, and has scarcely any cryptogamia (one has the form of yellow, waxy, mamellated plates), without any other fissures than some transverse rents, which extend to the liber, and appear to be the effect of desiccation; whereas the circular impression of quilled yellow cinchona, for example, depends on the organization of the bark. Sometimes the epidermis is wanting. The cortex, properly so called, is from one to three lines thick,¹ of a pale carnation-red, which becomes deeper in the air, especially at the outer surface, which, when it is deprived of epidermis, is always brownish-red; its fracture is foliated externally, shortly fibrous internally; and when examined by a lens, we observe, between the fibres, and especially between the laminae, a great abundance of two granular matters, one red, the other whitish, and which give the roseate colour above stated. Some pieces present in their fracture, and nearer the external than the internal edge, a yellow transparent exudation, like resin or gum. The bark has an unpleasant astringent taste, analogous to that of tan; its odour is feeble, and intermediate between that of tan and gray cinchona. The powder is fibrous, and very decidedly red." Pelletier and Caventou (*Journ. de Pharm.* vii. 109.) analyzed it, and found a *fatty matter*, a *peculiar acid* (*kinovic acid*), a *real resinoid matter*, *gum*, *starch*, *yellow colouring matter*, *alkalescent matter* in small quantity, and *lignin*.

13. Red Cinchona, with a White Micaceous Epidermis.

Under this name Guibourt designates a red bark having a white micaceous epidermis, and which I have found intermixed with the red bark of commerce.

COMPOSITION.—In February, 1791, Fourcroy (*Ann. de Chim.* viii. 113, and ix. 13) published an analysis of *St. Lucia Bark* (formerly called *St. Domingo Bark*), which was long regarded as a model of vegetable analysis. In 1802, Seguin (*Ann. de Chim.* xcii. 121; and xci. 273 and 304) concluded, that as the active principle of cinchona was precipitated by an infusion of nutgalls, it must be gelatine, and therefore proposed and employed the use of clarified glue as a febrifuge in intermittents. In 1803, Dr. Duncan, jun. (*Nicholson's Journal*, vi. 225) showed that the active principle could not be gelatine, but must be a subsequent *sui generis*, which he, therefore, termed *cinchonina*. In 1806, Vauquelin (*Ann. de Chim.* lix. 113) published some experiments on seventeen kinds of cinchona. In 1810, Gomes (*Mem. da Acad. Real das Sciencias de Lisboa*, iii. 201; and *Ed. Med. and Surg. Journ.* vii. 420) succeeded in isolating *cinchonina*, and obtaining it in a crystalline form. In 1820, Pelletier and Caventou (*Journ. de Pharm.* vii. 49) announced the existence of two organic alkalis, *cinchonina* and *quinina*, in cinchona bark. In 1829, Pelletier and Coriol (*Journ. de Pharm.* xv. 565) discovered a third alkali, *aricina*, in a new kind of cinchona bark.

The preceding are the most important epochs in the chemical history of the cinchona barks.

The constituent of *pale* (Loxa?), *yellow*, and *red cinchona*, are, according to Pelletier and Caventou, and other chemists, the following:

	Pale Cinchona.	Yellow Cinchona.	Red Cinchona.
1. Kinate of cinchonina.....	+	+	+
2. ——— quina.....	+	+	+
3. Soluble red colouring matter (<i>tannin</i>).....	+	+	+
4. Insoluble ditto (<i>red cinchonin</i>).....	+	+	+
5. Yellow colouring matter.....	+	+	+
6. Green fatty matter.....	+	+	+
7. Kinate of lime.....	+	+	+
8. Starch.....	+	+	+
9. Gum.....	+	0	0
10. Lignin.....	+	+	+

The following are the *chemical classifications* of cinchona barks, according to Goebel, (*Pharm. Waarenk.* i. 106,) Geiger, (*Handb. d. Pharm.* ii. 540,) and Pfaff, (*Bergen, Monogr.* 337,) before (p. 415) referred to:

¹ The bark of the trunk is five or six lines thick, covered with a white, friable, unequal, cracked epidermis: in other respects it resembles that of the branches.

acid does not precipitate the alkalis, lime, or barytes; it precipitates the salts of lead and silver; and lastly, it gives a beautiful green colour to the salts of iron. Crystallized kinic acid consists of $C^7 H^6 O^6$: its atomic weight, therefore, is 96.

5. KINOVIC ACID.—This acid was discovered by Pelletier and Caventou in Cinchona nova (see p. 426). It has considerable analogy to stearic acid. It is a brilliant white, light substance, very little soluble in water, but readily dissolved by alcohol and ether. A solution of kinovate of magnesia forms precipitates (kinovates with solutions of acetate of lead, bichloride of mercury, and the salts of cinchonia.

6. CINCHONA ALKALIS (Cinchonia, Quina, and Aricina).—It appears from the observations of Henry and Plisson (*Journ. de Pharm.* xiii. 269, and 369) that cinchonia and quina exist in cinchona bark in combination with kinic acid, and also with red cinchonic. The quantities of cinchonia and quina yielded by some cinchona barks is thus stated by Soubeiran (*Traité de Pharm.* i. 603) and by Von Santen (Bergen, *Monograph Pl.*),—Goebel's table has been already (p. 428) given:

According to Soubeiran.

One French lb. (7361 grs. Troy).	Troy Grains.
1. Uncoated Yellow (Calisaya) Bark	202 to 218 grs. of sulphate of Quina.
2. Coated Yellow (Calisaya) Bark	177 grs. of ditto.
3. Loxa Bark	88½ to 118 grs. of Sulphate of Cinchonia.
4. Gray (Lima) Bark	88½ grs. of ditto.
5. Deep Red Bark	118 grs. of Sulphate of Quina, and 59 grs. of Sulphate of Cinchonia.
Pale Red Bark	88½ grs. of Sulphate of Quina, and 59 grs. of Sulphate of Cinchonia.
Spongy Carthagena Bark	19½ to 20½ grs. of Sulphate of Cinchonia.

According to Von Santen.

One lb. (Apoth. Weight).	Apoth. Grains.
1. Coated Yellow (Calisaya) Bark..	160 grs. of Sulphate of Quina, and 2 grs. of pure Cinchonia.
2. Loxa Bark	53½ grs. of Sulphate of Quina.
3. Gray (Huanuco) Bark	210 grs. of pure Cinchonia.
4. Red Bark	184 grs. of pure Cinchonia, & 9 grs. of Sulphate of Quina.
5. Hard Carthagena Bark	30 grs. of pure Cinchonia, & 32 grs. of Sulphate of Quina.
6. Fibrous Carthagena Bark	33 grs. of pure Cinchonia, & 30 grs. of Sulphate of Quina.
7. Huamaties Bark	93 grs. of pure Cinchonia.
8. Ash-Cinchona Bark	1 gr. of Gallate of Quina.
9. False Loxa Bark	0

Cinchona and quina possess the following properties: when burned with nitrate of ammonia they leave no mineral, earthy, or alkaline residuum. Their alkaline nature is shown by their restoring the blue colour of reddened litmus. An iodate and hydriodate are formed when iodine and water is mixed with cinchonia or quina. Nitric acid does not colour either of these alkalis; hence they are distinguished from morphia, brucia, and commercial strychnia. When a solution of the nitrate of either cinchonia or quina is concentrated, the anhydrous nitrate separates under the form of oleaginous drops, which solidify on cooling, and, if immersed in water, absorbs this fluid, and become covered in a few days with groups of crystals. Solutions of the salts of cinchonia and quina form precipitates on the addition of ammonia, ferrocyanide of potassium, carbazotic acid, tincture of nutgalls, oxalate of ammonia, or of tartrate of potash. Cinchonia, quina, and aricina, may be regarded as oxides of a common base (composed of $C^{20} H^{12} N$), which has been termed *quinogen*.

1 atom Quinogen..... = 146	1 atom Quinogen..... = 146	1 atom Quinogen..... = 146
1 atom Oxygen..... = 8	2 atoms Oxygen..... = 16	3 atoms Oxygen..... = 24
1 atom Cinchonia..... = 154	1 Quina..... = 162	1 Aricina..... = 170

According to this hypothetical view cinchonia is a monoxide, quina a binoxide, and aricina a teroxide.

a. QUINA (Quinine; Quina; Quinum) (Quinia).—The simplest, readiest, and cheapest mode of procuring it, is by precipitating a solution of the disulphate of quina by ammonia, and collecting and drying the precipitate. Pelletier crystallized it by dissolving it in alcohol of sp. gr. 0.815, and setting the solution aside to evaporate spontaneously in a dry place.

Pure quina is white, inodorous, very bitter, and fusible at about 300° F. The fused quina when cold is yellow, translucent, friable, and somewhat like resin. Boiling water dissolves 1.200th of its weight of quina: cold water dissolves a much less quantity. It is readily soluble in alcohol (especially when hot), and in ether. Crystallized quina is a hydrate of quina, and contains one equivalent of water. The salts of quina are readily crystallizable, very bitter, and have a pearly aspect. They are for the most part, soluble in water, alcohol, and ether. The

oxalate, tartrate, tannate, and ferrocyanate, are the less soluble salts. Tincture of nutgalls causes a precipitate (*tannate of quina*) in a solution of a quina sub or neutral salt. Ammonia also produces a precipitate (*quina*).

The following is the composition of quina :

	Atoms.	Eg. Wt.	Per Cent.	Liebig.	Pelletier and Dumas.
Carbon.....	20	120	74.08	74.40	75.02
Hydrogen.....	12	12	7.40	7.61	6.66
Nitrogen.....	1	14	8.64	8.11	8.45
Oxygen.....	2	16	9.88	9.88	10.43
Anhydrous Quina.....	1	162	100.00	100.00	100.56

1. *Disulphate of Quina* (see p. 445).

2. *Monosulphate of Quina; Neutral Sulphate of Quina*.—This salt is readily formed by adding sulphuric acid to the disulphate. It is sometimes produced in the manufacture of the latter salt, and remains, on account of its greater solubility, in the mother liquor, with the sulphate of cinchonia. It is also produced when we dissolve the disulphate in an aqueous liquid acidulated with sulphuric acid. This salt crystallizes in square prisms. It reddens litmus, but is not acid to the taste. It is soluble in 22 parts of water at 55° F. or 11 parts at 73° F. It is also soluble in alcohol. It is composed of

	Atoms.	Eg. Wt.	Per Cent.
Sulphuric Acid.....	1	40	14.6
Quina.....	1	162	59.1
Water.....	8	72	26.3

Crystallized Sulphate of Quina..... 1 274 100.00

3. The *Native Kinate of Quina* is crystalline, very bitter, slightly soluble in alcohol, but very soluble in water. It is decomposed by ammonia, potash, or of lime. The salts of lead and of silver slightly acidulated, do not produce with it any apparent precipitate.

4. The *Native Compound of Red Cinchonic and Quina* is bitter, scarcely soluble in cold water, but more so in boiling water; the liquor becomes turbid as it cools. Acids promote its solution in water. It is readily soluble in alcohol. Alkalis decompose it, and precipitate the quina.

β. *CINCHONIA* (*Cinchonine; Cinchonina; Cinchoninum*).—Obtained by precipitation from a salt of Cinchonia by ammonia. It crystallizes with facility from its alcoholic solution. *Crystallized Cinchonia* is anhydrous, colourless, inodorous, and bitter. The form of the crystals is a four-sided prism, with oblique, terminal facets. When heated this salt does not fuse until it begins to decompose: it then fuses, furnishes a crystalline sublimate (*cinchonia?*), gives out ammonia, and leaves a carbonaceous residuum. It is soluble in 2,500 parts of cold water, and in a somewhat less quantity of boiling water; the hot solution becomes opaque as it cools. It is soluble in alcohol, especially when hot: from the solution, on cooling, crystals are obtained. Its solubility in alcohol is, however, less than that of quina in this fluid. It is soluble in ether, but much less so than in alcohol. It dissolves, though slightly, in fixed oils, somewhat more so in oil of turpentine, and readily in diluted acids.

1. *Disulphate of Cinchonia; Cinchonina Disulphas; Subsulphate of Cinchonia*.—Its crystals are short, oblique prisms, terminated by bihedral summits. Its taste is bitter. When heated it becomes phosphorescent: at 212° F. it fuses; at 248° F. it loses its water of crystallization. It is soluble in 6 parts of alcohol of sp. gr. 0.85, and in 11 parts of absolute alcohol. It requires 54 parts of cold water to dissolve it. The following is its composition:—

	Atoms.	Eg. Wt.	Per Cent.
Sulphuric Acid.....	1	40	10.42
Cinchonia.....	2	308	80.20
Water.....	4	36	9.38

Crystallized Disulphate of Cinchonia. 1 384 100.00

This salt has been frequently employed in medicine under the name of *sulphate of cinchonia*.

2. *Neutral Sulphate of Cinchonia* is not employed in medicine. It is prepared by adding sulphuric acid to a solution of the disulphate. The crystals contain eight atoms of water of crystallization. They are much more soluble than those of the disulphate.

3. The *Native Kinate of Cinchonia* possesses similar properties to the native kinate of quina; but ammonia produces with it a less flocculent precipitate, and which dissolves in alcohol, and is susceptible of crystallization.

Comparative Table of some distinguishing properties of Cinchonia and Quina.

	Cinchonia.	Quina.
Form.....	Crystalline.	Amorphous (in the anhydrous state.) The hydrate is crystallizable, but with difficulty.
Taste.....	Bitter.	Very bitter.
Fusibility.....	Infusible when quite dry; when moist fuses, but at the same time decomposes.	Fusible.
Composition.....	One atom contains only one atom of oxygen.	One atom contains two atoms of oxygen.
Combining proportion, or atomic weight.....	154	162
Solubility	in water.....	Dissolves in 2500 times its weight of boiling water.
	in alcohol.....	Soluble; solution readily crystallizes.
	in ether.....	Sparingly soluble; solution readily crystallizes.
Salts.	Disulphate { form and aspect solubility.....	Four-sided prisms. Soluble in 54 parts of cold water or 6 parts of spirits (sp. gr. 0.85).
	Neutral Sulphate.....	Soluble in half its weight of cold water or one part of cold spirit (sp. gr. 0.85).
	Hydrochlorate.....	Crystallizes in needles.
	Phosphate.....	Scarcely crystallizable; aspect gummy.
	Arseniate.....	Scarcely crystallizable.
	Acetate.....	Very soluble; crystals small and granular.
The solution of disulphate treated by chlorine, then by ammonia, yields.....	A reddish solution.	Crystallizes in 200 times its weight of boiling water. More soluble than cinchonia; solution with difficulty crystallizes. Very soluble; solution crystallizes with difficulty. Pearly silky needles. Soluble in 740 parts of cold water or 80 parts of spirit (sp. gr. 0.85). Soluble in 11 parts of cold water More soluble in spirit than sulphate of cinchonia. Crystallizes in silky or pearly tufts. Crystallizes in pearly needles. Crystallizes in prismatic needles. Less soluble; crystals in silky tufts, grouped in stars, &c.
		An emerald-green solution.

γ. ARICINA: *Cusco-cinchonia*; *Cusconin*.—Discovered in *Arica* or *Cusco-Cinchona* by Pelletier and Coriol in 1829. It was procured from this bark by the same process that quina is extracted from the yellow bark. It is a white crystallizable substance, analogous to cinchonia in many of its properties, but is distinguished by its acquiring a green tint by the action of nitric acid, and by a boiling saturated solution of the sulphate forming, as it cools, a tremulous jelly, which by desiccation becomes horny. It consists of—

	Atoms.	Eq. Wt.	Per Cent.
Carbon.....	20	120	70.59
Hydrogen.....	12	12	7.06
Nitrogen.....	1	14	8.23
Oxygen.....	3	24	14.12
Aricina.....	1	170	100.00

* * * Several other alkaloids have been said to exist in the Cinchona barks; but further evidence is required to establish their existence. Dr. Mills (*Quart. Journ. of Science* for April 1828, p. 379,) has given the name of *Blanquinine* to a supposed new alkaloid in white Cinchona *C. ovalifolia*, (see p. 424.) The *Chinoidine* of Sertuerner (*Jour. de Pharm.* xvi. 44.) is according to Henry fils and Delondre, (*Ibid.* 144,) merely a mixture of quina and cinchonia with yellow colouring matter. The *alkalescent matter of Cinchona nova* (see p. 426) requires further examination. The *alkaloids of the false Cinchona barks* have been already (p. 417) referred to.

CHEMICAL CHARACTERISTICS.—The most important chemical characteristics of the cinchona barks are those derived from the action of the following reagents on infusions of bark: *tincture of nutgalls*, *emetic tartar*, *gelatine*, *sulphate of iron*, and *neutral oxalate of ammonia*. The first is a test for the alkaloids, the three following for tannic acid, and the last for lime. Tables of the changes produced by these and other tests have been published by Vauquelin, (*Ann. de Chim.* lix. 113.) Von Santen, (Bergen, *Monogr.*) Guibourt, (*Hist. des Drog.* ii.) and Martius. (*Pharmakogn.* 126.) The following table is from the last mentioned pharmacologist:—

Cold Infusion, (prepared by digesting for 30 hrs. 1 part of bark in 32 of water).	Emetic Tartar.	Gelatine.	Neutral Oxalate of Ammonia.	Tincture of nutgalls.	Sulphate of iron.
1. HARD CARTHAGENA BARK.	Unchanged	Unchang'd	Turbidness	Strong yellowish-white turbidness.	Slight yellowish-white turbidness.
2. FIBROUS CARTHAGENA BARK	Unchanged	Unchg'd	Slight turbidness	Ditto	Colour yellowish.
3. HUAMALIES BARK	Slight turbidness	Unchg'd	Slight turbidness	Ditto	Colour greenish yellow.
4. HUANUCO BARK	Unchanged	Unchg'd	Scarcely changed	Very slight turbidness	Dirty brownish-green turbidness.
5. ASH CINCHONA	Unchanged	Unchang'd	Turbidness..	Turbidness..	Not changed.
6. LOXA BARK	Strong flocculent white turbidness	Slight flocculent turbidness	Very strong yellowish-white turbidness	Very strong yellowish-white turbidness	Dirty bluish-green turbidness.
7. FALSE LOXA BARK	Unchanged	Unchang'd	Turbidness..	Turbidness..	Not changed.
8. YELLOW (CALISAYA) BARK.	Turbidness	Unc'd[?]	Slight turbidness	Strong flocculent white turbidness	Slight dirty violet turbidness.
9. RED BARK	Unchanged	Unchang'd	Turbid	Ditto	Coarsely flocculent, slight dirty-violet turbidness.
10. CINCHONA RUBIGINOSA	Cloudy ...	Unchang'd	Turbid	Ditto	Very slight turbidness.
11. CINCHONA NOVA	Unchanged	Flocculent turbidness	Extremely slight turbidness	Unchanged	Dirty greenish-brown turbidness.

The barks may be arranged, after Vauquelin, in three sets :

1. Those whose infusions precipitate infusion of nutgalls, but not a solution of gelatine: ex. *Carthagenae barks*. These contain the alkalis, but no tannic acid.
2. Those whose infusions precipitate a solution of gelatine, but not an infusion of nutgalls: ex. *Cinchona nova*. These contain tannic acid, but no appreciable quantity of cinchonina or quina.
3. Those whose infusions precipitate both a solution of gelatine and an infusion of nutgalls: ex. *Loxa Bark*. These contain both alkalis and tannic acid.

CHEMICAL CHARACTERISTICS OF THE GOODNESS OF CINCHONA BARKS.—The best cinchona barks are those which contain, in the greatest abundance, the vegetable alkalis and tannic acid. For, although the essential tonic operation of cinchona depends on the cinchonina and quina, yet the astringency and part of the tonic effect arises from the tannic acid. "There exists a law in Sweden," says Berzelius, (*Traité de Chim.* v. 587,) "in virtue of which every cinchona bark imported into the country is tested by the infusion of galls, the persulphate of iron, a solution of gelatine, and emetic tartar; and it is proved by an experience of more than sixteen years, that the most efficacious bark is that which precipitates the most strongly a solution of gelatine and emetic tartar; in other words, that which contains the most tannin." Hence the chemical tests for good cinchona bark are twofold—1st, those which detect the tannic acid, and 2dly, those which detect the vegetable alkalis.

1. Tests for Tannic Acid.—These are three in number :

1. A solution of gelatine, which occasions in infusion of cinchona a whitish precipitate (*tannate of gelatine*).
2. A solution of a sesquiferruginous salt (as persulphate of iron or sesquichloride of iron) which produces a green colour or precipitate (*tannate of iron*).
3. A solution of emetic tartar, which causes a dirty white precipitate (the nature of which has been before discussed, p. 428).

¹ An infusion of Calisaya, twice as strong as the above, yields a white precipitate on the addition of sulphate of soda (see p. 434).

2. **Quinometry.**—Various alcaolometrical processes, applicable to the cinchona barks, have been recommended. They are essentially of two kinds: some consist in the use of certain reagents or tests which precipitate the alkaloids from an infusion of the bark, others are processes for the extraction of the alkaloids, which are obtained either in the free state or as salts (disulphates).

1. **PROCESSES BY TESTS.**—*a.* **Tannic acid** is a very delicate test of the Cinchona alkalis, which it precipitates from their solutions, in the form of *tannates*. On this depends the value of infusion or tincture of nutgalls, employed as a test of the goodness of bark by Vauquelin, (*op. supra cit.*), by Berzelius, (*op. supra cit.*) and by O. Henry. (*Journ. de Pharm.* xx. 429.)

β. **Chloride of Platinum.**—Duflos's quinometrical method (*Pharm. Central-Blatt für* 1831, S. 537) is founded on the property of the cinchona alkalis to form with [neutral] chloride of platinum double salts (*platinum-chlorides of the alkaloids*) which are insoluble in alcohol, and very difficultly soluble in cold water. One grain of these salts dried in the air contains about half a grain of the alkaloids.

γ. **Bichloride of Mercury.**—As bichloride of mercury forms with hydrochlorates of quina and cinchona, double salts (*mercury-bichlorides of the alkaloids*) which are only slightly soluble in water and in alcohol, it may perhaps be applicable, in some cases, as an alcaolometrical test.

2. **EXTRACTION OF THE CINCHONA ALKALIS.**—The methods of extracting cinchonia and quina from bark for alcaolometrical purposes are various. They may be referred to under four divisions:

a. **By Alcohol.**—Some chemists begin by preparing an alcoholic tincture of bark, without using in the first instance either acid or mineral alkali. This is the method adopted by Pelletier and Caventou, (*Journ. de Pharm.* vii. 52,) by Tilloy, (*Ibid.* xiii. 530,) and by Bonnet. (*Pharm. Central-Blatt für* 1832, S. 900.) From this tincture the alkaloids may be extracted by various processes.

β. **By Acidulated Liquids, without the previous use of alkaline solutions.**—In some alcaolometrical processes the bark is digested in spirit, acidulated with sulphuric or hydrochloric acid; as in those of Henry fils, (*Journ. de Pharm.* xvi. 754,) and Stoltze. (*Pharm. Central-Blatt für* 1832, S. 896.) In others acidulated water is used, as in the methods of Von Santen, (*Bergen. Monogr.* 343,) Henry and Plisson, (*Journ. de Pharm.* xiii. 270,) and Winkler. (*Pharm. Central-Blatt für* 1835, S. 509.)

γ. **By Acidulated Liquors, after the use of alkaline solutions.**—Scharlau's method (*Pharm. Central-Blatt für* 1832, S. 487) is founded on the property of red cinchonic and cinchona-tannin (with both of which the cinchona-alkaloids are combined) to dissolve in caustic alkalis, and thereby to be extracted from the bark: the cinchonia and quina which are left behind may be subsequently removed by an acidulated liquor. Badollier (Dumas, *Traité de Chim.* v. 745) also employed caustic potash: Stoltze (*Ibid.* 746) a mixture of lime and water. In the process of the *Edinburgh Pharmacopœia* for the manufacture of disulphate of quina, an alkaline carbonate (carbonate of soda) is used.

δ. **By Water.**—The *Edinburgh Pharmacopœia* gives the following directions for ascertaining the good quality of yellow bark. "A filtered decoction of 100 grains in two fluid ounces of distilled water gives, with a fluid ounce of concentrated solution of carbonate of soda, a precipitate, which, when heated in the fluid, becomes a fused mass, weighing when cold 2 grains or more, and easily soluble in solution of oxalic acid." In this process the native salts of quina extracted by the boiling water are decomposed by carbonate of soda. By heat the quina fuses.

Of the above quinometrical processes I give the preference to that employed by the Edinburgh College in the manufacture of disulphate of quina.

The separation of quina and cinchonia, in order to estimate the quantity of each, is a matter of some importance. It is effected by the different degrees of solubility of these alkaloids or their salts, and by the easy crystallizability of cinchonia.

1. **Boiling Alcohol** may be employed to separate these alkaloids: when this liquid, charged with the two alkaloids, cools, the cinchonia crystallizes, but the quina remains in the mother liquor. This mode of separation was adopted by Pelletier and Caventou. (*Journ. de Pharm.* vii. 305.)
2. **Ether** was used by Scharlau (*Pharm. Central-Blatt für* 1832, S. 488,) as well as by others, to separate the two alkaloids: quina is more soluble than cinchonia in this liquid.
3. **Disulphate of quina is less soluble in water than disulphate of cinchonia:** hence, when these two salts have been dissolved in boiling water, the first crystallizes as the solution cools, while the disulphate of cinchonia remains in the mother liquor.

To manufacturers of disulphate of quina it is of importance to have a ready means of estimating the quantity of quina, as distinguished from cinchona, which a bark yields. *Sulphate of Soda* is frequently used for this purpose. It has been found that the yellow (Calisaya) bark contains so much lime that an infusion (prepared by digesting for twenty-four hours one part of coarsely-powdered bark in sixteen parts of cold water) yields, on the addition of sulphate of soda, a white precipitate of sulphate of lime; whereas those barks (as the *pale* kinds) which are deficient in quina give no precipitate with this salt. Guibourt (*Journ. de Chim. Méd.* ii. 624, 2nd Ser.) directs this test to be used thus: mix the powder of the bark with water, so as to form a thin paste; which is to be placed on a filter, and the filtered liquor tested with sulphate of soda (crystals).

PHYSIOLOGICAL EFFECTS.—1. Of the Cinchona Barks.—The experiments of Dr. Adair Crawford (*Experimental Inquiry into the Effects of Tonics*, 1816,) on the effects of tonics in promoting the cohesion of the animal tissues, have been already (vol i. p. 189) referred to. He found that a kitten's intestines, which had been immersed in a thick mixture of cinchona bark and water, required a greater weight to break them than those immersed in water merely, in the ratio of 25.5 to 20.7. He found, moreover, that the same effect was produced on the blood-vessels and nerves; but an opposite effect on the skin, the cohesion of which it diminished in the ratio of 24.5 to 7.9. Hence he inferred that cinchona bark strengthened the alimentary canal, blood-vessels and nerves, but had a debilitating or relaxing effect on the skin. The error pervading these inferences has been already pointed out. Admitting that the dead animal tissues are invariably affected by cinchona in the way Dr. Crawford states, the conclusion that living tissues would be influenced in the same way is not supported by facts. Cold water relaxes dead, but corrugates living, animal tissues.

a. On Vegetables.—Leaves of plants, immersed in an infusion of pale bark, were dried, but not contracted, in twenty-four hours. (De Candolle, *Phys. Vég.* 1349.)

β. On Animals generally.—Dr. Freind (*Emmenol.* c. xiv.) states that an ounce and a half of a strong decoction of bark injected into the jugular vein of a dog caused, in fifteen minutes, strong palpitations of the heart, and frequent spasms. Half an ounce more being injected, brought on tetanus and death. The blood was found after death liquid, the lungs red and turgid; the right ventricle was distended with blood, the left contained scarcely any. Rauschenbusch (quoted by Wibmer, *Wirk. d. Arzn. u. Gifte.* Bd. ii. 132,) has also made experiments with cinchona bark. In animals to whom he had given it for some days, he found the stomach and alimentary canal contracted, and the coats thickened, but no traces of inflammation. The heart was firmer, the lungs covered with red spots, the liver yellowish, the bile watery and greenish. When the blood was exposed to the air, it remained dark coloured for a longer time than usual, was less coagulable, and the serum separated more slowly: it appeared like that drawn in inflammatory cases. The pulse was stronger and fuller, the animal heat increased, and when the bark had been used for a long period, the muscles were pale, and their energy enfeebled. Some experiments on the effect of cinchona on the blood discs of frogs were made by Leeuwenhoek, (*Contin. ad Epist.* p. 119,) who found that the infusion of bark divided some of the discs, and coagulated others.

γ. On Man.—The *topical effects* are astringent and slightly irritant. The astringency depends on tannic acid [and red cinchonic?]: hence those barks whose infusions are most powerfully affected by gelatine and the sesquiferruginous salts, enjoy the greatest astringent power. Both Loxa and yellow (Calisaya) bark possess this property in a pre-eminent degree: whereas Carthagea bark is deficient in it. The *constitutional effects* are principally manifested

by the disordered conditions of the vascular and cerebro-spinal systems. In some conditions of system, cinchona operates as an *irritant* or *stimulant*; in others as a *stomachic*, *tonic*, and *corroborant*.

If a man in a state of perfect health take a small or moderate dose of bark, no obvious effects are produced,—or perhaps a little thirst, with some slight disorder of stomach, or a temporary excitement of appetite may be brought on. If the dose be increased, the alimentary canal becomes disordered (indicated by the nausea, vomiting, loss of appetite, thirst and constipation, or even purging); a febrile state of the system is set up (manifested by the excitement of the vascular system and dry tongue), and the cerebro-spinal system becomes disordered, as is shown by the throbbing headache, and giddiness. The disturbance of the functions of the stomach is produced not only when the bark is given in the more nauseating form of powder, but also in the form of infusion or decoction or tincture. These symptoms indicate a stimulant operation, which is still more manifest when the bark is given to a person suffering with gastro-enteric irritation, accompanied with fever. All the morbid phenomena are exasperated, the febrile disorder is increased, and symptoms of gastritis come on. None of the effects now enumerated include those to which the term *tonic* is properly applicable. These are to be sought for in patients suffering from debility, without symptoms of local irritation. In such we find cinchona improves the appetite, promotes the digestive functions, and increases the strength of the pulse. The muscular system acquires more power, and the individual is capable of making greater exertion, both mental and bodily, than before; the tissues acquire more firmness to the touch, and lose their previous flabbiness; moreover, it has been asserted, and with great probability of truth, that the quality of the blood improves.

The real *stomachic*, *tonic*, and *corroborative* effects of cinchona, as indeed of other agents of the same class, are then only observed in certain morbid conditions.

“The general operation of cinchona bark,” observes Sundelin, (*Heilmittell.* ii. 307, 3^{te} Aufl.) “consists in the *increase and exaltation of the tone of the irritable fibres and of the fibres of the vessels* (hence by its use the pulse becomes fuller, stronger and regular, and the muscular power increased); also in the *general augmentation of the cohesion of the organic mass* (hence it counteracts a tendency to liquefaction [*Verflüssigung*] and disintegration [*Entmischung*], diminishes profuse secretions which proceed from atony of the extremities of the vessels, and of the discerning surfaces and organs, and improves generally the crasis) and lastly, in *augmentation of the vital energy of the sensible system*. (By the last-mentioned property it restores sensibility, when defective or abnormally increased, and the property of reaction of the nervous system, to their normal state, and augments the influence of this system on the muscular fibre and on the reproductive system).” As these effects are not produced until the active constituents of the bark have been absorbed, they take place gradually, and by the long continued use of this agent.

The power possessed by cinchona of suspending or completely stopping periodical diseases, deserves to be noticed here, though it will have to be again referred to hereafter. It is doubtless in some way related to the before mentioned effects; but the connection is, as yet, mysterious and incomprehensible.

Active principles of the cinchona barks.—The cinchona alkaloids are the essential tonic principles of bark. In them also resides the *antiperiodic* (*specific*, as it is frequently termed) power of this remedy (see p. 439). The tannic acid confers astringent powers, and promotes the tonic operation of the alkaloids. The red cinchonic must also slightly contribute to the general effects of the bark. The kinate of lime (supposed by Deschamps to be the active principle of cinchona) is probably inert: it has neither bitterness nor stypticity, and is insoluble in alcohol. The aromatic flavour depends on volatile oil.

Comparison of cinchona with other tonics.—Cinchona scarcely admits of comparison with any other vegetable substance. It is pre-eminently distinguished by its great tonic and almost specific febrifuge properties. It is farther distinguished from the *simple bitters* (as gentian, quassia, simaruba, calumba, &c.) by its astringency; from the *pure astringents* (as oak bark, nutgalls, catechu, kino, &c.) by its extreme bitterness; from the *aromatic bitters* (as cascarilla, chamomile, wormwood, elecampane, &c.) by its astringency and comparative deficiency in volatile oil, and consequently, in stimulant properties. Willow and angustura barks, perhaps more closely approximate to cinchona than other vegetable substances in ordinary use. In regard to antiperiodic or febrifuge powers, arsenious acid is the only remedy that can be compared with bark.

Comparison of the cinchona barks with each other.—I need not insist on the superiority of *genuine* over *false* cinchona barks. The inferiority of those barks which have a *whitish epidermis* (as the *Carthagena* barks, see p. 424 et seq.) is shown by the small quantity of cinchona alkaloids which they yield. The anecdote before-mentioned (p. 426) proves that the Spaniards had long since ascertained the inferiority of one of these. *Pale, Red, and Yellow (Calisaya) Cinchona* are the kinds which have been principally examined in this country: their pre-eminence over all others is now universally admitted. The experiments and observations of Saunders, (*Obs. on the sup. Effic. of Red Peruv. Bark*, 1782,) Rigby, (*Essay on the Use of Red Peruv. Bark*, 1783,) Kentish, (*Exp. and Obs. on a new Spec. of Bark*, 1784,) Irving, (*Expts. on Red and Quill. Peruv. Bark*, 1785,) and Skeete (*Expts. and Obs. on Quill. and Peruv. Bark*, 1786,) seem to have established the superiority of *red* bark to the pale or quilled kind. But in adopting this statement we ought, if possible, to ascertain what kind of pale bark was used in making the above observations? And also to determine whether the red bark referred to be identical with that now in commerce? Dr. Relph (*Inq. into the Med. Effic. of Yellow Bark*, 1794,) afterwards asserted the superiority of *yellow* bark to both the pale and red kinds. His statements are borne out by the almost exclusive consumption of this bark during the last twenty years.

2. *Of the Cinchona Alkaloids.* *a. On Vegetables.*—According to Goepfert, the leaves of plants plunged in a solution of sulphate of quina (gr. ss. of the salt to ʒss. of water) presented evidences of contraction in six or eight hours. (De Candolle, *Phys. Vég.* 1349.)

β. On Animals generally.—As soon as Pelletier had discovered the alkalis in bark, he sent some of them to Magendie for trial, who ascertained that neither in the pure nor saline state were they poisonous; and he found that ten grains of the sulphate or acetate of these bases might be injected into the veins of a dog without any ill effect. (*Journ. de Pharm.* vii. 138.) Hartl (*Wirk. d. Arzneim. u. Gifte*, Bd. ii. S. 133,) found that three grains of quina, applied to a wound in a rabbit, occasioned no ill effects.

γ. On Man.—The constitutional effects of the cinchona alkalis are similar to those of the barks, but more energetic. It will be superfluous, therefore, to enumerate the symptoms caused by *small doses* of these substances. Far more interesting are the effects of *large doses*, as they lead to a more intimate acquaintance with the kind of influence exercised by the barks.

In doses of from ten to twenty or more grains, disulphate of quina has produced three classes of effects:

1. *Gastro-enteric irritation*, marked by pain and heat in the gastric region, nausea, gripings, and purging. Occasionally ptialism has been observed. Constipation sometimes follows its use.
2. *Excitement of the vascular system*, manifested by increased frequency and fulness of pulse and augmented respiration. Furred tongue, and other symptoms of a febrile state, are also observed.
3. *Disorder of the cerebro-spinal functions*, indicated by headache, giddiness, contracted, in

some cases dilated, pupils, disorder of the external senses, agitation, difficulty of performing various voluntary acts (as writing), somnolency, in some cases delirium, in others stupor.

A remarkable case is mentioned by Trousseau and Pidoux. (*Traité de Thérap.* ii. 217.) A soldier took 48 grains of the disulphate of quina for the cure of an asthma [spasmodic], which returned daily at a certain hour. Four hours after taking it he experienced buzzing in the ears, diminished sensibility, giddiness, and violent vomitings. Seven hours after taking the quina he was blind and deaf, delirious, incapable of walking on account of the giddiness, and vomited bile copiously. In fact, he was in a state of intoxication. These effects subsided in the course of the night.

Difference in the operation of quina and cinchonina.—When we take into consideration the analogy of composition and of chemical properties of these two alkaloids, we are led to suspect analogy of physiological effects. When they were in the first instance submitted to examination, cinchonina and its salts were thought, principally on the evidence of Chomel, to be much inferior in activity to quina and its salts. But the subsequent observations of Dufour, Petroz, Potier, Bally, Nieuwenhuiss, Mariani, Bleyne, and others, have proved that the disulphates of these alkalis may be substituted for each other. (*Dict. de Mat. Med.* t. ii. 288.) Nay, Bally gives the preference to the disulphate of cinchonina, on the ground that it is less irritating than the disulphate of quina. That cinchonina is as active as quina might have been anticipated, *a priori*, when we recollect that those barks in which cinchonina is the predominant principle have been celebrated as therapeutic agents. This fact of the equal value of cinchonina and its salts with quina and its salts, acquires some importance from the apprehended failure of the yellow bark, in which the quina abounds. Practitioners, however, have been so long accustomed to the use of the disulphate of quina, that as long as this can be procured, some difficulty will be experienced in the introduction into practice of the disulphate of cinchonina.

Comparison of the Cinchona Alkaloids with their salts.—Some of the salts of the cinchona alkaloids being more soluble than their bases, it has been inferred that they are, consequently, more active. But it has been asserted by Nieuwenhuiss, Mariani, Bleyne, and others, that the bases are equally active, and may be substituted for the salts with advantage. (*Dict. de Mat. Med.* t. v. p. 596.) Acid drinks should be given to favour their solution in the stomach. Quina, in the crude or impure state, has been employed with success by Trousseau. (Soubeiran, *Traité de Pharm.* i. 604.) Its advantages over the disulphate, are, that it is less apt to purge; it may be exhibited in a smaller dose, and it has but little bitterness. This last property facilitates the use of it, especially in children.

Comparison of the salts of the cinchona alkaloids with each other.—I have already described the effects of the disulphate of quina. The sulphate of quina is formed when we dissolve the disulphate in water, acidulated with sulphuric acid: it is somewhat more irritant than the last-mentioned salt. The phosphate of quina is said to be neither so apt to disturb the stomach, nor to excite the vascular system, as the disulphate. Hence it is better adapted for cases accompanied with gastric irritation and febrile disorder. The ferrocyanate of quina has been recommended, in preference to the disulphate, in intermittent fevers, accompanied with inflammatory symptoms. The tannate of quina is declared, by Dr. Rolander, of Stockholm, to be the most powerful of the quina salts. The tannic acid, though not the peculiar febrifuge constituent of cinchona bark, yet contributes to its tonic powers, and thereby promotes the activity of the alkaloids. This statement is supported by the already referred-to remark of Berzelius (see p. 432), that the most active cinchonas are those which contain the largest quantity of tannin. The nitrate, hydrochlorate, acetate, and citrate of quina, have been employed in medicine; but I am not acquainted

with any remarkable advantages they possess over the sulphate. The *kinate of quina*, as being one of the native salts of the alkaloid, deserves further examination. The *arsenite of quina* might, perhaps, be found available in some obstinate intermittents, and well deserves examination. The *salts of cinchonia*, except the disulphate, have been imperfectly examined.¹

Comparison of the cinchona barks with their alkaloids.—It has been asserted, that the cinchona alkaloids possess all the medicinal properties of the barks, and may be substituted for them on every occasion (Magendie, *Formul.* p. 131, 8^{me} éd.); but I cannot subscribe to either of these statements; for, in the first place, the alkalis are deficient in the aromatic quality possessed by the barks, and which assists them to sit easily on the stomach; and it is to this circumstance that I am disposed to refer a fact which I have often observed, that disulphate of quina will sometimes irritate the stomach, occasion nausea and pain, and give rise to febrile symptoms, while the infusion of bark is retained without the least uneasiness. Moreover, we must not overlook the tannic acid, which confers on bark an astringent property. So that while we admit that the essential tonic operation of the barks depends on the alkalis which they contain, yet the latter are not always equally efficacious. In some cases, however, they are of great advantage, since they enable us to obtain, in a small volume, the tonic operation of a large quantity of bark.

Uses.—From the preceding account of the physiological effects of cinchona, some of the indications and contra-indications for its use may be readily inferred. Thus its topical employment is obviously indicated in cases of local relaxation, with or without excessive secretion; also in poisoning by those agents whose compounds with tannic acid are difficultly soluble, and, therefore, not readily absorbed. But as a topical remedy, or astringent, cinchona is greatly inferior to many other agents which contain a much larger quantity of tannic acid. The contra-indications for the local use of cinchona, are, states of irritation (nervous or vascular), and of inflammation. In these conditions it augments the morbid symptoms.

The indications for its use, as a general or constitutional remedy, are, debility with atony and laxity of the solids, and profuse discharges from the secreting organs. I have observed that it proves less successful, and often quite fails, when the complexion is chlorotic or anæmic, in such, chalybeates often succeed where cinchona is useless or injurious. As contra-indications for its employment, may be enumerated acute inflammation, inflammatory fever, plethora, active hemorrhages, inflammatory dropsies, &c. To these may be added, an extremely debilitated condition of the digestive and assimilative organs. Thus, patients recovering from protracted fever are at first unable to support the use of bark, which acts as an irritant to the stomach, and causes an increase of the febrile symptoms. In such I have found infusion of calumba a good preparative for cinchona.

Hitherto I have referred to those indications only which have an obvious relation to the known physiological effects of cinchona. But the diseases in which this remedy manifests the greatest therapeutic power, are those which assume an intermittent or periodical type. Now in such the *methodus medendi* is quite inexplicable; and, therefore, the remedy has been called a *specific*, an *anti-periodic*, and a *febrifuge*. But the more intimately we become acquainted with the pathology of disease, and the operation of medicines, the less evidence have we of the specific influence of particular medicines over particular maladies. Some diseases, however, are exceedingly obscure; their seat or nature, and the condition of system under which they occur, or the cause of their occurrence, being little known. There are also many medicines, the precise action of which is imperfectly understood, but which evidently exercise a most important, though

¹ For further details respecting the effects of the salts of quina, consult Merat and De Lens, *Dict. de Mat. Méd.* t. v. 597; and Dierbach, *Novec. Entid. d. Mat. Méd.* Bd. i. 8. 238.

to us quite inexplicable, influence over the system. Now it sometimes happens, that imperfectly-known diseases are most remarkably influenced by remedies, the agency of which we cannot comprehend: in other words, we can trace no known relation between the physiological effects of the remedy and its therapeutical influence. This incomprehensible relationship exists between arsenic and lepra; between the cinchona bark and ague. But though this connexion is to us mysterious (for I do not admit the various hypotheses which have been formed to account for it), we are not to conclude that it is necessarily more intimate than that which exists in ordinary cases.

1. *In Periodical or Intermittent Diseases.*—The system is subject to several diseases, which assume a *periodical* form; that is, they disappear and return at regular intervals. When the patient appears to be quite well during the interval (*i. e.* when the intermission is perfect and regular) the disease is called an *intermittent*; whereas it is called *remittent* when the second paroxysm makes its appearance before the first has wholly subsided (*i. e.* when the disease presents exacerbations and remissions, but no intermissions). The pathology of these affections is involved in great obscurity, and the cause or causes of their periodicity are completely unknown. Various circumstances, however, induce us to regard intermittent maladies as morbid affections of the nervous system; for the phenomena, both healthy and morbid, of periodicity, seem to be essentially nervous. (See some remarks on periodic movements in Müller's *Elem. of Phys.* by Baly, vol. i. p. 924.)

One of the most curious circumstances connected with the history of these diseases is the facility with which they are sometimes cured. It is well known that sudden and powerful impressions, both mental and corporeal (as those caused by terror, alcohol, opium, cinchona, arsenious acid, &c.), made during the intermission, will sometimes prevent the return of the succeeding paroxysm; and occasionally from that time all morbid phenomena disappear. In remittent diseases, on the other hand, the same impressions are much less frequently successful, and sometimes, instead of palliating, exasperate the symptoms. The agents which are capable, under certain circumstances, of making these curative impressions, are apparently so dissimilar in their nature and physiological action, that we can trace in their *methodus medendi* scarcely any thing in common, save that of making a powerful impression on the nervous system. Of these *anti-periodic* agents cinchona and arsenious acid stand pre-eminent for their greater frequency of success, and, therefore, are those usually resorted to. I have already (vol. i. p. 538) made some remarks on their relative therapeutical value. They differ in two particulars; first, cinchona may be given, as an antiperiodic, in any quantity which the stomach can bear; whereas arsenious acid must be exhibited in cautiously-regulated doses; secondly, there are two modes of attempting the cure of an intermittent by cinchona;—one is, to put an immediate stop to the disease by the use of very large doses of the remedy given a few hours prior to the recurrence of the paroxysm,—the other is to gradually extinguish the disease by exhibition of moderate doses at short intervals during the whole period of the intermission, so that the violence of every succeeding paroxysm is somewhat less than that of the preceding one;—but in the case of arsenious acid the latter method is alone safe, and, therefore, to be adopted.

It has been asserted that cinchona is admissible in the interval only of an intermittent fever; and that if it be exhibited during the paroxysm it has a tendency to prevent the subsidence of the latter. But this statement is much overcharged. Morton (*Pyretologia*,) and others have given it in almost every stage without injury. Dr. Heberden (*Comment. art. Feb. Interm.*) observes, “the only harm which I believe would follow from taking the bark even in the middle of the fit is, that it might occasion a sickness, and might harass the patient by being vomited up, and might set him against it.” It is, however, more efficacious during the interval, though it may not be absolutely hurtful in the pa-

roxysm. Dr. Cullen (*Mat. Med.* ii. 96,) was strongly of opinion that the nearer the exhibition of the cinchona is to the time of accession, the more certainly effectual will it be. I have already stated that arsenious acid may be given with good effect during the whole period (paroxysm and intermission) of the disease.

A very necessary condition to its perfect success is that it sit well on the stomach; for if it occasion vomiting or purging it is much less likely to act beneficially. Hence an emetic and a purgative are recommended to precede its employment. The use of these is more especially necessary if the disease be recent. For an adult, about 15 grains of ipecacuanha, with a grain of tartarized antimony, may be exhibited as an emetic, unless there be symptoms of determination to the brain, or of inflammation of the digestive organs. A senna draught, with a calomel pill, forms a good purgative. To enable it to sit well on the stomach, cinchona (or the sulphate of quina) is frequently given in conjunction with aromatics. The infusion or decoction of cinchona, though much less effective, are, however, less liable to disturb the stomach than the powder of cinchona or the sulphate of quina. Opium is sometimes a necessary adjunct to cinchona to prevent its running off by the bowels. In some cases where the stomach was too irritable to admit of the administration of cinchona or sulphate of quina by the *mouth*, these agents have been otherwise introduced into the system. Thus *clysters* of cinchona were used by Helvetius, Torti, and Baglivi. (Murray, *App. Med.* i. 871.) Van Swieten (*Commentaries*, vii. 277) says he has often seen this method successful in young children; but that it takes three times as much bark as would suffice if the remedy were swallowed. *Cataplasms* of cinchona have also been employed. Rosenstein applied them to the abdomen; Torti to the wrist. (Murray, *op. cit.* 872.) Alexander (*Exper. Essays*, 38) cured an ague by a *pediluvium* of decoction of cinchona; but Heberden (*Comment.*) tried it without success. *Bark jackets* were employed with success in the agues of children by Dr. Pye. (*Med. Obs. and Inq.* ii. 245.) They consisted of waistcoats between whose layers powdered cinchona was quilted. The dry powder of cinchona has been *applied to the skin*: thus Dr. Darwin strewed it in the patient's bed. Chrestien (*De la Méthode Intralept.* 232 and 270) successfully used the tincture and alcoholic extract by the *intraleptic method* (vol. i. p. 156). More recently sulphate of quina has been employed in the same way. The last mentioned operation has also been applied by the *endermic method* (*Archiv. Gén. de Med.* 1826; *Revue Méd.* 1827): but this mode of using it is sometimes attended with intense pain and eschar. (Trousseau and Pidoux, *Traité de Thérap.* ii. 219.) To infants at the breast, Rosenstein advises its indirect exhibition *by the nurse*, in whose milk its active principle is administered to the child. (*Ibid.* 231.) More recently sulphate of quina mixed with tobacco (in the proportion of 15 grs. of the former to an ounce of the latter) has been employed as a *snuff* in intermittent headache.

Cinchona and its preparations prove most successful in the simple or uncomplicated form of intermittents; that is, where the disease appears to be purely nervous. But when agues are accompanied with inflammatory excitement or with visceral diseases, cinchona generally proves either useless or injurious. In remittents it proves much less successful than in regularly-formed intermittents. In all these cases we endeavour to promote the efficiency of the cinchona by reducing the disease to the form of a pure or simple intermittent. The means to effect this must of course depend on a variety of circumstances; but blood-letting, both general and local, purgatives, and diaphoretics, are those which for the most part will be found available. Under some circumstances mercury given in alterative doses, or even as a very slight sialogogue, proves beneficial.

Intermittent fevers are not the only periodical diseases in which cinchona has been found beneficial. It is a remedy which has proved serviceable in several other cases in which a paroxysm (of pain, spasm, inflammation, hemorrhage,

or fever) returns at stated periods. Thus intermittent neuralgia, rheumatism, headache, amaurosis, catarrh, ophthalmia, stricture, &c., have been greatly benefitted by its use. Some of these affections have been regarded as *masked agues*. When periodical diseases recur at uncertain periods, as in the case of epilepsy, no particular advantage can be expected from the use of cinchona.

2. *In Continued Fever.*—In the latter stage of continued fever, when the vital powers are beginning to sink, and when there is no marked and decided symptom of inflammatory disease of the brain or digestive organs, cinchona or sulphate of quina sometimes proves highly beneficial. If the tongue be dry, as well as furred, and the skin hot and dry, no advantage, but the reverse, can be anticipated from its employment. It is most applicable to the low forms of fever occurring in debilitated constitutions. When exacerbations or remissions, however indistinct, occur at regular periods, the administration of cinchona is the more likely to be followed by good effects. Under the preceding circumstances there can scarcely be two opinions as to the admissibility of bark. But on the general propriety of administering this remedy in continued fever, considerable difference of opinion has prevailed. (Clutterbuck, *On the Seat and Nature of Fever*, 399, 2d edit., 1825.) Dr. Heberden (*Comment.*) cautiously observes, "I am not so sure of its being useful as I am of its being innocent." In order to avoid offending the stomach, it is frequently advisable to begin with the infusion, for which, afterwards, first the decoction, then the sulphate of quina, may be substituted. In the stage of convalescence, the use of cinchona or sulphate of quina may often be advantageously preceded by infusion of calumba: without this precaution, irritation of stomach or febrile symptoms are readily set up.

3. *In inflammatory diseases.*—As a general rule, stimulants and tonics, as cinchona, are improper in inflammatory diseases. Yet to this statement, which applies principally to the first stage, to acute and active cases, and to the disease when it occurs in strong and vigorous habits, many exceptions exist. Thus when it takes place in old and debilitated constitutions; when it is of a mild or atonic character, and has existed for some time without giving rise to any obvious organic changes; when it assumes an intermittent or even remittent form; or when it is of a certain quality, which experience has shown to be less benefitted by ordinary antiphlogistic measures, cinchona is sometimes admissible and advantageous after evacuations have been made proportioned to the activity of the disease and the vigour of the system. *In scrofulous inflammation* (as of the eye) its value is fully appreciated. *In rheumatism*, in which disease Morton, Fothergill, Saunders, and Haygarth, have so strongly recommended it, its use is now obsolete, except under circumstances similar to those which regulate its employment in ordinary inflammation. The same remarks apply to its employment in *erysipelatous inflammation*, in which it was at one time much esteemed.

4. *In maladies characterised by atony and debility.*—Cinchona is useful in a great variety of diseases dependent on, or attended by, a deficiency of tone or strength, as indicated by a soft and lax condition of the solids, weak pulse, incapability of great exertion, impaired appetite, and dyspeptic symptoms. Thus, in *chronic atonic affections of the alimentary canal*, it proves very serviceable, especially in some forms of dyspepsia and anorexia. In these it should be given half an hour, or an hour, before meal-times. *In some chronic maladies of the nervous system*, as chorea, when it occurs in delicate girls; also in the neuralgia of weakly subjects. Disulphate of quina has been used by Dr. Bright (*Guy's Hospital Reports*, vol. i.) in tetanus. *In mortification*, it is useful in those cases in which tonics and astringents are obviously indicated; but it has no specific power of checking the disease, as was formerly supposed. *In passive hemorrhages*, from relaxation of vessels, as in some cases of profuse menstruation, or uterine hemorrhage consequent on miscarriage. *In profuse mucous discharges* with great debility, as in leucorrhœa, excessive bronchial secretion, old diar-

rhœas, &c. *In cachectic diseases*, as enlargements and indurations of the absorbent glands, of a scrofulous nature, strumous ophthalmia, obstinate ulcers, &c. (See Dr. J. Fordyce, *Med. Obs. and Inq.* i. 184.) Also in venereal diseases, when the secondary symptoms occur in shattered and broken-down constitutions, and after the full use of mercury. Likewise in some of the chronic skin diseases, which are seen in cachectic habits.

5. *In the convalescence* of either acute or chronic lingering diseases, as fever, inflammation, hemorrhage, profuse suppuration, &c.; also after important surgical operations, when the strength is greatly reduced. In no class of cases is the efficacy of cinchona or its alkaloids more manifest than in these.

6. *As a topical astringent and antiseptic.*—The efficacy of cinchona as an astringent and antiseptic depends on tannic acid. But as many vegetable substances exceed cinchona in the quantity of this acid which they contain, so they surpass it in astringency. Hence the topical uses of bark are comparatively unimportant; and, for the most part, are nearly obsolete. Powdered cinchona is frequently employed as a tooth powder. Formerly it was used as an application to mortified parts, foul ulcers, caries, &c. The decoction, with or without hydrochloric acid, is applied as a gargle in putrid sore throat.

7. *As a chemical antidote.*—The value of cinchona bark, as a chemical antidote, depends on its tannic acid. I have already offered some observations on its employment in poisoning by emetic tartar. I believe, in all cases it might be advantageously replaced by other and more powerful astringents; as nutgalls, or, on an emergency, green tea.

ADMINISTRATION.—In the form of *powder*, cinchona is now rarely administered. The bulk of a full dose, its disagreeable taste, its tendency to cause nausea and vomiting, and the quantity of inert woody fibre which it contains, form great objections to its employment. Yet of its great efficacy, as a febrifuge or antiperiodic, in intermittents, and of its superiority in these cases, to the decoction or infusion, no doubt can exist; but sulphate of quina has almost entirely superseded it. Its dose is from a scruple to a drachm, or even more than this, when the stomach can bear it.

1. **INFUSUM CINCHONÆ**, L. E. D. (U. S.); *Infusion of Pale [Loxa] Bark.*—(Lance-leaved Cinchona [any species of Cinchona, according to prescription, *E.*]; bruised [in powder, *E.*, in fine powder, *D.*], ℥j.; Boiling [Distilled, *L. Cold, D.*] Water, Oj. [℥xij. *D.*]:—Macerate for six (four, *E.*) hours in a vessel lightly covered, and strain [through linen or calico, *E.*]—The directions of the *Dublin College* are as follows: Triturate the bark with a little of the water, and during the trituration pour on the rest; macerate for 24 hours, shaking it from time to time, then pour off the clear liquor.)—[The U. S. P. directs Peruvian Bark, bruised, an ounce; boiling water a pint. Macerate for two hours and strain, or prepare by displacement. The kind of bark is left to the discretion of the physician.]—Water extracts from cinchona bark the kinates of quina, cinchonina, and lime, gum, soluble red cinchonic (tannin) and yellow colouring matter. The greater part of the cinchona alkaloids remains in the marc, as a very small quantity only of the compound of red cinchonic and the cinchona alkaloids is extracted.—The infusion of cinchona is stomachic and tonic, but is scarcely energetic enough to be febrifuge. It is a light preparation, applicable as a tonic, where the stomach is very delicate, and cannot support the more active preparations of this medicine.—The dose is ℥ʒj. to ℥ʒij. thrice a day.

2. **INFUSUM CINCHONÆ COMPOSITUM**, U. S. Prepared with an ounce of Peruvian Bark, a fluidrachm of aromatic sulphuric acid, and a pint of water. Maceration to be practised for 12 hours before straining. It is a stronger preparation than the preceding, as the alkaloids are converted into soluble sulphates.—J. C.]

3. **DECOCTUM CINCHONÆ**, E.; *Decoction of Bark.*—(Crown, Gray, Yellow, or

Red Cinchona, ℥j. bruised; Water, ℥xxxiv. Mix them, boil for ten minutes, let the decoction cool, then filter it, and evaporate to sixteen fluidounces.)

α. Decoetum Cinchonæ cordifoliæ, L.; *Decoction of Yellow [Calisaya] Bark*.—(Heart-leaved Cinchona, bruised, 3x.; Distilled Water, Oj. Boil for ten minutes in a lightly-covered vessel, and strain the liquor while hot.)

β. Decoetum Cinchonæ lancifoliæ, L.; *Decoetum Cinchonæ, D.*; *Decoction of Pale [Loxa] Bark*.—Lance-leaved Cinchona, bruised, 3x. [℥j. D.]; Distilled Water, Oj. [a sufficient quantity to afford a pint wine measure after straining, D.]

γ. Decoetum Cinchonæ oblongifoliæ, L.; *Decoction of Red Bark*.—(As the Decoetum Cinchonæ cordifoliæ, but using Oblong-leaved Cinchona.)

[Decoetum Cinchonæ, U. S.—Peruvian Bark, an ounce; Water, a pint. Boil for ten minutes in a covered vessel, and strain the liquor while hot.—J. C.]

By boiling, water extracts from cinchona the kinates of quina, cinchonina, and lime, gum, soluble red cinchonic (tannin), yellow colouring matter, starch, and a portion of the compound of the red cinchonic with the cinchona alkaloids. While hot, the liquor is transparent; but, as it cools, it becomes turbid, owing partly to the deposition of the tannate of starch when the temperature falls below 88° F.; and partly because the red cinchonic compound being more soluble in hot than in cold water, is deposited on cooling. Of 146 parts of the deposit from decoction of yellow (Calisaya) bark, Soubeiran (*Traité de Pharm.* i. 607) found 60 parts (principally tannate of starch) were insoluble in alcohol, and the remaining 86 parts were readily soluble in alcohol, and yielded the cinchona alkaloids. The same author also found that by decoction, yellow (Calisaya) bark lost two-thirds of its weight; whereas, by infusion, it merely lost one-third of its weight. If the water employed in preparing the decoction or infusion be acidulated (with sulphuric or hydrochloric acid) the medicinal value of the preparation is greatly increased; for the acid decomposes the insoluble red cinchonic salt, and forms, with the cinchona alkaloids, a soluble combination. Alkaline solutions, on the other hand, yield less powerful, though highly coloured, preparations: they readily dissolve the red cinchonic and the acids, but they render the alkaloids insoluble. Decoction of cinchona is stomachic, tonic, and febrifuge.—The dose is ℥ʒj. to ℥ʒij.

4. TINCTURA CINCHONÆ, L. E. D. (U. S.); *Tincture of Bark*.—(Heart-leaved [Yellow, or any other species, according to prescription, E., Lance-leaved, D.] Cinchona, bruised [in fine powder, E., coarsely powdered, D.], ʒviiij. [ʒiv. E. D.]; Proof Spirit, Oij. [wine measure, D.; Oj. E.] Macerate for fourteen [seven, D.] days, and strain. The directions of the *Edinburgh College* are as follows:—"Percolate the bark with the spirit, the bark being previously moistened with a very little spirit, left thus for ten or twelve hours, and then firmly packed in the cylinder. This tincture may also be prepared, though much less expeditiously, and with much greater loss, by the usual process of digestion, the bark being in that case reduced to coarse powder only."—[The U. S. P. directs Peruvian Bark, in powder, six ounces; Diluted Alcohol, two pints. Macerate for fourteen days, or displace.]—Spirit extracts all the bitter and astringent principles of cinchona; both the kinates of the cinchona alkaloids, as well as the combination of these substances with the red cinchonic. If the spirit be too concentrated, the kinates are less readily dissolved by it. Tincture of cinchona is stomachic, tonic and stimulant.—The dose of it is ℥ʒj. to ℥ʒij. It is usually employed as an adjuvant to the infusion or decoction of cinchona, or to the solution of the disulphate of quina.

5. TINCTURA CINCHONÆ COMPOSITA, L. E. D. (U. S.); *Compound Tincture of Bark*.—(Lance-leaved Cinchona [Yellow Bark, E.], bruised [coarsely powdered, D. E.; fine, if percolation be followed, E.], ʒiv. [ʒij. E. D.]; Orange Peel [Bitter, E.], dried [bruised, E.] ʒiij. [ʒiiss. E. ʒss. D.]; Serpentry, bruised, ʒvj. [ʒiij. E. D.]; Saffron [chopped, E.], ʒij. [ʒj. E. D.]; Cochineal, powdered,

ʒj. [ʒij. *E. D.*]; Proof Spirit, Oj. [Oj. and ʒijj. *E.*, ʒxxx. *D.*] Digest for fourteen days, and strain. "Digest for seven days; strain and express strongly; filter the liquors. This tincture may also be conveniently prepared by the method of percolation, in the same way as the compound tincture of cardamom," *E.*—[The proportions of the U. S. P. are, Peruvian Bark, in powder, ʒij.; Orange Peel, bruised, ʒiss.; Virginia Snake Root, bruised, ʒijj.; Saffron, cut, Red Saunders, rasped, aa ʒi.; Diluted Alcohol, ʒxx. Macerate for fourteen days, and filter, or proceed by displacement.]—This is usually sold as *Huxam's Tincture of Bark*. It is a more agreeable and more stimulant, though less powerful, tonic than the simple tincture, and is less apt to disturb the stomach. Made according to the London Pharmacopœia, it contains one-half less cinchona than the simple tincture. It is employed as a tonic and stomachic.—The dose of it is ʒʒj. to ʒijj.

6. *EXTRACTUM CINCHONÆ, E.*; *Extract of Bark*.—(Take any of the varieties of Cinchona, but especially the Yellow or Red Cinchona, in fine powder, ʒiv.; Proof Spirit, ʒxxiv. Percolate the cinchona with the spirit; distil off the greater part of the spirit; and evaporate what remains in an open vessel over the vapour-bath to a due consistence.)

a. Extractum Cinchonæ cordifoliæ, L.; *Extract of Yellow [Calisaya] Bark*.—(Heart-leaved Cinchona, bruised, ʒxv.; Distilled Water, *Cong.* iv. Boil down in a gallon of the water to six pints, and strain the liquor while hot. In the same manner boil down the bark in an equal measure of water four times, and strain. Lastly, all the liquors being mixed, evaporate to a proper consistence.)

β. Extractum Cinchonæ lancifoliæ, L.; *Extractum Cinchonæ, D.*; *Extract of Pale [Loxa] Bark*.—(Prepared as the preceding, using Lance-leaved Cinchona, *L.*—Pale Bark, coarsely powdered, lb. j.; Water, Ovj. Boil for a quarter of an hour, in a vessel almost covered; then having filtered the liquor while yet hot, and laid it aside, boil the bark again in an equal quantity of water, and filter again in the same manner: proceed in the same way a third time, and then mixing all the liquors, reduce them by evaporation to a proper consistence, *D.*)

γ. Extractum Cinchonæ oblongifoliæ, L.; *Extract of Red Bark*.—(Prepared as the preceding, using Oblong-leaved Cinchona.)

The *watery extract of cinchona* (*extractum cinchonæ, L. D.*) contains the same constituents already mentioned (p. 443) as being found in decoction of bark. Mr. Brande (*Dict. de Pharm.* 179) says, lance-leaved [*i. e.* pale] bark yields 30 per cent. of watery extract. The active principles of this preparation are the kinates of the cinchona alkaloids. The *spirituous extract* (*extractum cinchonæ, E.*) is a more efficacious preparation, as it contains, besides the alkaline kinates, the compound of the red cinchonic with the cinchona alkaloids. When prepared with rectified spirit, 24 per cent. of extract is obtained from lance-leaved [*i. e.* pale] bark. But as the *Edinburgh College* direct proof spirit to be employed, the produce is larger.—Well-prepared (*i. e.* not decomposed by evaporation) extract is a very useful preparation, which, however, has been nearly superseded by sulphate of quina. It is given in the form of pill, in doses of from gr. v. to gr. xx. Or the watery extract may be dissolved in water, or in infusion of roses, or, for administration to children, in syrup of mulberries or of orange-peel.

[The *Extractum Cinchonæ, U. S.*, is thus prepared:—Take of Peruvian Bark, in coarse powder, a pound; Alcohol, four pints; Water, a sufficient quantity. Macerate the Peruvian Bark with the Alcohol for four days; then filter by means of an apparatus for displacement, and when the liquid ceases to pass, pour gradually upon the bark sufficient water to keep its surface covered. When the filtered tincture measures four pints, set it aside, and proceed with the filtration until six pints of infusion are obtained. Distil off the alcohol from the tincture and evaporate the infusion, till the liquids respectively are brought to the consistence of thin honey; then mix them and evaporate so as to form

an extract. The remarks applicable to the extract of the Ed. Col. are applicable to this.]

7. QUINÆ DISULPHAS, L. E.; *Sulphate of Quinine*, offic.; *Subsulphate of Quina*. (Quinæ Sulphas, U. S.)—The directions of the *London College* for the preparation of this salt are as follows:

Take of Heart-leaved Cinchona, bruised, lb. vii.; Sulphuric Acid, ℥ix.; Purified Animal Charcoal, ℥ij.; Hydrated Oxide of Lead; Solution of Ammonia; Distilled Water, each as much as may be sufficient. Mix four ounces and two drachms of the Sulphuric Acid with six gallons of distilled Water, and add the Cinchona to them; boil for an hour, and strain. In the same manner again boil what remains in Acid and Water, mixed in the same proportions, for an hour, and again strain. Finally, boil the Cinchona in eight gallons of distilled water and strain. Wash what remains frequently with boiling distilled water. To the mixed liquors add Oxide of Lead, while moist, nearly to saturation. Pour off the supernatant liquor, and wash what is thrown down with distilled water. Boil down the liquors for a quarter of an hour, and strain; then gradually add Solution of Ammonia to precipitate the Quina. Wash this until nothing alkaline is perceptible. Let what remains be saturated with the rest of the Sulphuric Acid, diluted. Afterwards digest with two ounces of Animal Charcoal, and strain. Lastly, the Charcoal being thoroughly washed, evaporate the liquor cautiously, that crystals may be produced.

Mr. Phillips (*Transl. of the Pharm.*) gives the following explanation of this process. "The quina exists in combination with a peculiar acid, called Kinic Acid, forming with it Kinate of Quina, which is soluble to a certain extent in water, and is rendered more so by the sulphuric acid employed in the process, and perhaps by decomposing it. Whatever may be the state of combination, the solution contains sulphuric acid, kinic acid, and quina, mixed with extractive and colouring matter, the latter being got rid of by the animal charcoal. On adding oxide of lead the sulphuric acid combines with it, and the resulting sulphate being insoluble is precipitated, while the kinic acid and quina remain in solution; when ammonia is added, after the separation of the sulphate of lead, the kinic acid unites with it, and the kinate of ammonia formed is soluble, while the quina is precipitated, and this, when afterwards combined with sulphuric acid, forms disulphate of quina, which crystallizes."

The directions of the *Edinburgh College* for the preparation of disulphate of quina are as follows:

Take of Yellow Bark, in coarse powder, one pound; Carbonate of Soda, eight ounces; sulphuric acid, half a fluidounce; Purified Animal Charcoal, two drachms. Boil the bark for an hour in four pints of water, in which half the carbonate of soda has been dissolved; strain and express strongly through linen or calico; moisten the residuum with water, and express again, and repeat this twice. Boil the residuum for half an hour with four pints of water and half the sulphuric acid; strain, express strongly, moisten with water, and express again. Boil the residuum with three pints of water and a fourth part of the acid; strain and squeeze as before. Boil again the residuum with the same quantity of water and acid; strain and squeeze as formerly. Concentrate the whole acid liquors to about a pint; let the product cool; filter it, and dissolve in it the remainder of the carbonate of soda. Collect the impure quina on a cloth, wash it slightly, and squeeze out the liquor with the hand. Break down the moist precipitate in a pint of distilled water; add nearly one fluidscruple of sulphuric acid, heat it to 212°, and stir occasionally. Should any precipitate retain its gray colour, and the liquid be neutral, add sulphuric acid, drop by drop, stirring constantly, till the gray colour disappears. Should the liquid redden litmus, neutralize it with a little carbonate of soda. Should crystals form on the surface, add boiling distilled water to dissolve them. Filter through paper, preserving the funnel hot; set the liquid aside to crystallize; collect and squeeze the crystals; dissolve them in a pint of distilled water heated to 212°; digest the solution for fifteen minutes with the animal charcoal; filter, and crystallize as before. Dry the crystals with a heat not exceeding 140°.

The mother-liquors of each crystallization will yield a little more salt by concentration and cooling.

The object of this process is to extract, by means of the solution of carbonate of soda, the acids, the colouring and extractive matters, the gum, &c. from the bark, but leaving the cinchona alkaloids. Stoltze used for this purpose lime; Badollier and Scharlau caustic potash (see p. 433). The alkaline decoction has a very deep colour. By boiling the residuum in water acidulated with sul-

phuric acid, the alkaloids are dissolved. On the addition of carbonate of soda, double decomposition takes place, and the impure quina is precipitated. This is afterwards dissolved in water acidulated with sulphuric acid, and the filtered liquid is set aside to crystallize. The impure disulphate of quina thus obtained is redissolved in boiling water, and the solution, after being decolorized by digestion with animal charcoal, is filtered, and put aside to crystallize.

I have repeated this process, which has the great merit of obviating the use of alcohol, and I believe it to be an excellent one, combining both simplicity and economy. In one experiment I employed one lb. of picked uncoated yellow (Calisaya) bark, and found that the precipitated impure quina required two fluidscruples and five minims of sulphuric acid to saturate it, instead of one fluidscruple, directed by the Edinburgh College. In another experiment I could not get the impure sulphate of quina to crystallize until it had been digested with animal charcoal.

The method of manufacturing disulphate of quina, which has been usually followed by *manufacturers* in this country, is as follows:

Coarsely pulverized yellow (Calisaya) bark is boiled with water acidulated with sulphuric or hydrochloric acid. The residuum boiled a second or a third time with acidulated water. Some repeat the process a fourth time. Finely-powdered slacked lime is added to the filtered decoction (when cold), until the liquor is sensibly alkaline, and acquires a dark colour. The precipitate is collected, drained on a cloth, and then submitted to graduated pressure (usually in a hydraulic press). The cake thus obtained is, when dry, reduced to powder, and digested in rectified spirit. The filtered tincture is distilled until the residuum (impure quina) in the retort has a brown viscid appearance. This residuum is then to be carefully saturated with very diluted sulphuric acid, the solution filtered, and set aside to crystallize. The disulphate of quina thus obtained is yellowish-brown. It is drained in a cloth, compressed, dissolved in water, decolorized by animal charcoal, recrystallized, and dried. This last part of the process must be very carefully conducted, to avoid efflorescence.

Some persons think it preferable to convert the quina of this alcoholic solution into a sulphate before distillation, in order to separate the fatty matter. I am informed, by a maker of this salt, that the use of spirit in the process does not, on the large scale, add much more than a penny an ounce to the cost of the disulphate, as the greater part is recovered.

On the large scale the decoction of the bark is usually prepared in a large vat, the boiling being effected by the steam. The acidulated decoction contains the quina, the cinchonia, the yellow colouring matter, the red cinchonic, the kinic, and the sulphuric (or hydrochloric) acids. The lime saturates all the acids, and forms soluble salts, (if sulphuric acid have been employed, sulphate of lime is formed, the greater part of which precipitates), which remain in the liquid with a portion of red colouring matter. The precipitate is composed of quina, cinchonia, a combination of lime and red cinchonic, fatty matter, excess of lime, and, when sulphuric acid has been employed, sulphate of lime: the whole is contaminated with colouring matter. Alcohol extracts from this precipitate the quina and cinchonia, the fatty matter, and the colouring matter; leaving undissolved the excess of lime, the compound of lime with the red cinchonic, and when sulphuric acid has been used, sulphate of lime. The sulphuric acid being added then to the impure quina, converts it into a disulphate.

On account of the expense of spirit of wine, various substitutes have been proposed. Pyroxilic spirit has been tried, but I believe has not answered. Pelletier has taken out a patent for the employment of a volatile oil (oil of turpentine). The dried cake of quina and lime, obtained in the usual manner, is to be digested in oil of turpentine, which dissolves the quina. The oleaginous solution is then to be agitated with water acidulated with sulphuric acid, by which a sulphate of quina is obtained. By repose, the oil rises to the top, and after removal may be employed again, while the solution of the sulphate is to be evaporated as usual. Hitherto, however, this process has not succeeded, partly because the turpentine does not extract more than nineteen-twentieths of the quina present. If any attempts, however, should be made to procure the

disulphate in America, it is possible that some modification of this process would be the best.

Disulphate of quina occurs in small, fibrous, odourless, very bitter crystals, which have a pearly aspect, and a flexibility like amianthus. Exposed to the air, they effloresce slightly. When heated they become luminous; friction promotes this phosphorescence. At 240° F. they melt like wax; at a more elevated temperature the salt assumes a fine red colour; and when ignited in the air burns, leaving at first a carbonaceous residuum, but which is subsequently dissipated. One part of this salt requires 80 parts of cold alcohol (sp. gr. 0.850) or 740 parts of cold, or 30 parts of boiling, water to dissolve it: as the saturated solution cools, part of the salt separates. A remarkable property of this salt is to give a blue tinge to water. The following is the composition of this salt:

	Atoms.	Eq. Wt.	Per Cent.
Sulphuric acid	1	40	9.17
Quina	2	324	74.31
Water	8	72	16.52
Crystallized Disulphate of Quina	1	436	100.00

By exposure to the air the crystals lose four (Soubeiran says six) equivalents of water, equal to about eight per cent. When fused they evolve two more equivalents. One hundred grains of the crystals dissolved in water, acidulated with hydrochloric acid, yield by the addition of chloride of barium a quantity of sulphate of baryta, which when ignited weighs 26.6 grs. If chlorine gas or a solution of chlorine be added to an aqueous solution of the salt, and afterwards ammonia, an emerald-green colour is produced.¹

Adulteration.—Various foreign bodies (as earthy and alkaline salts, gum, sugar, starch, fatty matters, sulphate of cinchonia, and salicin) are, it is said, occasionally intermixed with disulphate of quina. The following are the tests by which the presence of these bodies is ascertained:—By digesting disulphate of quina in alcohol this salt is dissolved, leaving any alkaline or earthy sulphates, gum, or starch, that may be present. Gum is soluble in cold water; starch is coloured blue by a solution of iodine. When heated in the open air the disulphate of quina is burned and dissipated: the earthy salts, on the other hand, are left. The disulphate is soluble in water acidulated with sulphuric acid, whereas fatty matters are insoluble. To detect sugar, add to a solution of the disulphate carbonate of potash: quina precipitates, while sulphate of potash and sugar are left in solution: the latter may be detected by its sweet taste, or by evaporating the liquid to dryness, and digesting the residue with spirit, which dissolves the sugar, but leaves the sulphate. Ammoniacal salts are detected by the ammoniacal odour emitted on the addition of caustic potash. Salicin may be recognised by oil of vitriol, which turns it red (see p. 187). Sulphate of cinchonia may be made to crystallize, in a pulverulent form, by stirring the solution, and in this state it may be readily intermixed with disulphate of quina. This fraud, I suspect, has been recently carried on to no very slight extent. To detect it, precipitate a solution of the suspected salt in water by potash; collect the precipitate, and boil it in alcohol. The cinchonia crystallizes as the liquor cools, while the quina remains in the mother-liquor.

The characteristic marks of the purity of disulphate of quina are, according to the *London College*, as follows:

“Totally dissolved in water, especially when mixed with an acid. Quina is thrown down by ammonia, the liquor being evaporated; what remains ought not to taste of sugar. One hundred parts of disulphate of quina lose eight or ten parts of water with a gentle heat. It is totally consumed by fire. Chlorine first added to it, and afterwards ammonia, it becomes green.”

¹ Meeson (by mistake printed Roper) in the *Lond. Med. Gaz.* vol. xi. pp. 330 and 362; also in the *Phil. Mag.* Feb. 1835; André, *Journ. de Pharm.* xxii. 127.

The characters given by the *Edinburgh College* are as follows :

"A solution of ten grains in a fluidounce of distilled water, and two or three drops of sulphuric acid, if decomposed by a solution of half an ounce of carbonate of soda, in two waters, and heated till the precipitate shrinks and fuses, yields, on cooling, a solid mass, which, when dry, weighs 7.4 grains, and in powder dissolves entirely in solution of oxalic acid."

The quantity of carbonate of soda required to decompose 10 grs. of disulphate of quina, to which a few drops (say six grains) of sulphuric acid have been added, is less than twenty-five grains. (Mr. R. Phillips, *Lond. Med. Gaz.* Aug. 17, 1839.)

Disulphate of quina is given in doses of from gr. j. to grs. v. Occasionally it is exhibited in much larger doses as a febrifuge; but it is very apt to disagree, causing disturbance of stomach, febrile disorders, and headache. I have known fourteen grains taken, and have heard of a scruple or half a drachm being exhibited at a dose. It may be given either in the form of a pill, made with conserve of roses, or dissolved in some aqueous liquid by the aid of an acid. Infusion of roses is a favourite vehicle for it. An ointment (composed of ʒj. of disulphate of quina and ʒij. of lard) rubbed into the axilla has been used with success to cure ague in children. (*Lond. Med. Gaz.* April 3, 1840.)

2. CEPHAELIS IPECACUANHA, Richard, L. E. D.—THE IPECACUANHA
CEPHAELIS.

Callicocca Ipecacuanha, Brotero.

Sex. Syst. Pentandria, Monogynia.

(*Radix, L. D.*—Root, *E.*)

(*Ipecacuanha, U. S.*)

HISTORY.—Ipecacuanha is first mentioned by Michael Tristram, (*Purchas, Pilgrimes*, vol. iv. fol. 1311,) who calls it *Igpecaya* or *Pigaya*. In 1684 it was described and figured by Piso. (*Hist. Nat. Brazil.* 101.) In 1686 it was celebrated in Paris as a remedy for dysentery. It appears that Jean-Adrian Helvetius (then a young man) attended with Afforty, a member of the faculty, a merchant, named Grenier, or Garnier, who, when he recovered from his illness, gave to his physician, as a testimony of his gratitude, some of this root, as a valuable remedy for dysentery. Afforty attached very little importance to it, but gave it to his pupil, Helvetius, who tried it, and thought he had found in it a specific against dysentery. Numerous placards were placed about the streets of Paris, announcing to the public the virtues of the new medicine, which Helvetius sold without discovering its nature. Luckily for him, some of the gentlemen of the court, and even the Dauphin, the son of the king (Louis XIV.) were at this time afflicted with dysentery. Being informed by his minister Colbert of the secret possessed by Helvetius, the king deputed his physician Aquin and his confessor Le P. de Chaise to arrange with Helvetius for the publication of the remedy. 1000 Louis-d'or was the price which was paid, after some trials had been made with it at the Hôtel-Dieu, and which were crowned with the most brilliant success. Garnier now put in his claim for a part of the reward, saying that he, properly speaking, was the discoverer of the medicine; but the claim was not allowed. Subsequently Helvetius obtained the first medical honours of France. He wrote a treatise, describing the use of ipecacuanha in diarrhœa and dysentery. (K. Sprengel, *Hist. de la Méd.* t. v. p. 468.)

Great confusion existed for a long time respecting the plant yielding Ipecacuanha. In 1800 Dr. Gomes returned from the Brazils, and brought with him the plant, on which he published a dissertation. In 1802 Brotero (*Trans. of the Linn. Soc.* vol. vi. p. 137,) described it under the name of *Callicocca Ipecacuanha*, which Richard (*Bull. de la Soc. de la Fac. de Méd.* 1818,) afterwards changed to *Cephaelis Ipecacuanha*.

BOTANY. Gen. Char.—Tube of the *calyx* obovate; limb very short, five-toothed. *Corolla* somewhat funnel-shaped; its lobes five, small, rather obtuse. *Anthers* inclosed. *Stigma* bifid, usually exserted. *Berry* obovate-oblong, crowned with the remains of the calyx, two-celled, two-seeded (De Cand).

Sp. Char.—*Stem* ascending, at length erect, somewhat pubescent at the apex. *Leaves* oblong-ovate, rough above, finely pubescent beneath. *Stipules* cleft into setaceous segments. *Heads* terminal, erect, at length pendulous. *Bracts* four, somewhat cordate, (De Cand.)

Root perennial, annulated, simple, or dividing into a few diverging branches, flexuous, from four to six inches long; when fresh, pale brown externally. *Stem* somewhat shrubby, two or three feet long, emitting runners. *Leaves* rarely more than four or six, placed at the end of the stem and branches; *petioles* pubescent, which are connected to each by the erect stipules. *Stipules* membranous at their base. *Peduncles* solitary, erect when in flower, reflexed when in fruit. *Head* semiglobose, eight to ten-flowered. *Involucre* one-leafed, spreading, deeply four to six-parted: segments obovate. *Bracts* acute, pubescent; a single one to each flower. *Calyx* minute. *Corolla* white. *Stamens* five. *Ovary* obovate; *style* filiform, white; *stigmas* linear, spreading. *Berry* soft, fleshy, violet-black. *Seeds* (nucules) pale, plane-convex: *albumen* horny. (Condensed from Martius, *Spec. Mat. Med. Brazil.* p. v. 1824).

Hab.—Brazil; in moist shady situations from 8° to 20° south latitude. Abundant in the valleys of the granitic mountains, which run (more or less distant from the sea) through the provinces of Rio Janeiro, Espirito Santo, and Bahia; also met with in Pernambuco. Humboldt and Bonpland found it on the St. Lucar mountains of New Granada.

COLLECTION OF THE ROOTS.—The roots are gathered at all seasons of the year, though more frequently from January to March inclusive; and as no care is taken in the cultivation of the plant, it has become scarce around the principal towns. Those Brazilian farmers who reside in the neighbourhood of the plant, carry on considerable commerce with it. The native Indians also are very assiduous in the collection of it. Those called by the Portuguese the Coroados, who live near the river Xipoto, in the province of Minaes, as well as their neighbours the Puri, are the greatest collectors of it. They sometimes leave their villages for two months at a time, fixing their habitations in those places in which this plant abounds. They cut the roots from the stems, dry them in the sun, and pack them in bundles of various sizes and forms. (Martius, *op. cit.* p. 6.)

COMMERCE.—Ipecacuanha is imported into this country from Rio Janeiro, in bales, barrels, bags, and serons. The duty is 1s. per lb. The quantities on which this was paid, for the last six years, are as follows:

In 1834.....	9,038 lbs.	In 1837.....	11,435 lbs.	In 1840.....	6483 lbs.
1835.....	7,469	1838.....	12,426	1841.....	9,623
1836.....	11,437	1839.....	7,453		

DESCRIPTION.—The root of this plant is the *ipecacuanha* (*radix ipecacuanhæ*) of the shops. No other root is known in English commerce by this name. By continental writers it is denominated *annulated ipecacuanha* (*radix ipecacuanhæ annulata*) to distinguish it from the roots of *Psychotria emetica* and *Richardsonia scabra*; the first of which is termed striated *ipecacuanha*—the second, undulated *ipecacuanha*: both will be described hereafter.

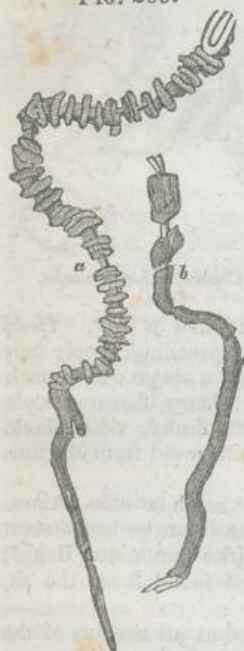
The root of *Cephaelis Ipecacuanha* occurs in pieces of three or four inches

FIG. 208.

*Cephaelis Ipecacuanha.*

long, and about the size of a small writing-quill: variously bent and contorted; simple or branched. It has a knotty appearance, in consequence of a number of deep circular fissures about a line in depth, and which extend inwardly to a central ligneous cord, so as to give the idea of a number of rings strung upon a thread (hence the name *annulated*). These rings are unequal in size, both

FIG. 209.



Brown Ipecacuanha Root.

- a. Ringed portion.
b. Portion of a root without rings.

with respect to each other and to different parts of the same ring. This root has a resinous fracture. Its substance consists of two parts: one called the *cortical portion*, which is brittle and resinous, of a horny appearance, with a grayish or brownish-gray colour—sometimes whitish; and a *second*, called *meditullium*, and which consists of a thin, yellowish-white, woody, vascular cord, running through the centre of each piece. In 100 parts of good ipecacuanha, there are about 80 of cortex and 20 of meditullium. Ipecacuanha root has an acrid, aromatic, somewhat bitter taste, and a slightly nauseous, but peculiar odour. The colour of the root varies somewhat, being brownish, reddish-brown, grayish-brown, or gray.

Richard, (*op. cit.*) Merat, (*Dict. des Scien. Méd. t. xxvi.*; and *Dict. Mat. Méd. iii.*) and Guibourt, (*Hist. des Drog. i.*) admit three varieties of annulated ipecacuanha, whose principal distinction is the colour of the epidermis. The age of the root, the nature of the soil, and the mode of drying, are among the different circumstances producing these varieties. Sometimes they are met with in the same bale.

Var. a. BROWN ANNULATED IPECACUANHA, Richard: *Brown Ipecacuanha*, Lemery.—(*Radix ipecacuanhæ annulata fusca*.) This is the best kind. The greater part of the ipecacuanha of commerce consists of this variety. Its epidermis is more or less deeply brown, sometimes even blackish; its fracture is gray, or brownish: its powder is gray. The cortical portion has a horny appearance. The root which I have received from Professor Guibourt, as *blackish gray ipecacuanha*, is somewhat less brown. It is the *gray or annulated ipecacuanha* of Merat.

I have occasionally found in commerce a *brown non-annulated* variety of ipecacuanha (fig. 209 b) imported in distinct bales. It consists of slender, cylindrical, often branched pieces, frequently several inches long, smooth, or slightly warty, but not annulated or moniliform, with a very thin cortex, and a woody meditullium of the usual size, or thicker. These pieces appear to be the subterraneous bases of the stems or runners, and the ends of the roots. Occasionally pieces of the brown annulated ipecacuanha are found attached.

Var. b. RED ANNULATED IPECACUANHA, Richard.—This differs from the preceding by the lighter and reddish colour of its epidermis, by its less powerful odour, and by its want of aromatic taste. Sometimes it has, when broken, the same horny and semi-transparent quality of the brown ipecacuanha, but more frequently it is opaque, dull, and farinaceous; in which case it is generally less active. These differences probably depend on the nature of the soil in which the plant grew. The root which I have received from Professor Guibourt under the name of *reddish gray annulated ipecacuanha*, is scarcely so red as the pieces which I have met with in English commerce. It is the *red-gray ipecacuanha* of Lemery and Merat.

Var. c. GRAY ANNULATED IPECACUANHA, Richard; *White Gray Ipecacuanha*, Merat; *Greater Annulated Ipecacuanha*, Guibourt.—The colour of this variety is grayish-white. Professor Guibourt has met with it of a reddish-gray colour. Gray ipecacuanha occurs in pieces of larger diameter than either of the foregoing kinds, with fewer, more irregular, and less prominent rings. It is merely a portion of the root of *Cephaelis*, which has become more developed, either from meeting with excess of nourishment, or from some other circumstance.

I have found, in English commerce, a gray ipecacuanha, whose roots were not longer than the brown variety, but whose rings were imperfectly developed.

COMPOSITION.—The most important analyses of ipecacuanha are those of Pelletier, (*Journ. de Pharm. iii. 148.*) Richard and Barruel, (*Ibid. vi. 264.*) and Bucholz, (*Gmelin, Handb. d. Chem. ii. 1281.*)

Pelletier's Analyses.			Red do.		Bucholz's Analysis.	
Brown Annulated Ipecacuanha.						
	Cortex.	Medullium.	Cortex.			
Emetina.....	16	1-15	14		Emetic extractive [emetina]....	4.13
Odoriferous Fatty matter...	2	traces	2		Soft resin.....	2.43
Wax.....	6	—	—		Wax.....	0.75
Gum.....	10	5.00	16		Gum.....	25.17
Starch.....	42	20.00	18		Starch.....	9.00
Ligneous matter.....	20	66.00	48		Woody fibre.....	10.80
Non-emetic extractive..	0	2.45	—		Bitter extractive.....	10.12
Loss.....	4	4.80	2		Sugar.....	2.00
					Extractive, gum, and starch, ex- tracted by potash.....	34.80
Ipecacuanha.....	100	100.00	100		Loss.....	0.80
					Ipecacuanha.....	100.00

1. ODOROUS FATTY MATTER.—It is extracted from ipecacuanha by ether. It is of a brownish-yellow colour, soluble in alcohol and ether, to both of which it communicates a yellow colour. Its odour is very strong, and similar to that of the essential oil of the horse-radish; it becomes insupportable when heat is applied, but is weak and analogous to that of the ipecacuanha root when diluted. The taste is acrid; the specific gravity is greater than that of alcohol.

This fatty matter consists of two substances; 1st, a very fugacious volatile substance, which is the odorous principle of ipecacuanha root; 2dly, a fixed fatty matter (which some chemists have mistaken, when mixed with emetina, for resin), having little or no odour.

Notwithstanding its strong taste and odour, the fatty matter of this root does not seem to have any effect on the stomach. Given in large doses to animals, it had no sensible operation. Caventou took six grains at one time, but experienced no marked effects therefrom. Pelletier and Magendie swallowed some grains of it, and experienced a disagreeable impression on the throat, but it was temporary only.

2. EMETINA.—When first discovered by Pelletier and Magendie, in 1817, it was termed *la matière vomitive*, or *emetine* (from *εμεσις*, I vomit).

Pure emetina is white (when not absolutely pure it has a grayish-yellow tinge), pulverulent, inodorous, with a slightly bitter taste; fusible at 122° F.; very slightly soluble in cold, but much more so in hot, water; very soluble in alcohol, but scarcely soluble in ether and oils. It dissolves in acids, the acidity of which it does not entirely destroy. The salts of emetina are slightly acid, and very crystallizable. They form gummy masses, in some only of which are traces of crystallization occasionally found. Emetina restores the blue colour of litmus which has been reddened by an acid. I find that the yellowish-white emetina, sold in the shops under the name of pure emetina, is coloured red by nitric acid, the red colour being much deepened on the addition of ammonia. An alcoholic solution of iodine, added to an alcoholic solution of emetina, produces a reddish precipitate (*hydriodate of emetina?*) Tincture of galls copiously precipitates solutions of emetina (*tannate of emetina*). The effect of these reagents on emetina is similar to their effect on morphia; but from this last substance emetina is distinguished by the salts of iron, which produce no change of colour in it.

The following is the composition of emetina:

	Atoms.	Eq. Wt.	Per Cent.	Dumas and Pelletier.
Carbon.....	35	210	65.42	64.57
Hydrogen.....	25	35	7.79	7.77
Nitrogen.....	1	14	4.36	4.30
Oxygen.....	0	72	22.43	22.95
Emetina	1	321	100.00	99.59

The following are stated by Magendie (*Formulaire*, 95) as the effects of impure emetina:—From half a grain to two grains given to cats and dogs caused at first vomiting, then sleep. In doses of from six to ten grains, vomiting, sleep, and death, took place. Dissection showed inflammation of the pulmonary tissue, and of the mucous membrane of the alimentary canal, from the cardia to the anus. The same effects (namely, vomiting, sleep, and death) were observed when impure emetina was dissolved in water, and injected into the jugular vein, into the pleura, into the anus, or into the muscular tissue. On man a quarter of a grain excited nausea and vomiting; a grain and a half, or two grains, taken fasting, caused continued vomiting, and decided disposition to sleep.

The effects of pure emetina are similar, but more energetic. In one case 1-16th of a grain caused vomiting in a man eighty-five years of age: two grains are sufficient to kill a dog.

Emetina has been proposed as a remedial agent,—as a substitute for ipecacuanha, all the advantages of which it is said to possess in a much smaller dose, and without the unpleasant taste and odour which the root is known to have. I confess, however, I think, very little advantage is likely to be gained by the substitution. When we wish to give emetina in a liquid form, it may be readily dissolved in water by the aid of acetic or dilute sulphuric acid.

CHEMICAL CHARACTERISTICS.—A decoction of the root, filtered and allowed to cool, becomes, on the addition of a solution of free iodine, blue (*iodide of starch*). Tincture of nutgalls forms, in the decoction as well as in the tincture

diluted with water, a grayish white precipitate (*tannate of emetina*). Sesquichloride of iron communicates a greenish tint (*tannate [gallate, Pelletier] of iron*) to the decoction as well as to the diluted tincture. A solution of isinglass forms in the infusion, after twelve hours, a precipitate (*tannate of gelatine*). Alcohol renders the decoction turbid (*gum*). Diacetate of lead forms with the tincture, and especially with the decoction, a precipitate (*colouring matter, gum, and oxide of lead*).

PHYSIOLOGICAL EFFECTS.—If the powder or dust of ipecacuanha be applied to the eyes or face, it acts as an irritant, and causes redness and swelling of these parts. Inhaled, it irritates the respiratory passages, and, in some persons, brings on difficulty of breathing, similar to an attack of spasmodic asthma. (Scott, *Phil. Trans.* for 1776, p. 168.) Mr. Roberts, surgeon, at Dudley, is affected in this way; and I have received from him the following account of his case:—"If I remain in a room where the preparation of ipecacuanha is going on—for instance, making the pulv. ipecac. comp.—I am sure to have a regular attack of asthma. In a few seconds dyspnoea comes on in a violent degree, attended with wheezing and great weight and anxiety about the præcordia. The attack generally remains about an hour, but I obtain no relief until a copious expectoration takes place, which is invariably the case. After the attack is over I suffer no further inconvenience. I have always considered that the attack proceeds from the minute particles of the ipecacuanha floating in the atmosphere, acting as an irritant on the mucous membrane of the trachea and bronchial tubes." In some cases the mere odour of the root seems sufficient to excite difficulty of breathing, with a feeling of suffocation.

There is one case recorded of poisoning by the incautious inhalation of the dust of ipecacuanha, in the process of powdering it, by a druggist's assistant. It is mentioned by Dr. Prieger. (*Rust's Mag.* B. xxxii. H. i. S. 182.) The patient, who was suffering with catarrh and cough, inhaled, during three hours, the dust from the root; in consequence of which vomiting came on, followed by a tightness of the chest. An hour after this he complained of a sense of suffocation, and constriction of the trachea and throat: his appearance was pale and deathly. The physician who was called in, bled him, and gave assafœtida and belladonna with temporary relief; but in five hours a fresh attack came on, with the most imminent danger of suffocation. A strong decoction of *uva ursi*, with the extract of rhatany, was administered with almost immediate relief, and in an hour his breathing was much freer. He was able to leave the house in two days, but suffered several days with difficulty of breathing.

When taken in small and repeated doses, ipecacuanha principally directs its influence to the secreting organs, especially those of the chest, whose activity it promotes. It specifically affects the bronchial membrane, in some morbid conditions of which it promotes expectoration, while in others, attended with a profuse secretion of phlegm, it exerts a beneficial influence, and often contributes to the restoration of the part to its normal condition. In somewhat larger doses it creates nausea with its concomitant phenomena, depression, increased secretion of saliva and buccal mucus, &c. If a diaphoretic regimen be adopted, it exerts a powerfully relaxing influence over the skin. In full medicinal doses it occasions vomiting, followed by a tendency to sleep. Its operation as an emetic is exceedingly safe, since inflammation is not produced by it, even when an overdose has been swallowed.

The vomiting produced by ipecacuanha is not so violent as that induced by emetic tartar, neither is it so long continued, nor attended with such nausea. Furthermore, ipecacuanha is less disposed to act on the bowels. The tonic and astringent qualities of the zincic compounds, as well as their want of diaphoretic power, distinguish these emetic substances from ipecacuanha. Squill (with which ipecacuanha agrees in its expectorant and emetic qualities) is distinguished by its greater acidity, and by its influence not being concentrated on the pulmonary organs, as is the case with ipecacuanha, which does not,

therefore, possess that power of stimulating the urinary organs possessed by squill (see pp. 117).

The most remarkable effects of ipecacuanha seem to be produced by the agency of the eighth pair of nerves. "How singular it is," says Dr. M. Hall, (*Lectures in the Lancet*, for April 21, 1838,) "that ipecacuanha taken into the bronchia should excite asthma, and taken into the stomach should induce another affection of the respiratory system, vomiting." Sundelin (*Handb. d. sp. Heilmittell.* ii. 5,) ascribes the red condition of the bronchial membrane, and the congestion of the lungs of animals killed by emetine, not to the specific stimulus exerted by this substance over the pulmonary mucous membrane, but to an exhausting stimulus over the eighth pair of nerves, by which a condition similar to suffocative catarrh (*Steckfluss*) is brought on; for he has observed the same appearances in the bodies of persons who have died of this disease, where there was certainly no inflammatory condition of the bronchial membrane, but a paralytic condition of its small blood-vessels.

USES.—Ipecacuanha is employed in full doses as an emetic, or in smaller doses as an expectorant and nauseant.

1. *In full doses, as an emetic.*—The mildness of its operation adapts ipecacuanha for the use of delicate and debilitated persons, where our object is merely to evacuate the contents of the stomach. Thus it is well fitted for the disorders of children requiring the use of emetics (as when the stomach is overloaded with food, in hooping-cough, croup, &c.) on account of the mildness and certainty of its action. It is also exceedingly useful for adults (especially delicate females); thus, in gastric disorders, to evacuate undigested acrid matters from the stomach,—to promote the passage of biliary calculi,—as a counter-irritant at the commencement of fevers,—in many inflammatory diseases (as acute mucous catarrh, cynanche, hernia humoralis, and ophthalmia),—in asthma,—and as an evacuant in cases of narcotic poisoning. When the indication is to excite gentle vomiting in very weak and debilitated frames, Dr. Pye (*Med. Obs. and Inq.* vol. i. 240,) has shown that it may be effected frequently with the utmost ease and safety by ipecacuanha in doses of from two to four grains. Dr. Cullen (*Mat. Med.* ii. 474,) has expressed some doubt with respect to the correctness of this statement; but it is well known that ten grains of Dover's powder (containing one grain of ipecacuanha) not unfrequently causes vomiting.

The mildness of its operation is not the only ground for preferring ipecacuanha to other emetic substances. Its specific power over the pulmonary organs and the stomach leads us to prefer it in maladies of these parts, in which vomiting is likely to be beneficial; especially in those affections in which the nerves appear to be more than ordinarily involved, as spasmodic asthma and hooping-cough. In the first of the complaints, Dr. Akenside (*Med. Trans.* i. 93) has shown that it proves equally serviceable even when it fails to occasion vomiting, and merely produces nausea. He gave a scruple, in the paroxysm, to create vomiting, and, in the interval, five grains every morning, or ten grains every morning. Dr. Wright (*Memoir of*, pp. 379 and 397) recommends gentle emetics of ipecacuanha at the commencement of the treatment of dysentery.

2. *In small doses as a nauseant, antispasmodic, diaphoretic, and expectorant.*—When given in doses insufficient to occasion vomiting, ipecacuanha is serviceable in several classes of complaints, especially those of the chest and alimentary canal.

a. *In Affections of the Respiratory Organs.*—Nauseating doses of ipecacuanha are used with considerable advantage in acute cases of *mucous catarrh*. They favour expectoration, and relaxation of the cutaneous vessels. In milder and more chronic forms, smaller doses, which do not occasion nausea, will be sufficient. In children, who bear vomiting much better than adults, full nauseating or even emetic doses are to be preferred.

"When a child becomes hoarse, and begins to cough," says Dr. Cheyne,

(*Cyclop. of Prac. Med.* art. *Croup*, vol. i. p. 496.) "let every kind of stimulating food be withdrawn; let him be confined in an apartment of agreeable warmth; have a tepid bath; and take a drachm of the following mixture every hour, or every two hours, if it produces sickness:—℞ Vini Ipecacuanhæ, ℥iij.; Syrupi Tolut. ℥v.; Mucil. Acaciæ, ℥j. Mix.: and all danger will probably be averted. Whereas, if no change be made in the quality of the food, and if he be sent into the open air, he will probably undergo an attack of bronchitis or croup."

In *hooping-cough*, in which disease considerable benefit is obtained by the use of emetic substances, ipecacuanha is frequently administered with advantage. After giving it to create vomiting, it should be administered in nauseating doses. In *asthma*, benefit is obtained by it, not only when given so as to occasion nausea and vomiting, as above noticed, but also in small and repeated doses. In both this and the preceding disease, the benefit procured by the use of ipecacuanha arises, not from the mere expectorating and nauseating operation alone of this remedy, but from its influence otherwise over the eighth pair of nerves. In *bronchial hemorrhage* (hæmoptysis) the efficacy of ipecacuanha has been greatly commended. A. N. Aasheim, (*Vis anthæmopt. rad. ipec.* in *Acta Reg. Soc. Med. Hafn.* i. 170,) a Danish physician, gave it in doses of one-fourth of a grain every three hours during the day, and every four hours during the night. In this way it excites nausea, and sometimes even vomiting. It checks the hemorrhage, alleviates the cough, and relaxes the skin.

β. In *Affections of the Alimentary Canal*.—In *indigestion*, Daubenton (*Mém. sur les Indigest.* 1798) gave it in doses just sufficient to excite a slight sensation of vermicular motion of the stomach, without carrying it to the point of nausea. Eberle (*Treat. of the Mat. Med.* i. 44, 2d ed.) tried it, in his own case, with evident advantage. An anti-emetic quality has been assigned to it by Schönheider. (*Acta Reg. Soc. Hafn.* ii. 139.) In *dysentery*, ipecacuanha has gained no trifling celebrity, whence its name of *radix antidysenterica*. In severe forms of the disease no one, I suspect, now would think of relying on it as his principal remedy; but as an auxiliary, its efficacy is not to be denied. The advocates for its use, however, are not agreed as to the best mode of using it. Sir George Baker, (*De Dysentery*, 1761,) and Dr. Cullen, (*Mat. Med.* ii. 477,) consider it to be of most benefit where it acts as a purgative, but this can scarcely be its *methodus medendi*. From my own observations of its use in the milder forms of dysentery met with in this country, I am disposed to ascribe its efficacy in part to its diaphoretic powers, since I have always seen it promoted by conjoining a diaphoretic regimen. But its tendency to produce an antiperistaltic movement of the intestines doubtless contributes to its antidysenteric property. It is best given, I think, in conjunction with opium, (of course depletion proportional to the violence of the disease and the strength of the patient preceding its use.) Its determination to the skin should be promoted by warm clothing, and the free use of mild, tepid aliments. Mr. Twining (*Trans. of the Med. and Phys. Soc. of Calcutta*, vol. iv. p. 170) gave ipecacuanha in large doses (grs. vj.), with extract of gentian, without causing vomiting. Mr. (Playfair *Edinb. Med. and Surg. Journal*, vol. ix. p. 18) recommends from half a drachm to a drachm of ipecacuanha, with from thirty to sixty drops of laudanum, to be given at the commencement of the disease.

γ. In *various other maladies*.—As a sudorific, ipecacuanha is given in combination with opium, (see *Pulvis Ipecacuanhæ compositus*) in various diseases. On the continent it is esteemed as an antispasmodic. In uterine hemorrhage also it has been employed. In chronic visceral enlargements it has been administered as a resolvent.

ADMINISTRATION.—The usual dose of ipecacuanha, in *powder*, as an *emetic*, is grs. xv. But a much smaller quantity (for example, six, or four, or even two grains) will frequently suffice, as I have before mentioned. But a scruple, or half a drachm, may be taken with perfect safety. A commonly-used emetic

consists of one grain of emetic tartar, and ten or fifteen grains of ipecacuanha. For infants, half a grain or a grain of this root is usually sufficient to occasion vomiting. In all cases, the operation of the remedy should be assisted by diluents. As a *nauseant* the dose is from one to three grains. As an *expectorant* and *sudorific*, the dose should not exceed one grain: for infants, one-quarter or one-eighth of a grain. *Ipecacuanha lozenges* contain usually from a quarter to half a grain of the powder, and may be used in catarrhal affections to promote expectoration. *Infusion of ipecacuanha* (prepared by digesting ℥ij. of the coarsely-powdered root in ℥vj. of boiling water) may be used as an emetic, in cases of narcotic poisoning, in doses of ℥ʒj. to ℥ʒij.

1. VINUM IPECACUANHÆ, L. E. D. (U. S.); *Wine of Ipecacuanha*.—(Ipecacuanha, bruised, ℥ijss. [ʒij. D. (U. S.)]; Sherry Wine, (Wine, U. S.) Oij. [*wine measure, D.*] Macerate for fourteen [seven, E.] days, and strain).—According to Dr. A. T. Thomson, a pint (*i. e.* ℥ʒxvj.) of wine takes up 100 grains of the soluble matter of ipecacuanha. This preparation is diaphoretic, expectorant, and emetic.—Dose, for an adult, as a diaphoretic and expectorant, ℥x. to ℥xl.; as an emetic. ℥ʒij. to ℥ʒiv. On account of the mildness of its operation, it is given, as an emetic, to children: the dose is from ℥xx. to ℥ʒi.; according to the age of the child. It is also exceedingly useful as an expectorant in the diseases of infants: dose from ℥v. to ℥x.

2. SYRUPUS IPECACUANHÆ, E. (U. S.); *Syrup of Ipecacuanha*.—(Ipecacuanha, in coarse powder, ℥iv.; Rectified Spirit, Oj.; Proof Spirit and Water, of each ℥ʒxiv.; Syrup, Ovij. Digest the ipecacuanha in four fluidounces of the rectified spirit, at a gentle heat, for twenty-four hours; strain and squeeze the liquor, and filter. Repeat this process with the residuum and proof spirit; and again with the water. Unite the fluids, and distil off the spirit till the residuum amount to twelve ounces; add to the residuum five fluidounces of rectified spirit, and then the syrup). [The U. S. P. directs Ipecacuanha in coarse powder, ℥j; Diluted Alcohol, Oj.; Syrup, Oij. Macerate the ipecacuanha in the alcohol for fourteen days and filter. Evaporate the filtered liquor to ℥ʒij. and again filter; then mix it with the syrup and evaporate by means of the water bath to the proper consistence, or prepare the alcoholic solution by displacement and proceed as after directed.]—A syrup of ipecacuanha is a very useful preparation for children; but some difficulties attend its preparation. An aqueous decoction of this root contains so much starch that it can scarcely be filtered. Even the infusion filters slowly, is always turbid, and yields a syrup which does not keep well. Hence MM. Guibourt and Henry (*Pharm. Raison.* i. 502, 2d ed.) introduced a process, of which that of the Edinburgh Pharmacopœia is a modification (improvement?). They prepared an alcoholic extract, which is dissolved in water and mixed with concentrated syrup. About two fluidscruples of the Edinburgh preparation contain the strength of one grain of ipecacuanha; hence the dose of it, as an *emetic*, for infants, will be half a teaspoonful; for adults, ℥ʒj. or ℥ʒiss. As an *expectorant*, the dose is ℥ʒj. to ℥ʒij.

3. PULVIS IPECACUANHÆ COMPOSITUS, L. E. D.; *Compound Powder of Ipecacuanha*; (Pulvis Ipecacuanhæ et Opii, U. S.); *Dover's Powder*; *Pulvis Doveri*, offic.—(Ipecacuanha, powdered; Hard Opium, powdered, of each ℥j.; Sulphate of Potash, powdered, ℥j. Mix them. The proportions used by all the British Colleges are the same. The *Dublin College* directs the Sulphate of Potash to be rubbed with the Opium, and the Ipecacuanha to be then intermixed.) This preparation is an imitation, (though not a very exact one) of a formula given by Dover (*The ancient Physician's Legacy to his Country*, p. 14. 1733); whence it is commonly known in the shops as *Dover's Powder*. The following is Dr. Dover's recipe:

“Take Opium, ℥j.; Saltpetre; Tartar vitriolated, of each ℥iv.; Ipecacuanha, ℥j.; Liquorice, ℥j. Put the saltpetre and tartar into a red hot mortar, stirring them with a spoon until they have done flaming. Then powder them very fine. After that slice in your opium; grind these to a powder, and then mix the other powders with them. *Dose*, from 40 to 60 or 70

grs. in a glass of white wine posset, going to bed. Covering up warm, and drinking a quart or three pints of the posset drink while sweating."

The compound powder of ipecacuanha is one of our most certain, powerful, and valuable sudorifics. The sulphate of potash is intended to serve the double purpose of promoting the sudorific operation of the other ingredients, and of minutely dividing, by the hardness of its particles, the opium and ipecacuanha. The nitrate of potash also employed by Dr. Dover probably contributed still further to the sudorific effect of the powder. The opium and ipecacuanha combined, enjoy great sudorific properties not possessed by either of these substances individually. I am inclined, however, to ascribe the greater part of the activity of the compound to the opium, which it is well known strongly determines to the cutaneous surface (see *OPIMUM*), and often produces pricking or itching of the skin; and when assisted by the copious use of warm aqueous diluents, operates as a sudorific. This effect, however, is greatly promoted by the ipecacuanha, which has a relaxing influence over the cutaneous vessels. The use of the posset, enjoined by Dr. Dover, is an important part of the sudorific plan. The contra-indications for the use of compound powder of ipecacuanha are an irritable condition of the stomach (when this preparation is apt to occasion sickness), and cerebral disorder. Thus, in fever, a dry furred tongue, and a dry skin, with much disorder of the cerebro-spinal functions, it, like other opiates, is calculated to prove most injurious. In such cases, the antimonial sudorifics may be resorted to (see vol. i. pp. 196 and 564). But when the tongue is moist, the skin, if not damp, at least soft, and the functions of the brain not much involved, it will probably operate beneficially. In slight colds, catarrhs, and rheumatic pains, it often proves most effectual. In various inflammatory affections, when the febrile excitement does not run too high, and when the brain is undisturbed, it may be used with good effect. In acute rheumatism, it is occasionally highly serviceable. In diarrhœa and dysentery also. In hemorrhages from internal organs, as the uterus, it is useful on the principle of revulsion or counter-irritation (vol. i. p. 145), by its power of determining to the skin. The dose of this preparation is usually from grs. v. to grs. x., given in currant jelly or gruel, or made into a pill (see *Pilule Ipecacuanhæ et Opii*), or administered in a common saline draught. Where the stomach is irritable, I have frequently seen five grains cause sickness. On the other hand, in some cases where a powerful sudorific is required, and the head quite free, grs. xv. or even ʒj. of this powder are not unfrequently given.

4. *PILULÆ IPECACUANHÆ COMPOSITÆ*, L.; *Pilule Ipecacuanhæ et Opii*, E.; *Compound Pills of Ipecacuanha*; *Pills of Ipecacuanha and Opium*.—(Compound Powder of Ipecacuanha, ʒij.; Squill, fresh-dried; Ammoniacum, of each, ʒj.; Mixture of Acacia, as much as may be sufficient. Beat them together until incorporated, L.—Powder of Ipecacuanha and Opium, *three parts*; Conserve of Red Roses, *one part*; beat them into a proper mass, which is to be divided into four-grain pills, E.)—Narcotic, and sudorific. Employed in chronic catarrh.—Dose, gr. v. to gr. x.

5. *TROCHISCHI MORPHIÆ ET IPECACUANHÆ*. (See *Morphia*).

3. *UNCA'RIA GAM'BIER*, Roxburgh, E.—*THE GAMBIR*.

Nau'clea Gam'bir, Hunter.

Sex. Syst. Pentandria, Monogynia.

(The extract obtained from the leaves, E.; Gambir, or Gambir-Catechu.)

HISTORY.—*Gambier*, or *Gambir*, is the Malay name of an extract obtained from the leaves of this shrub. Rumphius (*Herb. Amboin.* vol. v. tab. 34,) has described the plant under the name of *Funis uncatu*s or *Dawn Gatta Gambir*.

BOTANY. **Gen. Char.**—Limb of *calyx* short, urceolate, five-cleft. *Corolla* funnel-shaped; tube slender; throat naked; lobes five, spreading, oval-oblong. *Anthers* inclosed or protruded. *Style* filiform, protruded; *stigma* tumid, undivided. *Capsules* pedicellate, clavate, tapering to the base. *Seeds* numerous,

imbricated, winged.—Climbing *shrubs*. *Peduncles* when old becoming axillary compressed hooked spines. *Flowers* in loose heads (Lindley; De Cand.)

Sp. Char.—*Branches* terete. *Leaves* ovate-lanceolate, acute, with short petioles, smooth on both sides. *Stipules* ovate. *Peduncles* axillary, solitary, opposite, bracteolate about the middle; the lowest ones sterile, converted into hooked spines (De Cand.)

A stout, scandent *shrub*. *Florets* green and pink. *Capsules* stalked, clavate, two-celled, two-valved.

Hab.—Islands of East Indian Archipelago. Extensively cultivated. On the Island of Bintang there are 60,000 *Gambir plantations*. (Bennett's *Wanderings*, ii.)

EXTRACTION OF GAMBIR.—Two methods of obtaining Gambir are described: *one* consists in boiling the leaves in water, and inspissating the decoction; the *other*, which yields the best Gambir, consists in infusing the leaves in warm water, by which a fecula is obtained, which is inspissated by the heat of the sun, and formed into cakes. (*Asiatic Researches*, xi. 188.)

Dr. Campbell (Roxburgh, *Fl. Ind.* i. 518,) has described the method of making the *circular* or *cylindrical* variety of Gambier, as followed in the colony established by the Sultan of Moco, where the manufacture is carried on to a considerable extent. It consists in shredding and bruising the young shoots and leaves "in water for some hours, until a fecula is deposited; this, inspissated in the sun to the consistence of a paste, is thrown into moulds of a circular form, and in this state the Gambier is brought to market." Dr. Roxburgh (*op. cit.*) describes the manufacture of the *cubical* variety as practised eastward to the Bay of Bengal. The process consists in "boiling the leaves and young shoots; evaporating the decoction by fire and the heat of the sun. When sufficiently inspissated, it is spread out thin, and cut into little square cakes, and dried."

Mr. Bennett, (*Wanderings*, ii. 183,) has given a very full account of the method of making the *cubical* variety as practised at Singapore. The leaves are plucked from the prunings, and boiled in a *qualie*, or cauldron (made of bark, with an iron bottom); after being boiled twice and rinsed, they are used as a manure for the pepper vine. The decoction is evaporated to the consistence of a very thick extract, of a light, yellowish, brown colour, like clay, which is placed in oblong moulds. The pieces thus obtained are divided into squares, and dried in the sun on a raised platform. Hunter (*Linn. Trans.* ix.) says, Sago is often intermixed with the extract, but Bennett denies that this is done at Singapore. The best Gambier is made at Rhio, in the isle of Bintang; the next best is that of Lingin.

COMMERCE.—Gambir (the cubical variety) is imported from Singapore principally. Its principal use here is for tanning; and among dealers it is distinguished from catechu, cutch, &c. by the name of *terra japonica*. The following are the quantities imported during the last four years (Messrs. Powell's *Annual Price Current* for 1840):

In 1836	970 tons.	In 1838	1600 tons.
1837	2738	1839	5213

During the last three years, its price has varied from 15s. to 26s. per cwt. The duty on it is 1s. per cwt. It is brought over in cane baskets, lined with palm leaves. Mr. Bennett says they are made of a kind of rattan found in the jungle at Singapore.

DESCRIPTION AND VARIETIES.—*Gambir* (*Terra Japonica*, of tanners; *Catechu* in square cakes, of druggists; *Cubical Resinous Catechu*, of Guibourt; *Gambier of Second quality*, Bennett,) (*Med. and Phys. Journ.* vol. lxxvii.) occurs in cubes, whose faces are about one inch square. When thrown into water, it floats. These cubes are externally of a deep reddish or yellowish brown colour; their fracture is dull and porous, and internally their colour is paler

than that of their surface, being yellowish cinnamon brown; the fractured surface not unfrequently presenting some darker feebly shining stripes, extending from without inwards. This kind has no odour; its taste is powerfully astringent and bitter, but subsequently becoming sweetish. It melts entirely in the mouth. When heated in a platinum crucible it undergoes a kind of semifusion, and swells up; and when incinerated leaves a light white ash. Nees v. Esenbeck (*Handb. d. Med. Pharm. Bot.* i. 881.) says twenty grains of this Gambir leave only half a grain of ash. It is partially soluble in cold water. When boiled in water it almost completely dissolves and yields a decoction which, while hot, is clear reddish brown, but, on cooling, becomes turbid, owing to the deposition of catechine. By digestion in ether it forms a deep reddish-brown tincture, which, by evaporation, yields a reddish-brown astringent extract: the portion which is insoluble in ether is dark brown, tough and elastic. Examined by the microscope, Gambir is found to consist in great part of myriads of minute crystals (*catechine*) intermixed with a kind of mucous tissue.

Mr. Bennett (*Med. and Phys. Journ.* lxxvii.) has described three qualities of Gambir, specimens of which are contained in my own collection, as well as that of the *Medico-Botanical Society of London*. To these I must add a fourth, which I have received from Professor Guibourt.

1. Small Circular Moulded Gambir: *Gambir of the first quality*, Bennett; *Lozenge Gambir*.—This occurs in small round cakes, about the size of a small lozenge. Its form is something like that of a plano-convex lens, slightly flattened on the convex side. One of its surfaces is flat, round, about half an inch in diameter; the other one is convex, with a star-like pattern impressed on it. Its colour is pale pinkish yellowish white. It has a chalky or earthy feel, and is brittle. Specimens of this are in the collection of the *Medico-Botanical Society*.

Amylaceous Lozenge Gambir.—Under the name of *Gambir*, or *China Catechu*, I have received from Bombay small circular cakes of Gambir adulterated with sago meal. The cakes are circular and cylindrical, about $3\frac{1}{4}$ lines in diameter, and two lines thick; flat at the bottom, and slightly convex at the top. They are grayish yellowish white; have a cretaceous feel, and are easily reduced to powder. Their decoction when cold is rendered blue by tincture of iodine. Examined by the microscope multitudes of particles of sago may be detected, intermixed with crystals of catechine. I have received the same kind of gambir from Dr. D. Maclagan, of Edinburgh, under the name of *White Gambir*.

2. Gambir in parallelepipeds: *Gambir of the second quality*, Bennett.—This occurs in two forms: *cubes* (forming the Gambir of English commerce, described in the text), and *square prisms* or *oblong pieces*. The latter I received from Dr. Maclagan, of Edinburgh, under the name of *Yellow Gambir in parallelepipeds*. The length of the prisms is two inches; the size of the terminal faces half an inch square. In other respects the oblong variety agrees with the square kind.

3. Cylindrical Gambir: *Gambir of the third quality*, Bennett.—This occurs in circular discs, or short cylindrical pieces, the length of the cylinder being only about one-third of an inch, while its diameter is one inch and a quarter. One of the round surfaces is marked with the fibres of a cloth, on which the cakes have been dried. The colour internally is pale, dull, pinkish yellow, externally being a shade darker. Its fracture is dull and porous. It is easily scraped to powder with the nail, and in this state has a chalky feel. Its taste is astringent, but less so than the other kinds; it is gritty under the teeth. It sinks in water. The samples in the *Medico-Botanical Society* are somewhat smaller than those which I have found in commerce. This kind contains many impurities.

4. Cubical Amylaceous Gambir.—It is in cubes, which swim in water, and whose faces are about half an inch square. Externally these cubes are dark brown, being darker coloured than the kind just described. Its fracture is dull and porous, its colour internally being pale cinnamon brown. It is readily distinguished from all other kinds of Gambir, by the black colour produced when the tincture of iodine is applied to the fractured surface. When digested in water it is resolved into two parts:

Matter soluble in water	45
Matter insoluble in water, principally amylaceous	55

The amylaceous matter is probably sago. 100

COMPOSITION.—Gambir (the cubical variety) was analyzed by Nees v. Esenbeck, (*Pharm. Centr.-Blatt. für 1830*, 45.) who found *Tannin* 36 to 40 per cent., *Peculiar Matter, Gum* or *Gummy Extractive, Tannic Deposit* (similar to red cinchonic), and $2\frac{1}{2}$ per cent. of *Woody Fibre*.

1. TANNIC ACID.—The properties of this acid have been before (p. 192.) described. That extracted from Gambir is soluble in water, alcohol, and ether, and gives a green colour to the salts of iron.

2. CATECHINE; *Catechuic Acid*; *Tanningensäure*, Buchner; *Resinous Tannin*, Nees.—When Gambir is treated with cold water, an insoluble residuum is left: this is *impure catechine*, and was termed by Nees, *Resinous Tannin*. When obtained quite pure, it is a white, light powder, composed of silky needles, having a peculiar sweet taste. It is very slightly soluble only in cold water, more so in boiling water. Ether, and especially alcohol, are better solvents for it. It produces a green colour with salts of iron, but does not produce a precipitate with a gelatinous solution. Its composition is $C^{15}H^6O^6$. If it be digested in caustic potash, and the solution exposed to the air, oxygen is absorbed, and the catechine acid is converted into *Japonic Acid*, composed of $C^{14}H^4O^4$. But if it be dissolved in carbonate of potash, and exposed to the air without heat, it is converted into *Rubinic Acid*, composed of $C^{24}H^8O^8$.

PHYSIOLOGICAL EFFECTS.—Gambir is one of the most powerful of the *pure astringents*, whose effects have been before described (see vol. i. 188.) Its sweet taste depends, in part at least, on catechuic acid.

USES.—It is employed by druggists as catechu (see *Acacia Catechu*).

4. RUBIA TINCTORUM, Linn. D.—DYER'S MADDER.

Sex. Syst. Tetrandria, Monogynia.

(Radix, D.)

(Rubia, U. S. Sec. List.)

HISTORY.—Madder (*έρυθρόδανον*) was employed in medicine by Hippocrates. (Ed. Fœs. 407 and 634.) Theophrastus, (*Hist. Plant.* ix. 14.) Dioscorides, (lib. iii. cap. 160.) and Pliny, (*Hist. Nat.* lib. xxiv. cap. 66 and 68, ed. Valp.) also mention this substance. In the middle ages it was called *varantia*. (Beckmann, *Hist. of Invent. and Discov.* iii. 275.)

BOTANY. Gen. Char.—Tube of the *calyx* ovate-globose; limb scarcely any. *Corolla* five-partite, rotate. *Stamens* short. *Styles* two, short. *Fruit* didymous, somewhat globose, baccate, juicy (De Cand.)

Sp. Char.—Herbaceous. *Leaves* four to six in a whorl, somewhat petiolate, lanceolate, smooth above; their margin and keel, as well as the angles of the stem, aculeate, rough. *Peduncles* axillary, trichotomous. Lobes of the *corolla* gradually callous-acuminate, not cuspidate (De Cand.)

Root perennial, horizontal, long, crouching, reddish brown. *Stems* several, herbaceous, tetragonal, with hooked prickles. *Leaves* somewhat membranous. *Flowers* small, yellow.

Hab.—Levant and south of Europe.

DESCRIPTION AND VARIETIES.—Madder roots (*radix rubiæ tinctorum*) are long, cylindrical, about the thickness of a writing quill, branched, externally deep reddish brown. They consist of an easily separable cortex, whose epidermis is thin, and of a ligneous medullium, which in the fresh state is yellow, but by drying becomes reddish. The odour of the root is feeble; the taste is bitter and astringent.

Levant, Turkey, or Smyrna Madder, is imported whole, and constitutes the roots usually found in the shops. *Dutch or Zealand Madder* is imported ground. Four kinds of the powder are distinguished: *crop* (the best), *ombro*, *gamene*, and *mull* (the worst). *French Madder* is imported both ground and whole; it is produced in the environs of Avignon and Alsace. Small quantities of *Spanish Madder* are imported. The substance termed *East India Madder*, or *Munjeet*, is the root of *Rubia Munjista*, Roxb.

COMPOSITION.—Several analyses of madder have been made, viz. by Bucholz, (Gmelin, *Hand. d. Chem.* ii. 1280.) John, (*Ibid.*) and Kuhlmann. (*Ann. Chim. et Phys.* xxiv. 225.)

Bucholz.		Kuhlmann.
Resinous red colouring matter.....	1.2	Red colouring matter.
Extractive ditto.....	39.0	Yellow ditto (<i>Xanthin</i> .)
Reddish brown substance, soluble in potash		Mucilage.
and hot alcohol.....	1.9	Nitrogenous matter.
A pungent extractive.....	0.6	Bitter substance.
Gummy matter.....	9.0	Gum.
Woody fibre.....	22.5	Sugar.
Matter soluble in potash.....	4.6	Woody fibre.
Vegetable salts of lime, with colouring matter	1.8	Vegetable acid.
Water.....	12.0	Porous resin.
Loss.....	7.4	Salts in the ashes.
Madder root.....	100.0	Madder root.

The nature of the colouring matters of madder has been further investigated by Robiquet and Colin, (*Ann. Chim. et Phys.* xxxiv. 225,) by Gaultier de Claubry and Persoz, (*Ibid.* xlvi. 69,) and by Runge. (*Records of Science*, ii. 452, and iii. 44, and 135.) According to the last mentioned chemist, there are no less than five colouring matters in madder. The same chemist mentions two colourless acids of madder; viz. *Madderic* and *Rubiatic Acids*. The colouring matters are as follows:

1. **MADDER PURPLE** (? *Purpurin*, Robiquet and Colin).—An orange-yellow crystalline powder. It is slightly soluble in cold water, very readily so in alcohol and ether. A strong solution of alum dissolves it. Alkalis dissolve it, forming cherry-red solutions. The colours which it imparts to mordanted tissues are less permanent than those produced by madder-red.

2. **MADDER RED** (? *Alizarin*, Robiquet and Colin).—Is red, insipid, odourless, crystallizable by sublimation, insoluble in a strong solution of alum, almost insoluble in cold water, but is soluble in alcohol and ether. Alkalis dissolve it, forming violet-coloured solutions. It dyes cloths, which have been mordanted red. Its composition is $C^{37} H^{12} O^{10}$.

3. **MADDER ORANGE**.—Is very soluble in ether, sparingly so in cold alcohol. If water be added to a hot solution in spirit, crystals are deposited.

4. **MADDER YELLOW** (? *Xanthin*, Kuhlmann).—It is very soluble in water and alcohol. It has no affinity for cotton impregnated with the alum mordant.

5. **MADDER BROWN**.—Not being valuable as a dye-stuff, it has not been carefully examined.

It appears from Decaisne's observations¹ that the colouring matter of *Rubia tinctorum* does not reside in peculiar vessels or secretory apparatus, but in the interior of the elementary organs. Nor is it confined to the root, for in the stem of full-grown plants larger or smaller spots are here and there found, where the cells and spiral vessels are filled with it. Moreover, it appears that in madder root only yellow colouring matter is observed, which is the more intense as the plant is older. When the yellow sap of the root comes in contact with the atmosphere, it acquires, by the influence of oxygen and moisture, a red colour, and a granular substance forms in it.

PHYSIOLOGICAL EFFECTS.—The influence of madder over the system is exceeding slight. Its topical effect is scarcely obvious. Home (*Clin. Experiments*, p. 422, 2d ed.) ascribed to it emmenagogue qualities. Others have declared it to be diuretic. Neither of these effects, however, were observed by Dr. Cullen. (*Mat. Med.*) It may, perhaps, possess mild astringent and tonic properties.

But the most remarkable physiological effect of madder is that of colouring the bones of animals fed with it, red. This fact was noticed by Belcher; (*Phil. Trans.* vol. xxxix.) though Beckmann (*Hist. of Invent. and Discov.* iii. 279,) has adduced evidence to prove that some hints of it are to be found in the works of the ancients. This effect on the bones is produced more effectually, and in a much shorter time, in young than in old animals. In birds, the beak and claws become coloured. As the nerves, cartilages, aponeuroses, tendons, and periosteum are not tinged, the effect is ascribed to the chemical affinity of the phosphate of lime for this colouring matter. Mr. Gibson (*Manchester Memoirs*, i. 146, 2d Ser.) accounts for it as follows:—The blood charged with the red particles imparts its superabundance of them to the phosphate as it circulates through the bones. But as soon as the blood is freed from the madder by excretion, the serum then attracts the colouring matter, and in a little time entirely abstracts it.

This hypothesis has, however, been combated by Mr. Paget, (*Lond. Med. Gaz.* Nov. 15, 1839,) who asserts that the madder colours only those particles of phosphate of lime which are deposited during its use; and that it has no influence on the phosphate already existing in the bones before its administration, nor has the serum any chemical power to remove the colour from the phosphate once tinged. The coloured phosphate does indeed regain its whiteness after a time, when the madder is no longer exhibited; but this he ascribes to the

¹ *Recherches Anatom. et Physiol. sur la Garance*. Bruxelles, 1837. Also Meyer's Report on the Progress of Vegetable Physiology during the year 1837, translated by W. Francis, p. 49, Lond. 1839.

"gradual decomposition of the madder, as reddened skeletons gradually lose their colour when exposed to air and light." As, however, living bones are not subjected to the same influence of air and light (powerful decolorizers), which the skeletons referred to are, the analogy does not hold good; and this part of Mr. Paget's hypothesis is, therefore, unsatisfactory.

Tiedemann and Gmelin (*Vers. u. d. Wegen auf welche Subst. S. 7*) could not detect the colouring matter of madder in the chyle; and the red tint of the serum prevented them ascertaining its existence in the blood, though of this scarcely a doubt can exist, inasmuch as it has been found in the excretions (for example, urine, milk, and sweat).

USES.—It was formerly a favourite remedy in jaundice, in which disease Sydenham used it. (Sydenham's *Works*, by Dr. Pechey, p. 150, 4th ed. 1705.) On account of its capability of tinging the bodies red, it has been recommended in rickets and mollities ossium, on the supposition of its promoting the deposition of bone earth; (*Journ. de Méd.* t. xxxvii. 1772;) but this notion appears to be groundless. Home (*Clin. Exper.*) employed it as an emmenagogue in uterine complaints.—The dose of it is ʒss. to ʒij. three or four times a day.

OTHER MEDICINAL AND DIETETICAL RUBIACEÆ.

1. *PSYCHOTRIA EMETICA* is a native of Colombia, Peru, and probably of other parts of South America. Its roots constitute the *striated ipecacuanha* of Richard, Guibourt, and Merat; the *black* or *Peruvian ipecacuanha* of some other authors. They are neither annulated nor undulated, but longitudinally striated. They have deep circular intersections at various distances, giving them the appearance of being articulated; and when slight force is used, they fracture at these parts. As met with in commerce, they have externally a blackish-gray colour, with a brownish tinge; but when fresh, they are said to be dirty reddish-gray. Their fracture is resinous: the medullium, or central ligneous cord, is yellowish, and perforated by numerous holes, which are very visible by a magnifier: the cortical portion is softish, easily separable, and of a grayish-black colour, becoming much deeper when moistened. Its powder is deep gray. According to the analysis of Pelletier, this root consists of—*emetina* 9, *fatty matter* 12, *gallic acid* a trace, *gum*, *starch*, and *ligneous matter* 79.

2. *RICHARDSONIA SCABRA* (*R. braziliensis*, Gomez) is a native of the Brazil, New Granada, Peru, &c. Its root is the *undulated ipecacuanha* of Guibourt; the *amylaceous* or *white ipecacuanha* of Merat. It has a jointed appearance, from constrictions which are remote from each other. It is about the same size as that of the annulated species; is tortuous, attenuated at the extremities; externally of a grayish-white colour, becoming brownish by age. It presents no rings, properly so called, but is marked by sinicircular grooves. It consists, like the annulated species, of a thin yellowish medullium, and a cortical portion. The fracture of the root is not at all resinous, but farinaceous, and of a dull-white colour: the fractured surface presenting, when examined by a magnifier, numerous shining pearly, probably amylaceous, spots. The odour is musty. The composition of it, according to Pelletier, is *emetina* 6, *fatty matter* 2, *starch* and *ligneous matter* (very little of the latter) 92.

FIG. 210.

FIG. 211.



Striated Ipecacuanha (Roots of *Psychotria emetica*.)

a. An old root with a well marked intersection.
b. Contorted root.

Undulated Ipecacuanha Root.

a. Root of *Richardsonia scabra*.
b. Root of a *Richardsonia*.

3. COFFEA ARABICA.—The important dietetical uses of coffee (*semina coffeæ*), the albumen of the seed of *Coffea arabica*, demands a short notice. The coffee plant is a native of Arabia Felix and Ethiopia, but is extensively cultivated in Asia and America. It is an ever-green shrub, from fifteen to twenty feet high, with oblong-ovate, acuminate, smooth leaves, a five-toothed calyx, a white tubular corolla, with a five-parted spreading limb, five stamina, one pistil with a bifid style, and an oval, succulent, blackish-red or purplish two-seeded berry. The seeds are inclosed in a membranous endocarp (the parchment-like putamen of some botanists), and consist of a horny, yellow, bluish or greenish albumen, which is on one side flat, with a longitudinal furrow, on the other convex. At one end of the seed is the embryo, with its cordiform cotyledons. The dried berries were imported from Demerara in 1839. Occasionally the seeds contained in their endocarp (*coffee in the husk*) are met with in commerce.

FIG. 212.



Coffea Arabica.

The varieties of coffee are distinguished in commerce according to their places of growth; but considered with reference to their physical properties, they are characterized by colour (yellow, bluish, or greenish) and size (the smallest seeds are about three lines long and two broad, the largest five lines long and two lines and a half broad). *Arabian* or *Mocha Coffee* is small, and dark yellow. *Java* and *East India* (Malabar) kinds are larger, and paler yellow. The *Ceylon* is more analogous to the *West India* kinds (Jamaica, Berbice, Demerara, Dominica, Barbadoes, &c.), which, as well as the *Brazilian*, have a bluish or greenish gray tint. *Roasted Coffee* (*semina coffeæ tosta*) is, when ground, extensively adulterated with chicory. To detect the adulteration, shake the suspected coffee with cold water in a wine glass: if it be pure coffee it will swim, and scarcely communicate any colour to the fluid. Chicory, on the other hand, sinks, and communicates a deep red tint to the water. The presence of *roasted corn* may be detected by the blue colour produced on the addition of a solution of iodine to the cold decoction. Coffee, in both the raw and roasted states, has been the subject of repeated chemical investigations (see Thomson, *Org. Chem.* p. 98); but the results hitherto obtained can scarcely be considered satisfactory. The distilled water of coffee offers traces of a *volatile oil*. Pfaff declares that the aroma of roasted coffee depends on the volatilization, or rather decomposition, of a peculiar acid contained in raw coffee, and which has been denominated *caffic acid*. The same authority gives for the composition of this acid—Carbon 29.1, Hydrogen 6.9, and Oxygen 6.4. Zenneck, however, asserts, that the aromatic principle of roasted coffee is neither acid nor alkaline. It is, probably, a *volatile oil* generated during torrefaction, though it is not known what constituent of the raw coffee produces it. *Caffein* is a volatile, crystalline, neutral constituent of coffee. Its composition is $C^8 H^2 N^2 O^2$. The decoction of coffee is coloured green by the persalts of iron, probably in consequence of the presence of *catechine*. By the action of alkalis on a volatile principle of coffee, a green substance is produced, called *coffee green*. The other constituents of coffee are—*gum, resin, fixed oil, extractive, albumen, and lignin*.

The following is a comparative analysis of raw and roasted Martinico coffee, made by Schrader :

Raw Coffee.		Roasted Coffee.	
Peculiar coffee principle.....	17.53	Coffee principle.....	12.50
Gummy and mucilaginous extract.....	3.64	Extractive.....	4.80
Extractive.....	0.62	Gum and mucilage.....	10.42
Resin.....	0.41	Oil and resin.....	2.08
Fatty oil.....	0.52	Solid residue.....	68.75
Solid residue.....	66.66	Loss.....	1.45
Loss (water?).....	10.57		
	100.00		100.00

Raw coffee must be slightly nutritious, on account of the gum and other nutritive principles which it contains. Rasori employed it, like powdered bark, in intermittent fever; and Grindel used it, in other cases, also as a substitute for cinchona. By roasting, its nutritive principles are (for the most part) destroyed, while the empyreumatic matters developed communicate a stimulant influence with respect to the nervous system.

Roasted coffee possesses powerfully anti-soporific properties; hence its use as a drink by those who desire nocturnal study, and as an antidote to counteract the effects of opium, and other narcotics, and to relieve intoxication. In those unaccustomed to its use it is apt to occasion thirst and constipation. I know two persons on whom it acts as a purgative. It is sometimes very useful in relieving headache. It has also been employed as a febrifuge, in intermittents; as a stomachic, in some forms of dyspepsia; as an astringent, in diarrhoea; and as a stimulant to the cerebro-spinal system, in some nervous disorders. Floyer, Dr. Percival, and others, have used it in spasmodic asthma; and Laennec (*Treatise on Diseases of the Chest*, by Forbes, 2d ed. p. 418) says, "I have myself seen several cases in which coffee was really useful."

ORDER LIII.—CAPRIFOLIACEÆ, *Jussieu*.—THE HONEY-SUCKLE
TRIBE.

ESSENTIAL CHARACTER.—*Calyx* superior, four or five cleft, usually with two or more bracts at its base. *Corolla* superior, monopetalous or polypetalous, rotate or tubular, regular or irregular. *Stamens* epipetalous, equal in number to the lobes of the corolla, and alternate with them. *Ovary* with from one to three or four cells, one of which is often monospermous, the others polyspermous: in the former the ovule is pendulous; *style* one; *stigmas* one, or three to four. *Fruit* indehiscent, one or more celled, either dry, fleshy, or succulent, crowned by the persistent lobes of the calyx. *Seeds* either solitary and pendulous, or numerous and attached to the axis; *testa* often long; *embryo* straight, in fleshy albumen; *radicle* next the hilum.—*Shrubs* or *herbaceous* plants, with opposite *leaves*, destitute of *stipules*. *Flowers* usually corymbose, and often sweet-scented. (Lindley.)

PROPERTIES.—Not uniform.

SAMBUCUS NIGRA, *Linn.*, *L. E. D.*—COMMON ELDER.

Sex. Syst. Pentandria, Trigynia.

(Flores, *L.*—Flowers, *E.*—Flores. *Bacca.* Cortex interior, *D.*)

HISTORY.—Hippocrates employed the elder (*ἀξέρι*) in medicine.

BOTANY. *Gen. Char.*—Limb of the *calyx* small, five-cleft. *Corolla* rotate, pitcher-shaped, five-cleft; its lobes obtuse. *Stamens* five. *Style* none. *Stigmas* three, sessile. *Berry* roundish, scarcely crowned, pulpy, one-celled (*Gærtn.*), three to five-seeded; funiculi bearing the oblong seeds in the axis of the fruit. (De Cand.)

Sp. Char.—*Stem* shrubby, somewhat arboreous. *Leaves* pinnatisect, smooth; segments ovate-lanceolate, serrate. *Corymbs* five-partite. (De Cand.)

Stem much and irregularly (though always oppositely) branched, of quick growth; *branches* (after a year's growth) clothed with smooth gray bark, and filled with a light spongy pith. *Leaflets* deep green, smooth, usually two pair, with an odd one. *Cymes* [corymbs] large, smooth, of numerous cream-coloured flowers, with a sweet but faint smell; some in each cyme sessile. *Berries*, globular, purplish-black; their stalks reddish. (Smith.)

Hab.—Indigenous: in hedges, coppices, and woods; common.

DESCRIPTION.—The *liber* or *inner bark* (*cortex interior sambuci*) is collected from the branches: its colour is greenish-white; its taste sweetish astringent; its odour feeble. Its infusion is rendered slightly green by the sesquichloride of iron. *Elder flowers* (*flores sambuci*) are white when fresh, but by drying become yellow, and retain an agreeable odour. *Elder berries* (*bacca sambuci*) yield, by expression, a purple juice, called *elder rob*.

COMPOSITION.—I am unacquainted with any analysis of *elder bark*. The flowers were analyzed by Eliason, (*Gmelin, Handb. d. Chem.* ii. 1279,) who obtained from them *volatile oil*, *acid resin*, *tannin*, *oxidized extractive*, *nitrogenous extractive*, *gum*, *woody fibre*, *glutinous matter*, *albumen*, *malates of potash and lime*, *mineral salts*, and a trace of *sulphur*. *Elder juice* contains *malic acid*, a little *citric acid*, *sugar*, *pectin*, and *colouring matter*, which is reddened by acids, and made green by alkalis.

PHYSIOLOGICAL EFFECTS.—The *flowers*, owing to their volatile oil, are mildly stimulant, and, perhaps, sudorific. The *berries* are cooling, aperient, and diuretic. The *inner bark* (*liber*) is hydragogue, cathartic, and emetic. The *leaves*, probably, possess similar, though less energetic, properties.

USES.—The *flowers* are seldom employed, except in the preparation of *elder-flower water* and *elder ointment*. The use of the *berries* is now almost solely confined to the manufacture of *elder wine*. The *insipissated juice* of the berries is, however, an official preparation. The *inner bark* has been used as a hydragogue cathartic in dropsy. It may be given in decoction (prepared by boiling ℥j. of the bark in Oj. of water to Oj.), in doses of ℥iv. Smaller doses have been used as an aperient and resolvent in various chronic disorders.

I. OLEUM SAMBUCCI, *L.* *Oil of Elder.*—(Directed to be obtained from the

flowers by submitting them to distillation with water.)—By distillation the flowers yield a small quantity of a butyraceous, odoriferous oil, but totally unfit for any useful purpose. Its introduction into the Pharmacopœia must, therefore, have been an oversight. The liquid sold in the shops as *Green Oil* (*Oleum viride*) or *Oil of Elder*, is prepared by boiling leaves (usually those of the elder) in rape oil. It is employed as a liniment.

2. **AQUA SAMBUCCI**, L. E.; *Elder Flower Water* (Elder flowers [fresh, E.], lb. x. [or Oil of Elder, ʒij. L.]; Water, Cong. ij.; Proof Spirit, fʒvij. [Rectified Spirit, fʒij. E.] Mix them, and let a gallon distil.)—Elder-flower water is frequently made from the *pickled flowers* (*flores sambuci saliti*) which are prepared with alternate layers of the flowers and common salt compressed and preserved in a well-closed vessel [usually a cask]: the water which exudes being rejected. It cannot be made from the oil, as ordered by the London College. It is principally used as a perfume.

3. **UNGUENTUM SAMBUCCI**, L. D.; *Elder Ointment* (Elder Flowers, Lard, of each lb. ij.; Boil the Elder flowers in the Lard until they become crisp; then press through a linen cloth.—The *Dublin College* uses the leaves instead of the flowers. The formula is as follows:—Fresh leaves of Elder, lb. iij.; Prepared Hog's Lard, lb. iv.; Prepared Mutton Suet, lb. ij. Make an ointment in the same manner as the Savine Ointment.

The *Unguentum Sambuci*, Ph. L. is the *white elder ointment* of the shops. Except in its agreeable odour it has no advantage over spermaceti ointment. The *Unguentum Sambuci*, Ph. D. is the *green elder ointment of the shops*: it is inodorous. It is popularly used as a cooling ointment.

4. **SUCCUS SPISSATUS SAMBUCCI**, D.; *Inspissated Juice of Elder*; *Elder Rob.* (Prepared as the *succus spissatus aconiti*).—Refrigerant, laxative, and diuretic. Diluted with water it forms a cooling beverage in febrile and inflammatory disorders.—Dose, ʒj. to ʒij.

[For the same purposes the *Sambucus canadensis* is used in the U. S.—J. C.]

ORDER LIV.—ARALIACEÆ, Richard.—THE ARALIA TRIBE.

ARALIE, Jussieu.

1. **PA'NAX QUINQUEFO'LIUM**, Linn. is a native of North America, growing in the Northern, Middle, and Western States of the Union. Its root is the *American Ginseng* (*radix ginseng*). It is exported to China, where it is highly valued. Pieces of it are said to be occasionally found intermixed with *senega root*.

FIG. 213.



Panax quinquefolium.

2. **PA'NAX SCHIN'SENG**, Nees v. Esenbeck, is a native of Asia, and has been usually confounded with the preceding species. Nees admits three varieties:—*P. Schin-seng*, var. *coraiensis*; *P. Schin-seng*, var. *japonica*, and *P. Schin-seng*, var. *nepalensis* (*P. Pseudo-ginseng*, Wallich). The root of this species is the *Asiatic Ginseng* (*radix ninsi*).

The Chinese physicians ascribe the most improbable and extravagant virtues to ginseng. They regard it as an invigorating and aphrodisiac agent. At Pekin it is said to have been sometimes worth its weight in gold! To the taste it is mucilaginous, sweetish, somewhat bitter, and slightly aromatic. In Europe it is believed to possess very little power.

3. **ARALIA NUDICAULIS**, U. S. *False Sarsaparilla*. *Sec. List.* This is an indigenous plant of the United States, where in addition to the name given, it is called *small spikenard*. The flower, stem, and leaf, arise together from the root, the former is naked, terminated by three umbels with small greenish flowers, the leaf is ternate or quinate in three divisions, the leaflets are oval and acuminate, the whole leaf is longer than the flower. The root is officinal; it is horizontal, creeping, several feet long, as thick as the little finger, of a yellowish brown colour externally, having an aromatic odour and a warm sweetish taste. It differs from sarsaparilla in its woody structure and central medulla. In its medical properties, it is mildly stimulating and diaphoretic, and is used as a domestic remedy in rheumatism and other chronic diseases. The form of administration is decoction.—J. C.]

ORDER LV.—UMBELLIFERÆ, *Jussieu*.—THE UMBELLIFEROUS TRIBE.APIACEÆ, *Lindley*.

ESSENTIAL CHARACTER.—Tube of the *calyx* adherent to the ovary; the limb [superior calyx of *Lindley*] entire, or five-toothed, or obsolete. *Petals* five, inserted into the upper part of the calyx [inserted on the outside of a fleshy epigynous disc, *Lindley*], usually inflexed at the point; aestivation imbricate, rarely valvate. *Stamens* five, alternate with the petals, incurved in aestivation. *Ovary* [inferior *Lindley*] adherent to the calyx, two (rarely one) celled, with solitary pendulous ovules: *styles* two, distinct, incrassated at the base into *stylopodia*, covering the whole of the ovarium; *stigmas* simple. *Fruit* (called *diachæna*, *polyachæna*, or *cremocarpium*) consisting of two *mericarps* (i. e. two carpella, with half of the calyx attached, so that they can be called neither *carpella* nor *achenia*), separable from a common axis (*carpophorus*), to which they adhere by their face (*commissure*); the dorsal surface of each carpel is traversed by *ridges*, of which five are primary (*costæ* seu *juga primaria*), and four secondary (*juga secundaria*); the latter are sometimes absent: the spaces between the ridges are called *channels* (*valleculæ*). In the channels, within the pericarp, are, sometimes, linear oily receptacles, called *vittæ*. *Seed* pendulous, usually adhering inseparably to the pericarp, rarely loose: *embryo* minute, pendulous from the apex of the axis (*carpophorus*); *radicle* pointing to the hilum; *albumen* abundant, horny, flat (*Orthospermæ*), or rolled inwards at the edges (*Campylospermæ*), or rarely curved inwards from the base to the apex (*Celospermæ*).—*Herbaceous* plants, with fistular furrowed stems. *Leaves* usually divided, sometimes simple, sheathing at the base. *Flowers* in umbels, white, pink, yellow, or blue, generally surrounded by an *involucre* (condensed from De Candolle).

PROPERTIES.—Extremely variable.

1. CARUM CARUI, *Linn. L. E. D.*—COMMON CARAWAY.

Sex. Syst. Pentandria, Digynia.

(Fructus, L.—Fruit, E.—Semina, D.)

(Carum, U. S.)

HISTORY.—Caraway is not mentioned in the writings attributed to Hippocrates. Pliny (*Hist. Nat.* lib. xix. cap. 49, ed. Valp.) and Dioscorides, (lib. iii. cap. 66,) however, speak of it: the former calls it *Careum* (from Caria, its native country)—the latter terms it *καρος*.

BOTANY.—**Gen. Char.**—Margin of the *calyx* obsolete. *Petals* regular, obovate, emarginate, with an inflexed lobe. *Stylopodium* depressed. *Styles* deflexed. *Fruit* contracted at the side, ovate, or oblong. *Mericarps* [half-fruits] with five equal filiform ridges, the lateral ones marginal. *Commissure* flat, bivittate. *Channels* one vittate. *Carpophorus* free, forked at the apex. *Seeds* terete-convex, flat in front.—Smooth often perennial herbs. *Root* tuberous, edible. *Leaves* pinnatisect; the segments many-cleft. *Involucre* variable. *Flowers* white. (De Cand.)

Sp. Char.—*Root* fusiform. *Leaves* bipinnatisect; the lower segments of the branches decussate, all many-cleft. *Involucre* none (De Cand.)

Biennial. *Stem* branched, about 2 feet high. *Umbels* numerous, dense. *Flowers* white or pale flesh-coloured; appear in June.

Hab.—In meadows and pastures all over Europe; naturalized in England. Largely cultivated in Essex.

DESCRIPTION.—The *mericarps*, commonly called *caraway seeds* (*fructus* seu *semina carui*) are from $1\frac{1}{2}$ to 2 lines long, usually separated, slightly curved inwards, of a brownish colour, with five lighter coloured primary ridges; there are no secondary ones. In each channel is one *vitta*, and on the commissure are two. The smell is aromatic and peculiar, the taste warm and spicy. The caraway of the shops is in part the produce of this country, but is partly supplied from Germany. In 1839, duty (30s. per cwt.) was paid on 515 cwts. which were imported.

COMPOSITION.—No analysis of the fruit has been made. The aromatic qualities depend on a volatile oil.

OLEUM CARUI (see p. 466).

VOL. II.

PHYSIOLOGICAL EFFECTS.—Caraway is an aromatic stimulant and condiment (see vol. i. p. 183). Its effects are similar to those of dill and anise.

USES.—Caraway is principally consumed by the confectioner and cook. It is also used by the distiller for flavouring liquors. Its medicinal employment is not extensive. It is given to relieve the flatulent colic of children, and enters, as an adjuvant or corrective, into several officinal compounds. It is less seldom employed in substance than in the form of *oil, spirit, or water.*

1. **OLEUM CARUI, L. E. D. (U. S.); Oil of Caraway.**—(Obtained by submitting the fruit [bruised, *E.*] to distillation with water).—The quantity obtained from a given weight of fruit is variable. Recluz says about 4·7 per cent.; but I am informed, by a manufacturing chemist, that he has obtained 213 lbs. of oil from 35 cwts. of the fruit; which is about 5·43 per cent. When fresh prepared it is colourless; but it becomes yellow and subsequently brown by keeping. It is limpid, and has the aromatic odour of the fruit and an acrid taste. Its sp. gr. is 0·950. According to Schweizer, (*Pharmaceutisches Central-Blatt für 1841*, S. 789,) it consists of *carbon* 86·14, *hydrogen* 10·65, and *oxygen* 3·18. When submitted to distillation with caustic potash it yields a carbo-hydrogen (*caruen*) whose formula is $C^{10}H^8$. The brown residue in the retort yields, when mixed with water, a brown resin and a brown alkaline solution. If the latter be saturated with an acid and distilled, an acrid oil (*caruacrol*) is obtained. Oil of Caraway is generally employed in the preparation of the *spirit and water.* It is used to impart flavour, to correct the nauseating and griping qualities of some medicines, and to relieve flatulence. It is frequently added to cathartic pills and Powders.—Dose, one to ten drops.

2. **SPIRITUS CARUI, L. E. D.; Spirit of Caraway.**—(Caraway bruised, ℞xxij. [lb. ss. *E.*, lb. j. *D.*]; Proof Spirit, Cong. j. [Ovij. *E.* Cong. j. *wine measure, D.*]; Water, Oij. [Ojss., *E.* Sufficient to prevent empyreuma, *D.*] Mix [macerate for two days in a covered vessel, *E.*, for twenty-four hours, *D.*] and distil off a gallon [lb. vij. *E.*], by a gentle heat).—This is frequently imitated by dissolving the oil of caraway in spirit. It is aromatic and carminative.—Dose, ℥j. to ℥iv. Sweetened with sugar, this spirit is drunk in Germany as a dram (*Kümelliqueur; Kümelbrandtwein*).

3. **AQUA CARUI, L. D.; Caraway water.**—(Caraway, lb. iss. [lb. j. *D.*]; Water, Cong. ij. [enough to prevent empyreuma, *D.*]; [Proof Spirit, ℥vij. *L.*] Distil a gallon).—This is usually imitated by dissolving or diffusing the oil through water by the aid of sugar or of carbonate of magnesia. It is employed as a carminative vehicle for purgatives (as saline purgatives, magnesia, &c.) and in the flatulent colic of children.

2. PIMPINELLA ANISUM, Linn. L. E. D.—THE ANISE.

Sex. Syst. Pentandria. Digynia.

(Fructus, *L.*—Fruit, *E.*—Semina, *D.*)

(Anisum, *U. S.*)

HISTORY.—Anise was used by Hippocrates. (Pp. 263, 265, &c. ed. Fœs.) It is also mentioned by Pliny (*Hist. Nat.* lib. xx. cap. 72, ed. Valp.) and Dioscorides. (Lib. iii. cap. 65.) The latter terms it ἀνισον. It was introduced into this country in 1551. In our translation of the New Testament, (*Matth.* xxiii. 23,) the word *anise* occurs instead of *dill*.

BOTANY.—**Gen. Char.**—Margin of the *calyx* obsolete. *Petals* obovate, emarginate, with an inflexed lobe. *Fruit* contracted at the side, ovate, crowned by a cushion-like disk, and reflexed, somewhat capitate styles. *Mericarps* [half-fruits] with five, filiform, equal ridges, the lateral ones being marginal. *Channels* multivittate, with a bifid free carpophorus. *Seed* gibbous convex, anteriorly flattish.—*Roots* simple, radical *leaves* pinnatisect; the segments roundish, toothed, rarely undivided, those of the stem more finely cut. *Umbels* of many rays. *Involucre* none. *Petals* white, rarely pink or yellow (De Cand.)

Sp. Char.—*Stem* smooth. Radical *Leaves* cordate, somewhat roundish, lobed, incised, serrate; middle ones pinnate lobed, the lobes cuneate or lanceolate; the upper ones trifid, undivided, linear. *Fruit* bearing a few scattered hairs (De Cand.)

Root tapering. *Stem* erect, branched, about a foot high. *Flowers* small, white.

Hab.—Island of Scio and Egypt. Largely cultivated for its fruit in Malta, Spain, and various parts of Germany. It also grows in Asia.

DESCRIPTION.—The fruit called *aniseed* (*fructus seu semina anisi*), is slightly compressed at the sides. The separated mericarps are ovate, of a grayish-green colour, with five paler, thin, filiform, primary ridges (there are no secondary ones), and covered with downy hairs. In each channel are three vittæ. The odour is aromatic, and similar to that of the fruit of *Illicium anisatum*, or *star anise*, a plant belonging to the family Winteraceæ. The taste is sweetish and aromatic. By careless observers, aniseed may be confounded with the fruit of hemlock.

COMMERCE.—Aniseed is principally imported from Alicant and Germany (the first is preferred); but some is also brought from the East Indies. In 1839, duty (5s. per cwt.) was paid on 192 cwts.

COMPOSITION.—A very elaborate analysis of the fruit has been made by Brandes and Reimann in 1826. (Gmelin, *Handb. d. Chem.* ii. 1277.) The following are their results:—*Volatile oil* 3.00, *stearin combined with chlorophylle* 0.12, *resin* 0.58, *fatty oil soluble in alcohol* 3.38, *phytolol* 7.85, *incrySTALLIZABLE SUGAR* 0.65, *gum* 6.50, *extractive* 0.50, *substance analogous to ulmin* (Anis-ulmin) 8.60, *gumoin* 2.90, *lignin* 32.85, *salts* (acetate, malate, phosphate, and sulphate) of *lime and potash* 8.17, *inorganic salts, with silicic acid and oxide of iron* 3.55, *water* 23.00 (excess 1.65).

OIL OF ANISE, (see below.)

PHYSIOLOGICAL EFFECTS.—Anise is an aromatic stimulant (see vol. i. p. 183.) Its effects are similar to those of dill. The odour of anise is said to be recognised in the milk of those who have taken it: moreover, the urine, we are told, acquires an unpleasant smell from it: hence it would appear that the oil of anise becomes absorbed. It has been supposed to promote the secretion of milk, urine, bronchial mucus, and of the menses, though without sufficient evidence. Vogel (*Hist. Mat. Med.* 161,) says, that he accidentally discovered that pigeons are readily killed by a few drops of the oleum anisi. Hillefeld (Wibmer, *Wirk. d. Arzneim.* Bd. ix. S. 207,) also notices its poisonous operation on pigeons.

USES.—Anise is used to flavour liqueurs, sweetmeats, confectionary of various kinds, ragouts, &c.

In medicine it is employed to relieve flatulence and colicky pains, especially of children to prevent the griping effects of some cathartics. Nurses sometimes take it to promote the secretion of milk. It has also been employed in pulmonary affections. It is used as a horse medicine.

I. OLEUM ANISI, L. E. D. (U. S.) *Oil of Anise.*—(Obtained by submitting the fruit with water to distillation).—Mr. Brande says, that from 1 cwt. of fruit about two pounds of oil are obtained. The greater part of the oil consumed in this country is foreign. The oil of anise of the shops is imported into this country from Germany and the East Indies. In 1839 duty (1s. 4d. per lb.) was paid on 1544 lbs. It is procured, by distillation, from the fruit, in whose pericarp it resides. When carefully prepared it is transparent and nearly colourless, having a slightly yellow tinge. It has the odour and taste of the fruit from which it is obtained. Its specific gravity increases with its age: thus Martius says, that when the oil is fresh distilled, the specific gravity is only 0.979; but after keeping it for a year and a half, the specific gravity had

increased to 0.9853. It congeals at 50° F., and does not liquefy again under 62°. It is soluble in all proportions in alcohol; but spirit, whose specific gravity is 0.84, dissolves only 0.42 of its weight. By exposure to the air it forms resin, and becomes less disposed to concrete. It is composed of two volatile oils,—one solid at ordinary temperatures (*stearoptène*); the other liquid (*eleoptène*)—in the following proportions:—eleoptene 75, stearoptene 25. According to Cabours the stearoptene consists of $C^{20} H^{12} O^2$.

The *oleum badiani*, or the *oil of star-anise* (*Illicium anisatum*), has the odour and taste of the oil of anise; but it preserves its fluidity at 35.6 F. It is said to be sometimes substituted for the *oleum anisi*.

Spermaceti, which is said to be sometimes added to oil of anise, to promote solidification, may be distinguished by its insolubility in cold alcohol. Camphor said to be added for the same purpose, is recognised by its odour.—Dose, five to fifteen drops on sugar, or rubbed up with sugar, in camphor mixture.

2. SPIRITUS ANISI, L. *Spiritus Anisi Compositus*, D.; *Spirit of Anise*.—(Anise, bruised, ℥x. [Anise and Angelica seeds of each lb. ss. D.]; Proof Spirit, Cong. j. [wine measure, D.]; Water, Oij. [sufficient to prevent empyreuma, D.] Mix [macerate for twenty-four hours, D.] and let a gallon distil).—Stimulant, stomachic, and carminative. Dr. Montgomery (*Observ. on the Dubl. Pharm.*) says that the preparation of the Dublin Pharmacopœia is nearly the composition of the Irish *Usquebaugh*, which is coloured yellow by saffron, or green by sap-green. A spirit of anise, sweetened with sugar, is sold by the liqueur dealers. A somewhat similar compound is prepared in France, under the name of *crome d'anise*. The pharmacopœial preparation is usually imitated by dissolving the oil in spirit.—Dose, ℥j. to ℥iv.

3. AQUA ANISI. *Anise Water*.—(Extemporaneously made by diffusing the oil through water by the aid of sugar or spirit).—Employed to relieve flatulent colic of infants, and as a vehicle for other medicines.

3. FENICULUM VULGARE, Gærtner, L.—COMMON FENNEL.

Sex. Syst. Pentandria, Monogynia.

Feniculum officinale, E.—*Anethum Feniculum*, D.

(*Feniculum*, U. S.)

HISTORY.—Fennel (*μάραθρον*) was used by Hippocrates, (p. 551, &c. ed. Fœs.) Some botanists (e. g. Matthioli) have been of opinion that *μάραθρον* of Dioscorides (lib. iii. cap. 81) is *sweet fennel* (*Feniculum dulce*, De Cand.), and that the *ισσομάραθρον* of the same authority (*ibid.* cap. 82) is *common fennel* (*Feniculum vulgare*, De Cand.); but the latter part of the opinion does not, from an observation of Bauhin, (*Prodromus*, p. 76,) appear probable. (Dierbach, *Arzneim. d. Hippocr.* 191.)

BOTANY. **Gen. Char.**—Margin of the *calyx* swollen, obsolete, toothless. *Petals* roundish, entire, involute, with a squarish, blunt lobe. *Fruit* by a transverse section nearly taper. *Mericarps* [half fruits] with five prominent, bluntly-keeled ridges, of which the lateral ones are marginal and rather broader. *Channels* univittate. *Commisures* bivittate. *Seed* nearly semi-terete.—Biennial or perennial herbs. *Stems* taper, somewhat striated, branched. *Leaves* pinnatisect, decomposed; the segments linear, setaceous. *Involucre* scarcely any. *Flowers* yellow (De Cand.)

Sp. Char.—*Stem* somewhat terete at the base. Lobes of the *leaves* linear, subulate, elongated. *Umbels* of 13 to 20 rays. *Involucre* none. (De Cand.)

A biennial, three or four feet high. *Flowers* golden yellow. *Fruit* scarcely two lines long, oval, of a dark or blackish aspect; the channel is brownish, owing to the vitta, the ridges are pale yellowish gray.

Hab.—Sandy and chalky ground all over Europe.

DESCRIPTION.—The fruit, called *wild fennel seed* (*semina seu fructus feniculī*

vulgaris) has a strong aromatic, acrid taste, and an aromatic odour. Its other qualities have been described.

COMPOSITION.—The peculiar properties of the fruit depend on a *volatile oil*.

OIL OF COMMON, WILD, OR BITTER FENNEL (*Oleum Feniculi vulgaris*).—A pale yellow, limpid oil, having the peculiar odour of the fruit. Its sp. gr. is 0.997. It congeals by cold, though with much more difficulty than oil of anise. It consists of a stearoptene which has the same composition as that of oil of anise; and a liquid oil which is isomeric with oil of turpentine.

PHYSIOLOGICAL EFFECTS.—Aromatic stimulant (see vol. i. p. 183), similar to those of sweet fennel.

USES.—This species is not employed in medicine.

4. FENICULUM DULCE, C. Bauhin; De Cand.—SWEET FENNEL.

Sex. Syst. Pentandria, Monogynia.
(Fructus.)

HISTORY.—This plant is regarded by some botanists as a cultivated variety of the former plant. De Candolle (*Prodr.* iv. 142) is the principal systematic writer who regards them as distinct species. The London College, in quoting his *F. vulgare* as the officinal plant, has committed an obvious error, seeing that it is his *F. dulce* which is always employed in medicine in this country.

BOTANY. *Gen. Char.*—See *F. vulgare*.

Sp. Char.—*Stem* somewhat compressed at the base. *Radical leaves* somewhat distichous; lobes capillary, elongated. *Umbels* of six to eight rays. (De Cand.)

This plant differs from *F. vulgare* in several other particulars. It is an annual, and much smaller plant. It flowers earlier. Its turiones are sweeter, less aromatic, and, therefore, edible. The fruit is much longer; some of the specimens being nearly five lines in length, less compressed, somewhat curved and paler, with a greenish tinge.

Hab.—Italy, Portugal, &c. Cultivated as a pot-herb, and for garnishing.

DESCRIPTION.—The fruit, termed *sweet fennel seeds* (*fructus seu semina feniculi dulcis vel feniculi cretici*), has a more agreeable odour and flavour than common or wild fennel. Two kinds are known in trade, *shorts* and *longs*: the latter is most esteemed.

COMPOSITION.—The peculiar properties of the fruit depend on a volatile oil.

PHYSIOLOGICAL EFFECTS.—Sweet fennel is an aromatic stimulant (see vol. i. p. 183); its effects are similar to those of anise or dill.

USES.—Seldom employed. May be given in the flatulent colic of children, or as a carminative vehicle for remedies which are apt to gripe.

1. OLEUM FENICULI, E. D. (U. S.); *Oil of Sweet Fennel*; *Oleum Feniculi dulcis*.—(Obtained by submitting the fruit [bruised, E.] with water to distillation.)—Nineteen *cwts.* of the fruit (*shorts*) yield 78 lbs. of oil. (*Private information*.) This oil is distinguished from the oil of wild fennel by its more agreeable odour and taste. Stimulant and carminative. Seldom used.—Dose, two to twenty drops.

2. AQUA FENICULI, E. D.; *Fennel Water*.—(Obtained as *Aqua Anethi*.) Carminative. Employed to relieve flatulent colic of infants, and as a vehicle for other medicines.—Dose, for an adult, ℥ʒj. to ℥ʒij.; for an infant, ℥ʒj. to ℥ʒij.

5. ARCHANGELICA OFFICINALIS, Hoffm. and Koch.—GARDEN ANGELICA.

Angelica Archangelica, Linn, E. D.

Sex. Syst. Pentandria, Digynia.

(Root, E.—Semina, D.)

HISTORY.—It is doubtful whether the ancient Greeks and Romans were acquainted with this plant, as no certain notice of it appears in their writings. C. Bauhin (*Pinax*, 155) calls it *Angelica sativa*.

BOTANY. Gen. Char.—Margin of the *calyx* with five short teeth. *Petals* elliptical, entire, acuminate, with the point curved inwards. *Fruit* somewhat compressed at the back, with a somewhat central raphé, two-winged on each side. *Mericarps* [half-fruits] with thick, keeled ridges; the three dorsal ones elevated, the two lateral ones dilated into a twice as broad wing. *Seed* not adhering to the integument; the nucleus free, covered all over with numerous vittæ. *Carpophorus* two-partite.—Perennial *herbs*. *Leaves* pinnatisect; segments broadly ovate, acute, coarsely dentate, terminal, lobed. *Petioles* large, sheathing, saccate. *Involucre* scarcely any; *partial one* halved, many-leaved. *Flowers* white, or greenish. (De Cand.)

Sp. Char.—*Stem* smooth, terete, striated. *Leaves* bipinnatisect; segments subcordate, lobed, sharply serrated, the odd one three-lobed; sheaths loose, saccate. Leaflets of the *partial involucre* equalling the partial umbel. (De Cand.)

Root biennial, large, fleshy, branched, resinous, pungently aromatic. *Stem* four or five feet high, a little glaucous. *Foliage, stalks, and even the flowers,* bright green. It flowers from June to September.

Hab.—Indigenous; northern parts of Europe. Cultivated in moist situations, and on the banks of ditches.

DESCRIPTION.—The dried angelica root (*radix angelicæ*) of the shops, is imported from Hamburg in casks. In 1839 duty (4s. per cwt.) was paid on 386 cwts. Formerly *Spanish Angelica* was alone employed for medicinal purposes. The dried root of the shops consists of a short cylindrical head, from which numerous branches arise. The size of these branches varies: the larger ones are as thick as the little finger, and six or eight inches long. Externally the root is corrugated, and grayish brown. Internally it is dirty white, and presents, when cut transversely, numerous dark points, which are the cut extremities of vessels or intercellular spaces filled with a liquid, strongly odorous, oil or oleo-resin. To the taste the root is at first sweet, then hot, aromatic, and bitter. The odour is peculiar, and not very disagreeable. The fruit, called *angelica seeds* (*fructus seu semina angelicæ*), have the odour and taste, but in a diminished degree, of the root.

COMPOSITION.—Angelica root has been analyzed by John, (Gmelin, *Handb. d. Chem.* ii. 1277,) and by Bucholz and Brandes. The latter chemists obtained *volatile oil* about 0.70, *acrid soft resin* 6.02, *bitter extractive* 26.40, *gum* with some common salt 31.75, *starch* (not inulin) 5.40, *woody fibre* 8.60, *peculiar matter* (oxidized extractive?) 0.66, *albumen* 0.97, *water* 17.50, [loss 2.0]. The aromatic qualities of the root and seeds depend on the volatile oil and resin.

PHYSIOLOGICAL EFFECTS.—Both root and seeds are pungent aromatic stimulants and mild tonics.

USES.—Angelica (either root or seeds) is scarcely employed in modern practice, though it was formerly much esteemed. The tender stems, stalks, and midribs of the leaves, are made, with sugar, into a sweetmeat or candy (*candied angelica*; *caules seu rami angelicæ conditi*), which, taken as a dessert, is a very agreeable stomachic. The *seeds* are used in the preparation of the *spiritus anisi compositus*, D. The principal consumption of angelica root and seeds is by rectifiers and compounders in the preparation of gin and the liqueur termed *bitters*.

6. OPOPONAX CHIRONIUM, Koch. L.—THE OPOPONAX.

Pastina'ca, Opop'onax. Linn. D.

Sex. Syst. Pentandria, Monogynia.

(*Gummi-resina, L. D.*)

HISTORY.—Hippocrates (*Opera*, p. 402, ed. Fœs.) employed opoponax (*παραύαξ*). Theophrastus (*Hist. Plant.* lib. ix. c. 12) mentions four, and Dios-

corides, (lib. iii. cap. 55-6-7,) three kinds of *πανάκες*. The latter of these writers has given a good account of opoponax (*ὀποπώρας*), which he says is procured from *πανάκες ἡράκλειον*.

BOTANY. Gen. Char.—Margin of the *calyx* obsolete. *Petals* roundish, entire, rolled inward, with a rather acute lobe. *Stylopodium* broad, thick. *Styles* very short. *Fruit* flattened at the back, with a dilated convex margin. *Mericarps* [half-fruits] with three dorsal, filiform, very thin ridges, and no distinct lateral ones. *Vittæ* three to each channel, six to ten to each commissure. *Seed* smooth. Perennial herb. *Root* thick. *Stem* rough. *Leaves* bipinnatisect; segments unequally cordate, crenate, obtuse. *Umbels* compounded of many rays. General and partial *involucre* few-leaved. *Flowers* yellow. (De Cand.)

sp. Char.—The only species.—A plant six or seven feet high, resembling the parsnip.

Hab.—Sunny parts of the South of France, Italy, Sicily, Croatia, and Greece.

EXTRACTION.—According to Dioscorides, whose account is probably correct, this gum-resin is obtained by incisions into the root: a milky juice exudes, which, by drying, becomes yellow, and forms opoponax.

DESCRIPTION.—Opoponax (*gummy opoponax*) occurs in irregular yellowish-red lumps (*opoponax in massis*), or in reddish tears (*opoponax in lachrymis*). It has an acrid bitter taste, and an unpleasant odour. Rubbed with water it forms an emulsion. Its general properties as a gum resin have been before (vol. i. p. 183,) noticed.

COMPOSITION.—Opoponax has been analyzed by Pelletier. (*Bull. de Pharm.* iv. 49.) He found the constituents to be

Resin	42.0
Gum	33.4
Starch	4.2
Extractive	1.6
Wax	0.3
Malic acid	2.8
Lignin	9.8
Volatile oil, traces of caoutchouc, and loss	5.9
Opoponax	100.0

RESIN.—Reddish yellow; fusible at 122° F. Soluble in alkalis, alcohol, and ether. The alkaline solution is reddish: the resin is precipitated from it, by hydrochloric acid, in the form of yellow flocks. Nitric acid acts freely on the resin. Its composition, according to Johnston, is C⁴⁰ H²⁵ O¹⁴.

PHYSIOLOGICAL EFFECTS.—Similar to the other fetid, antispasmodic gum-resins (see vol. i. p. 185). It is, perhaps, more allied to ammoniacum than to any other of these substances.

USES.—Opoponax is rarely employed. It is adapted to the same cases as the other gum-resins of this class (see vol. i. p. 185).

7. FERULA ASAFÆTIDA, Linn. L. E. D.—THE ASAFÆTIDA FERULA.

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, L. D.—Gummi-resinous exudation, E.)

(Asafœtida, U. S.)

HISTORY.—It is uncertain at what period asafœtida was first known or described. The difficulty in determining its history arises from the confusion which has existed with respect to the *Succus Cyrenaicus* and asafœtida. By many writers the two substances were considered to be identical, (see Geoffroy, *Tract. de Mat. Med.* ii. 609); but this opinion seems now to have been satisfactorily disproved by the discovery of the plant, called by the Greeks *σίλφιον*, by the Romans *laserpitium* (*Thapsia Silphion*, Viviani), which yields the Cyrenaic juice, and which agrees tolerably well with the rude figures struck on the Cyrenaic coins. (*Penny Cyclopædia*, vol. viii. p. 265; and Lindley, *Fl. Med.* ii. 52.) It would appear, however, that the Cyrenaic juice becoming scarce,

the ancients employed some other substance of similar, though inferior, properties, as a substitute, and to both of these they applied the term *laser*. "For many years," says Pliny, (*Hist. Nat.* lib. xix. cap. 15, ed. Valp.) "this plant [laserpitium or silphion] has not been found in Cyrenaica, because the publicans [or farmers] who rent the pastures, finding it more profitable, destroy it as food for cattle. One stalk only, found in our days, was sent to the emperor Nero. We may know when cattle meet with young shoots of it, by the sleeping of the sheep when they have eaten it, and by the sneezing of the goats. For a long time past the only *laser* brought to us is that produced abundantly in Persia, Media, and America; but it is far inferior to the Cyrenaic."

Now it is not at all improbable that the *laser of Persia* may have been our *asafœtida*. The word "*asafœtida*," says Murray, (*App. Med.* i. 361,) "seems to have been introduced by the Monks into the school of Salerno." But it appears to have been of oriental origin, and may be, as some have suspected, derived from the word *laser*. Nicolaus Myrepsicus, (*Antidotarius*, cap. xxvii. p. 365, quoted by Alston, *Mat. Med.* li. 438,) almost the last of the Greek physicians, and who lived, according to Sprengel, (*Hist. de Méd.* iv. 368,) about 1227, A. D. speaks of *ἀσα φηρίδα*. "There are two kinds of *Assa* (i. e. *laser*, Lat. Trans.)," says Avicenna, (lib. 2^{ndas}, tr. 2^{ndas}, cap. 53,) "one *fetid*, the other *odoriferous*."

BOTANY.—**Gen. Char.**—Margin of the *calyx* shortly five-toothed. *Petals* ovate, entire, acuminate, with an ascending or incurved point. *Fruit* flattened at the back, with a dilated flat border. *Mericarps* [half-fruits] with three, dorsal, filiform ridges, the two latter obsolete and lost in the dilated margin. *Vitæ* in the dorsal channels three or more; in the commissure four or many. *Seed* flat. *Carpophorus* bipartite.—**Herbs.** *Root* thick. *Stem* tall. *Leaves* supra-decompound; the segments usually divided into linear lobes. *Umbels* of many rays, lateral, often opposite or verticillate. *Involucre* various. *Flowers* yellow (De Cand.)

Sp. Char.—*Stem* terete, simple, clothed with leafless sheaths. *Leaves* radical, pinnatisect; the segment one or two-pinnatifidsinate; lobes oblong, obtuse. *Involucre* none (De Cand.)

Root perennial, tapering, ponderous, increasing to the size of a man's arm or leg, covered with a blackish-coloured bark, beset near the top with many strong, rigid fibres; its internal substance white, fleshy, abounding with a thick, milky juice, which has an excessively strong, fetid, alliaceous smell. *Stem* two or three yards high or more, six or seven inches in circumference at the base, smooth. Radical *leaves* near two feet long. Kæmpfer (*Aman. exot.* 535,) compares their shape to the leaves of *Pæonia officinalis*; but in colour, and other respects, he says they resemble *Ligusticum Levisticum*, or Lovage. The *fruit* is flat, thin, reddish-brown, like that of parsnip, only rather larger and darker (Kæmpfer).

Hab.—Persia; mountains of Chorasán and Laar. The *asafœtida* plant, stated by Lieut. Burnes (*Travels into Bokhara*, ii. 243,) to grow at an elevation of 7,000 feet on the Hindoo Koosh, is described as being an annual. If the description be correct, the plant can scarcely be *F. Asafœtida*.

There is reason to suspect that *Ferula Asafœtida* is not the only plant from which a gum-resin, called *asafœtida*, is obtained; but that one, if not more, other species yield it, (Lindley, *Fl. Med.* p. 45-6, and *Bot. Reg.* Aug. 1839.) *Ferula persica* has been described by Dr. Pope (*Phil. Trans.* vol. lxxv.) as the true *asafœtida* plant; and the Edinburgh College has admitted it as being, probably, one source of *asafœtida*. Michaux sent us fruit from Persia as *asafœtida*. (Lindley, *Fl. Med.* 46.) That it does really yield *asafœtida* seems furthermore probable, from the strong smell of that drug, which pervades the whole plant. (Stevenson and Churchill, *Med. Bot.* iv. 169; and Nees and Ebermaier, *Handb.* ii. 55.) It is, I think, not unlikely that the tear and lump *asafœtida* of the shops are procured from different species. Dr. Royle (*Illustr.* 230,) suggests, that *Prangos pabularia* was one of the kinds of *Silphion* of the ancients, and may be an *asafœtida* plant.

EXTRACTION.—Asafetida is obtained by making incisions into the upper part of the root; the footstalks of the leaves and the fibres at the top of the root being previously removed. Kæmpfer divides the business of collecting into four parts: the *first* begins about the middle of April, and consists in digging the earth about the root, removing the leaves and fibres, which are afterwards laid over the root to defend it from the sun. The *second* commences on the 25th of May. Each collector is provided with a sharp knife to cut the root, a broad iron spatula to scrape off the juice, a cup fixed to his thigh to receive it, and two baskets hung over his shoulders upon a pole. The top of the root is then cut off transversely, and, on the third day (*i. e.* the 27th of May), the juice is scraped off and put in the cups. A fresh incision is then made, and the juice removed the day but one following (*i. e.* the 29th of May), when they again cut the roots. The cups are from time to time emptied into large vessels. The juice is exposed to the sun to become harder, and is conveyed home in the baskets. The *third* and *fourth* acts are mere repetitions of the second. The third commences about the 10th of June, the fourth about the 3d of July. Except after the last operation, the roots are carefully defended from the sun, after each incision, by covering them with leaves. (Kæmpfer, *op. cit.*)

COMMERCE.—Asafetida is exported from the Persian gulf to Bombay, from whence it is sent to Europe. It comes over usually in casks and cases. In 1825 the quantity imported was 106,770 lbs.; in 1830 only 8,722 lbs. The quantity retained for home consumption, is, however, very small. In 1838, duty (6s. per cwt.) was paid on 60 cwts.; in 1839, on 24 cwts.

DESCRIPTION AND VARIETIES.—Asafetida (*Asafetida*; *Gummi Asafetida*, offic.) occurs in irregular pieces of variable size. Externally they are yellowish or pinkish-brown. The fracture is conchoidal, whitish, or milk-white, translucent, pearly, with a waxy lustre. By exposure to light and air the recently-fractured surface acquires, in a few hours, a violet-red or peach-blossom red colour, which, after some days or weeks, diminishes in intensity, and gradually passes into yellowish or pinkish-brown. Asafetida is fusible and inflammable, burning in the air with a white flame and the evolution of much smoke. Its taste is acrid and bitter, and its odour strong, alliaceous, and peculiar; to most persons being remarkably disagreeable, whence the Germans have denominated asafetida *Teufelsdreck*, or *Stercus Diaboli*; in plain English, *Devil's dung*. However, this dislike to asafetida is not universal; some of the Asiatics being exceedingly fond of it, taking it with their food as a condiment, or using it to flavour their sauces, or even eating it alone. Hence, among some of the older writers, we find it denominated *Cibus Deorum*,—*Food of the Gods*. Captain M. Kinnier (Ainslie, *Mat. Ind.* i. 21,) tells us, that in Persia the leaves of the plant are eaten like common greens, as is the root when roasted: and Lieut. Burnes, (*Travels*, ii. 243,) speaking of asafetida, says, “in the fresh state it has the same abominable smell; yet our fellow-travellers greedily devoured it.” But the fondness of this substance is not confined to the Asiatics; for I am assured, by an experienced gastronome, that the finest relish which a beef steak can possess, may be communicated by rubbing the gridiron, on which the steak is to be cooked, with asafetida.

I am acquainted with three varieties only of asafetida:

a. *Asafetida in the tear* (*Asafetida in granis seu lachrymis*).? *Asafetida of the Ferula persica*.—This kind occurs in distinct, roundish, flattened or oval tears, and also in irregular pieces, varying from the size of a pea to that of a walnut, of a yellow or brownish-yellow colour externally, but white internally. This kind is comparatively rare. I think it not at all improbable that this variety is obtained from a different plant to that which furnishes the lump variety; for its colour, externally, is more yellow, its odour is much feebler, and its fresh-fractured surface becomes more slowly and less intensely red by exposure

to the air. As it has considerable resemblance to *ammoniacum in the tear* (with which, indeed, except by its odour, it might be readily confounded), may it not be the substance which Olivier (Fée, *Hist. Nat. Pharm.* ii. 199) calls *ammoniacum*, and which he says is produced by *Ferula persica*?

β. Lump Asafetida (*Asafetida in massis*). *Asafetida of the Ferula Asafetida*.—This variety is the kind usually met with in the shops. It occurs in variable sized masses, of irregular forms, and having a reddish or brownish-yellow colour. Frequently these masses are observed to be made up of tears, agglutinated by a reddish-brown substance: these form that kind of asafetida sometimes denominated *amygdaloid* (*asafetida amygdaloides*).

γ. Stony Asafetida (*Asafetida petraea*).—I have never met with this kind in English commerce. My samples were received from Dr. Martiny. It occurs in irregular, more or less angular pieces, which have the odour of asafetida, and a yellowish brown colour, and present numerous small shining points or plates. It slightly effervesces in hydrochloric acid. By incineration it yields a white ash, which strongly effervesces on the addition of acids. Angelini found in stony asafetida, 51.9 per cent. of gypsum.

COMPOSITION.—Asafetida has been analyzed by Pelletier, (*Bull. de Pharm.* iii. 556,) Trommsdorff, Brandes, and Angelini. (Gmelin, *Handb. d. Chem.* ii. 624):

<i>Pelletier's Analysis.</i>		<i>Brandes's Analysis.</i>	
Resin.....	65.00	Resin.....	48.85
Gum.....	19.44	Gum, with traces of saline matters.....	19.40
Bassorin.....	11.65	Bassorin.....	6.40
Volatile Oil.....	3.60	Volatile Oil.....	4.60
Supermalate of lime, and loss.....	0.30	Extractive, with saline matters.....	1.40
		Sulphate and carbonate of lime.....	9.70
Asafetida.....	100.00	Oxide of iron and alumina.....	0.40
		Sand and lignin.....	4.60
		Water.....	6.00
		Asafetida.....	101.35

1. VOLATILE OIL OF ASAFETIDA.—This is obtained by distilling asafetida with either water or alcohol. It is on this principle that the odour of this gum-resin depends. It is lighter than water, and is at first colourless, but by exposure to the air acquires a yellow tinge. It dissolves in all proportions in alcohol and ether, but requires more than 2000 times its weight of water to dissolve it. Its taste is at first mild, then bitter and acrid; its odour is very strong. It evaporates very quickly, and soon fills a large room with its odour. Sulphur, and probably phosphorus, are among its elementary constituents. The presence of sulphur in asafetida is shown in various ways: thus if chloride of barium be added to water distilled from asafetida, and likewise a little chloride, the sulphur becomes gradually acidified, and after some time a precipitate of sulphate of baryta is formed. If the oil be rubbed with mercury, it forms sulphate of mercury. Moreover, if pills made of asafetida be rolled in silver leaf, the latter, after a few days, is blackened by the formation of a sulphuret of silver.

2. RESIN OF ASAFETIDA.—The resinous matter of asafetida is soluble in alcohol. When the alcoholic solution is mixed with water, a milky fluid is formed, owing to the deposition of the *hydrated resin*. Oil of turpentine and the oil of almonds also dissolve the resin, but less readily than alcohol. The resin obtained by evaporating the alcoholic solution, consists, according to Johnston, of $C^{40} H^{26} O^{10}$. By exposure to the sun's rays it becomes violet red. Brandes has shown that the resin of asafetida is of two kinds; one insoluble in ether, the other soluble. The proportion of the first to the second is as 1.6 to 47.25.

a. Resin insoluble in ether.—Is brownish-yellow, brittle, tasteless, has a slight alliaceous odour, is fusible, and soluble in warm caustic potash.

β. Resin soluble in ether.—Is greenish-brown, brittle, has an aromatic odour, and a faint, but permanent, alliaceous bitter taste. Chlorine decolorizes it. Cold oil of vitriol renders it dark red: if heat be applied, sulphurous acid is evolved, and the mixture becomes black: if the liquid be diluted with water, and saturated with an alkali, the surface assumes a sky-blue colour. Nitric acid renders it first orange, then yellow, and makes it almost insoluble in ether. Hydrochloric acid dissolves it, and colours it pale red. It dissolves in boiling concentrated acetic acid, but is deposited when the solution cools.

CHARACTERISTICS.—Asafetida possesses the usual characteristics of a gum-resin (vol. i. p. 185). From other gum-resins it is distinguished by its peculiar odour, which is especially obvious when a small portion of this substance is

heated on the point of a knife, and by its fresh-fractured surface becoming red on exposure to air. Heated with sulphuric acid it blackens, yields a dark, blood-red liquid, and develops sulphurous acid gas: if the liquid be diluted with water, and saturated with caustic potash, it becomes blue, especially on the surface, by reflected light, similar to that observed when disulphate of quina is dissolved in water.

PHYSIOLOGICAL EFFECTS.—Asafætida is usually placed, by pharmacological writers, among those remedies denominated antispasmodics or stimulants. It is the most powerful of the fetid gum-resins already noticed (vol. i. p. 185). Its local effects are moderate: it is devoid of those acrid and irritating properties possessed by gamboge, euphorbium, scammony, and many other resinous and gummy-resinous substances. In the mouth, as already mentioned, it causes a sensation of heat, and the same effect, accompanied by eructations, is experienced in the stomach, when it is swallowed. In Professor Jorg (Wibmer, *Wirk. d. Arzneim. u. Gifte*. Bd. ii. 366) and his pupils (males and females), who endeavoured to elucidate the effects of this medicine by experiments made on themselves, doses of asafætida, not exceeding a scruple, caused uneasiness and pain of the stomach, increased secretion of the gastro-intestinal membrane, and alvine evacuations. The pulse was increased in frequency, the animal heat augmented, the respiration quickened, and the secretions from the bronchial membrane and skin promoted. A very constant effect was headache and giddiness. The urino-genital apparatus appeared to be specifically affected, for in the males there was an increase of the venereal feelings, with irritation about the glans penis, while in the females the catamenial discharge appeared before its usual period, and uterine pain was experienced.

These stimulant effects of asafætida were observed in a greater or less degree in all the nine persons experimented on; and it should be borne in mind, that the dose did not, in any one case, exceed a scruple. Very opposite to these results, and to the observations of practitioners generally, is the statement of MM. Trousseau and Pidoux, (*Traité de Thérap.* p. 12-13,) who tell us that they have taken half an ounce of good asafætida at one dose, with no other effect than that of altering the odour of their secretions, by which they were kept for two days in an infected atmosphere, possessing a more horrible degree of fetidity than even asafætida itself! These apparently contradictory results seem to prove, that different individuals are most unequally susceptible of the influence of this remedy.

The influence of asafætida in convulsive and spasmodic diseases seems indisputable. As in these cases the functions of the excitomatory system are the functions principally or essentially involved, it is not assuming too much to suppose, that the influence of asafætida is principally directed to the excitomatory nerves. To paraphrase the words of Dr. M. Hall, (*Lectures in the Lancet*, April 14, 1838,) asafætida acts through the *excitor* nerves; its effects are manifested through the *motor* nerves. The varying degrees of excitability or susceptibility (natural and morbid) of these nerves in different subjects, will, perhaps, in some measure account for the unequal effects produced by this agent on different healthy individuals, as well as for the therapeutical influence in certain subjects being disproportionate to the observed physiological effects.

Asafætida, or its odorous principle, becomes absorbed by the veins, though slowly. Flandrin (Magendie, *Physiol.*, by Milligen, 288, 1823,) gave half a pound of this gum-resin to a horse; the animal was fed as usual, and killed sixteen hours afterwards. The odour of asafætida was distinguished in the veins of the stomach, of the small intestine, and the cæcum: it was not noticed in the arterial blood, nor in the lymph. Tiedemann and Gmelin (*Versuch*. S. 9,) were not successful in their search for it; they gave two drachms of asafætida to a dog, and at the end of three hours were unable to recognise the odour of it either in the chyle of the thoracic duct, or in the blood of the splenic and portal veins;

but they detected it in the stomach and small intestines. In farther proof of the opinion that asafœtida becomes absorbed, may be mentioned the detection of the odour of this substance in the secretions. The experience of MM. Trousseau and Pidoux, already related, may be adduced as corroborative of this statement. We are told that the transpiration of Asiatics who use asafœtida daily, is extremely fetid; a circumstance to which Aristophanes (*Equites*, Act. ii. Scen. 4,) alludes. Vogt (*Pharmakodyn.* ii. 126, 2^{te} Aufl.) says, that the secretions from carious ulcers sometimes smell of asafœtida, when this substance has been taken for some time.

The stimulant influence of asafœtida, over the organs of circulation and of secretion (as the bronchial membrane and skin), depends apparently on the topical action of the oily and resinous particles on the vessels in their passage through the latter.

Uses.—From the foregoing remarks it will be readily gathered, that asafœtida is contra-indicated in febrile and inflammatory diseases, on account of its stimulant properties; as also in vascular irritation, or inflammation of the stomach, on account of its topical influence on this viscus. On the other hand, it is found highly useful in spasmodic or convulsive diseases not dependent on disease of the nervous centres, but of the kind called by Dr. Hall eccentric.

1. *In spasmodic and convulsive diseases.*—Few remedies have acquired such celebrity in *hysteria*, as asafœtida. Dr. Cullen (*Mat. Med.* ii. 367,) speaks in the highest terms of it, and I believe the experience of most practitioners corroborates his opinion of its virtues. "I have found it," says he, "to be the most powerful in all hysteric cases; and when the presence of an hysteric paroxysm prevented medicines being taken by the mouth, I have found it given in clyster to be very effectual." When the circulation is very languid, ammonia may with advantage be conjoined. Schönheyder (*Acta. Reg. Soc. Hafn.* i. 168,) recommends asafœtida with opium, in the form of clyster. In *infantine convulsions*, clysters of asafœtida are often used with good effect. Even in the *epilepsy* of adults they are not always without value. In purely *spasmodic asthma*, I have never seen relief from the use of asafœtida. This observation, which accords with Dr. Cullen's experience, does not agree with the statements of others. Trousseau and Pidoux (*op. cit.* p. 15,) declare they have seen it produce good and undoubted effects. But in old chronic catarrhs, with occasional spasmodic difficulty of breathing and spasmodic cough, I have procured the most marked relief by the combined use of asafœtida and ammonia. I have no experience of the use of this gum-resin in the disease called *laryngismus stridulus*, in which Millar, (*Obs. on the Asthma and Hooping Cough*, 1769,) and others, have found it beneficial. In *hooping cough*, both Millar and Kopp (*Lond. Med. Gaz.* i. 581,) have found it beneficial. It promotes expectoration, and diminishes both the violence and frequency of the attacks. The repugnance which children manifest to its use is, however, a great drawback to its employment. In *flatulent colic* of hysterical and dyspeptic individuals, or of infants, few remedies are more efficacious, when the disease is unaccompanied by any marks of inflammatory action, and is attended with constipation. Of its efficacy in the flatulent colic of infants, I can speak from repeated observation; it is given with great advantage in the form of clyster. In most cases, its laxative operation is an advantage; but should this be an objection, it may be counteracted by the addition of laudanum.

2. *As a stimulating expectorant and antispasmodic in chronic catarrh*, it is often of considerable use. It is adapted for old persons, and where the disease is of long standing. I have found it most beneficial in those cases where the cough and difficulty of breathing assume at intervals a spasmodic form, and where the wheezing is considerable. In such, I have found full doses of asafœtida with ammonia give great relief. In delicate females, subject to repeated attacks of catarrh, attended with wasting, sweating, and other constitutional

symptoms of phthisis, I have found asafetida of frequent benefit. In these cases it does not act merely by its expectorant effects, for oftentimes one good consequence of its use is diminution of excessive bronchial secretion.

3. *In affections of the alimentary canal.*—The use of asafetida in *flatulent colic* has been above noticed. It is often of considerable value in relieving flatulence in old persons, especially in hypochondriacal and hysterical subjects, and when accompanied with constipation, as it has a laxative effect. It provokes the expulsion of the gaseous matter, and appears to aid in preventing its reproduction. It is beneficially used in the form of clyster, to relieve a tympanitic condition of the abdomen and flatulent distension of the bowels in low fevers. In *constipation, with flatulence*, it is an useful addition to purgative mixtures or enemata. It has often been used as an *anthelmintic*; but is of less frequent efficacy.

4. *As an emmenagogue in uterine obstructions* (amenorrhœa and chlorosis) asafetida has been employed from a notion that it specifically affected the womb, —an opinion which is supported by the reports of Jörg's female pupils, that it brought on the catamenial discharge earlier than usual. Experience, however, has not been much in favour of the emmenagogue operation of asafetida when this remedy has been employed in diseases. "Whether it be owing," says Dr. Cullen, "to the imperfect state in which we too frequently have this medicine, or to somewhat in the nature of the amenorrhœa, I would not positively determine; but this is certain, that I have very seldom succeeded in employing the asafetida as an emmenagogue."

5. *As a condiment.*—I have already referred to the condimentary uses made of asafetida, especially by oriental nations. At the Pass of "Dundan Shikun," says Lieutenant Burnes, (*Travels*, i. 143,) "we found the asafetida plant in exuberance, and which our fellow-travellers ate with great relish." It is much used by the Brahmins against flatulence, and to correct their cold vegetable food. (*Ainslie, Materia Indica*, vol. i. 21.)

ADMINISTRATION.—The dose of asafetida is from grs. v. to ℥j. or ʒss. It may be given in substance, in the form of *pill*, or made into an *emulsion*. In hysteria and flatulent colic, where we want an immediate effect, it is best administered in a liquid form. Used as an *enema*, it may be administered to the extent of two drachms, rubbed up with warm water. The following are the official preparations of asafetida:—

1. MISTURA ASSAFETIDÆ, L. D. (U. S.); *Lac Asafetida*; *Mixture of Asafetida*.—(Asafetida, ʒv. [ʒj. D.] [ʒij. U. S.]; water Oj. [Oss. U. S.] [Pennyroyal water, fʒviij. D.] Triturate the asafetida with the water, gradually poured on, until they are perfectly mixed).—Stimulant and antispasmodic. Used in hysteria, in doses of ʒss. to fʒjss. Frequently employed as an enema in the flatulent colic and convulsions of children, as well as in worms. The tincture of asafetida, mixed with pennyroyal water, is often used as a substitute for the official mixture.

2. ENEMA FÆTIDUM, D. E.; *Asafetida* or *Fetid Clyster*.—(Made by adding to the *cathartic enema* two [fluid] drachms of tincture of asafetida).—The fetid clyster is a valuable stimulant, antispasmodic, and carminative purgative, which may be used with most beneficial results in hysteria, flatulent colic, infantile convulsions, and worms in the rectum.

3. TINCTURA ASSAFETIDÆ, L. E. D. (U. S.); *Tincture of Asafetida*.—(Asafetida [in small fragments, E.] ʒv. [ʒiv. D. U. S.]; Rectified Spirit, Oj. [and water, Oss. D.] Macerate for fourteen [seven, E.] days and strain. "This tincture cannot be made by percolation, without much delay." E.—Add the spirit to the asafetida previously triturated with the water, macerate for fourteen days, and filter, D.)—Stimulant and antispasmodic. Used in hysteria and flatulent colic.—Dose, ʒss. to fʒij. Pennyroyal is a good vehicle for it. When mixed with aqueous liquids, it becomes milky, owing to the deposition of the hydrated resin.

4. PILULÆ ASSAFETIDÆ, E. (U. S.); *Pilule Galbani Compositæ*, L. D.; *Asafetida* or *Compound Galbanum Pills*.—(Asafetida; Galbanum; and Myrrh, *three parts* of each; Conserve of Red Roses, *four parts*, or a sufficiency; mix them, and beat them into a proper pill mass, E.—Galbanum, ʒj; Myrrh; Sagapenum; of each ʒjss.; Asafetida, ʒss.; Syrup [Treacle, D.] as much as may be sufficient. Beat them together until incorporated, L. D.)—As the most powerful ingredient of this combination is asafetida, the more appropriate name for the pills would be *pilule asafetidæ compositæ*. This compound is stimulant and antispasmodic. It is used in hysteria, chlorosis, &c.—Dose, grs. x. to ʒj.

[The *Assafetida Pills* of the U. S. P. are made by taking Assafetida, ʒjss. Soap, ʒss.—Incorporate the two and divide into 240 pills].

5. PILULÆ ALOES ET ASSAFETIDÆ, E. (See pp. 113 and 479.)

6. SPIRITUS AMMONIÆ FETIDUS, L. E. D. (See vol. i. p. 282.)

7. EMPLASTRUM ASSAFETIDÆ, E. (U. S.); *Plaster of Assafetida*. (Litharge Plaster; Assafetida, of each ʒij.; Galbanum; Bees'-wax, of each ʒj. Liquefy the gum-resins together, and strain them; then add the plaster and wax also in the fluid state, and mix them all thoroughly.)—[The U. S. P. directs, Assafetida, Lead Plaster, each a pound; Galbanum, Yellow Wax, each half a pound; Diluted Alcohol, three pints. Dissolve the Assafetida and Galbanum in the Alcohol, with the aid of a Water Bath; strain the liquor while hot, and evaporate to the consistence of honey; then add the lead plaster and wax previously melted together; stir the mixture well, and evaporate to the proper consistence.]—It is applied, as an antispasmodic, over the stomach or abdomen in hysteria with flatulence, to the chest or between the shoulders in hooping-cough.

8. FERULA? AN UNCERTAIN SPECIES YIELDING SAGAPENUM, L.

Sez. Syst. Pentandria, Digynia.

(*Gummi-resina*, L. D.)

HISTORY.—Sagapenum (*σαγάπηνον*) is mentioned both by Hippocrates (p. 626, ed. Fœs.) and Dioscorides. (Lib. iii. cap. 95.) Pliny (*Hist. Nat.* lib. xx. cap. 75, ed. Valp.) calls it *Sacopenium*. Dioscorides says it is a liquor obtained from a ferulaceous plant growing in Media.

BOTANY.—Nothing is known with respect to the plant yielding sagapenum. Willdenow considered it to be *Ferula persica*, and he has been followed by Sprengel and Fée. But his opinion was not supported by any well-ascertained fact; on the contrary, several circumstances already mentioned (p. 472) seem to show that this plant produces a kind of assafetida. There is, indeed, no evidence to prove that sagapenum is got from a *Ferula*, for the statement of Dioscorides cannot be admitted as having much weight.

DESCRIPTION.—Two kinds of sagapenum (*sagapenum*; *gummi sagapenum*) are occasionally met with. The finest (*sagapenum in the tear*), consists of masses made up of agglutinated, brownish yellow, semi-transparent tears, and resembling galbanum, but having a darker colour and a more alliaceous odour. A commoner kind (*soft sagapenum*), occurs in soft, tough masses, in which no distinct tears are distinguishable. When heated on the point of a knife in the candle, sagapenum gives out a much more aromatic and agreeable odour than galbanum. It has a hot and acrid taste. It is imported from the Levant.

COMPOSITION.—Sagapenum has been analyzed by Pelletier, (*Bull. de Pharm.* iii. 481,) and by Brandes, (*Gmelin, Handb. d. Chem.* ii. 625.)

Pelletier's Analysis.		Brandes's Analysis.	
Resin.....	54.26	Resins.....	50.29
Gum.....	31.94	Gum, with calcareous salts.....	32.72
Volatile oil and loss.....	11.80	Volatile oil.....	3.73
Bassorin.....	1.00	Bassorin.....	4.48
Malate of lime.....	0.40	Malate and phosphate of lime.....	1.12
Peculiar matter.....	0.60	Impurities.....	4.30
		Water.....	4.60
Sagapenum.....	100.00	Sagapenum.....	101.24

1. OIL OF SAGAPENUM.—Pale yellow, lighter than water, soluble in alcohol and ether. Has a strong alliaceous odour, and a mild (afterwards hot) bitter, alliaceous taste. Sulphuric acid renders it dark red.

2. RESIN OF SAGAPENUM.—Obtained by evaporating an alcoholic solution; it is pale yellow, having a strong garlic odour, and becoming fluid at 212° F. Its composition, according to Johnston, is C⁴⁰ H²⁹ O⁹. By the action of ether it is resolved into two resins.

a. Resin insoluble in ether.—Brownish-yellow, tasteless, odourless, fusible, soluble in warm liquor potassæ and in spirit, but insoluble in the oils of turpentine and almonds.

β. Resin soluble in ether.—Reddish-yellow, with a feeble odour of sagapenum, and a mild (afterwards bitter) taste. It is soluble in spirit, and slightly so in the oil of turpentine and almonds. It dissolves in sulphuric acid, forming a blood-red solution, from which water separates a violet substance.

PHYSIOLOGICAL EFFECTS AND USES.—Its effects and uses are the same as those of assafœtida. It is usually considered to hold an intermediate rank between assafœtida and galbanum; but it is rarely employed.

ADMINISTRATION.—It is given in substance, in the form of pill, in doses of from grains v. to ℥j. or ʒss.

PILULÆ SAGAPENI COMPOSITÆ, L.; *Compound Pills of Sagapenum*. (Sagapenum, ʒj.; Aloes, ʒss.; Syrup of Ginger, as much as may be sufficient. Beat them together until incorporated.)—This preparation corresponds to the *Pilulæ Aloës et Assafœtidæ*, E. (p. 113); the latter, however, being more active. It is used as a warm stimulating purgative in dyspepsia, with flatulence and costiveness.—Dose, grains v. to ℥j.

9. DOREMA AMMONIACUM, Don. L. E.—THE AMMONIACUM DOREMA.

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, L.—Gummy-resinous exudation, E.)

(Ammoniacum, U. S.)

HISTORY.—The term *ammoniacum* has been applied to two different gum-resins; one, the produce of *Ferula tingitana*; the other, of *Dorema Ammoniacum*. The first is the ammoniacum of Hippocrates, (p. 670, ed. Fœs.) Dioscorides, (lib. iii. cap. 98.) and Pliny, (*Hist. Nat.* lib. xii. cap. 49, ed. Valp.); the latter is the commercial ammoniacum of the present day.

Dioscorides says ἀμμωνιακόν is obtained from a species of *Ferula*, which he calls ἀγασθλλίς, growing near Cyrene, in Africa. Pliny terms the plant *Metopion*, and says it grows in that part of Africa which is subject to Ethiopia, near the temple of Jupiter Hammon (or Ammon), which, as well as the gum-resin, received its name from ἀμμος, sand, on account of the sandy soil of the country. Both Dioscorides and Pliny mention two kinds of ammoniacum; the best, called *Thrauston* (θραῦσμα) resembled olibanum, and had an odour like castoreum, and a bitter taste; and the commonest, termed *Phyrama* (φύραμα) had a resinous appearance, and was adulterated with earth and stones. *African ammoniacum* (in Arabic, *Fasogh* or *Feshook*) is, Dr. Lindley informs me, “certainly the produce of *Ferula tingitana*.”

I have not been able to ascertain when *Persian ammoniacum* (the produce of *Dorema Ammoniacum*) first came into use. As the Greeks and Romans make no mention of it, they were, probably, unacquainted with it. Avicenna (lib. ii. cap. 8) does not mention the origin of his ammoniacum (*assach*, Arab.) The ammoniac (*eschak*, Arab.) of Abu Mansur Mowajik, (*Lib. Fund. Pharm.* i. 35. ined. R. Seligmann. 1830.) an ancient Persian physician, who wrote about 1055, A. D., was doubtless of the Persian kind; as was also the ammoniac (*derukht ushuk*) of Beva Ben Khuas Khan, A. D. 1512. (Ainslie, *Mat. Ind.* i. 160.) The Arabic terms (*assach*, *eschak*, and *ushuk*.) by which the three last named authors designate ammoniac, closely resemble that (*oshac*) by which the ammoniacum plant is now known in Persia, (*Linn. Trans.* vol. xvi. 605); hence we infer they all referred to the same object.

BOTANY. Gen. Char.—Epigynous disk, cup-shaped. Fruit slightly com-

pressed from the back, edged; with three distinct, filiform, primary ridges near the middle, and, alternating with them, four obtuse secondary ridges; the whole enveloped in wool. *Vittæ*, one to each secondary ridge, one to each primary marginal ridge, and four to the commissure, of which two are very small (Lindley).

Sp. Char.—The only species.

A glaucous green plant, about seven feet high, looking like the Opoponax. *Root* perennial. *Stem* about four inches in circumference at the base. *Leaves* large, petiolate, somewhat bipinnate, two feet long; pinnæ in three pairs; petioles downy, sheathing at the base. *Umbels* proliferous, racemose; partial ones globose, on short stalks, often arranged in a spiked manner. *Involucre*, general or partial, none. *Petals* white. *Stamens* and *styles* white. *Ovaries* buried in wool. *Fruit* naked. (Condensed from Don.)

Hab.—Persia, in the province of Irak, near Jezud Khast, and on the plains between Yerdekaust and Kumisha.

EXTRACTION.—The whole plant is abundantly pervaded with a milky juice, which oozes forth upon the slightest puncture being made, even at the ends of the leaves. This juice when hardened constitutes ammoniacum. Through the kindness of my friend Dr. Lindley, I have in my museum the upper part of the (apparently flowering) stem, about ten inches long, with lumps of ammoniacum sticking to it at the origin of every branch. It was gathered by Sir J. M'Niell, in Persia (I believe between Ghorian and Khaff). It does not appear that artificial incisions are ever made in the stem. Lieut. Col. Kennet (*Linn. Trans.* xvi. 605) says, "When the plant has attained perfection, innumerable beetles, armed with an anterior and posterior probe of half an inch in length, pierce it in all directions; it [ammoniacum] soon becomes dry, and is then picked off, and sent *via* Bushire to India, and various parts of the world."

COMMERCE.—Ammoniac is usually imported from Bombay, but occasionally it comes from the Levant. It is brought over in chests, cases, and boxes. The quantity imported is but small.

DESCRIPTION.—Common or Persian ammoniacum, usually termed *gum ammoniacum* or *ammoniac* (*gummi ammoniacum*), occurs in two forms; *in the tear and in the lump*.

α. Ammoniacum in the Tear (*ammoniacum in lachrymis seu granis*) occurs in distinct dry tears, usually more or less spheroidal, though frequently of irregular forms, varying in size from that of the fruit of coriander (or even smaller) to that of a walnut. Externally they are of a yellow (pale reddish or brownish) colour, with a waxy lustre; internally they are white or opalescent, opaque, or only feebly translucent at the edge of thin films. At ordinary temperatures, it is moderately hard and brittle, but softens like wax in the hand.

β. Lump Ammoniacum (*ammoniacum in placentis seu massis*). This occurs in masses usually composed of agglutinated tears, whose properties it possesses. It is sometimes met with in soft plastic masses, of a darker colour, and mixed with various impurities. To separate these, it is melted and strained (*Strained Ammoniacum; Ammoniacum colatum*).

Both kinds have a faint, unpleasant, peculiar odour, by which this gum-resin may be readily distinguished from all others. This odour is best detected by heating the ammoniacum on the point of a penknife. The taste is bitter, nauseous, and acrid. Umbelliferous fruits are not unfrequently found intermixed with both sorts. In most of its other properties ammoniacum agrees with other gum-resins (vol. i. p. 185).

I am indebted to Dr. Lindley for a fine sample of *African Ammoniacum* (*αμμονιακον*, Diosc.) It was sent by W. D. Hays, Esq., the British Consul at Tangier, to the Hon. W. T. Fox Strangways, and is marked, "*Gum Ammoniac* or *Fusogh*, Tangier, 17 June, 1839, J. W. D. H." It is an oblong piece, about three inches long, and one and a half inches thick, and broad. Its weight is about 830 grains. Externally it is irregular and uneven, and has a dirty

appearance, similar to what ammoniacum would acquire from repeated handling and long exposure to the air in a dusty situation. It is partially covered with paper. A few pieces of reddish chalky earth (which effervesces with acids) are found sticking to it, thus confirming the account given of it by Jackson, (*Account of the Empire of Morocco*, 3d ed. p. 156,) though the quantity of this on my specimen is not sufficient to affect in any way the saleability of it. It appears to be made up of agglutinated tears, like the lump Persian ammoniacum. Internally it has very much the appearance of lump ammoniacum, but is not so white, but has a brownish, reddish, and in some places a faint bluish tint. Its odour is very faint, and not at all like Persian ammoniacum. Heated on the point of a knife, its distinction from Persian ammoniacum is very obvious. Its taste is also much slighter than that of the commercial ammoniacum. Rubbed with water, it forms an emulsion like the latter. It is the produce of *Ferula tingitana* (Lindley).

COMPOSITION.—Ammoniacum has been analyzed by Calmeyer, Bucholz, (Gmelin, *Handb. d. Chem.* ii. 624,) Braconnot, (*Ann. de Chem.* lxxviii. 69,) and by Hagen. (Schwartz, *Pharm. Tubel.* 280, 2^{te} Aug.)

Braconnot's Analysis.		Hagen's Analysis.	
Resin	70.0	Resin	68.6
Gum	18.4	Gum	19.3
Gluteniform matter, insoluble in water and alcohol	4.4	Gluten (colla)	5.4
Water	6.0	Extractive	1.6
Loss	1.2	Sand	2.3
		[Volatile oil and water	2.8]
Ammoniacum	100.0	Ammoniacum	100.0

1. VOLATILE OIL OF AMMONIACUM.—Transparent, lighter than water.

2. RESIN OF AMMONIACUM.—Reddish-yellow, tasteless, has the odour of the gum-resin. Soluble in alkalis and alcohol; partially soluble in ether and the oils (fixed and volatile). Its preparation according to Johnston is $C^{40} H^{32} O^9$.

PHYSIOLOGICAL EFFECTS.—The effects of ammoniacum are similar to, though less powerful than, those of asafœtida (vol. i. p. 185) and of the other fetid gum-resins already (vol. i. p. 185) mentioned. MM. Trousseau and Pidoux (*Traité de Thérap.* p. 19,) assert that in all the cases in which they have employed it, it had no stimulant effect either local or general. "We have taken," say these authors, "two drachms of this substance at once, without experiencing any of those accidents complaisantly indicated by authors." I would remark, however, that the local irritation produced by the plaster of ammoniacum is known to most practitioners,—a papular eruption being a frequent result of the application of this agent. Ammoniacum contains much less volatile oil than either asafœtida or galbanum; its stimulant influence is less than either of these. Full doses of it readily disturb the stomach.

USES.—Though applicable to all the same cases as asafœtida (p. 476) and the other fetid gum-resins (vol. i. p. 185), its internal use is principally or almost solely confined to chronic pulmonary affections. It is not fitted for irritation or inflammation of the bronchial membrane. But in chronic coughs, with deficient expectoration, or in chronic catarrhs and asthmatic cases of old persons with profuse secretion, it sometimes gives slight relief. Though I have seen it extensively employed, in a few cases only have I observed it beneficial. As a topical, discutient, or solvent application, in the form of plaster, to glandular enlargements, indolent affections of the joints, &c. it occasionally proves useful.

ADMINISTRATION.—The dose of ammoniacum is from grs. x. to ʒss. It may be given in the form of pill or emulsion. It is a constituent of the *compound pills of squills* (see p. 118), a very useful expectorant in old catarrhs.

I. MISTURA AMMONIACI, L. D. (U. S.) *Lac Ammoniaci*; *Ammoniacum Mixture*; (Ammoniacum, ʒv. [ʒj. D.] (ʒi. U. S.); Water Oj. (Oss. U. S.) [Pennyroyal Water, fʒviiij. D.] Rub the ammoniacum with the water gradually poured on, until they are perfectly mixed. [It should be strained through linen, D.]—The resinous constituent of ammoniacum is more effectually suspended in water by the aid of the yolk of an egg. This mixture acts as a stimulant to the bronchial membrane, and is used as an expectorant in chronic coughs,

humoral asthma, &c. It is a convenient and useful vehicle for squills or ipecacuanha. Dose fʒss. to fʒj.

2. EMPLASTRUM AMMONIACI, L. E. D. (U. S.) *Plaster of Ammoniacum*. (Ammoniacum, ʒv.; Distilled Vinegar, fʒviij.; [fʒix. E.; Vinegar of Squills, Oss. *wine measure*, D.] Dissolve the ammoniacum in the vinegar, then evaporate the liquor [in an iron vessel, E.] with a slow fire, [over the vapour bath, E.] constantly stirring, to a proper consistence.)—A very adhesive, stimulant, and discutient or resolvent plaster. It sometimes causes an eruption. It is applied to indolent swellings, as of the glands and joints. A very useful application to the housemaid's swollen knee.

3. EMPLASTRUM AMMONIACI CUM HYDRARGYRO, L. E. D. See vol. i. p. 603.

9. ANETHUM GRAVEOLENS, Linn. L. E.—COMMON GARDEN DILL.

Sex. Syst. Pentandria, Digynia.

(Fructus, L.—Fruit, E.)

HISTORY.—This plant is mentioned by Hippocrates, (*Opera*, p. 359, ed. Fœs.) by Dioscorides, (lib. iii. cap. 67,) and by Pliny. (*Hist. Nat.* lib. xx. cap. 74, ed. Valp.) It is also noticed in the New Testament. (*Matt.* xxiii. 23.)

BOTANY. **Gen. Char.**—Margin of the *calyx* obsolete. *Petals* roundish, entire, involute, with a squarish retuse lobe. *Fruit* lenticular, flattened from the back, surrounded by a flattened border. *Mericarps* [half-fruits] with equidistant, filiform ridges; the three intermediate [dorsal] acutely keeled, the two lateral more obsolete, losing themselves in the border. *Vittæ* broad, solitary in the channels, the whole of which they fill, two on the commissure. *Seeds* slightly convex, flat in front.—Smooth erect *annuals*. *Leaves* decompose, with setaceous linear lobes. *Involucre* and *involucellæ* none. *Flowers* yellow (De Cand.)

Sp. Char.—*Fruit* elliptical, surrounded with flat dilated margin (De Cand.)

Root tapering long. *Stem* one and a half or two feet high, finely striated, simply branched. *Leaves* tripinnated; segments fine capillary; leaf-stalks broad and sheathing at the base. The plant greatly resembles common fennel, though its odour is less agreeable.

Hab.—South of Europe, Astracan, Egypt, Cape of Good Hope, Timor &c. Probably migratory. Cultivated in England.

DESCRIPTION.—The fruit, commonly called *dill seed* (*fructus seu semina anethi*) is oval, flat, dorsally compressed, about a line and a half long, and from a half to one line broad, brown and surrounded by a lighter-coloured membranous margin (*ala*). Each mericarp or (half-fruit) has five primary ridges, but no secondary ones. In each channel is one vitta, and on the commissure are two vittæ. These vittæ contain the aromatic oil. The odour of the fruit is strongly aromatic; the taste warm and pungent.

COMPOSITION.—Dill owes its peculiar properties to a volatile oil. (See below.)

PHYSIOLOGICAL EFFECTS.—Aromatic stimulant, carminative and condimentary, analogous to other aromatic umbelliferous fruits (vol. i. p. 183).

USES.—Employed as a condiment by the Cossacks. Loudon (*Encyclopædia of Gardening*) says the leaves “are used to heighten the relish of some vegetable pickles, particularly cucumbers; and also occasionally in soups and pickles.”

In medicine it is principally employed in the diseases of children. It is a common domestic remedy among nurses, to relieve flatulence and griping of infants. Occasionally it is taken under the idea of its promoting the secretion of milk. Practitioners generally use dill as a vehicle for the exhibition of purgative and other medicines to children, the griping of which it assists in preventing. The whole fruits may be given to adults in doses of ten grains to a drachm.

1. OLEUM ANETHI, E. *Oil of Dill*. (Obtained by submitting the bruised fruit

of dill, with water, to distillation.) Two *cwts.* of the fruit yield 8lbs. 5ozs. of oil. (*Private information.*) This oil is pale yellow. Its sp. gr. is 0.881. Its odour is peculiar and penetrating, analogous to that of the fruit. Its taste is hot, but sweetish. Alcohol and ether readily dissolve it. According to Tietzmann 1440 parts of water dissolve one part of this oil. Principally used to prepare dill water. May be taken in the dose of a few drops on sugar, or dissolved in spirit.

2. AQUA ANETHI, L. E. *Dill Water.* (Dill, bruised, lb. jss. [3xviii. E.]; Proof Spirit, f3vij. [Rectified Spirit, 3ij. E.]; Water, Cong. ij. Mix. Let a gallon distil.)—This compound is usually prepared by diffusing the oil through water by the aid of sugar or spirit. Carminative. Dose, for adults, f3j. to f3ij.; for infants, f3j. to f3ij. It is generally given to infants with their food.

10. GALBANUM OFFICINALE, Don., L.—OFFICIAL GALBANUM.

Sex. Syst. Pentandria, Digynia.

(Gummi-resina, L. D.—Concrete gummy-resinous exudation of an imperfectly ascertained umbelliferous plant, probably a species of *Opoidia*, E.)

HISTORY.—Galbanum is mentioned by Moses (*Exodus*, xxx. 34) who ranks it among the sweet spices. It was used in medicine by Hippocrates, (page 401, &c. ed. Foes.); Dioscorides (*Ibid.* iii. 97) says it (*χαλβάνη*) is the *μετρώπιον*, growing in Syria.

BOTANY.—Hitherto no sufficient evidence has been adduced to prove that galbanum is yielded by any known plant. “The *Bubon Galbanum* of Linnæus possesses neither the smell nor the taste of Galbanum, but in these particulars agrees better with Fennel, and the fruit has no resemblance whatever to that found in the gum.” (Don, *Linn. Trans.* xvi. 603.) The *Dublin College*, therefore, is in error in referring this gum-resin to *Bubon Galbanum*. Mr. Don found an umbelliferous fruit in the galbanum of commerce, which he believes to be that of the plant yielding this gum-resin, and as it constitutes a new genus, he has called it *Galbanum officinale*. The following are the characters of the fruit:

Fruit compressed at the back, elliptical; *ridges* seven, elevated, compressed, bluntly keeled, not winged; the lateral distinct, marginal. *Channels* broadish, concave, without vittæ. *Commis-
sure* flat, dilated, bivittate: *vittæ* broad, somewhat curved. (Don.)

But though it is not at all improbable that these fruits are the produce of the galbanum plant, yet no proof of this has been hitherto adduced, and Dr. Lindley, therefore, very properly asks, “Did the fruit found by Mr. Don upon the gum really belong to it?” (*Fl. Med.* 51.)

More recently Sir John M’Niell sent home specimens of a plant called a *second sort of ammoniacum*, gathered near Durrood, July 27, 1838, to the branches of which are sticking lumps of a pale yellow waxy gum-resin, which Dr. Lindley took for galbanum; and the plant which yields it being essentially different from all others, has been named by him *Opoidia galbanifera*. (*Botanical Register* for August 1, 1839, p. 65-6.) Dr. Lindley was kind enough to send me a small fragment of this gum-resin for examination, but I was unable to identify it with any other known product of the order Umbelliferae. It certainly was neither *asafœtida* nor *ammoniacum*; nor did it appear to me to be either *sagapenum* or galbanum.

The precise country where galbanum is produced has not been hitherto ascertained. Dioscorides says it is obtained in Syria; a statement which is perhaps correct, though hitherto no evidence of this has been obtained. It is not improbable that it is also procured in Persia, or even in Arabia, as suggested by Dr. Royle. *Opoidia Galbanifera* grows in the province of Khorasan, near Durrood.

EXTRACTION.—Geoffroy (*Trait. de Mat. Méd.* ii. 623) says, though I know not on whose authority, that galbanum is generally obtained by making an in-

cision into the stalks about three fingers' breadth above the root, from which it issues in drops, and in a few hours becomes dry, and hard enough to gather.

DESCRIPTION.—The gum-resin galbanum (*galbanum seu gummi-resina galbanum*) occurs in the two forms of tears and lump.

a. Galbanum in the tear (*galbanum in lachrymis seu granis*) is rare: it occurs in distinct, round, yellow or brownish yellow, translucent tears; none of which, in my collection, exceed the size of a pea. Their fracture is feebly resinous and yellow.

β. Lump Galbanum (*galbanum in massis*) is the ordinary galbanum of commerce. It consists of large irregular masses of a brownish or dark brownish yellow colour, and composed of agglutinated tears, some few of which, when broken, are observed to be translucent and blueish, or pearl-white. The mericarp, pieces of the stem, &c. are found intermixed with the tears. To separate these, galbanum is melted and strained (*strained galbanum; galbanum colatum.*)

The odour of both kinds is the same; viz. balsamic, and peculiar. The taste is hot, acrid, and bitter. When exposed to cold, galbanum becomes brittle, and may be reduced to powder. In many of its other properties it agrees with the other gum-resins. It is imported from the Levant and from India, in cases and chests.

Recently another gum-resin from India has been introduced as galbanum; but it is said to resemble the latter in colour only, and to be unsaleable.¹

COMPOSITION.—Galbanum has been analyzed by Neumann, (Pfaff, *Syst. de Mat. Méd.* iii. 294.) Pelletier, (*Bull. de Pharm.* iv. 97.) Fiddechow, and Meissner. (Schwartz, *Pharm. Tabel.* 284, 2^e Ausg.)

Pelletier's Analysis.		Meissner's Analysis.	
Resin	66.86	Resin	65.8
Gum	19.23	Gum	22.6
Volatile oil and loss	6.34	Bassorin	1.8
Wood and impurities	7.32	Volatile oil	3.4
Supermalate of lime	traces	Bitter matter with malic acid	0.2
Galbanum	100.00	Vegetable remains	2.8
		Water	2.0
		Loss	1.4
		Galbanum	100.0

1. VOLATILE OIL OF GALBANUM.—Obtained by submitting the gum resin, with water, to distillation. It is colourless and limpid. Its sp. gr. is 0.912: its odour is like that of galbanum and camphor; its taste is hot, afterwards cooling and bitterish. It is soluble in spirit, ether, and the fixed oils.

2. RESIN.—Is the residue obtained by boiling the alcoholic extract of galbanum in water. It is dark yellowish-brown, transparent, brittle, and tasteless; soluble in ether and alcohol, scarcely so in spirit containing 50 per cent. of water, or in almond oil. Very slightly soluble in oil of turpentine, even when aided by heat. It dissolves in oil of vitriol, forming a dark yellowish-brown liquid. According to Pelletier, galbanum-resin has the remarkable property of yielding an indigo-blue oil when heated to 248° F. or 266° F. The composition of galbanum resin is, according to Johnston, C⁴⁰ H²⁷ O⁷.

PHYSIOLOGICAL EFFECTS.—The general effects of galbanum are those of the fetid antispasmodic gum-resins already described (vol. i. p. 185). It is usually ranked between asafoetida and ammoniacum, being weaker than the former, but stronger than the latter. As it yields, by distillation, more volatile oil than asafoetida does, it has been supposed that it must exceed the latter in its stimulant influence over the vascular system; but as an antispasmodic, it is decidedly inferior to asafoetida. A specific stimulant influence over the uterus has been ascribed to it: hence the Germans call it *Mutterharz* (i. e. *uterine resin*).

USES.—Galbanum is principally adapted for relaxed and torpid habits, and is objectionable in inflammatory or febrile disorders. It is employed in the same cases as asafoetida (p. 476), with which it is generally given in combination. It is principally used in chronic mucous or pituitous catarrh, in which it often

¹ Mr. E. Solly, *Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society*, Lond. 1841, p. 144.

times proves serviceable. It has also been employed in amenorrhœa and chronic rheumatism. Externally it is applied as a mild stimulant, resolvent, or suppurant, in indolent swellings.

ADMINISTRATION.—It may be given in *substance*, in the form of pill, in doses of from grs. x. to ʒss., or in the form of *emulsion*.

1. TINCTURA GALBANI, D. *Tincture of Galbanum*. (Galbanum, cut very small, ʒij.; Proof Spirit, Oij. [*wine measure*].) Digest for seven days, and filter.—Stimulant and antispasmodic. “Used for the same purposes as the tincture of asafœtida, than which it is less nauseous and less powerful.”—Dose, fʒj. to fʒij.

2. PILULÆ GALBANI COMPOSITÆ, L. D. (See p. 478).

3. EMPLASTRUM GALBANI, L. D. *Emplastrum gummosum*, E. *Plaster of Galbanum*. (Galbanum, ʒviiij.; Plaster of Lead, lb. iij.; Common Turpentine, ʒx.; Resin of the Spruce Fir, powdered, ʒijij. Add first the Resin of the Spruce Fir, then the Plaster of Lead melted with a slow fire, to the Galbanum and Turpentine melted together, and mix them all, L.—“Litharge plaster, ʒiv.; ammoniac, galbanum, and bees’ wax, of each ʒss. Melt the gum-resins together, and strain them: melt also together the plaster and wax: add the former to the latter mixture, and mix the whole thoroughly.” E.—Litharge Plaster, lb. ij.; Galbanum, lb. ss.; Scrapings of Yellow Wax, ʒiv. Melt the galbanum, and add the litharge plaster and wax; then melt them together with a medium heat, and strain, D.)—This plaster, spread upon leather, is applied to indolent tumours, to promote their suppuration, and to disperse them. Its operation appears to be that of a mild stimulant. It is also applied to the chest in chronic pulmonary complaints. In weakly, rickety children, with weakness of the lower extremities, it is applied to the lumbar region.

11. CUMINUM CYMINUM, Linn. L. E.—THE OFFICINAL CUMIN.

Sex. Syst. Pentandria, Digynia.

(Fructus, L.—Fruit, E.)

HISTORY.—This plant is mentioned in both the Old and New Testament, (*Isaiah*, xxviii. 27; *Matthew*, xxiii. 23,) and by Hippocrates, (*Opera*, 407, &c. ed Fœs.) Dioscorides, (lib. iii. cap. 68,) and Pliny. (*Hist. Nat.* lib. xix. cap. 47, ed. Valp.) The Greeks call it κύμινον ἡμετέρον vel αὐθιόπιπτον.

BOTANY.—*Gen. Char.*—Teeth of the *calyx* five, lanceolate, setaceous, unequal, persistent. *Petals* oblong, emarginate, erect, spreading, with an inflexed lobe. *Fruit* contracted at the side. *Mericarps* [half fruits] with wingless ridges; the primary ones five, filiform, minutely muricated, the laterals forming a border; the secondary ones four, more prominent, and aculeate. *Channels* under the secondary ridges one-vittate. *Carpophorus* bipartite. *Seed* somewhat concave anteriorly, on the back convex.—*Herbs.* *Leaves* many-cleft: lobes, linear, setaceous. Leaflets of the *involute* two to four, simple or divided. *Involucellum* halved, two to four-leaved, becoming reflexed. *Flowers* white or pink (De Cand.)

Sp. Char.—Lobes of the *leaves* linear, setaceous, acute. *Umbel* three to five-cleft. *Partial involucre* equalling the pubescent fruit (De Cand.)

Root annual. *Stem* slender, branched, about a foot high. *Leaves* filiform, *Flowers* white or reddish.

Hab.—Upper Egypt, Ethiopia. Extensively cultivated in Sicily and Malta.

DESCRIPTION.—The fruit, commonly termed *cumin seeds* (*fructus seu semina cumini*), is larger than anise, and of a light-brown or grayish-yellow colour. It has some resemblance to, though it is larger than, caraway. Each mericarp has five primary ridges, which are filiform, and furnished with very fine prickles. The four secondary ridges are prominent and prickly. Under each of these is one vitta. The odour of the fruit is strong and aromatic. Both odour and

taste are somewhat analogous to, but less agreeable than, caraway. Cumin is imported from Sicily and Malta. In 1839, duty (2s. per cwt.) was paid on 53 cwt.

COMPOSITION.—The peculiar properties of cumin reside in a volatile oil.

OIL OF CUMIN; *Oleum Cumini*. Obtained by submitting the fruit to distillation with water. Sixteen cwt. of the fruit yield about 44 lbs. of oil. This oil, as usually met with, is pale yellow and limpid. Its smell is disagreeable; its taste very acrid. It consists of two oils, one a carbo-hydrogen called *Cumen* or *Cymen* $C^{18}H^{24}$; the other an oxygenated oil called *Hydruret of Cumyl* $C^{20}H^{11}O^2 + H$. *Cumyl* is an hypothetical base composed of $C^{20}H^{11}O^2$. When treated with caustic potash, oil of cumin yields *hydrated cuminic acid* $C^{20}H^{11}O^3 + Aq$. This is a crystallizable solid.

PHYSIOLOGICAL EFFECTS.—Cumin agrees with the other aromatic umbelliferous fruits (see vol. i. p. 183) in its mildly stimulant and carminative qualities.

USES.—Internally, cumin is rarely used; caraway being an equally efficient, and much more agreeable medicine. As a discutient and resolvent, it was formerly employed, externally, in the form of *plaster* (*emplastrum cumini*, Ph. L. 1824) and *cataplasm* (*cataplasma e cymino*, Quincy). As there is now no preparation of cumin in the British Pharmacopœia, I am surprised at the retention of this substance in the *Materia Medica*. The dose of cumin is grs. xv. to 3ss. It is principally used in veterinary surgery.

12. DAUCUS CAROTA, Linn. L. D.—COMMON OR WILD CARROT.

Sez. Syst. Pentandria, Digynia.

(Fructus; Radix recens, L.—Radix, D.)

D. Carota, var. *sativa*, De Candolle, E. (Root).

D. Carota, var. *sylvestris*, D. (Semina).

(Carota, U. S.)

HISTORY.—According to Dr. Sibthorp, (*Prodr. Fl. Græc.* i. 183,) this plant is the *σταφυλίνος* of Dioscorides. (Lib. iii. cap. 59.) Hippocrates (p. 686, ed. Fœs.) employed it in medicine under the same name. The *σταφυλίνος ἄγριος* of Dioscorides is, according to Dr. Sibthorp, the *Daucus guttatus*.

BOTANY.—**Gen. Char.**—Margin of the *calyx* five-toothed. *Petals* obovate, emarginate, with an inflexed point; the outer generally radiating, and deeply bifid. *Fruit* somewhat compressed from the back, ovate or oblong. *Mericarps* [half-fruits] with the five primary ridges filiform and bristly; the three middle ones at the back; the two laterals on the plane of the commissure; the four secondary ridges equal, more prominent, winged, split into a simple row of spines. *Channels* beneath the secondary ridges one-vittate. *Seed* anteriorly flattish.—Usually biennial herbs. *Leaves* bipinnatisect. *Involucre* of many, trifid, or pinnatifid leaflets; partial involucre of many entire, or trifid leaflets. *Flowers* white or yellow; the central generally fleshy, blackish purple, sterile (De Cand.)

Sp. Char.—*Stem* hispid. *Leaves* two or three-pinnatisect; the segments pinnatifid; the lobes lanceolate, cuspidate, almost equal to the umbel. *Prickles* equal to the diameter of the oblong-oval fruit (De Cand.)

Root slender, yellowish, aromatic, and sweetish. *Stem* two or three feet high, branched, erect, leafy, hairy or bristly. *Leaves* on broad, concave, ribbed footstalks, distinctly hairy. *Umbels* large, white, except the one central neutral flower, which is blood-red. *Fruit* small, protected by the incurvation of the flower-stalks, by which the umbels are rendered hollow, like a bird's nest.—(Condensed from Smith.)

Hab.—Indigenous; in pastures and the borders of fields, in a gravelly soil, common. Europe, Crimea, and the Caucasus; from thence, probably, carried to China, Cochin-China, and America.

Daucus Carota, var. *sativa*, D. C.; E. *Cultivated or Garden Carrot*.—This has a thick succulent root, whose colour varies. Loudon mentions ten garden varieties.

DESCRIPTION.—The officinal root is that of the cultivated plant (*radix dauci sativi*). It is tape-shaped, now and then branched, reddish or pale straw-coloured, succulent, of a peculiar, not unpleasant odour, and a sweet, mucilaginous, agreeable taste. Carrot juice (*rob dauci*) is reddish, turbid, with the odour and taste of the root. By standing, a feculent matter (*amyllum dauci*), which has been recently employed in medicine, deposits. (*Pharm. Central-Blatt für 1841*, p. 204.) It coagulates at a temperature under 212° F. The coagulum is yellow, and when dried amounts to 0.629 of the juice. The root of the wild, or uncultivated, carrot is small, woody, acrid, and bitter, with a strong aromatic odour. The officinal fruits, usually called carrot seeds (*fructus seu semina dauci sylvestris*) are those of the wild carrot: they are brownish, from one to one and a half lines long, with a peculiar and aromatic odour, and a bitter and warm taste. Their other characters have been described (p. 486). The seeds of the cultivated carrot are much milder.

COMPOSITION.—The fruit (commonly termed seeds) has not been analyzed: the seeds owe their peculiar properties to volatile oil (*oleum seminum dauci sylvestris*). The root has been analyzed by Vauquelin, (*Ann. de Chim. et Phys.* xli. 46,) by Wackenroder, (Gmelin, *Handb. d. Chem.* ii. 1277,) and by C. Sprengel. (*Pharm. Central-Blatt für 1832*, p. 443.) The constituents of the expressed juice, evaporated to dryness, are, according to Wackenroder, fixed oil with some volatile oil 1.0, carotin 0.34, uncrystallizable sugar with some starch and malic acid 93.71, albumen 4.35, ashes composed of alumina, lime, and iron 0.60.

1. **VOLATILE OIL OF CARROT-ROOT.**—Colourless, has a smell of carrots, a strong, permanent, unpleasant taste, and a sp. gr. of 0.8863 at 54° F. It is little soluble in water, but very soluble in alcohol and ether. From 34 lbs. of the fresh root only half a drachm of oil was obtained. It is probable that the volatile oil of carrot-fruits possesses analogous properties.

2. **CAROTIN.**—A crystalline, ruby-red, tasteless, odourless, neutral substance. It is fusible and combustible, but not volatile, soluble in the mixed and volatile oils, slightly so in alcohol, not in ether unless fat oil be present. Its solutions are decolorized by solar light.

3. **PECTIC ACID.**—By the action of alkalis on the ligneous tissue of carrots, Braconnot procured pectic acid. I have repeated his experiments, and can confirm his statements, but the quantity obtained is small. Pectic acid consists, according to Fremy, of C²⁴ H¹⁷ O²².

PHYSIOLOGICAL EFFECTS AND USES.—The fruit (*seed* of the shops) of the carrot is an aromatic stimulant and carminative, like the other aromatic umbelliferous fruits (see vol. i. p. 183). Aretæus says it possesses diuretic properties, a statement confirmed by Eberle. (*Mat. Med.* ii. 260, 2d ed.) It has been employed in suppressions of urine and painful micturition, and also in dropsies. The expressed juice has been used as an anthelmintic.

The boiled root is a well-known article of food. Raw scraped carrot is sometimes applied to chapped nipples: it is a stimulant, and occasionally proves a painful application. Boiled carrots are only employed in the form of poultice.¹

CATAPLASMA DAUCI, D.; Carrot Poultice. (Root of Cultivated Carrot, any quantity. Boil the root in water until it becomes soft enough to form a cataplasm.)—It is used to correct the fetid discharge, allay the pain, and change the action of ill-conditioned, phagedenic, sloughing, and cancerous ulcers. (*Med. Observ. and Inq.* vol. iv. pp. 184-191, and 355.)

13. CONIUM² MACULATUM, Linn. L. E. D.—THE COMMON OR SPOTTED HEMLOCK.

(Conii Folia et Conii Semen, U. S.)

HISTORY.—This plant is usually supposed to be the *κόνιον* of the Greek writers,—the celebrated *Athenian state poison*, by which Socrates (*Works of Plato*, by T. Taylor, vol. iv.; *The Phædo*, p. 340) and Phocion (*Plutarch's Lives*)

¹ For further details respecting the medicinal uses of the carrot, see Bridault, *Traité sur la Carotte, et Recueil d'Observations sur l'Usage et les Effets salutaires de cette Plante dans les Maladies externes et internes*, 8vo. Rochelle, An. xi.

² This word is sometimes incorrectly accented *Co'nium*. But "those words which, in Greek, are written with ei before a vowel, and in Latin with e or i, have the e or i long; as *Enēas*, *Cassiopēa*, *Cythariā*, *Centauriā*," &c. (Grant's *Institutes of Latin Grammar*, p. 343, 2d ed. 1823.)

died,—and the *cicuta* of the Roman authors. Various reasons contribute to give the common opinion on this point a high degree of probability. Dioscorides (lib. iv. cap. 79) described the plant sufficiently well to prove it must have been one of the Umbelliferæ; and he tells us that it had a heavy odour, and a fruit like that of anise. The latter simile applies to our Conium, for a very intelligent druggist mistook, in my presence, the fruit of the hemlock for that of anise; and at the examination for M. B. at the University of London, in 1839, a considerable number of the candidates, to whom the hemlock fruit was shown, made the same mistake. Dioscorides also tells us, that the κώνιον of Crete and Megara was the most powerful, and next to this came that of Attica, Chio, and Cilicia. Now Dr. Sibthorp (*Prodr. Fl. Græcæ*, i. 187) found Conium maculatum growing near Constantinople, not unfrequently in the Peloponnesus, and most abundantly between Athens and Megara. So that the locality of our Conium agrees, as far as has been ascertained, with that of the ancient plant. Moreover, Conium maculatum is at this present time called by the Greeks κώνιον. (*Ελληνική Φαρμακοποιία*, 1837.) We may gather from the poetical account of the effects of κώνιον given by Nicander, (*Alexipharmaca*, f. 34-5, Paris, 1549,) that this plant “brings on obliteration of the mental faculties, dimness of sight, giddiness, staggering, stifling, coldness of the limbs, and death by asphyxia; a view of its effects,” says Dr. Christison, (*Transactions of the Royal Society of Edinburgh*, vol. xiii.) “which differs little from the modern notions of the poisonous action of the spotted hemlock.” It is also remarkable that the ancients regarded κώνιον as having the power of discussing tumors—a virtue which has been assigned to hemlock by writers of the present day.

I am fully aware that the characters of the ancient plant, as given us by Dioscorides and Pliny, (*Hist. Nat.* lib. xxv. cap. 95, ed. Valp.,) are insufficient to distinguish it from some other Umbelliferæ, yet I think the evidence of its being our Conium maculatum is deserving of much greater confidence than Dr. Christison is disposed to give it. The absence of all notice, in the writings of the ancients, of the purple spots on the stem, has been urged against the probability of this opinion. “Pliny’s term *nigricans*, applied to the stem, is but a feeble approach,” says Dr. Christison, “to the very remarkable character of the modern plant, the purple spotted stem.” But in 1839 I showed to the pupils attending my lectures a stem of hemlock to which the term *blackish* might be applied without greater impropriety of language than is daily made use of when a man is said to have a black eye; for the dark purple spots had coalesced so as to cover most completely the lower part of the stem. Admitting, however, that the term is not strictly correct, I would observe, first, that there is no poisonous umbelliferous plant to which it applies so well as to hemlock; and, secondly, Dioscorides and Pliny may be well excused for using it, seeing that a distinguished living professor describes the spots on the stem as *blackish*. (See Orfila, *Toxicol. Gén.* ii. 299, 1818.)

It is evident that our generic term *Conium* is derived from the Greek word κώνιον. Linnæus has been censured by Lamarek for using this name, since the Latin authors call our hemlock *Cicuta*, which he, therefore, contends ought to be its designation now. But it ought to be remembered that Linnæus has only restored its ancient name, for the word *Cicuta* is unknown to the Greek language. By modern botanists the latter term is applied to a distinct genus of plants; and when, therefore, we meet with it in botanical works, we must not confound it with the *cicuta* of the Romans. Especially careful should the student be not to confound *Conium maculatum* with *Cicuta maculata*. It is certainly much to be regretted that such a ground of confusion should exist, but I am afraid it is now too late to obviate it.

BOTANY. Gen. Char.—Margin of the *calyx* obsolete. *Petals* obcordate, somewhat emarginate, with a very short inflexed lobe. *Fruit* compressed at the side, ovate. *Mericarps* [half-fruits] with five, prominent, undulated, crenu-

lated, equal ridges, the lateral ones marginal. *Channels* with many striæ, but no vitta. *Carpophorus* bifid at the apex. *Seed* incised with a deep narrow groove, and confounded with it.—European, biennial, poisonous *herbs*. *Root* fusiform. *Stem* round, branched. *Leaves* decomposed. Both partial and general *involucre*s, three to five-leaved; partial one, halved. *Flowers* white, all fertile. (De Cand.)

Sp. Char.—Leaflet of the partial *involucre* lanceolate. Partial *umbel* short. (De Cand.)

Root biennial, tap-shaped, fusiform, whitish, from six to twelve inches long, somewhat resembling a young parsnip. *Stem* from two to six feet high, round, smooth, glaucous, shining, hollow, spotted with purple. *Leaves* tripinnate, with lanceolate, pinnatifid leaflets, of a dark and shining green colour, smooth, very fetid when bruised, with long, furrowed footstalks, sheathing at their base. *Umbels* of many general as well as partial rays. *General involucre* of several (usually three to seven) leaflets: *partial involucre* of three leaflets on one side. *Margin of calyx* obsolete. *Petals* five, white, obcordate, with inflexed points. *Stamina* five, epigynous, as long as the petals. *Ovarium* ovate, two-celled, striated; *styles* two, filiform, spreading; *stigma* round. *Fruit* ovate, compressed laterally; *mericarps* (half-fruits) with five primary, but no secondary, ridges, which are undulato-crenated; the channels have many striæ, but no vitta. *Seed* with a deep, hollow groove in front.

Hab.—Indigenous; hedges and waste ground, especially near towns and villages. In other parts of Europe, the East of Asia, and in the cultivated parts of North America and Chili, into which it has been introduced.

In distinguishing *Conium maculatum* from other Umbelliferae, the following characters should be attended to:—The large, round, smooth, spotted *stem*; the smooth, dark, and shining green colour of the lower *leaves*; the *general involucre* of from three to seven leaflets; the *partial involucre*, of three leaflets; the *fruit* with undulated crenated primary ridges. To these must be added, that the whole *herb*, when bruised, has a disagreeable smell (compared by some to that of mice, by others to that of fresh cantharides or of cats' urine).

The indigenous Umbelliferae most likely to be confounded with *Conium maculatum*, are, *Ethusa cynapium* and *Anthriscus vulgaris*. *ETHUSA CYNAPIUM*, or *Fool's Parsley*, is distinguished from hemlock by its smaller size, by the absence of the strong disagreeable smell which distinguishes the *leaves* of hemlock, by the want of a *general involucre*, by the three long, narrow, unilateral, pendulous leaflets composing the *partial involucre*, by the *ridges* of the fruit being entire (i. e. not undulate or crenate) and by the presence of *vitta*. *ANTHRISCUS VULGARIS*, or *Common Beaked-Parsley*, is known from hemlock by the paler colour and slight hairiness of the *leaves*, by the absence of spots on the *stem*, by the swelling under each joint, by the absence of a *general involucre*, by the roughness of the *fruit*, and by the absence of a strong unpleasant odour when the *leaves* are bruised. *ANTHRISCUS SYLVESTRIS* (*Charophyllum sylvestre*), or *Common Cow-Parsley*, is scarcely likely to be confounded with hemlock. The stem, though purplish, is striated, downy at the lower part, and slightly swollen below the joint; the leaves are rough edged; there is no *general involucre*; and the partial one usually consists of five or more leaflets.

DESCRIPTION.—The leaves (*folia conii*) only are officinal. They should be gathered from wild plants, just before the time, or at the commencement of flowering. If intended for drying, the larger stalks should be removed, and the foliaceous parts quickly dried in baskets, by the gentle heat (not exceeding 120° F.) of a proper stove. Exclusion from solar light contributes greatly to the preservation of the colour. If properly dried, the leaves should have a fine green colour, and their characteristic odour; and when rubbed with caustic potash should evolve the odour of conia. They should be preserved in cool, closed, perfectly opaque, and dry vessels. Tin canisters possess these properties. However, no reliance can be placed on the dried leaves, however carefully prepared, for they sometimes yield no conia, though they possess the proper hemlock-odour and a fine green colour. If the fresh leaves be subjected to pressure, they yield a greenish juice (*succus conii*) from which, on standing, a green *fecula* subsides. The fruit, commonly termed *hemlock seeds* (*fructus seu semina conii*), has very little odour, and a slight, somewhat bitterish taste.

It retains for a much longer time than the leaves its active principle unchanged (see *Conia*).

COMPOSITION.—Schrader (*Berlin Jahrbuch*, 1805, S. 152.) made a comparative analysis of wild and cultivated hemlock, but with no important result. He also made a comparative examination of hemlock and cabbage (*Brassica oleracea*), the only curious part of which was, that he found a striking resemblance between them. (Schweigger's *Journ. für Chem.* Bd. v. S. 19, 1812.) Peschier (Pfaff, *Syst. d. Mat. Med.* Bd. vii. S. 300; Berzelius, *Traité de Chim.* vi. 254.) found in hemlock a salt which he called *coniate of conia*, being composed of a peculiar crystallizable acid (*coniic acid*), and a peculiar base. Hemlock juice was analyzed by Bertrand; (*Recueil de Mém. de Méd. de Chir. et de Pharm. Mil.* t. ix. p. 300,) the leaves by Dr. Golding Bird; (*Lond. Med. Gaz.* xi. 248,) the ashes by Brandes. (*Berlin Jahrbuch*, 1819, S. 116.) An analysis of hemlock (leaves?) by the last-mentioned chemist, is quoted by Merat and De Lens. (*Dict. de Mat. Méd.* ii. 391.) Peschier and Brandes first announced the existence, in this plant, of a peculiar basic principle, which Giseke, (*Journ. de Pharm.* xiii. 366,) in 1827, obtained in combination with sulphuric acid. But Geiger, (*Mag. für Pharm.* xxxv. 75 and 259,) in 1831, procured it, for the first time, in an isolated form, and described some of its properties and effects on animals. It was afterwards examined by Dr. Christison, (*Trans. Roy. Soc. Edinb.* vol. xiii. and *Med. Gaz.* xviii. 123,) and by MM. Boutran-Charlard and O. Henry. (*Journ. de Chim. Méd.* t. ii. 2nd Sér. p. 350.)

Schrader's Analyses.		Brandes's Analyses.	
	Hemlock.	Cabbage.	
Extractive	2.73	— 2.34	Peculiar basic principle (<i>conicine</i>).
Gummy extractive	3.52	— 2.89	Very odorous oil.
Resin	0.15	— 0.05	Vegetable albumen.
Vegetable albumen	0.31	— 0.29	Resins.
Green fecula	0.80	— 0.63	Colouring matter.
Water, with acetic acid and various salts	92.49	— 93.80	Salts.
			[Lignin and water].
Total	100.00	— 100.00	Hemlock.

1. VOLATILE OIL OF HEMLOCK. (*Odoriferous principle*.)—The distilled water of hemlock possesses, in a high degree, the characteristic odour of hemlock, but is scarcely, if at all, poisonous. Hence it is obvious that the odorous matter is not the active principle. Furthermore it shows that the characteristic odour of hemlock, in the different preparations of this plant, is not to be taken as a necessary indication of their activity. Bertrand isolated the odorous matter, and found it to be a volatile oil of an acrid taste and peculiar odour.

2. CONIA (*Conicine*; *Concin*; *Cicutine*).—Exists in hemlock in combination with an acid (*coniic acid*, Peschier;) so that it cannot be recognized by its odour, nor obtained by distillation, without the assistance of an alkali. It exists, probably, in all parts of the plant, but is more copious in the fruit than in the leaves; and, most remarkably, it may be preserved for a much longer time in the former than in the latter. Geiger procured from six lbs. of fresh, and nine lbs. of dried fruits, about one ounce of conia, whereas from 100 lbs. of the fresh herb he obtained only a drachm of this alkaloid. He could get traces only of it in fresh dried leaves, while he extracted a drachm of it from nine ounces of the fruit which had been preserved (not very carefully) for sixteen years. This by no means agrees with my own observations and experiments for I have found that fruit which had been kept for three years yielded only a very minute portion of conia; though from the same sample when fresh gathered I had obtained a considerable quantity. From 40 lbs. of the ripe, but green, seeds (*mericarps*), Dr. Christison obtained two ozs. and a half of hydrated conia. Conia, free from all impurity but water, may be obtained by distilling the alcoholic soft or syrupy extract of the seeds (*mericarps*) with its own weight of water and a little caustic potash. The conia passes over readily, and floats on the surface of the water (which contains conia in solution). When pure, conia is an oily-looking transparent liquid, lighter than water. Its odour is strong and penetrating, somewhat like that of hemlock, or more analogous to a combination of the odours of tobacco and mice. Its taste is acrid; it is sparingly soluble in water, but is entirely soluble in alcohol and ether. It reddens turmeric, and neutralizes the dilute acids, forming salts. While saturating, the liquors have a bluish-green tint, which subsequently passes to a reddish-brown. It combines with about a fourth of its weight of water to form a *hydrate of conia*. When placed in a vacuum, in the presence of bodies very attractive of water, it in part volatilizes, and leaves a reddish, very acrid, pitchy residue, which appears to be anhydrous [partially decomposed?] conia. The

vapour of conia is inflammable. By exposure to the air, liquid conia acquires a dark colour, and is resolved into a brown resin and ammonia. Its boiling point is 370° F., but it readily distils with water at 212° F.

Conia is characterized by its liquidity at ordinary temperatures, its volatility, its peculiar odour, its reddening turmeric paper, its vapour forming white fumes (*hydrochlorate of conia*) with the vapour of hydrochloric acid, its solution in water, forming, with infusion of nutgalls, a white precipitate (*tannate of conia*) its sulphate and other salts being deliquescent and soluble in alcohol, its not being reddened by either nitric or iodic acids, and lastly, by its alcoholic solution not being precipitated by the alcoholic solution of carbazotic acid. Several of the *salts of conia* are crystallizable. When solutions of them are evaporated they lose a part of their base, the odour of which becomes sensible. The nitrate of conia, when decomposed by heat, yields brown pyrogenous products. Potash added to a salt of conia sets the base free, which is then recognized by its odour.

Liebig analyzed conia. Its constituents are:

	Atoms.	Eq. Wt.	Per Cent.	Liebig.
Carbon.....	12	72	66.67	66.913
Hydrogen.....	14	14	12.96	12.000
Nitrogen.....	1	14	12.96	12.805
Oxygen.....	1	8	7.41	8.282
Conia.....	1	108	100.00	100.000

The effects of conia have been tried on mammals (the dog, cat, rabbit, and mouse), birds (pigeon, kite, and sparrow), reptiles (slow-worm), amphibians (the frog), annelides (earth-worm), and insects (fly and flea). One drop placed in the eye of a rabbit killed it in nine minutes; three drops employed in the same way killed a strong cat in a minute and a half; five drops poured into the throat of a small dog began to act in thirty seconds, and in as many more motion and respiration had entirely ceased.

The following are the symptoms produced, as detailed by Dr. Christison. "It is, in the first place, a local irritant. It has an acrid taste; when dropped into the eye, or on the peritoneum, it causes redness or vascularity; and to whatever texture or part it is applied, expressions of pain are immediately excited. But these local effects are soon overwhelmed by the indirect or remote action which speedily follows. This consists essentially of swiftly-spreading palsy of the muscles,—affecting first those of voluntary motion, then the respiratory muscles of the chest and abdomen, lastly the diaphragm, and thus ending in death by asphyxia." Convulsive tremors, and twitches of the limbs, sometimes, though not invariably, are observed. The external senses do not appear to be affected until respiration is impaired. If a rabbit be lifted up by his ears when under the influence of the poison, he makes the same kind of struggles to be released that he does when in health. So also if we place him in an uneasy posture, he makes attempts to alter his position, proving that his senses are unimpaired. After death the muscles are susceptible of the galvanic influence. MM. Boutran-Charlard and O. Henry state, that most of the animals to whom they gave conia became "a prey to the most dreadful convulsions. The plaintive cries, the contortions, and the rigidity of the limbs, which have always preceded death, leave no doubt as to the cruel pains which this kind of poisoning brings on." This account agrees neither with my own observations, nor with those published by Dr. Christison.

Does conia become absorbed? In favour of the affirmative view of this question may be mentioned the fact, that this alkali acts on all the textures admitting of absorption; and that the quickness with which the effects occur, are in proportion to the absorbing power of the part. But the rapidity of its action, when introduced into the veins, is a barrier to the supposition of its acting on the nervous centres by local contact; for Dr. Christison states, that two drops, neutralized by dilute muriatic acid, and injected into the femoral vein of a young dog, killed the animal in two or three seconds at farthest.

The primary seat of the action of conia is probably the spinal cord. In this conia and strychnia agree; but in the nature of the effect, they seem, as Dr. Christison has observed, to be the counterparts of each other. Conia exhausts the nervous energy of the cord, and causes muscular paralysis; strychnia irritates it, and produces permanent spasm of the respiratory muscles. It is evident, therefore, that, like strychnia and nux vomica (see p. 354), its operation is on the seat of the reflex functions, which, according to Mr. Grainger, (*Obs. on the Struct. and Funct. of the Spinal Cord.*) is the gray matter of the spinal cord.

These effects of conia suggest its employment in convulsive or spasmodic diseases; as tetanus, poisoning by strychnia, brucia, or nux vomica, hydrophobia, &c. I have tried it on two rabbits under the influence of strychnia, and found that it stopped the convulsions, but hastened rather than prevented death. In September, 1838, it was tried in a case of hydrophobia at the London Hospital. The following is a brief report of the case:—"In the case of hydrophobia, in a middle-aged man, after the disease was fully formed, two minims of conia, dissolved in thirty drops of acetic acid, were applied endermically to the præcordium (the cuticle being previously removed by a blister). The effects were instantaneous. The pulse fell from 64 to 46, and became more regular. The vomiting and convulsions ceased; the respiration became less difficult, and the symptoms of the disease appeared to be altogether mitigated. The man ex-

pressed himself as feeling much better, and entertaining hopes of an ultimate recovery. These effects were, however, but transitory, and in about seven minutes the symptoms began to reappear, and shortly assumed their previous urgency. Three minims of conia were injected into the rectum, about a quarter of an hour after the endermic application of it, but it produced no effect in allaying the symptoms of the disease. The remedy was not repeated, and the man became rapidly worse, and died in a few hours."

3. EMPYREUMATIC OIL OF HEMLOCK (*Pyro-conia?*).—This oil, obtained by the destructive distillation of hemlock, resembles, according to Dr. Morries, (*Ed. Med. and Surg. Journ.* xxxix. 377,) that procured from foxglove (see p. 287).

CHARACTERISTICS FOR MEDICO-LEGAL PURPOSES.—Hemlock can only be properly recognized by its botanical characters, already described: yet its remarkable odour may sometimes be of considerable assistance in recognizing the plant or its preparations; nor is the fact to be lost sight of, that potash develops a strong smell of conia. In some cases it might be possible to obtain some conia by distilling the alcoholic extract of the suspected substance with water and caustic potash.

PHYSIOLOGICAL EFFECTS. *a. On Vegetables.*—Marcet placed a haricot plant (*Phaseolus vulgaris*) in a solution of five grains of the extract of hemlock. In a few minutes the two lower leaves curled at their extremities; the next day they were yellow and subsequently died. (*Ann. Chim. et Phys.* xxix. 219.) Schübler and Zeller (*Schweigger's Journ. f. d. Chem.* Bd. l. S. 54,) also confirm its poisonous operation.

β. On Animals generally.—The effects of hemlock on animals have been tried by Harder, (Boneti, *Sepulchr.* l. iv. sect. x. Obs. iv. p. 488,) Wepfer, (*Hist. Cicut. aquat.* p. 201, 1733,) Orfila, (*Toxicol. Gén.* ii.) and Schubarth. (Wibmer, *Wirk. d. Arzneim. u. Gifte.* ii. 169.) The animals experimented on were the dog, wolf, rabbit, and guinea-pig. The action of hemlock on the solipedes and ruminants is very much less energetic than on the carnivora. Moiroud (*Pharm. Vét.* 359,) has given three lbs. and a half of the plant to a young horse, without inconvenience; but in another instance the decoction of four ounces proved fatal. It caused dejection, stupor, dilatation of the pupils, trembling, salivation, nausea, spasmodic contraction of the muscles of the extremities, rolling of the eye, grinding of the teeth, and copious cold sweats. From the observations of Orfila, hemlock is a local irritant (though this action was not constantly observed), and produces giddiness, convulsions, loss of sensibility, palsy, and coma. This account, as Dr. Christison observes, does not agree with the symptoms induced by conia, which does not seem to affect the senses so long as the respiration goes on. "But it is possible," he adds, "that the difference is more apparent than real, and that hemlock has been supposed to extinguish sensation, merely because by inducing paralysis it takes away the power of expression; at least in some experiments I have made, sensation did not appear to be affected; and the whole phenomena were identical with those produced by conia. In these experiments I used very strong extracts, prepared by absolute alcohol from the fresh leaves or full-grown seeds; and each of them occasioned, in doses of thirty grains or thereabouts, paralysis of the voluntary muscles, with occasional slight convulsions, then paralysis of the respiratory muscles of the chest and abdomen, and finally cessation of the action of the diaphragm. Sensation appeared to continue so long as it was practicable to make an observation on the subject; and the heart contracted vigorously for a long time after death." But from the united observations of the effects of hemlock on animals and man, I cannot help suspecting, either that this plant contains a second active principle, whose operation is somewhat distinct from conia, or that the influence of this alkaloid is greatly modified in the plant by combination with other matters.

γ. On Man.—In small or medicinal doses, hemlock has been frequently administered for a considerable period, with obvious relief, in certain diseases (tumours of various kinds, for example), without any other evident effect; hence the statement of some authors, that hemlock acts insensibly on the system. "It

seldom purges," says Storck, (*Essay on Hemlock*, Eng. Tr. 2d ed. 1762.) "and very rarely vomits. Sometimes it increases perspiration, and often it occasions a copious discharge of viscid urine. In many patients, nevertheless, it does not sensibly augment any of the secretions." Long-continued use, especially if the doses be increased, will sometimes occasion disorder of the digestive organs or of the nervous system, dryness of the throat, thirst, and occasionally, it is said, an eruption of the skin. Choquet (Orfila, *Toxicol. Gén.* ii.) mentions the case of a man who gradually increased the dose of the extract to half a drachm; it produced slight delirium and syncope, which obliged him to suspend its use.

The ancients were of opinion that hemlock exercised a specific influence over the breasts and testicles. "It extinguishes the milk," says Dioscorides, "and prevents the development of the mammæ of virgins; moreover, in boys it causes wasting of the testicles." Pliny gives a similar account of it, and adds, "it reduces all tumours." The same notions of its effects seem to have been entertained by the Arabians; for Avicenna praises it as a remedy for tumours of the breasts and testicles. More recently, (*Lond. Med. Gaz.* viii. 125,) somewhat similar effects on the breasts have been ascribed to it. In two cases it is said to have caused atrophy of the mammæ.

In *large or poisonous doses* the symptoms are those indicating disorder of the cerebro-spinal functions. In some of the best-recorded cases the leading symptom was coma; the effects being altogether analogous to those of opium. In other instances, convulsions, or violent delirium, or both, were the prominent symptoms. As an illustration of the *comatose condition*, sometimes brought on by this poison, I shall quote a case recorded by M. Haaf, a French army surgeon, and which occurred to him while in garrison at Torrequemada, in Spain, in March, 1812. (Orfila, *Toxicol. Gén.*)

A soldier having eaten of some broth, into which hemlock had been put, went to sleep immediately after his supper. In an hour and a half he was found groaning and breathing with difficulty; in consequence of which M. Haaf was sent for. He found his patient in a profound sleep, without sense, respiring with difficulty, and lying on the ground. His pulse was 30, small, and hard; the extremities cold; the face bluish, and distended with blood, like that of a person strangled. Twelve grains of emetic tartar were given, and occasioned some fruitless attempts to vomit. He became gradually worse, had violent palpitations of the heart, and died in three hours after his fatal supper.

Several other cases in which coma was the leading symptom might be quoted, but the one just related is the best.

We have no well-detailed cases in which *delirium* was the leading symptom. The following must suffice, by way of illustration; it is from Kircher (Wibmer, *Wirk. &c.* ii. 172):—Two priests ate hemlock root by mistake; they became raving mad, and mistaking themselves for geese, plunged into the water. For three years they suffered with partial palsy and violent pain. Orfila also mentions a vine-dresser and his wife, who became mad and furious from hemlock.

As illustrations of the *convulsions* caused by hemlock, I may refer to the cases mentioned by Limprecht and Ehrhard. (Wibmer, *op. cit.*) The first states that an old woman suffered for three months with abdominal pain and convulsive movements of the limbs, in consequence of eating hemlock root. Ehrhard mentions trismus as one of the symptoms in another case. Dr. Watson (*Phil. Trans.* vol. xliii. No. 473, p. 18.) has related two cases in which giddiness, coma, and convulsions occurred.

These statements, as well as others of a like tendency which might be quoted, do not agree with the (as yet ascertained) effects of conia. The *post-mortem* appearances throw but little light on the *modus operandi* of hemlock. Venous congestion, especially of the cerebral vessels, a fluid condition of the blood, and,

in the lower animals, redness of the alimentary canal, are the occasional appearances.

USES.—In the present state of uncertainty with respect to the real physiological operation of hemlock, it is obviously impossible to lay down indications or contra-indications for its use, which can be much relied on. Acute inflammation, fever, apoplexy, or tendency to it, and paralysis, are among the circumstances which oppose the employment of hemlock.

The uses of hemlock may be reduced to two heads: those which depend on its influence over the organic functions; and, secondly, those which have reference to its influence over the cerebro-spinal system. The resolvent or discutient and alterative uses come under the first head; the antispasmodic and anodyne under the second.

1. *As a resolvent or discutient and alterative.*—Under the continued use of small and repeated doses of hemlock, glandular and visceral enlargements have frequently subsided; hence has arisen the opinion, entertained in all ages, of the resolvent and discutient powers of this remedy, and of the stimulus which it communicates to the absorbing vessels. The mammæ and the skin are the parts in which these powers have been supposed to be more especially manifested; and the asserted effects (wasting of the breast, profuse sweating, and eruptions) of hemlock on these parts, in healthy individuals, lend support to this opinion. But the influence of hemlock over the organic functions does not appear to be limited to this resolvent operation. In foul ulcers the quality of the discharge has been greatly improved, while pain has been alleviated, and the tendency of the sores to spread has apparently been greatly diminished. If, then, these effects be really referrible to hemlock (and they have been asserted by so many writers in all ages, that we can scarcely refuse to admit them), they prove that this plant exercises a most profound influence over nutrition and the other organic functions, and which we have no better term to indicate than that of alterative. But so frequently has this influence failed to manifest itself, especially in those cases where it was most desired, that a very proper doubt has prevailed among practitioners of the present day, whether it really exists, and whether those phenomena which have been supposed to indicate it, are not really referrible to other influences and circumstances. That hemlock has some influence of the kind referred to, I confess I do not doubt; but it has been greatly exaggerated, and thereby much unmerited discredit has been brought on the remedy; for practitioners, finding that it would not do all that had been ascribed to it, have frequently dismissed it as altogether useless. Whether the failures ought, in part at least, to be ascribed to imperfect modes of preparing and administering this plant, we are, as yet, unable positively to affirm. One fact, however, is certain, that many of the preparations of hemlock in ordinary cases are inert, or nearly so; and others, probably, have had their properties greatly changed in the process of their preparation. The remark made by Dr. Christison, with respect to the physiological effects of this plant, applies well to the point under discussion. "If," says this writer, "physicians or physiologists would acquire definite information as to the physiological effects of hemlock, in small or medicinal doses, they must begin the inquiry anew. Little importance can be attached to any thing already done in this field, as I have no doubt whatever that by far the greater proportion of the preparations of hemlock hitherto employed have been of very little energy, and, in the doses commonly used, are absolutely inert."

The diseases to which the preceding remarks especially apply, are, *enlargements and indurations of the absorbing and secreting glands, and of the viscera, scrofula, obstinate chronic skin diseases, and foul ulcers.* I am not prepared to offer any opinion, as to whether the diseases to which the terms *scirrhus* and *cancer* are strictly applicable, have ever been cured by hemlock. One fact is undoubted, that diseases, supposed to have been scirrhus and cancerous, have

been greatly alleviated, and, in some cases, apparently cured by this remedy. This fact does not rest on the sole testimony of Storck, (*Essay on the Med. Nat. of Hemlock*, [Eng. Transl.] 2d ed. 1762,) but on that of a multitude of practitioners. (See Bayle, *Bibl. Thérap.* iii. 618.) Bayle has collected, from various writers, forty-six cases of cancerous diseases, said to have been cured, and twenty-eight ameliorated, by hemlock. In *scrofula*, in which disease Fothergill, (*Med. Obs. and Inq.* iii. 400,) and many others, (see Bayle, *op. cit.*) have praised it, it seems to be occasionally useful as a palliative in irritable constitutions. It allays the pain, and assists in reducing the volume of enlarged lymphatic glands, and in scrofulous ulcerations improves the quality of the discharge, and disposes the sores to heal. Even *enlargements of the liver, spleen, and pancreas*, have been, at times, apparently, benefited by hemlock. In *mammary tumours* and *profuse secretion of milk (galactorrhœa)*, a trial of it should never be omitted. In *bronchocele* it has been found efficacious by Dr. Gibson, Professor of Surgery in the University of Pennsylvania. (*United States Dispensatory*.) In *syphilis* it is useful, by alleviating nocturnal pains, and in diminishing the tendency to spread of irritable sores. (Pearson, *Obs. on the Effects of Var. Art. of the Mat. Med. in Lues Venerea*, p. 62, 1800.) In *chronic skin diseases* (lepra, herpes, &c.) it is now but rarely employed.

2. *As a cerebro-spinal agent (antispasmodic and anodyne).*—The power possessed by conia of paralyzing the motor-nerves, suggests the employment of hemlock as an *antispasmodic*. Hitherto, however, trials of it have been made in a few spasmodic diseases only, and those have not proved favourable to its reputation. In some spasmodic affections of the respiratory organs it has gained a temporary celebrity only. In *hooping-cough*, Dr. Butter (*Treat. on the Kink-cough*, 1773,) spoke favourably of it, as having the advantage over opium of not being liable to check expectoration. But though the violent and periodic fits of coughing are obviously of a spasmodic nature, and, therefore, apparently adapted for the use of hemlock, experience has fully proved that the disease is one which will run through a certain course. At the best, therefore, hemlock can prove a palliative only. In other forms of *spasmodic cough*, as well as in *spasmodic asthma*, hemlock deserves farther trial. In *tetanus*, conia or hemlock held out some hopes (fallacious, I am afraid) of doing good. Mr. Curling has kindly furnished me with the notes of a case which occurred in the London Hospital. A tincture of hemlock seeds was exhibited on the eighth day of the disease, at first in doses of ℞xx. every hour, which were increased in the course of the three following days to ℥ij. every quarter of an hour, until the patient (a man aged 46) had taken, in all, two pints! but without any decided effect on the spasms or brain. Morphia and laudanum were afterwards used, but the man died. A small quantity of conia, obtained from three ounces of the same tincture used in this case, killed a cat in less than four minutes. In a case of *chorea*, treated by Mr. Curling, no relief was obtained by the use of the above-mentioned tincture, given to the extent of three ounces in twelve hours. The patient (a young man) ultimately died, exhausted from the long-continued and violent convulsions of nearly all the voluntary muscles.

Hemlock has been frequently employed as an *anodyne*, and often with apparent relief. As, however, conia does not appear to have the same paralyzing influence over the sensitive, that it has over the motor nerves, some doubt has been raised on the real anodyne influence of hemlock. However, in *tender glandular enlargements, in painful ulcers, in scirrhus and cancer, in rheumatism, and in neuralgia*, hemlock has, at times, evidently mitigated pain; and its power of *allaying troublesome cough*, is, in some instances, referrible to its diminishing the preternatural sensibility of the bronchial membrane.

Anaphrodisiac properties have been ascribed to hemlock, and hence this remedy has been used in nymphomania and satyriasis.

ADMINISTRATION.—Hemlock is used in the form of *powder, tincture, extract, ointment and poultice.*

ANTIDOTES.—No chemical antidote is known for hemlock, though it is not improbable that an infusion of galls might be serviceable, as mentioned for *conia*. The first object, therefore, is to evacuate the poison from the stomach; this is to be effected by the same means as directed for poisoning by opium. If the poison be suspected to have passed into the bowels, a purgative is to be administered, unless diarrhœa have come on. The subsequent treatment will depend on the symptoms: blood-letting is frequently required, to relieve the congested state of the cerebral vessels. Opium is generally prejudicial. Artificial respiration should not be omitted in extreme cases. As strychnia and nux-vomica appear to produce a condition of the spinal cord opposite to that of *conia*, would either of these agents be serviceable?

L. PULVIS CONII; *Powder of Hemlock.*—The powder, when properly prepared from the leaves, has the peculiar odour of the plant, and a fine green colour: but neither the odour nor the colour are absolutely indicative of activity. The test of the presence of *conia* is caustic potash, and as the *Edinburgh College* properly observes, “the powder, triturated with aqua potassæ, exhales a powerful odour of *conia*.” But the odour of the volatile oil of the plant being very analogous to that of *conia*, creates some difficulty with inexperienced persons. The vapour of *conia*, evolved from powdered hemlock by potash, fumes with hydrochloric acid; but the same occurs with ammonia, set free by the same agent. As the powder, however well prepared, quickly spoils by keeping, it is not a preparation which deserves confidence, and should never be used if it have been kept beyond the year. The dose of it is three or four grains twice or thrice daily, the quantity being gradually increased until some obvious effect (nausea, dryness of the throat, giddiness, headache, or disordered vision) in the system is produced. As different parcels of the powder possess very unequal powers, it is necessary, when changing the parcels, to recommence with small doses. I have already (p. 490) referred to the observation of Geiger as to the small quantity, or even entire absence, of *conia*, in the dried leaves of hemlock.

2. TINCTURA CONII, L. E. D. (U. S.); *Tincture of Hemlock.* (Hemlock leaves, dried, ℥v. [℥ij. D.]; Cardamom seeds, bruised, ℥j.; Proof Spirit, Oij. [Oj. wine measure, D.] Macerate for fourteen [seven D.] days, and strain. The formula of the *Edinburgh College* is as follows: “Fresh leaves of conium, ℥xij.; Tincture of Cardamom, Oss.; Rectified Spirit, Oiss. Bruise the hemlock leaves, and express the juice strongly; bruise the residuum, pack it firmly in a percolator; transmit first the tincture of cardamom, and then the rectified spirit, allowing the spirituous liquors to mix with the expressed juice as they pass through; add gently water enough to the percolator for pushing through the spirit remaining in the residuum. Filter the liquor after agitation.”—The process of the *Edinburgh College* yields a much more energetic preparation than that of the London and Dublin colleges, as it obviates the necessity of drying the leaves, and, therefore, much deserves the preference. If, however, the percolation were dispensed with, and the tincture prepared merely by adding spirit (not tincture of cardamom) to the expressed juice, the process would be greatly improved. If the leaves have been sufficiently pressed, the percolation is scarcely necessary, and, therefore, only adds to the labour and expense of the process. Any active matter lost by omitting percolation, may be easily compensated for, by increasing the quantity of juice employed, the cost of which scarcely deserves notice. The employment of tincture of cardamom is objectionable, since it prevents the apothecary from forming a judgment of the colour, taste, and smell of, and the effect of potash on, this preparation. And lastly, if the percolation process be adopted, surely the directions of the *Edinburgh College* are too loose. The quantity of water which is to be employed “for pushing through the spirit” should be accurately defined, or it will be impossible to

have preparations made at different times, and by different persons, of uniform strength. Good tincture of hemlock should evolve a strong odour of conia on the addition of potash. In 1837 (*Lond. Med. Gaz.* xix, 770) I recommended the use of an *alcoholic tincture of the bruised fruit*. More recently, Dr. Osborne (*Dub. Journ.* xvi, 469,) has advised the same. *Tinctura conii*, L. D. is given in doses of ℥ss. or ℥ʒj. which are to be gradually increased until some effect is produced. *Tinctura conii*, E. must be employed more cautiously; though the quantity of hemlock leaves used by the Edinburgh College would, if dried, be scarcely half that employed by the London and Dublin Colleges (as 1000 parts of the fresh leaves yield only 185 parts when dried, according to Henry and Guibourt. (*Pharm. Raison.* i, 27.) The drying, however, as I have already noticed, greatly deteriorates the activity of the leaves.

[The United States Pharmacopœia directs Hemlock leaves ℥iv. Diluted Alcohol Oij.]

Succus Conii; Preserved Juice of Hemlock.—The method of preparing the preserved vegetable juices has been before described (see vol. i. p. 325). Mr. Bentley informs me that from 1 cwt. of hemlock leaves gathered in May he procured twelve imperial quarts of juice. The preserved juice of hemlock appears to me to be an excellent preparation.

3. *EXTRACTUM CONII*, L. E. (U. S.): *Succus inspissatus Conii*, D.; *Extract of Hemlock*. (Fresh hemlock leaves, lb. j.; bruise them, sprinkled with a little water, in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence, L. The *Dublin College* directs it to be prepared as the inspissated juice of Aconite. The following are the directions of the *Edinburgh College*: "Take of Conium any convenient quantity, beat it into a uniform pulp in a marble mortar, express the juice and filter it. Let this juice be evaporated to the consistence of a very firm extract, either in a vacuum with the aid of heat, or spontaneously in shallow vessels exposed to a strong current of air freed of dust by gauze screens. This extract is of a good quality only when a very strong odour of conia is disengaged by degrees, on its being carefully triturated with aqua potassæ."—Most of the extract of the shops is inert, or nearly so. "We were one day," says Orfila, (*Toxicol. Gén.* ii.) "in the shop of an apothecary, who had several times furnished us with the extract of hemlock, which we had administered to dogs to the dose of ten drachms, without producing any serious accident. We endeavoured to prove to him that the medicine was badly prepared; and, in order to convince him effectually, we swallowed, in the presence of several persons who happened to be in his shop, a drachm of this extract (seventy-two grains) dissolved in two drachms of water. We felt no effect from it, whilst twenty or thirty grains of the extract, well prepared, would have probably proved fatal to us. Let it be conceived now what advantage a person is likely to derive from such an extract, who takes one or two grains of it per day, or even thirty or forty, with the hope of getting rid of a scirrhus tumour, or of any other disease."

The extract of hemlock contains very little conia; this has been shown by Geiber and Christison, and has been verified by myself. From ℥iv. of extract procured from one of the most respectable drug houses in town, I was unable to procure any sensible quantity of this alkali. "From what has come under my own observation," says Dr. Christison, "the extracts of hemlock may become feeble, if not inert, in one or two ways,—either by the heat being continued after the concentration has been carried on to a certain extent, or by long keeping. On the one hand, I have always observed, that from the point at which the extract attains the consistence of this syrup, ammonia begins to be given off in abundance, together with a modified odour of conia. And, on the other hand, I have found extracts, which were unquestionably well prepared at first, entirely destitute of conia in a few years,—a remark which applies even to the superior extract prepared by Mr. Barry, of London, by evaporation *in vacuo*."

Mr. Brande (*Dict. of Pharm.* 195,) observes that "the most active extract is that which is procured by moderate pressure from the leaves only; when the stalks and stems are used, and violent pressure employed, the extract is glutinous, dark-coloured, and viscid, and less active than in the former case, when it has a somewhat mealy consistency, and an olive-green colour. With every caution, however, on the part of the operator, the colour, odour, and efficacy of extract of hemlock, will vary with the season, and with the situation and soil in which the herb has grown. The best method of preparing this and similar extracts, consists in gradually heating the expressed juice to a temperature of about 212° [by which the vegetable albumen coagulates, and retains, mechanically, or chemically, a portion of the active principle], then to suffer it to cool, to strain it through moderately fine linen, and evaporate the strained liquor, and when it has nearly acquired a proper consistency, to add the matter which remained upon the strainer." One *cwt.* of hemlock yields from three to five lbs. of extract. If ammonia be evolved during the preparation of the extract, we may infer that decomposition of the conia is going on. However carefully extract of hemlock may be prepared, I prefer for medicinal use the tincture made with the expressed juice as before stated. The dose of the extract should, at the commencement, be two or three grains, and gradually increased until some obvious effect is observed.

[The United States Pharmacopœia also directs the *EXTRACTUM CONII ALCOHOLICUM* made in the way directed for the same Extract of Belladonna. See p. 308.—J. C.]

4. *PILULÆ CONII COMPOSITÆ*, L.; *Compound Pills of Hemlock.* (Extract of Hemlock, ʒv.; Ipecacuanha, powdered, ʒj.; Mixture of Acacia, as much as may be sufficient. Beat them together until incorporated.)—Antispasmodic, slightly narcotic, and expectorant. Used in spasmodic coughs, bronchitis, the incipient stage of phthisis, &c.—Dose, grs. v. to grs. x. twice or thrice daily.

5. *UNGUENTUM CONII*, D.; *Hemlock Ointment.* (Fresh leaves of hemlock, Prepared Hogs' Lard, of each lbs. ij.; boil the leaves in the lard until they become crisp, then express through linen.)—It is employed as an anodyne application to foul, painful, and cancerous sores, to glandular and scirrhus swellings, and to painful piles. An extemporaneous substitute may be prepared with lard and the extract of hemlock.

6. *CATAPLASMA CONII*, L. D.; *Hemlock Poultice.* (Extract of Hemlock, ʒij.; Water, Oj. Mix, and add Linseed, bruised, as much as may be sufficient to make it of a proper consistence, L. The formula of the *Dublin College* is as follows: Leaves of Hemlock, dried, ʒj.; Water, Oiss. Boil down to a pint, and having strained the liquor, add as much of the same kind of liquor as is sufficient to form a cataplasm.)—A *poultice of hemlock* is sometimes employed as a soothing anodyne application to cancerous, scrofulous, venereal, and other foul ulcers. It is sometimes prepared with the unstrained decoction and bruised meal; occasionally the bruised leaves, or the dried herb with hot water, is used. *Hemlock fomentation (fotus conii)* is sometimes applied to painful swellings. It is prepared with the herb (fresh when it can be procured) and hot water.

14. CORIAN'DRUM SATI'VUM, Linn. L. E. D.—THE OFFICINAL CORIANDER.

Ser. Syst. Pentandria, Digynia.
(Fructus, L.—Fruit, E.—Semina, D.)
(Coriandrum, U. S.)

HISTORY.—Coriander is mentioned by Moses. (*Exod.* xvi. 31.) It was used by Hippocrates. (*Opera*, 359, 529, &c. ed. Fœs.) Dioscorides (lib. iii. cap. 71,) and Pliny (*Hist. Nat.* lib. xx. cap. 82, ed. Valp.) also mention it. The Greeks called it κόριον or κοριαννον.

BOTANY. *Gen Char.*—Teeth of the *calyx* five, acute, unequal, persistent. *Pe.*

tals obovate, emarginate, with an inflexed lobe, the exterior radiating, bifid. *Fruit* globose, ten-ribbed, scarcely separating. *Mericarps* [half-fruits] with five primary, depressed, wavy ridges, and four secondary ones [besides the marginals] more prominent and keeled. *Channels* evittate. *Commissure* bivittate. *Carpopodium* in the middle face, semi-bifid, adnate at the base and apex. *Seed* excavated in the front, covered with a loose membrane.—Smooth *herbs*. *Stem* round, *Leaves* (upper ones at least) many cleft. *Umbel* with three to five rays. *Involucre* none. *Involucella* about three-leaved, halved. *Flower-bud* sometimes roseate. *Flowers* white. *Stylopodium* conical. (De Cand.)

Sp. Char.—The only species.

Root tapering. *Stem* erect, twelve to eighteen inches high. *Leaves* scarcely stalked, all bipinnate and cut; the *leaflets* of some of the lowermost wedge-shaped, or fan-shaped; acute notched; of the rest, in fine, linear segments. *Flowers* white, often with a reddish tint.

Hab.—Grows wild about Ipswich and some parts of Essex, but is not really indigenous. Native of the south of Europe. Cultivated in Essex.

DESCRIPTION.—The fruit, commonly termed *coriander seeds* (*fructus seu semina coriandri*), is globular, about the size of white pepper, of a grayish-yellow colour, and is finely ribbed. It consists of two hemispherical mericarps, adherent by their concave surfaces. Each mericarp has five primary ridges, which are depressed and wavy; and four secondary ridges, more prominent and carinate. The channels are without vittæ, but the commissure has two. The odour of coriander is peculiar and aromatic.

COMPOSITION.—The odour, taste, and medicinal qualities of the fruit depend on volatile oil.

VOLATILE OIL OF CORIANDER (*Oleum Coriandri*).—Yellowish; smells strongly and pretty agreeably of the coriander.

PHYSIOLOGICAL EFFECTS.—Aromatic stimulant, like the other carminative umbelliferous fruits (vol. i. p. 183).

USES.—Dr. Cullen considered coriander as more powerfully correcting the odour and taste of senna than any other aromatic; and hence it was formerly a constituent of the compound infusion of senna, though now ginger is substituted for it. It is only employed in medicine as an adjuvant or corrigent. It is used, however, by the confectioners and distillers. It is a constituent of the *confectio sennæ*.—The dose of coriander is ʒss. to ʒj.

OTHER UMBELLIFERÆ, DIETETICAL OR POISONOUS.

All the more important medicinal Umbelliferæ have been noticed. It remains now to enumerate those plants in common use for dietetical purposes, or which are indigenous and poisonous.

Of the **DIETETICAL UMBELLIFERÆ** several have been already mentioned. To these may be added Parsley (*Petroselinum sativum*) and Chervil (*Anthriscus Cerefolium*), used as pot-herbs and garnishings; the Parsnip (*Pastinaca sativa*) and Skirret (*Sium Sisarum*), employed on account of their esculent roots; Celery (*Apium graveolens*), an acetarious plant, the blanched leaf-stalks of which are eaten raw as a salad; Common Samphire (*Crithmum maritimum*), which is pickled; Eryngo (*Eryngium campes'tre*), the root of which is preserved, and eaten as a candy (*Candied Eryngo*; *Radix Eryngii condita*); and Lovage (*Levisticum officinale*), used by distillers for preparing a liqueur termed *lovage*.

The **POISONOUS INDIGENOUS UMBELLIFERÆ** are acro-narcotics. When swallowed they cause gastric irritation, giddiness, delirium, convulsions, and coma. The most important (after Conium maculatum, before mentioned), are Fool's Parsley (*Æthusa Cynapium*), which contains a peculiar alkaloid called *cynapina*; Hemlock Water-dropwort (*Enanthe crocata*); Celery-leaved Water-dropwort (*Enanthe apiifolia*); and Water Hemlock (*Cicuta virosa*).

ORDER LVI.—CUCURBITACEÆ, *Jussieu*.—THE GOURD TRIBE.

ESSENTIAL CHARACTER.—Flowers usually unisexual, sometimes hermaphrodite. *Calyx* five-toothed, sometimes obsolete. *Corolla* five-parted, scarcely distinguishable from the calyx, very cellular, with strongly-marked reticulated veins, sometimes fringed. *Stamens* five, either distinct or cohering in three parcels; *anthers* two-celled, very long and sinuous. *Ovary* inferior one-celled, with three parietal placentæ; *style* short; *stigmas* very thick, velvety or fringed. *Fruit* fleshy, more or less succulent [occasionally dry, opening by valves], crowned by the scar of the calyx, one-celled [in some *Momordicas* three or four-celled], with three parietal placentæ. *Seeds* flat, ovate, enveloped in an aril, which is either juicy, or dry and membranous; *testa* coriaceous, often thick at the margin; *embryo* flat, with no *albumen*; *cotyledons* foliaceous, veined; *radicle* next the hilum.—*Roots* annual or perennial, fibrous or tuberous. *Stem* succulent, climbing by means of tendrils formed by abortive leaves (stipules, *St. Hil.*) *Leaves* palmated, or with palmated ribs, very succulent, covered with numerous asperities. *Flowers* white, red, or yellow (*Lindley*).

PROPERTIES.—Variable; suspicious. The roots and fruits of many species are drastic cathartics. The fruits of other species are employed as articles of food.

1. CUCUMIS COLOCYNTHIS, *Linn. L. E. D.*—THE BITTER CUCUMBER, OR COLOCYNTH.

Sex. Syst. Monœcia, Syngenesiæ (*Linn.*)

(*Peponum Pulpa Exsiccata, L.*—Pulp of the Fruit, *E.*—Fructus pulpa, *D.*)

(*Colocynthis, U. S.*)

HISTORY.—Colocynth is supposed to be the plant termed, in the Old Testament, (2 *Kings*, iv. 39,) the *wild vine* (literally *the vine of the field*), whose fruit the Sacred historian calls *pakkoth*, a word which in our translation is rendered *wild gourd*. To understand the passage referred to, it is to be remembered that different kinds of gourd are commonly used in the East for shredding into pottages. (*Picture Bible*, ii. 226.) Colocynth was employed by the Greeks at a very early period. Hippocrates (pages 263 and 265, ed. *Fœs.*) employed *κόκκυνθίς ἄγρια* (*cucurbita sylvestris*, or *wild gourd*) only in pessaries for bringing on menstruation. Dioscorides (lib. iv. cap. 178) gives a good description of colocynth. Pliny (*Hist. Nat.* xx. 8, ed. *Valp.*) calls it *colocynthis*.

BOTANY. Gen. Char.—*Calyx* tubular-campanulate, with subulate segments scarcely the length of the tube. *Petals* scarcely adherent to each other and to the calyx. *Males: stamina* five, triadelphous. *Females: stigmas* three, thick, bipartite. *Fruit* (*peponida*) three to six-celled. *Seeds* ovate, compressed, not marginate.—*Flowers* monœcious or hermaphrodite, yellow (*De Cand.*)

Sp. Char.—*Stem* procumbent, somewhat hispid. *Leaves* cordate-ovate, many-lobed, white, with hairs beneath; the lobes obtuse; the petioles as long as the lamina. *Tendrils* short. *Flowers* axillary, solitary, stalked; *females* with the tube of the calyx globose, somewhat hispid, the limb campanulate, with narrow segments. *Petals* small. *Fruit* globose, smooth, yellow when ripe, with a thin solid rind and a very bitter flesh (*De Cand.*)

Root annual, white, branched. *Stems* herbaceous, angular, branched. *Leaves* bright green on the upper side, paler and clothed with whitish hairs underneath. *Tendrils* filiform, branching, opposite each leaf. *Calyx* five-toothed. *Corolla* yellow, with greenish veins. *Males: stamens* three, short, free; two of which have doubly-bent anthers, or consist of two anthers; in which case the number of stamens is really five. *Females: ovarium* round, smooth, inferior; *style* short, cylindrical; *stigmas* three; *filaments* without anthers. *Fruit* (*pepo*) about the size of an orange, with a thin but solid rind.

¹The followers of Linnæus are by no means agreed with their great master, or among themselves, as to the true order of Cucumis, and some other cucurbitaceous genera. The male flowers have, apparently, three stamina; but of these two have an anomalous structure, and are regarded by some botanists as stamina with doubly-folded anthers; by others as being composed each of two adherent stamina. Hence some have regarded the flowers as triandrous, some as pentandrous; the latter, taking into account the adhesion of the stamina, consider them to be syngenesious, triadelphous (polyadelphous), or monadelphous. So that while Linnæus adopted *Monœcia, Syngenesiæ*, as the class and order, Turton placed Cucumis in *Monœcia, Triandria*; Smith in *Monœcia, Pentandria*; or *Mon. Polyadelphia* (see his *Introd. to Botany*, p. 363, 4th ed.); Willdenow, Persoon, Loudon, &c. in *Monœcia, Monadelphia*; while Sprengel, in conformity with his modification of Linnæus's sexual system, places it in *Monadelphia, Monandria*.

Hab.—Japan, the sandy lands of Coromandel, Cape of Good Hope, Syria, Nubia, Egypt, Turkey, and the islands of the Grecian Archipelago. Cultivated in Spain.

PREPARATION OF THE FRUIT.—The fruit is gathered in autumn, when ripe and yellow, and in most countries is peeled and dried, either by the sun or by stoves.

COMMERCE.—Colocynth is imported from Spain (Almeira, Gibraltar, Cadiz, Malaga, &c.), Trieste, Smyrna, Alexandretta, Mogadore, &c. It comes over in cases, casks, boxes, &c. In 1839, duty (2d per lb.) was paid on 10,417 lbs.

DESCRIPTION.—The fruit called *colocynth* or *coloquintida* (*colocynthis*; *poma colocynthidis*) is imported either *peeled* (generally), or sometimes *unpeeled*. Its *pulp* (*pulpa colocynthidis exsiccata*) is nearly white, inodorous, light, spongy, porous, tough, intensely and nauseously bitter. The *seeds* (*semina colocynthidis*) are smooth, either white or yellowish white (*white colocynth seeds*), or brownish (*black colocynth seeds*), bitter (especially the dark-coloured ones) and inodorous. By digesting them in repeated portions of boiling water, and afterwards well washing them, the greater part of the bitterness may be extracted. Two kinds of colocynth, distinguished as *Turkey* and *Mogadore colocynth*, are known in commerce.

α. Turkey Colocynth: Peeled Colocynth.—This is imported from the Levant, Spain, &c. The usual size of each pepo is about two or three inches in diameter; the shape is more or less globular, according to the evenness with which the rind has been removed, and the degree of contraction in drying; the colour is white, or pale yellowish white. One hundred parts by weight are said to consist of 28 parts pulp, and 72 parts seed.

β. Mogadore Colocynth: Unpeeled Colocynth.—The pepo of this kind is larger than the preceding, and is covered with a yellowish, smooth, firm rind. It is imported from Mogadore in small quantity only, and is principally used by druggists for show-bottles.

The seeds of colocynth are usually described as white, perfectly bland, and highly nutritious. Captain Lyon (Duncan, *Edinb. Disp.*) states they constitute an important article of food in Northern Africa. "The seeds of Cucurbitaceæ, says De Candolle, (*Essai sur les Prop. Méd. des Plantes*, 191.) "do not participate in the qualities of the pulp which surrounds them; they are bland, demulcent, of an oily nature, and susceptible of easily taking the form of an emulsion." These statements do not apply to Colocynth seeds of commerce, which I never found devoid of bitterness; and Hillefeld (Marx, *Lehre v. d. Giften*, ii. 27.) says a scruple of them purged a dog. Heise (*Ibid.* 34.) found them poisonous.

COMPOSITION.—In 1817, Braconnot (*Journ. de Phys.* lxxxiv. 337,) analyzed the watery extract. The pulp was analyzed in 1818 by Meissner. (Pfaff's *Syst. d. Mat. Méd.* vi. 365.) Vauquelin (*Journ. de Pharm.* x. 416,) examined the active principle.

Meissner's Analysis.		Braconnot's Analysis.	
Bitter matter (<i>Colocynthin</i>).....	14.3	Bitter matter (<i>Colocynthin</i>) with some resin... 41.4	
Extractive.....	10.0	Resin.....	4.3
Bitter fixed oil.....	4.2	Vegetable jelly (<i>pectin</i>).....	18.6
Resin insoluble in ether.....	13.2	Azotic matter.....	21.4
Gum.....	9.5	Acetate of potash.....	5.7
Bassorin.....	3.0	Deliquescent salt of potash not soluble in alcohol.....	7.1
Gummy extract (obtained from the ligneous fibre by potash).....	17.0		
Vegetable jelly.....	0.6	Watery extract of Colocynth.....	98.5
Phosphate of lime and magnesia.....	5.7		
Ligneous fibre.....	19.2		
Water.....	5.0		
Colocynth Pulp.....	101.8		

COLOCYNTHIN: Colocynthite; Bitter or Purgative Principle of Colocynth.—By digesting the watery extract of colocynth in alcohol, and evaporating the tincture thus procured, we obtain a mass, composed, according to Vauquelin, of a bitter principle and acetate of potash. A little water readily dissolves the latter, leaving the bitter resinoid matter, to which the name of *Colocynthin* has been applied. It is a yellowish brown, translucent, brittle substance, dissolv-

ing in water, but much more readily in alcohol. The aqueous solution is precipitated by the tincture of galls, and by some metallic solutions (protosulphate of iron, sulphate of copper, and nitrate of mercury).

CHEMICAL CHARACTERISTICS.—The cold infusion is pale yellow, and very bitter; nitrate of mercury, sulphate of copper, and acetate of lead, cause in it gelatinous-flocculent precipitates, (*pectates?*); sesquichloride of iron and tincture of nutgalls do not render it turbid. Powdered colocynth gives scarcely any evidence of the presence of starch, on mixing it with tincture of iodine and water.

PHYSIOLOGICAL EFFECTS. *a. On Animals generally.*—The animals on whom the action of colocynth has been examined, are horses, dogs, sheep, and pigs. On dogs its operation appears to be analogous to that on man. Thus Viborg (*Wibmer, Wirk. d. Arzneim. ü Gifte.* ii. 230) states that two drachms caused in a dog violent vomiting and purging; and Orfila (*Toxicol. Gén.*) has shown that three drachms introduced into the stomach (the œsophagus being tied) are capable of causing death. It is remarkable, however, that its operation on horses is comparatively slight, at least according to the testimony of Viborg, Bourgelat, and Moiroud. (*Pharm. Vét.* 274.) The last-mentioned writer says he has given four drachms to a horse without exciting the least disorder; and he adds that another cucurbitaceous plant (briony) has likewise very little effect on the horse.

β. On Man.—Thunberg (*Travels,* ii. 171) tells us that, at the Cape of Good Hope, the colocynth fruit is said to be eaten when pickled, both by the natives and colonists, although it is very bitter. Mr. Dunsterville, Surgeon, of Algoa Bay, formerly one of my pupils, tells me that the colocynth growing there does not possess the least bitterness. Is it *Cucumis Colocynthis?*

Colocynth taken in *small or moderate doses* acts as a very safe and useful purgative. Its operation is not limited to the acceleration of the vermicular movements, but is extended to the secreting and exhaling vessels of the alimentary canal, whose functions it promotes. Moreover, it stimulates the other abdominal organs; and after the absorption of its bitter acrid principle, it not unfrequently proves diuretic. *In full doses*, it operates as a very active or drastic cathartic and hydragogue; but I have never seen any ill effects from its use. These remarks apply to the compound extract, the only preparation of colocynth of which I have personal experience. It would appear, partly from observation in the human subject, and also from the experiments of Orfila on dogs, that colocynth is one of those purgatives which exert a specific stimulant influence over the large intestines.

In excessive doses, colocynth, both in powder and decoction, has on several occasions operated as a mortal poison, causing violent vomiting and purging, griping pain, and other symptoms of gastro-intestinal inflammation. A teaspoonful and a half of the powder (about ʒiſs.) has proved fatal. (*Christison, On Poisons.*) In a case related by Orfila (*Toxicol. Gén.*) there were, besides the preceding symptoms, dimness of sight and slight delirium. In M. Carron d'Anancy's case (*Toxicol. Gén.*) the purging was followed by extreme tension and tenderness of belly, suppression of stools and urine, retraction of the testicles, and priapism. On a post-mortem examination there were found, besides the usual evidences of inflammation of the bowels, traces of inflammation of the liver, kidneys, and the bladder.

Considered in relation to other cathartics, colocynth will be found to rank near gamboge, from which it is distinguished by at least two circumstances: first, its cathartic effect is not the mere result of its topical acrid operation, but, in part, of its specific influence over the bowels; secondly, its action on the large intestine is more manifest than that of gamboge. In the latter property, colocynth approximates to aloes; but while it greatly exceeds the latter in its cathartic and hydragogue effects, it is devoid of the tonic influence possessed by aloes, when used in small doses.

Uses.—Besides being useful as an ordinary purgative, colocynth is adapted for acting as a stimulus to the abdominal and pelvic vessels and nerves in cases of torpor or inactivity, and, on the principle of counter-irritation already explained (vol. i. p. 153), for determining from other organs. The objections to its use are acute inflammatory affections of the alimentary canal, diseases of the large intestine, &c. The following are the principal cases in which it is employed.

1. *In Habitual Constipation.*—As an ordinary purgative for keeping the bowels regular, the compound extract of colocynth is in common use both among the public and medical men. It operates mildly, certainly, and effectually. I am acquainted with individuals who have taken this substance for years, without suffering any inconvenience therefrom. The simple extract is sometimes employed as a substitute, but is less advantageous.

2. *In Alvine Obstruction.*—In some cases of obstinate constipation, with sickness and other symptoms of an extremely irritable stomach, the compound extract of colocynth occasionally proves invaluable. Occupying but a small bulk, it is retained on the stomach, and succeeds in producing alvine evacuations, where the ordinary liquid purgatives fail, in consequence of being vomited up. Doubtful cases of intus-susception and hernia, even with stercoraceous vomiting, I have seen completely relieved by it. More than once have I known an operation averted by its use, in those who, in addition to the above symptoms, had old herniæ, which led the surgeon to suspect strangulation. A slight degree of abdominal tenderness is not to be considered as absolutely prohibiting its use. Occasionally the extract is rubbed down with soap and water, and administered as an enema (see *Enema Colocynthidis*.)

3. *In Diseases of the Brain.*—In apoplexy, or a tendency thereto, in paralysis, insanity, violent headache, &c. colocynth is sometimes employed with good effect, on the principle of revulsion or counter-irritation.

4. *In Dropsy.*—In dropsical affections, colocynth has been used as a *hydragogue*. But in this country it is less frequently employed for this than for other purposes: various other hydragogues (especially elaterium and jalap) being usually preferred. It is sometimes employed as a *diuretic*, being given in the form of decoction. Hufeland regarded it as a most effectual diuretic in persons of a cold and sluggish habit of body. (Eberle, *Mat. Med.* i. 119, 2nd ed.)

5. *In Amenorrhœa and Chlorosis.*—In some cases of obstructed menstruation, benefit is obtained by the use of drastic purgatives, like colocynth, which act on the rectum, and, by contiguous sympathy, affect the uterus.

ADMINISTRATION.—The *powder*, which is rarely used, may be administered in doses of from two to eight or ten grains, intimately mixed with some mild powder, (gum, or starch). The *decoction* (prepared by boiling ℥ij. of colocynth in Oj. of water for six minutes, and, according to Hufeland, adding to the strained liquor, ℥ij. of the spirit of sulphuric ether, and ℥j. of syrup of orange-peel) is given in doses of ℥ss. three times a day. The *tincture* (prepared according to the Prussian Pharmacopœia, by digesting ℥j. of colocynth pulp and ℥j. of star-anise in lb. j. of rectified spirit) is given in doses of twenty drops. Colocynth has been employed iatraplectically (see vol. i. p. 156) by Dr. Christien. (*Méth. Iatral.* p. 172.) The tincture of colocynth, or twenty grains of the powder mixed with hogs' lard, were used by way of friction on the abdomen and inner side of the thighs, in disorders of the intellectual functions. Diuresis was a common effect. The following are the officinal preparations of colocynth.

ANTIDOTE. See *Elaterium*, p. 512.

I. EXTRACTUM COLOCYNTHIDIS, L. E. D.; *Extract of Colocynth*: (Colocynth pulp [in pieces, L.] lb. j.; Water [Distilled, L.] Cong. ij. [Cong. j. wine measure, D.] Mix and boil with a slow fire for six hours, frequently adding distilled water, that it may always fill the same measure. Strain the liquor while

hot; lastly, evaporate it to a proper consistence, *L.*—The directions of the *Edinburgh College* are essentially the same, except that the evaporation is directed to be effected by the vapour bath.—The *Dublin College* directs the mixture to be boiled down to four pints, and the liquor filtered while hot; then evaporated to a proper consistence.)—When the decoction is very concentrated, it readily gelatinizes on cooling; hence it is necessary to strain it while hot. At Apothecaries' Hall, the produce of 100 lbs. of pulp is about 65 lbs of extract. (Barker and Montgomery, *Obs. on the Dub. Pharm.*) Extract of colocynth is an objectionable preparation, as it is very apt to become either mouldy or tough and hard by keeping.—The dose of it is grs. v. to ℥j.

2. *EXTRACTUM COLOCYNTHIDIS COMPOSITUM*, *L. D.* (*U. S.*) *Pilule Colocynthidis*, *E.*; *Compound Extract of Colocynth.* (Colocynth pulp, cut in pieces, ℥vj. Purified extract of Aloes [*Hepatic Aloes, D.*] ℥xij.; Scammony, powdered, ℥iv.; Cardamom Seeds, powdered, ℥j.; Soap, ℥iij.; Proof Spirit, *Cong. j.* [*wine measure, D.*] Macerate the colocynth in the spirit, with a gentle heat, for four days. Strain the spirit, and add to it the aloes, scammony, and soap; afterwards evaporate to a proper consistence, the cardamom being mixed towards the end, *L.*—The process of the *Dublin College* is essentially the same.—The process of the *Edinburgh College* is as follows:—"Socotrine or East Indian Aloes, and Scammony, of each, eight parts; Colocynth, four parts; Sulphate of Potash, and Oil of Cloves, of each, one part; Rectified Spirit, a sufficiency. Pulverize the aloes, scammony, and sulphate of potash, together; mix with them the colocynth previously reduced to fine powder; add the oil of cloves; and with the aid of a small quantity of rectified spirit, beat the whole into a proper pill mass, which is to be divided into five-grain pills."—Compound extract of colocynth, made according to the *London Pharmacopœia*, is an exceedingly valuable preparation; but owing to carelessness, inattention, fraud, or ignorance, the preparation of the shops is very unequal in its powers. The aloes used in the process should be purified (by straining) as directed by the *London College*: the necessity of this will be obvious to any one who has seen a *cwt.* of aloes melted. Should the Cape variety be substituted for the finer kind of aloes, the odour would detect the fraud. The scammony employed should be of the best quality (see p. 332). If the common (*i. e.* adulterated) kinds be used, the activity of the preparation is thereby deteriorated. If the compound extract, rolled into a ball and dropped into water, effervesces on the addition of hydrochloric acid, we may infer that the scammony employed was adulterated with chalk. If the filtered decoction, slightly acidified, become blue or purplish on the addition of tincture of iodine, the presence of some starchy substance (as jalap or adulterated scammony) may be inferred. The mode of detecting gamboge will be described hereafter (see *Gamboge*). If colocynth seeds have been employed as a substitute for the pulp, the tenacity of the extract, I am told, is greatly deteriorated. Some druggists substitute oil of cardamoms for the powder of the seeds, and by this means increase the odour of the preparation; but unless some inert powder be added, to compensate for the powder of the seeds omitted, the strength of the preparation would be somewhat greater than that intended in the *Pharmacopœia*.

Compound extract of colocynth is a powerful, sure, yet safe cathartic. Its uses are the same as those of colocynth before described. The dose of it is from five grains to a scruple. Calomel is frequently given in combination with it. The *pilule cathartica compositæ*, *U. S.* (before noticed, vol. i. p. 617) contains the compound extract of colocynth, extract of jalap, and calomel. Extract of hyoscyamus is frequently given in conjunction with the compound extract of colocynth. (See *pilule colocynthidis et hyoscyami*, *E.*)

In the shops a cheap substitute for the compound extract of colocynth is often sold under the name of *pill cochice* (*pilule coccice*, or *pilule cochice minores* of Galen). The substitute sold under this name at Apothecaries' Hall, London, is the *pilule colocynthidis*, *Ph. Ed.* without the sulphate of potash.

Colocynth is a constituent of *Morison's Pills*. (See Frazer's Report of the *Trial of Joseph Webb*, at York Assizes, 1834, p. 53.)

3. PILULÆ COLOCYNTHIDIS ET HYOSCYAMI, E.; *Pills of Colocynth and Henbane*.—(Colocynth-pill mass, *two parts*; Extract of Hyoscyamus, *one part*. Beat them well together, adding a few drops of rectified spirit, if necessary; and divide the mass into thirty-six pills.)—Extract of Hyoscyamus diminishes the pain and griping frequently experienced from the use of colocynth, but does not injure its evacuant properties. Both Sir H. Hallford and Dr. Paris (*Pharmacologia*, i. 299, 6th ed.) bear testimony to this.—The dose of this pill is grs. v. to grs. xv.

4. ENEMA COLOCYNTHIDIS, L.; *Colocynth Glyster*.—(Compound Extract of Colocynth, ℞ij.; Soft Soap, ℥j.; Water, Qj. Mix, and rub them together.)—A useful cathartic enema in obstinate constipation, whether arising from colic, or from other non-inflammatory conditions.

2. MOMORDICA ELATERIUM, Linn, L. E. D.—SQUIRTING CUCUMBER.

Ecbalium officinale, Nees & Ebermaier.

Sex. Syst. Monœcia, Syngenesia. Linn.¹

(*Pepones recentes*, L.—Feculence of the juice of the fruit, E.—Fructus; Fœcula, Folia; D.)

(*Elaterium*, U. S.)

HISTORY.—The term *ἐλατήριον* (from *ἐλαυνω*, *I impel or urge forward*) was employed by the Greeks to signify, not merely a medicine prepared from the *σίκος ἄγριος*, or *wild cucumber* (*Momordica Elaterium*), but also any purgative substance. (Foesius, *Econom. Hipp.*) Hippocrates (*Opera*, ed. Fœs. pp. 418, 547, and 877,) employed the root and leaves of the plant, as well as *ἐλατήριον*, in medicine. Dioscorides (lib. iv. cap. 155,) minutely describes the method of preparing *ἐλατήριον* by drying the feculence of the expressed juice of the fruit, and making it into troches. Pliny (*Hist. Nat.* lib. xx. cap. 1 & 2, ed. Valp.) calls the plant *cucumis sylvestris*, and gives a short account of the method of making elaterium. C. Bauhin (*Pinax*, 314,) terms the plant *cucumis asininus*, or *asses' cucumber*.

BOTANY. Gen. Char.—*Flowers* monœcious, yellow, or white; with a filiform peduncle having one bract (always?). *Males*: *calyx* five-cleft, with a very short tube. *Corolla* five-parted. *Stamens* triadelphous; *anthers* connate. *Females*: *filaments* three? (rather five, triadelphous), sterile. *Style* three-cleft. *Ovarium* bilocular. *Fruit* often (always?) muricate, opening with elasticity when ripe. *Seeds* compressed, reticulated when ripe (always?). (De Cand.)

Sp. Char.—Hispid, rough, glaucous. *Stem* short, without tendrils. *Leaves* cordate, somewhat lobed, crenate-dentate, very rugose on long stalks. *Fruit* ovate, obtuse, hispid-rough, with long peduncles. *Seeds* chestnut-brown (De Cand.)

Root annual. *Stem* thick, round, trailing, and branching. *Leaves* obtuse, grayish, and strongly reticulated on the under side; petioles long and bristly. *Flowers* axillary; the males form racemes of five or six flowers. *Calyx* adherent, with five, lanceolate, acute teeth. *Corolla* campanulate, yellow, reticulated with green veins. *Males*: *Stamina* three, two of which bear doubly-folded anthers [or five, four of which cohere, so as to form two bundles of two anthers each]. *Females*: *filaments* three, sterile; *ovarium* inferior, one-celled (spuriously three-celled); *style* simple; *stigmas* three, bifid. *Pepo* small, elliptical, pedunculated, grayish-green, covered with soft prickles; when ripe separating from its stalk, and expelling, with considerable violence, its brown seeds, and a thin mucus through the aperture at the insertion of the stalk.

¹ See the note to *Cucumis Colocynthis*, p. 500.

The phenomenon of the expulsion of the seeds of this plant has acquired, of late years,

FIG. 214.



Momordica Elaterium.

a. Pepo expelling its seeds. b. Stalk.
c. Transverse section of the pepo.

FIG. 215.



Endosmometer.

only in the juice around the seeds, therefore, that it could be looked for," and here it was found.

The precise situation of it will be readily comprehended by inspecting a transverse section of the elaterium pepo (see fig. 214, c.) We observe that the external portion of the pericarp (namely, the epicarp) is furnished with rigid hairs; within the epicarp is a whitish sarcocarp, forming what Dr. Clutterbuck terms the body of the fruit. The centre of the fruit is divided into three cells, by projections of the three parietal placentae to which the seeds are attached. Between these projections, and surrounding the seeds, is the *pulp*, the *placental matter*, or the *juice around the seeds* (Clutterbuck.) It is paler than the sarcocarp, and is composed of a very lax tissue, which, as the fruit matures, takes on, says Aug. St. Hilaire, a gelatinous consistence, becomes disorganized, and melts into water.

increased interest, from the circumstances of Dutrochet (*Nouv. Rech. sur l'End.* p. 66, 1828,) having adduced it as one of the effects of *endosmosis*. It is well known that when two fluids of unequal density are separated from each other by membrane (animal or vegetable,) a double permeation of fluids takes place,—that is, each fluid passes through the membrane, and mixes with the other fluid: the current in one direction is called *endosmosis*, that in the opposite direction *exosmosis*. The instrument employed by Dutrochet in conducting his experiments he called an *endosmometer*: it consists of a bell-shaped glass vessel (a bottomless bottle, for example,) closed at the lower end by bladder, at the neck by a cork, through which passes a straight tube; or we may have a curved tube issuing from the side of the neck (as in Fig. 215).

If syrup be put into the bell, and the bell then immersed in water, a portion of syrup will exude through the bladder, while a larger quantity of water will pass in; and if mercury be placed in the curved portion of the tube (as in Fig. 215), the liquid metal is pushed up. If, on the other hand, the bell contain water, and be immersed in syrup, the stronger current is from within outwards. In other words, the stronger current is, in general, from the lighter towards the denser fluid. Hence we comprehend why cherries and plums shrivel when preserved in syrup, but remain plump in brandy: in the first place *exosmosis* preponderates, because the syrup is denser than the juice of the fruit,—in the second, *endosmosis*, because the juice is denser than the brandy: the separating membrane is, of course, the skin or epicarp of the fruit.

Now to apply these facts to the phenomena of the Elaterium apple. In the centre of this fruit, and surrounding the seeds, is a very singular variety of organic matter, which appears like thick mucus. It is called by some botanists *placental matter* (see fig. 214, c.) More external to this, that is, in the tissue of the pericarp, there is another organic liquid, whose density is less than that of the placental matter. Now these two fluids being separated from each other by membrane, are in the exact condition for the operation of *endosmosis*; consequently the central cell gradually becomes very much distended (at the expense of the liquid in the tissue of the pericarp), and ultimately gives way at the weakest point—namely, where the peduncle is articulated with the fruit, and the contents of the cells are expelled with great violence, from the sudden contraction of the distended tissues.

Seat of elaterium.—Some years since Dr. Clutterbuck (*Lond. Med. Rep.* vol. xii.) ascertained that the active substance, elaterium, "is neither lodged in the roots, leaves, flowers, nor stalks, in any considerable quantity; nor is it to be found in the body of the fruit itself, or in the seeds contained within it; it was

"The centre of the fruit of *Momordica Elaterium*," says Dutrochet, (*op. cit.* p. 69,) "contains a very singular organic substance, and which has no resemblance to any other vegetable tissue. It seems to be a green very thick mucus. Viewed by the microscope, it appears to consist of an immense quantity of very small globules, agglomerated sometimes confusedly, sometimes so as to form irregular striæ. This substance is penetrated by a whitish liquid, by a sort of emulsion, which is so much the more dense as we observe it at an epoch nearer maturity. This aqueous liquid escapes immediately we open the green fruit. By the microscope we see some almost imperceptible globules which swim in this liquid. At the epoch of maturity this whitish liquid is much more abundant, and at the same time much denser; the globules, which it holds in suspension, have become much larger."

Hab.—South of Europe. Common on rubbish in the villages of Greece and the Archipelago. A few acres of it are annually cultivated at Mitcham.

EXTRACTION OF ELATERIUM.—We are indebted to Dr. Clutterbuck for the present improved method of manufacturing elaterium.

α. **DR. CLUTTERBUCK'S PROCESS.**—"The cucumbers should be gathered when nearly as ripe as possible, and without violence that might endanger their bursting. They should then be wetted by the affusion of cold water, that less of the juice when they are cut may adhere to the external surface. In this state they should be cut through longitudinally, and the juice allowed to strain through a fine sieve, placed in a large earthenware vessel. The seeds and surrounding pulp should be scooped out upon the sieve, and washed with repeated affusions of cold water, by which they will be freed from all adhering juice. Something will be saved also by afterwards rinsing the split cucumbers themselves in cold water, from which a portion of elaterium may be collected.

"After standing a few hours a sediment is formed, from which the clear liquor is to be poured off; it is then to be thinly spread on fine linen, and exposed to the air to dry; a gentle warmth may be employed without injury; but the access of sunshine destroys the fine green colour which the substance otherwise acquires." From forty fruits, Dr. Clutterbuck obtained only six grains of elaterium. The elaterium thus procured is of the finest quality; but the product is very small.

β. **PROCESS OF THE BRITISH PHARMACOPEIAS.**—The *London College* gives the following directions for its preparation:—Slice ripe wild cucumbers, and strain the juice very gently expressed, through a very fine hair-sieve; then set it by for some hours, until the thicker part has subsided. The thinner supernatant part being rejected, dry the thicker part with a gentle heat.—The processes of the *Edinburgh and Dublin Colleges* are essentially the same.

γ. **PROCESS ACTUALLY FOLLOWED.**—The following is the mode of preparation which I have seen practised at Apothecaries' Hall, London:—The fruits are cut longitudinally in halves by women, and are then placed in a hempen cloth and put into a common screw press. Apparently a tolerable pressure is applied but for a few minutes only, being removed before all the juice has ceased running out. A greenish slightly turbid liquor runs out. When the fruits are taken out of the press they are but very slightly crushed, so that the pressure cannot have been great. The juice as it runs from the press falls into a hair-sieve, through which it flows into a cylindrical-lipped glass jar. Here it is allowed to remain for about two hours, in which time a greenish fecula has deposited. The supernatant liquor is then carefully poured off, and the thicker liquid at the bottom is placed on a paper filter supported by a cloth one stretched on a wooden frame. A bitter, yellowish-brown (sherry-coloured) liquor runs through, and a green mass is left on the filter. The latter is then carefully dried by a stove, and constitutes the *finest elaterium*. The mother liquor which was poured off from the deposit is placed in shallow brown pans, and there lets fall a fresh deposit, which when separated and dried forms a *paler elaterium*.

After the elaterium has deposited from the juice, a mucilaginous matter subsides, which greatly deteriorates the elaterium (if it has not been previously separated), and renders it when dry, dark, gummy, and much curled.

THEORY OF THE PROCESS.—Dr. Clutterbuck's experiments have shown that the finest elaterium is obtained without pressure from the fruits when nearly as ripe as possible. In practice, however, pressure must be employed; because the cucumbers must not be too ripe when gathered, or they are apt to burst during their journey to town, or by handling; and in this imperfectly ripe state the juice does not flow from them until pressure be employed.

If the juice of one of the fruits be received on a plate of glass, it is at first nearly colourless and transparent. In a few minutes, however, by exposure to the air, it becomes slightly turbid (milky); and small white coagula are formed in it. By slow and spontaneous evaporation crystals of a rhomboidal figure are perceptible on the glass when examined by a magnifier. These crystals are

elaterin. They are probably formed by the influence of the air on the juice. Elaterium of commerce consists essentially of this elaterin contaminated with the green colouring matter, cellular tissue, and starch, expressed from the fruit, and mixed with the residue obtained by drying the bitter liquor above referred to, with which the tissues and elaterin were moistened.

DESCRIPTION.—The Elaterium (*elaterium: extractum elaterii*, L. E. D. seu *elaterium*, D.) of commerce, is a very variable article. Two kinds are distinguished, the *English* and the *Maltese*.

1. **English Elaterium** (*Elaterium anglicum*) is manufactured at Apothecaries' Hall, at Mitcham, and perhaps at other places. The *finest* (*elaterium album*, Auct.) occurs in light, friable, thin, very slightly curled flakes, or flat cakes, or fragments, which frequently bear the impression of the paper or muslin on which the elaterium was dried. Its colour is pale, grayish green, which by exposure becomes yellowish. Its taste is acrid and bitterish; it has a faint animal odour (not very dissimilar to that of ergot of rye), but combined with a fragrant which reminds me of senna or tea. By keeping nine or ten years, a sample of good elaterium in my museum has assumed a sparkling appearance, as if it contained very minute crystals.

Inferior kinds (*elaterium nigrum*, Auct.) are sometimes hard, break with difficulty, or with a resinous fracture, are much curled, gummy, and dark coloured (brown or olive-green). They are probably prepared from the juice, after the finest elaterium has been separated. In my museum, I have several varieties of this inferior kind, which were collected by Dr. Clutterbuck. One is in the form of a brownish powder.

Dr. Clutterbuck states, that of the best specimens of elaterium from Apothecaries' Hall, spirit dissolves more than half; while of inferior sorts, a fourth part only is dissolved. Mr. Barry (Paris, *Pharmacol.*) says that the solubility of elaterium, manufactured by Dr. Clutterbuck's process, is as follows:

Ten grains of Elaterium, manufactured according to Dr. Clutterbuck's process.	Dissolved in spirit, of Specific Gravity 0.800.
By Messrs. Allen and Co. { 1st sample.....	5.5 grains.
{ 2d sample.....	6.2 grains.
{ 3d sample.....	6.4 grains.
At Apothecaries' Hall.....	6 grains.

2. **Maltese Elaterium** (*Elaterium melitense*).—This is imported from Malta. It is in much larger flakes than the best English elaterium, and frequently has some adherent paper on which it has been dried; its colour is much paler, sometimes with hardly a trace of green. Some specimens are more friable and softer, and occasionally are rather chalky to the touch. My specimens are mixtures of chalk and starch; hence they effervesce with acids, and become blue with iodine. I am assured that Maltese elaterium is mixed, in this country, with buckthorn juice, to deepen its colour, and promote its purgative operation.

COMPOSITION.—Braconnot (*Journ. Phys.* lxxxiv. 292) analyzed the expressed, boiled, filtered, and evaporated juice of the plant. Soon after Dr. Clutterbuck's experiments on elaterium, Dr. Paris (*Pharmacologia*) analyzed this substance. In 1831, Mr. Hennell (*Journal of the Royal Institution*, i. 532) published an analysis of it. In 1835, Landerer (*Pharm. Central-Blatt für 1835*, 154) examined the juice of the fruit growing in Nauplia (Napoli). Furthermore, the active principle of elaterium was examined in 1831 by Dr. Morries, (*Ed. Med. and Surg. Journ.* xxxv. 339,) and afterwards by Marquart. (*Pharm. Central-Blatt für 1833*, S. 850.)

Dr. Paris's Analysis.		Mr. Hennell's Analysis.	
Elatin.....	} 1.2	Crystallizable substance (<i>Elaterin</i>).....	44
Bitter matter.....		Green resin.....	17
Extractive.....	} 2.6	Starch.....	6
Pecula.....		Woody fibre.....	27
Gluten.....	} 0.5	Saline matters.....	7
Woody matter.....			
Water.....	0.4		
Elaterium..... 10.0		Elaterium..... 101	

1. ELATERIN (*Elaterine*; *Momordicine*). Dr. Clutterbuck showed, in 1819, that the active principle of elaterium was insoluble in water, but soluble in alcohol; for he found a watery infusion of eight grains had no effect, whereas the alcoholic extract in the dose of one-sixteenth of a grain produced considerable purging, and often vomiting; and when the dose was increased to a quarter of a grain the effect was more considerable, and often took place in a very few minutes. The action of these liquids on elaterium led Dr. Clutterbuck to believe that the active principle was of a resinous nature. But the alcoholic tincture of elaterium contains three principles: elaterin, the green resin, and a bitter matter. By treating this alcoholic extract with boiling distilled water, the bitter matter is dissolved: the residue (elaterin and green resin) was termed by Dr. Paris *elatin*. Dr. Morries, in 1831, separated the green resin and isolated elaterin; though Mr. Hennell seems to have discovered it about the same time. Dr. Morries obtained it by evaporating the alcoholic tincture of elaterium to the consistence of thin oil, and then throwing it into boiling distilled water; a white crystalline precipitate was formed, which increased as the liquor cooled. This precipitate was afterwards purified by a second solution in alcohol and subsequent precipitation by water. Mr. Hennell's process was different. He separated the resin from the crystalline matter of the alcoholic extract of elaterium by ether, which took up the resin and left the elaterium; the latter was then purified by solution in hot alcohol and subsequent crystallization. Marquart's process is less likely to yield pure elaterium, since he procured it from an extract prepared by evaporating the expressed juice. Another method (founded I presume on the directions of the Edinburgh College, for the determination of the goodness of elaterium, see p. 510) is to treat the alcoholic extract of elaterium with a solution of potash, which takes up the bitter matter and the resin, and leaves the elaterin. The quantity of elaterin in elaterium is thus stated by different authorities:

100 parts of Elaterium.	Quantity of Elaterin.
Prepared according to the London College (<i>Hennell</i>).....	44
Best British Elaterium (<i>Morries</i>).....	26
Worst ditto (<i>Morries</i>).....	15
French Elaterium (<i>Morries</i>).....	5 or 6
Elaterium (<i>Edinburgh Pharmacopœia</i>).....	14.3 to 25
Best specimens (<i>Balmer</i> ¹).....	33
Fine sample, prepared at Apothecaries' Hall in 1839, and dried by steam heat (<i>Pereira</i>).....	26

These discrepancies must arise principally from the different degrees of goodness of samples examined; but partly also from different modes of proceeding. I found that 30 grs. of fine elaterium prepared at Apothecaries' Hall in 1839, lost by drying on a steam bath 1.5 grs. Boiled in repeated portions of rectified spirit, the dried mass lost 18 grs. The concentrated green tincture poured into diluted liquor potassæ (see process of the *Edinburgh Pharmacopœia*, p. 510) deposited crystals which dried by steam heat, weighed 7.5 grs.

Elaterin possesses the following qualities: it is crystalline, and has a silky appearance; the crystals, viewed by a magnifying glass, are observed to be rhombic prisms with striated sides; it is very bitter, but odourless; is neither acid nor alkaline, and is insoluble in water, but soluble in hot alcohol. Mr. Hennell says it is only very slightly soluble in ether; whereas Dr. Morries states it to be readily soluble in both ether and fixed oil. It is fusible, according to Mr. Hennell, at 350° F. The latter chemist states that it is composed of Carbon 36.9, Hydrogen 23.9, and Oxygen 39.2, which nearly corresponds to the formula $C^6 H^{12} O^2$. Dr. Morries says, that at a high temperature it is dissipated in a thick, white, pungent vapour, having an ammoniacal odour: if so, nitrogen must be a constituent. But neither by the odour, nor by turmeric, can I detect ammonia in this vapour. The late Dr. Duncan, of Edinburgh, ascertained that in doses of one-twelfth or one-sixteenth of a grain it had all the effects of a dose of elaterium. "A tenth of a grain," says Dr. Christison, "as I have myself witnessed, will sometimes cause purging in man; and a fifth of a grain, in two doses, administered at an interval of twenty-four hours to a rabbit, killed it in seventeen hours after the second dose." Dr. Golding Bird thinks one-sixteenth of a grain a fair dose to commence with: he repeats it every two hours until some effect is produced. It may be taken dissolved in spirit, and by this diffused through an aqueous vehicle.

2. GREEN RESIN (*Chlorophylle*?)—Is insoluble in water, but dissolves in alcohol, ether, and caustic potash. It does not redden litmus, though from its ready solubility in caustic potash

¹ *Lond. Med. Gaz.* xxv. 809.

its acid nature might be suspected. Some of it prepared by Mr. Hennell was tried at St. Bartholomew's Hospital, and found to act powerfully as a purgative in doses of less than a third of a grain. Perhaps this might have arisen from the presence of elaterin; for twenty-one grains of the resin yielded four grains of elaterin.

3. BITTER MATTER.—This is soluble both in water and alcohol. Its taste is intensely bitter: its colour is brownish yellow.

CHARACTERISTICS.—Good elaterium is friable, has a pale greenish-gray colour, and an animal odour. Digested in rectified spirit it yields a fine green tincture. Thrown into water it swims. It does not effervesce in diluted hydrochloric acid: the acid liquor being digested on elaterium, and subsequently rendered nearly neutral by ammonia, gives scarcely any cloudiness on the addition of oxalate of ammonia. Touched with tincture of iodine, it gives no evidence of the presence of starch: though if it be boiled in water, the decoction, when cold, gives traces of starch, by the blue colour developed on the addition of iodine. If the cinder formed by the burning of elaterium in the air be ignited in the outer cone of the flame of a candle, the presence of potash is indicated by the bluish or violet tinge.

Maltese elaterium has no odour, and scarcely any green tinge. Examined by the microscope, it is found to contain globules of wheaten starch. It sinks in water, effervesces with diluted hydrochloric acid, yielding a solution which, when nearly neutralized by ammonia, gives a copious precipitate (*oxalate of lime*) on the addition of oxalate of ammonia. Tincture of iodine stains it bluish or greenish black (*iodide of starch*). If the cinder obtained by burning Maltese elaterium in the air be ignited in the outer cone of the flame of the candle, it communicates an orange tint to the flame. The adulteration of elaterium by starch was known to Dioscorides. The *Edinburgh College* (1841) gives the following characteristics of good elaterium:

"Colour pale-gray: when exhausted by rectified spirit, the solution, concentrated, and poured into hot diluted aqua potassa, deposits, on cooling, minute silky, colourless crystals, weighing from a seventh to a fourth of the elaterium."

In the *Edinburgh Pharmacopœia* for 1839, it was stated that elaterium should yield "at least a seventh" of elaterin; and in the first edition of the "*Elements*," I observe that "these characteristics are not sufficiently accurate. Good elaterium is pale greenish-gray: and when treated as the College directs, should yield 26 per cent. of crystals (*i. e.* elaterin)." It will be seen that the College has now somewhat modified its original statement.

PHYSIOLOGICAL EFFECTS. *a. On Vegetables.*—Macaire found a branch of the *Momordica Elaterium* was speedily destroyed by immersing it in a solution of the extract of this plant. (*Mem. de la Soc. de Phys. de Genève*, iv.)

β. On Animals.—Viborg (*Wibmer, Wirk. d. Arzneim u. Gifte*, Bd. iii. s. 296) gave a pound of the fruit of *Momordica Elaterium* to the horse without any effect. Two and a half pounds of the whole plant (roots, leaves, and stem) also appeared inert.

The only experiments made with the extract of elaterium that I am acquainted with, are those of Orfila (*Tox. Gén.*) on dogs. They are three in number, and prove that this substance is a powerful local irritant, producing death even when it has been applied to the cellular tissue of the thigh, in consequence, as he supposes, of the nervous system being sympathetically affected. Moreover, he concludes, from his observations, that elaterium exerts a special action on the rectum.

γ. On Man.—The acridity of elaterium in its local operation is well shown by various facts. Pliny truly observes that the juice of the elaterium apple is dangerous when applied to the eye; and Dr. Clutterbuck mentions that some of it "getting accidentally into the eye in one instance, it occasioned severe pain and inflammation, with an erysipelatous swelling of the eyelids, that continued till the following day." We have a further proof of its irritant properties in the inflammation and ulceration of the fingers of those employed in its preparation.

When swallowed, therefore, it irritates the gastro-intestinal membrane, and occasions vomiting and violent purging; hence it is called a *drastic purgative*. Fine elaterium, in the dose of 1-8th of a grain, seldom fails to purge violently, and sometimes to vomit. This was long since noticed by Dr. Clutterbuck, and I can verify his statement from repeated observations. Even 1-16th of a grain will generally excite considerable purging.

The elaterium of the shops, however, is rarely so active as this; and I have known two grains given with no more effect than the pure elaterium would excite in the dose of 1-8th of a grain. Elaterium powerfully excites the secreting and exhaling vessels of the alimentary canal, and thereby occasions very watery stools; hence the term *hydragogue* applied to it. In some dropsical cases I have known a single dose discharge several pints of fluid by the bowels. The gripings and the increased number of evacuations prove that the irritation is not confined to the mucous coat, but is extended to the muscular coat. Under the influence of a full dose, the pulse is excited, the tongue becomes dry, and sometimes furred, and great thirst is produced. Occasionally the skin becomes damp under the operation of elaterium.

Elaterium has been supposed to exert a specific influence over the uterus. Thus Dioscorides and even later writers state that it provokes the menses, and is apt to produce the death of the fœtus in utero. Its uterine influence, however, is probably not greater, in proportion to its cathartic property, than that of other violent drastics, which act powerfully on the large intestines.

Does elaterium become absorbed? We have no stronger evidence to offer in favour of the affirmative of this question than that mentioned by Hippocrates, (*Επιδημιον*, lib. vi. sect. 5,) that the milk of women and goats who have eaten elaterium, or the wild cucumber, possesses purgative properties. Furthermore, the accident which occurred to Dr. Robert Dickson, Lecturer on Botany at St. George's Hospital, seems to prove that absorption must have taken place by the skin. (*Journ. de Chim. Méd.* iv. 61.) Dr. Dickson carried a specimen of the plant in his hat to his lodgings, in Paris, from the Jardin-du-Roi. In half an hour he experienced violent headache, which was followed by colicky pain, violent purging, vomiting, and fever.

Considered with respect to other cathartics, we find it pre-eminently distinguished by the violence of its purgative effect. Croton oil alone approximates to it. Its hydragogue operation exceeds that of most, if not all other, ordinarily used drastics.

Uses.—The principal use of elaterium is to excite watery evacuations in *dropsy*, by which a two-fold effect is to be hoped for; viz. *first*, absorption of the effused fluid; *secondly*, the stoppage of any further effusion in consequence of the metastasis of vital action from the seat of the dropsy to the intestinal membrane. In dropsies dependent on, or accompanied with, diseases of the kidney, the evacuation of water from the bowels is much to be preferred to the employment of stimulating diuretics which may add to the severity of the renal malady. Of the violent hydragogue purgatives, elaterium I believe to be the most useful in dropsy. It evacuates more watery fluid than the others; while, if it be good, its operation may be relied on. It is objectionable where there is great debility, and where any inflammatory or other disease of the bowels exists. I have seen the fatal termination of dropsy apparently accelerated by the use of elaterium. A dropsical patient, much debilitated, took, by order of his physician, a dose of elaterium, which caused excessive alvine evacuations, great exhaustion, sinking of the pulse, syncope, and death. Where no contra-indication to the use of elaterium exists, one or two doses of it should be given every other day, for a week or ten days. If continued longer than this, it might perhaps bring on an inflammatory condition of the bowels. Dr. Darwall (*Cyclop. Pract. Med.* art. *Anasarca*, vol. i. p. 79,) mentions a case in which hypercatharsis and maniacal delirium were produced by the prolonged use of elaterium;

the delirium, however, went off in a few hours. Some tonic (usually gentian) is commonly conjoined with elaterium. Thus a pill composed of elaterium and extract of gentian is frequently employed; or we may exhibit infusion of gentian on alternate days with the elaterium. Where there is a febrile condition of system, and also where there is an irritable or inflammatory condition of the alimentary canal, elaterium is inadmissible. It is best adapted for cold phlegmatic constitutions. Sydenham (*Works*, by Dr. Pechey, p. 393, 4th ed. 1705,) recommended elaterium in dropsy. Afterwards Lister, (*De hydrope*,) Heberden, (*Comment. art. Dropsy*,) Ferriar, (*Med. Hist. et Reflex.* vol. iv.) Clutterbuck, (*Lectures in Lancet* for May 6th, 1826, p. 170,) and other experienced practitioners, bore testimony to its exceeding great efficacy. But judging by the doses recommended, all of them, except the last-mentioned writer, seem to have been unaware of the great activity of the medicine when pure.

2. *In cerebral affections*, such as apoplexy, or tendency to it (manifested by sleepiness, stupor, or giddiness), mania, &c., elaterium, as a drastic purgative, sometimes proves serviceable on the principle of counter-irritation or revulsion (see vol. i. p. 153.)

3. *In obstinate constipation* from sluggishness of the intestinal tube, elaterium is occasionally useful. But care must be taken to ascertain that the constipation does not depend on any mechanical impediment (as hernia, intus-susception, &c.) to the passage of the fæces.

4. *In gout*.—A combination of elaterium and opium has been found serviceable in gout (see p. 89). (Also Sutton, *Tracts on Gout*, p. 201.)

ADMINISTRATION.—The dose of good elaterium is from one-sixteenth to one-half of a grain. I hear and read of practitioners giving this substance to the extent of one, two, or even three grains; but this can only be from the bad quality of the drug. I have repeatedly employed, and seen others exhibit elaterium, and have always observed that a quarter of a grain of good elaterium acted very powerfully, sometimes bringing away several pints of fluid; and half a grain usually occasioning vomiting, as well as violent purging. I confess I should not venture to exhibit a grain of the same preparation. It is usually given in the form of pills. The basis of the pills may be extract of gentian.

As elaterin (the active principle of elaterium) is soluble in rectified spirit, a *tincture of elaterium* (*tincture elaterii*) may be employed. It contains, besides elaterin, a bitter principle and green resin. *Elaterin* has been given either in powder (mixed with sixty-four times its weight of bitartrate of potash), or in solution in rectified spirit (*solutio elaterina*) by Dr. Golding Bird (*Lond. Med. Gaz.* xxv. 908,) in doses of one-sixteenth to one-eighth of a grain (see p. 509).

ANTIDOTES.—In the event of a case of poisoning by elaterium, the remedies would be demulcent drinks and clysters, opium, the warm bath, and fomentations to the abdomen; stimulants (such as ammonia and brandy) if the circulation fail; bloodletting to subdue the inflammatory symptoms, should the state of the general system not contra-indicate it.

OTHER DIETETICAL, MEDICINAL, OR POISONOUS CUCURBITACEÆ.

The fruits of several cucurbitaceous plants are employed as articles of food. The Cucumber (*Cucumis sativus*), the Melon (*Cucumis Melo*), the Water Melon (*Cucumis Citrullus*), the Vegetable Marrow (*Cucurbita ovifera*), the Pumpkin or Pumpion (*Cucurbita Pepo*), and the Melon-Pumpkin or Squash (*Cucurbita Melo-pepo*), are those in most frequent use. They contain a watery, sweet or acidulous cooling pulp, which is slightly nutritious when taken raw, and in some habits proves laxative.

The fresh root of *Bryonia dioica* is sold by herbalists under the name of *white bryony* and *mandrake root* (see p. 325). Fashioned into a rude representation of the human figure, I have seen it exhibited at an herb-shop as a sign. Bryony root contains a peculiar bitter matter called *bryonin*. The root operates as a violent emetic and purgative. I have seen one case of poisoning by it. The symptoms were those of cholera. As the accident occurred at the time when this disease was raging here, the practitioner who was called in concluded it was a case

of cholera, and mistook a piece of briony root shown him as being part of what the patient had eaten, for a piece of turnip. The patient (a woman) recovered. Bryony root is employed as a topical application to bruised parts.

ORDER LVII.—MYRTACEÆ, R. Brown.—THE MYRTLE TRIBE.

CHARACTERS.—*Sepals* four—six, generally five, concreted into a tube, which is adnate to the ovary, sometimes distinct at the apex, and as far as the margin of the ovary, at other times concrete at the apex, and as far as the throat. *Petals* inserted on the calyx, as many as the sepals with which they alternate, and quincuncial in æstivation, very rarely absent. *Stamens* inserted with the petals, often in many rows, double, or generally many times the number of the petals: *filaments* either free or variously all connected or polyadelphous, before flowering somewhat incurved; *anthers* ovate, bilocular, small, dehiscing by a double chink. *Carpella* four—six, generally five, by abortion often fewer, concrete into a many-celled ovary, which is adnate to the calyx. *Style*, composed of many partial styles concreted, and, therefore, called single, with a simple stigma. *Fruit* various, many-celled, many-seeded. *Seeds* various; *embryo* exalbuminous (De Cand.)—*Trees* or *shrubs*. *Leaves* generally opposite, rarely alternate, exstipulate, quite entire, dotted with pellucid glands, and usually with a vein running parallel with their margin. *Inflorescence* variable; usually axillary. *Flowers* red, white, occasionally yellow, never blue.

PROPERTIES.—Aromatic volatile oil and astringent matter (especially the former) are the principles to which the medicinal properties of Myrtaceæ are referrible. The pellucid dotting of the leaves and other parts indicates the volatile oil.

1. MELALEUCA MINOR, Smith, L. E.—THE LESSER MELALEUCA.

Melaleuca Cajuputi: *Maton*; *Roxburgh*.

Sex. Syst. Polyadelphia, Icosandria.

(Oleum è foliis destillatum, L.—Volatile oil of the leaves, E.)

(Oleum Cajuputi, U. S. Sec. List.)

HISTORY.—This tree was described by Rumphius (*Herb. Amboin.* lib. ii. p. 76.) under the names of *Arbor alba minor*, *Cajuputi*, *Daun kitsjil*, and *Cajukilan*. It has got its name from its colour *kayu-puti*, which signifies *white wood*, and hence its appellation, as given to it by Rumphius, *arbor alba*. (*Mat. Indica*, i. 261; and *Crawford, Hist. Ind. Archip.* vol. i. p. 513.)

BOTANY. *Gen. Char.*—Tube of the *calyx* almost hemispherical; limb five-partite. *Petals* five. Bundles of *stamens* five, elongated, alternate with the petals; *anthers* incumbent. *Style* filiform; *stigma* obtuse. *Capsule* connate with, and enclosed in, the thickened tube of the calyx, which is adnate at its base to the branch: three-celled, many-seeded. *Seeds* angular (De Cand.)—*Trees* or *shrubs*. *Leaves* alternate or opposite, quite entire, equal at the base. *Flowers* sessile, or somewhat adnate, spiked or capitate, white, yellowish, or purplish.

Sp. Char.—*Leaves* alternate, elliptical-lanceolate, somewhat acute, slightly falcate, three-five-nerved. *Flowers* spiked, rather distant. *Rachis*, *calyx*, and *branchlets*, villose (De Cand.)

Trunk tolerably erect, but crooked: *bark* thick, spongy, whitish, ash-coloured, the exterior lamina peeling off in thin flakes. *Branches* scattered, often drooping. *Leaves* short-stalked, while young silky, when full grown smooth, deep green, from three to five inches long, and from half to three-quarters of an inch broad, very aromatic when bruised. *Spikes* terminal. *Bracts* solitary, lanceolate. *Calyx* urceolate. *Corolla* white. *Filaments* from thirty to forty, united into five portions at the base: *anthers* with a yellow gland at the apex. *Style* rather longer than the stamens; *stigma* obscurely three-lobed; *ovary* ovate, united to the calyx. *Capsule* three-valved. (Condensed from *Roxburgh, Fl. Ind.* iii. 395; and *Trans. Med. Bot. Soc.* April 11, 1828.)

Hab.—Moluccas.

EXTRACTION OF THE OIL.—Rumphius (*Herb. Amboin.*) states that the leaves are gathered on a warm day, and placed in a sack, where they become hot and damp. They are then macerated in water, and left to ferment for a night, and

afterwards submitted to distillation. Two sackfuls of the leaves yield scarcely three drachms of oil, which is limpid, pellucid, and volatile. Lesson (*Journ. de Chim. Méd.* iii. 237,) has described the method of obtaining the oil at Bourou, one of the Molucca islands. The leaves, he says, are gathered in the latter end of September, and put into the cucurbit of a copper alembic, surmounted by a neck, terminated by a capital without a refrigeratory, and a sufficient quantity of water is then added. By distillation, this liquid is made to traverse a worm immersed in a hogshead filled with water, and is collected in a vessel; the oil which floats is very light, and of an herbaceous green colour, which is owing to chlorophylle, or perhaps a somewhat different resinous principle. By rectification it becomes colourless.

DESCRIPTION.—*Cajuput* or *Kyapootie oil* (*oleum cajuputi*) is usually imported in green glass bottles (in appearance similar to long-necked beer bottles). Its colour is green, the tint being that of a strong solution of chloride of copper. It is transparent, limpid, of a strong penetrating smell, resembling the combined odour of camphor, rosemary, and cardamom, and of an aromatic camphoraceous taste, succeeded by a sensation of coolness like that caused by oil of peppermint. In the mass the odour is disagreeable, but in small quantity, as when rubbed on the hand is much more fragrant. An apparently pure sample, which has been several years in my museum, has a sp. gr. of 0.925. Dr. Thomson (*Org. Chem.* 476,) says, the sp. gr. varies from 0.914 to 0.9274: while Mr. Brande (*Dict. of Pharm.*) states it to be 0.980. Oil of cajuput is soluble in alcohol. When carefully distilled with water, the first portion of oil which passes over is very light, and quite colourless: but towards the end of the process, a heavier and greenish oil distils over.

COMPOSITION.—According to Blanchet (quoted by Thomson, *op. cit.*) the composition of oil of cajuput is as follows:

	Atoms.	Eq. Wt.	Per Cent.
Carbon	10	60	77.92
Hydrogen ..	9	9	11.69
Oxygen	1	8	10.39
Cajuputi Oil	1	77	100.00

ADULTERATION.—M. Guibourt (*Journ. de Chim. Méd.* vii. 612,) detected in several samples of oil of cajuputi, oxide of copper in solution. It is, he says, easily recognised by shaking the oil with a solution of ferrocyanide of potassium, when a red precipitate (*ferrocyanide of copper*) is formed. To this metal, derived as is supposed from the copper vessels in which the oil has sojourned, M. Guibourt ascribes the green colour of the oil. This conclusion, however, was somewhat premature; for all the samples of the oil which I have examined were, though green, quite devoid of copper; and Mr. Brande observes, that none of the samples which he has examined have contained even a trace of copper.

In 1831, oil of cajuputi was extolled as a remedy for cholera. (*Lond. Med. Gaz.* viii.) In consequence of the great demand for it, which was thereby created, the price rose from two to fourteen shillings per ounce; and various imitations of it soon made their appearance in the market. One of these consisted of oil of rosemary flavoured with camphor and oil of cardamoms, and coloured. Except on this extraordinary occasion, the oil of cajuputi met with in the shops of this country, I believe to be pure as imported.

PHYSIOLOGICAL EFFECTS.—Cajuput oil is a powerful antispasmodic diffusible stimulant and sudorific (see vol. i. p. 185). From the ordinary distilled oils (as those of the labiate plants and umbelliferous fruits) it is distinguished by its stronger influence over the nervous system (evinced by its antispasmodic qualities) and by the greater diffusibility of its stimulant operation. It is allied to valerian (p. 407) between which and camphor (p. 246) it ought perhaps to be placed in a physiological classification; but in large doses, it does not disorder the mental faculties as these two medicines do.

USES.—Cajuput oil has acquired considerable celebrity among the Malays; and has been more frequently employed in Germany than in any other European nation. By British practitioners its uses have hitherto been very limited. As a diffusible stimulant it is useful where we wish promptly to raise the energy of the vital powers, especially when at the same time any spasmodic movements are to be allayed. With these views it has been employed in low fevers, paralytic affections, and cholera. In the last-mentioned diseases it acquired an ephemeral reputation, in consequence of the favourable reports of Sir Matthew Tierney, and others. (*Ibid.* vol. viii. pp. 628, 683, 746, &c.) As an antispasmodic, it is a very efficacious remedy, in painful spasmodic affections of the stomach, and in flatulent colic; but of its uses in epilepsy, chorea, hysteria, tetanus, spasmodic asthma, and some other spasmodic diseases, in which its efficacy has been extolled by oriental and continental practitioners, I have no experience. As a stimulating sudorific, it proves occasionally useful in chronic rheumatism. As an external remedy, it is probably scarcely superior to most other volatile oils. It has sometimes been applied to a carious tooth, to relieve toothache; and mixed with olive oil, has been used as a stimulating liniment in chronic rheumatism, painful affections, local paralysis, &c. As an anthelmintic, it was used by Rudolphi.

ADMINISTRATION.—The dose of it is from two to ten, or even more, drops. It may be taken on sugar, or in the form of an emulsion.

2. CARYOPHYLLUS AROMATICUS, Linn. L. E.—CLOVE-TREE.

Eugenia caryophylla Thunberg, D.

Sex. Syst. Icosandria, Monogynia.

(Flores nondum explicati, exsiccati; Oleum à floribus destillatum, L.—Dried undeveloped flower: Volatile oil of the undeveloped flowers, E.—Flores nondum explicati; et Oleum volatile, D.)

(Caryophyllus, U. S. Cloves.)

HISTORY.—The *caryophyllon* of Pliny (*Hist. Nat.* lib. xii. cap. 15. ed. Valp.) cannot have been our clove, since that naturalist describes it as being like a peppercorn, but larger and more brittle. Indeed it is not certain who first speaks of the clove. Paulus Aegineta (*De Re Medica*, lib. vii. cap. iii.) notices *καρυόφυλλον*, and, I think, probably refers to the clove; though Sprengel (*Hist. Rei Herb.* i. 217,) regards Simeon Seth as the first who mentions cloves.

BOTANY. **Gen. Char.**—Tube of the calyx cylindrical; limb four-partite. *Petals* four, adhering by their points in a sort of calyptra. *Stamens* distinct, arranged in four parcels, inserted in a quadrangular fleshy hollow near the teeth of the calyx. *Ovary* two-celled, each cell containing twenty ovules. *Berry*, when ripe, one or two-celled, one or two-seeded. *Seeds* cylindrical or semi-ovate: *cotyledons* thick, fleshy, concave externally, sinuous in various ways internally; *radicle* arising from the centre of the cotyledons, straight, superiorly hidden by the cotyledons.—*Trees.* *Leaves* opposite, coriaceous, dotted. *Cymes* terminal or in the forking of the branches; somewhat corymbase (De Cand.)

Sp. Char.—*Leaves* obovate-oblong, acuminate at both ends. *Cymes* many-flowered (De Cand.)

Trunk from 15 to 30 feet high. *Leaves* about four inches long, with a strong midrib and parallel lateral nerves; footstalks slender, aromatic; almost two inches long. *Flowers* odorous. *Calyx* at first green, afterwards purplish-red. *Petals* four, larger than the calyx, imbricated into a globe in bud, at length spreading, roundish, concave, yellowish-red, very soon caducous. In the centre of the calyx, and occupying the top of the ovary, is a quadrangular elevated line (or gland) surrounding, but not embracing, the base of the shortish, obtusely subulate style. *Filaments* much longer than the petals, yellow: *anthers* ovate-cordate, yellow, two-celled. *Ovary* oblong, or almost cylindrical. *Berry*

purplish, elliptical, one-seeded. Seed with a thin, soft integument; embryo elliptical, greenish-dotted (Condensed from *Bot. Mag.* t. 2749.)

FIG. 216.

*Caryophyllus aromaticus.*

HAB.—Molucca Islands; where, as well as at Sumatra, Mauritius, Bourbon, Martinique, St. Vincent's, &c., it is now extensively cultivated. The short-sighted and selfish policy of the Dutch to limit the cultivation of the plant to the Molucca Islands, has, therefore, completely failed.¹

COLLECTION.—Cloves are collected by the hand, or beaten with reeds, so as to fall upon the cloths placed under the tree, and dried by fire, or, what is better, in the sun.

COMMERCE.—They are imported in casks or bags. Those produced in the Molucca Islands usually come by way of Rotterdam. In 1839 duty (6d. per lb.) was paid on 93,549 lbs.

DESCRIPTION.—The clove of commerce (*caryophyllus*) is the unexpanded flower, the corolla forming a ball or sphere at the top, between the four teeth of the calyx, and thus with the tapering, somewhat quadrangular tube of the calyx, giving the appearance of a nail (whence the word *clove*, from the French *clou*, a nail). The length of the clove is from five to ten lines; its thickness from one to one and a half lines. Its colour is dark-brown with a yellowish-red tint; the corolla somewhat deeper. Good cloves should be dark-brown, and perfect in all parts, have a strong fragrant odour, and a hot acrid taste, and when slightly pressed with the nail, give out oil. They are distinguished in commerce by their place of growth. Those from the East Indies (*Amboyna* and *Bencoolen* cloves) are the best: they are the largest, plumpest, and most oily. The *Bencoolen* clove is the most esteemed. Cloves produced in the French possessions (*Bourbon* and *Cayenne* cloves) are smaller, more shrivelled, contain less oil, and are of inferior value. The *Cayenne* clove is the least esteemed.

Under the name of MOTHER CLOVES (*matrices caryophylli* seu *anthophylli*) are described, in several authors, the fruits of the clove (*fructus caryophylli aromatici*) which have been occasionally introduced as articles of commerce, and a sample of which has been preserved in the collection of the East India House. On the 8th of Feb. 1841, five bags of mother cloves were put up for sale in London. They have the shape of an olive, than which they are smaller. Superiorly they are crowned with the four teeth of the calyx, with the remains of the style in the centre. Their colour is similar to that of the clove: their odour and flavour similar, but much weaker. Internally we find the embryo with its two sinuous cotyledons.

The broken peduncles of the clove (*clove stalks*; *griffe de girofle*) are sometimes substituted by distillers for cloves (Guibourt).

COMPOSITION.—Cloves were analyzed by Trommsdorff, (Gmelin, *Handb. d. Chem.* ii. 1272,) who found them to consist of, *volatile oil* 18, *almost tasteless resin* 6, *peculiar kind of tannin* 13, *difficultly soluble extractive with tannin* 4, *gum* 13, *woody fibre* 28, and *water* 18.

1. VOLATILE OIL (see p. 517).

2. EUGENIN (*Stéaroptène* of Oil of Cloves).—This was found in oil of cloves by Bonastre. It is in thin, white, pearly scales, which become yellow by keeping. It is very soluble in alcohol and ether; has the odour and taste of cloves, but weaker, and is reddened by nitric acid. According to Dumas, its composition is Carbon 72.25, Hydrogen 7.64, Oxygen 20.11; or C⁷⁰H¹²O⁴.

3. CARYOPHYLLIN (*Clove sub-resin*).—First described by Lodibert, (*Journ. de Pharm.* xi. 101,) and afterwards examined by Bonastre. (*Ibid.* p. 103.) It is extracted from cloves by alcohol.

¹ See Marsden, *Hist. of Sumatra*, p. 146, 3rd ed.; Smith, in *Rees' Cyclop. art. Caryophyllus*; Crawford, *East. Archip.* iii. 368; Hooker, *Bot. Mag.* t. 2749.

The Molucca cloves yield the largest quantity of it; those of Bourbon contain less; and the Cayenne cloves none. It is a satiny, crystalline, odourless, tasteless, fusible and volatile substance; insoluble in water, soluble in alcohol and ether; slightly so in caustic alkalis. It is reddened by sulphuric acid. According to Dumas (*Ann. de Chim. et Phys.* liii. 164) it is composed of Carbon 79.5, Hydrogen 10.5, Oxygen 10.0; hence its formula is $C^{20}H^{16}O^2$; so that its composition is similar to that of camphor (p. 245).

4. CLOVE-TANNIN.—The tannin of cloves is less acerb than ordinary tannin, and its compound with gelatine has less elasticity.

CHEMICAL CHARACTERISTICS.—Nitric acid reddens infusion of cloves. Tincture of sesquichloride of iron renders it blue. The oil of cloves also undergoes similar changes to the infusion. These facts deserve especial attention in relation to opium and morphia (see OPIUM) on account of the analogous phenomena presented by morphia when acted on by nitric and sesquichloride of iron. (*Journ. de Pharm.* xi. 539 and 566.) Infusion and oil of allspice are similarly affected.

PHYSIOLOGICAL EFFECTS.—Cloves have a very agreeable flavour and odour, and are devoid of the fiery taste and acridity which distinguish pepper and ginger: in other respects their effects agree with those of other spices (vol. i. p. 183). Though volatile oil is by far the most important of their active principles, yet the tannin, extractive, and resin, must contribute something to their operation.

USES.—Cloves are principally used for culinary purposes, as flavouring ingredients. They are not employed in sufficient quantity to prove of much importance as condimentary stimulants, yet they are applicable as gastric excitants, in dyspeptic cases connected with relaxation of the alimentary canal. In medicine cloves are rarely employed alone, or as the basis or principal medicine, but usually as an addition to other medicines, the flavour of which they improve, or whose operation they correct. When, however, they are given alone, it is merely as a stomachic and carminative, to relieve nausea, vomiting, flatulence, or some allied stomach disorder. Distillers prepare a liquor called *cloves*.

ADMINISTRATION.—In substance cloves may be taken in doses of five or ten grains, or *ad libitum*.

1. INFUSUM CARYOPHYLLI, L. E. (U. S.); *Infusum Caryophyllorum*, D.; *Infusion of Cloves*; *Clove Tea*.—(Cloves, bruised, ℥iij. [ʒj., D.] [ʒij. U. S.]; Boiling [distilled, L.] Water, Oj. [Oss. *wine measure*, D.] Macerate for two hours in a vessel lightly covered, and strain [through calico, E.]—Aromatic, stimulant, and stomachic. Employed in dyspepsia, flatulent colic, gout, &c.; generally in combination with other medicines. Ammonia increases its efficacy. Dose, ℥ʒj. to ℥ʒij.

2. OLEUM CARYOPHYLLI, L. E. (U. S.); *Oleum Eugenie Caryophyllate*, D.; *Oil of Cloves*.—(Obtained by submitting cloves, with water, to repeated distillation).—No directions are given by the London and Dublin Colleges for the preparation of oil of cloves, which is placed by them among the articles of the *Materia Medica*.

To extract the whole of the oil from cloves, they must be subjected to repeated cohobations. On an average they yield from 17 to 22 per cent. of volatile oil (including the heavy and light oils). By distillation with water, cloves yield two volatile oils—one lighter, the other heavier, than water. Mr. Whipple informs me, that by the ordinary modes of distillation the heavy oil comes over first. The oil of cloves of commerce is a mixture of these two oils. When carefully and recently prepared it is colourless or light-yellow, but by keeping becomes brownish-red. It has a hot, acrid taste, and the well-known odour of cloves, and is soluble in alcohol, ether, concentrated acetic acid, and the fixed oils. Its sp. gr. is probably variable, though always greater than that of water. Lewis found it to be 1.034. Bonastre (*Ann. d. Chim. et Phys.* xxxv.) says, that of the unrectified oil is 1.055, but by rectification part of the light oil is lost, and the sp. gr. is then 1.361. Ettling (*Poggendorff's Annal.* xxxi. 526)

says its composition is, *Carbon* 74.6279, *Hydrogen* 8.1531, and *Oxygen* 17.2189. To separate it into the two oils he mixed it with potash ley, and distilled: a *light oil* passed over, while a compound of the *heavy oil* (*clove acid*) and potash remained in the retort, and, by distillation with phosphoric or sulphuric acid, gives out the heavy oil.

a. Light Oil of Cloves (Clove Hydro-Carbon).—Colourless. Sp. gr. 0.918. Incapable of combining with bases, but absorbing hydrochloric acid gas without yielding a crystalline compound. It consists of $C^{10}H^8$; hence it is isomeric with oil of turpentine (see p. 168).

β. Heavy Oil of Cloves (Cloves Acid; Caryophyllic Acid; Eugenic Acid).—It is colourless when recently prepared, but becomes coloured by age. Its sp. gr., according to Bonastre, is 1.079. It combines with alkalis to form crystalline salts (*alkaline caryophyllates* or *eugenates*; *clove-oil alkalis*). If a salt of iron be added to one of these, it yields a blue, violet, or reddish compound (*a ferruginous caryophyllate*), varying somewhat according to the nature of the ferruginous salt used: thus the protosulphate of iron yields a lilac, the persulphate a red, which becomes violet and afterwards blue; while the sesquichloride gives a vinous tint, which turns to red (Bonastre). Nitric acid reddens caryophyllic acid.

The composition of caryophyllic acid is as follows:

	Atoms.	Eq. Wt.	Per Cent.	Ettling.	Boeckmann.
Carbon	24	144	72.36	72.6327	72.696
Hydrogen	15	15	7.54	7.4374	7.434
Oxygen	5	40	20.10	19.9297	19.870
Clove Acid	1	199	100.00	99.9998	100.000

This statement does not agree with that of Dumas, who from his first analysis (*Ann. de Chim. et Phys.* liii. 164,) gave the formula $C^{20}H^{13}O^5$; and from his second one, (*Pharm. Central-Blatt.* Oct. 13, 1838, from *Ann. d. Pharm.* xxvii. 151,) $C^{20}H^{13}O^5$. But various reasons, not necessary here to enumerate, lead me to believe that Ettling's formula is the correct one, supported as it is by Boeckmann's analysis and by Dumas's statement, that the sp. gr. of the vapour of caryophyllic acid is 6.4. (*op. cit.*; also Thomson's *Org. Chem.* p. 1046.)

The oil of cloves is sometimes placed in the hollow of a carious tooth, to relieve toothache; but its more frequent medicinal use is as an addition to purgatives (e. g. *pilule colocynthidis*, E.) to check nausea and griping.—The dose of it is two to six drops. Distillers and soap makers extensively use oil of cloves.

3. *TINCTURA CARYOPHYLLI; Tincture of Cloves*—(Cloves, ʒj.; Rectified Spirit, ʒiv. Macerate for seven days, and then filter).—Though not contained in any of the British pharmacopœias, this is a very useful and elegant preparation, and has a place in the French Codex. A solution of the oil in spirit is less agreeable, and becomes milky on the addition of water.—Dose, ʒx. to fʒj. It may be usefully employed as an addition to purgative, stomachic, and tonic mixtures.

[Cloves enter into the composition of the *SYRUPUS RHEI AROMATICUS*, U. S. the formula of which should have been given at page 273. It is made in accordance with the following formula:—Rhubarb, bruised, two ounces and a half; Cloves, bruised, Cinnamon, bruised, each, half an ounce; Nutmeg, bruised, two drachms; Diluted Alcohol, two pints; Syrup, six pints. Macerate the Rhubarb and Aromatics in the Diluted Alcohol for fourteen days, and strain; then by means of a water bath, evaporate the liquor to a pint; and while it is still hot, mix it with the syrup previously heated. Or it may be made by displacement.—J. C.]

3. EUGENIA PIMENTA, De Candolle, E.—THE COMMON ALLSPICE.

(Myrtus Pimen'ta, Linn. L. D.)

Sex. Syst. Icosandria, Monogynia.

(Baccæ immaturæ exsiccatæ, L.—Unripe berries, E.—Fructus, D.)

(Pimenta, U. S.)

HISTORY.—It is scarcely probable that the ancients should have been acquainted with *allspice*, which is a native of the West Indies, and therefore could not have been known to the Europeans before the discovery of America. Yet Clusius (*Exotic*, lib. i. cap. 17,) thought it was the *garyophyllon* of Pliny, (*Hist. Nat.* lib. xii. cap. 15, ed. Valp.); an opinion, however, which, for the above-mentioned reason, can scarcely be correct. (Sloane's *Jamaica*, ii. 77.)

BOTANY. **Gen. Char.**—Tube of the *calyx* roundish; limb divided, as far as the ovary, into four segments. *Petals* as many as the lobes. *Stamens* indefinite, free. *Ovary* two or three celled; cells containing many ovules. *Berry* nearly globose, crowned by the calyx; when ripe, one, rarely two-celled. *Seeds* one or two, somewhat rounded, large; *embryo* spuriously monocotyledonous; *cotyledons* very thick, combined into one mass; *radicle* scarcely distinct, very short (De Cand.)—*Trees* or shrubs.

Sp. Char.—*Peduncles* axillary and terminal, trichotomous-paniculate. *Flowers* four-cleft, in the forks of the peduncle, nearly sessile, others paniculate. *Leaves* oblong or oval, pellucid-dotted, somewhat opaque, smooth. *Branches* terete; branchlets compressed; the younger ones, as well as the pedicels, pubescent (De Cand.)

Trunk about 30 feet high. *Leaves* about four inches long, on short foot-stalks. *Flowers* numerous. *Sepals* roundish. *Petals* reflected, greenish-white. *Berry* succulent, black or dark-purple when ripe; two-seeded. *Embryo* roundish, with the cotyledons consolidated. (Condensed from *Botanical Magazine*, t. 1236.)

Hab.—West Indies. It is cultivated in Jamaica in regular walks (*Pimento Walks*).

COLLECTION.—When the fruit has attained the full size, but is yet green, it is gathered and sun-dried on platforms and sheets. When nearly dry it is frequently winnowed. It is afterwards put in bags of 1 cwt. each, for the European market. (Wright, *Med. Plants of Jamaica*; Brown, *Nat. Hist. of Jamaica*, 248.) Some planters kiln-dry it.

DESCRIPTION.—*Pimento* or *Jamaica pepper* (*pimenta* seu *piper jamaicense*), commonly called *allspice* (because its flavour is considered to approach that of cinnamon, cloves, and nutmegs) is about the size of, or somewhat larger than, a peppercorn. It is round, brown, dull, roughish but not wrinkled, crowned with the segments of the calyx, and occasionally, though rarely, has a short pedicel. It consists of an external, somewhat hard but brittle shell, which is paler within, and incloses two dark-brown cochleate seeds. *Allspice* has an aromatic agreeable odour (intermediate between pepper and cloves), and a strong aromatic clove-like taste.

OVATE PIMENTO (*Brasilianischer* oder *Kron-Piment*, Dierbach (*Berlin. Jahrbuch*. Bd. xxxviii. s. 296); *Piment couronné* ou *Poire de Thevet*, Guibourt.) (*Hist. des Drog.* ii. 351.)—This is the fruit of *Myrtus pimentoides*, Nees v. Esenbeck, (*Icones Plant. Med.*) called by De Candolle (*Prodr.* iii. 243) *Myrica pimentoides*, a native of the West Indies. Except in shape, it strongly resembles the common allspice. It is ovate or oval, terminated superiorly by a large crown, formed by the five-toothed limb of the calyx. It is usually two, more rarely three or four-celled, each cell containing one seed. Guibourt has always found three, four, or six seeds in each fruit. In the only sample I have seen, and which came from St. Vincent's, there were in most of the fruits only two seeds.

COMMERCE.—Pimento is imported in bags, usually from the West Indies (almost entirely from Jamaica). In 1839, duty (9*d.* per lb.) was paid on 277,185 lbs.

COMPOSITION.—Pimento was analyzed by Braconnot, (Duncan, *Edinb. Dispens.*) and in 1825 by Bonastre. (*Journ. de Chim. Méd. i. 210.*)

Bonastre's Analysis.			Braconnot's Analysis.	
	Husks.	Kernels.		
Volatile oil.....	10.0	5.0	Volatile oil.....	1.9
Green oil.....	8.4	2.5	Amylum.....	9.0
Solid fat oil.....	0.9	1.2	Wax, with red colouring matter...	0.9
Astringent extract.....	11.4	39.8	Gum.....	6.0
Gummy extract.....	3.0	7.2	Nitrogenous matter.....	5.0
Colouring matter.....	4.0	...	Citrate of Potash.....	6.0
Resinous matter.....	1.2	...	Phosphate of Potash and loss.....	3.4
Uncrystallizable sugar.....	3.0	8.0	Insoluble matter.....	67.8
Malic or gallic acid.....	0.6	1.6		
Lignin.....	50.0	...		
Saline ashes.....	2.8	1.9		
Water.....	3.5	3.0		
Loss.....	1.6	1.8		
Red matter, insoluble in water.....	..	8.8		
Pellicular residue.....	..	16.0		
Brown flocculi.....	..	3.2		
Total.....	100.0	100.0	Total.....	100.0

1. VOLATILE OIL. (See below.)

2. GREEN OIL (*Resin?*) This substance, which has an acrid burning taste, contributes to the activity of pimento. Its odour is rancid, but somewhat clove-like. It dissolves readily in alcohol and ether, to which it communicates a green colour.

3. PIMENTO-TANNIN.—Is soluble in alcohol, strikes a green colour with the persalts of iron, and precipitates emetic tartar.

CHEMICAL CHARACTERISTICS.—See *Chemical Characteristics* of cloves, p. 517.

PHYSIOLOGICAL EFFECTS.—Allspice possesses the general properties of the species already noticed (vol. i. p. 183). It holds an intermediate rank between pepper and cloves.

USES.—Its principal employment is by the cook, for flavouring. It may be taken with advantage by those troubled with relaxed or atonic conditions of stomach. In medicine, its uses are similar to those of cloves; viz. to relieve flatulency, to cover the flavour of nauseous remedies, and to promote the operation of tonics and stomachics, and to prevent the griping of purgatives.

ADMINISTRATION.—In substance, allspice may be taken in doses of from ten grains to a drachm or more.

1. OLEUM PIMENTÆ, L. E. D. (U. S.); *Oil of Pimento*; *Oil of Allspice*.—(Obtained by submitting allspice, bruised, with water, to distillation). Mr. Whipple informs me that from 8 cwt. of pimento he procured 41 lbs. 6 oz. of oil (heavy and light). This is nearly six per cent. He also informs me that the light oil comes over first,—the reverse being the case with oil of cloves (see p. 517). The oil of pimento of the shops is a mixture of these two oils. Except in odour, its properties are almost identical with those of oil of cloves. By distillation with caustic potash, the *light oil* is separated; the residue, mixed with sulphuric acid and submitted to distillation, gives out the *heavy oil*.

a. Light Oil of Pimento (Pimento-Hydro-Carbon).—Has not, to my knowledge, been previously examined. Its properties appear to be similar to those of the *light oil* of cloves. It floats on water and on liquor potassæ, and is slightly reddened by nitric acid. Potassium sinks in, and is scarcely if at all acted on by it.

β. Heavy Oil of Pimento (Pimentic Acid).—Very similar to carophyllic acid. It forms with the alkalis, crystalline compounds (*alkaline pimentates*) which become blue or greenish on the addition of the tincture of chloride of iron (owing to the formation of a *ferruginous pimentate*). Nitric acid acts violently on and reddens it.

The medicinal uses of the oil of pimento are very limited. It is sometimes employed to relieve toothache, to correct the operation of other medicines, as purgatives and tonics, and to prepare the *spiritus* and *aqua pimentæ*. The dose of it is from two to six drops.

2. SPIRITUS PIMENTÆ, L. E. D.; *Spirit of Pimento*; *Spirit of Allspice*, (Pimento, bruised, ℥jss. [℥ij. D.]; Proof Spirit, Cong. j. [*wine measure*, D.]; Water, Oj. [sufficient to prevent empyreuma, D.] The *Edinburgh College* directs half a pound of bruised pimento to be used, and to proceed as for spirit of caraway [see p. 466].—Carminative and stomachic. Used in dyspepsia, and flatulent colic. Dose, ℥j. to ℥iv. In the shops, a spirituous solution of the oil is frequently substituted for the pharmacopœial preparation.

3. AQUA PIMENTÆ, L. E. D.; *Pimento Water*; *Allspice Water*. (Pimento, bruised, lb. j. [lb. ss. D.; or Oil of Pimenta, ℥ij. L.]; [Proof Spirit, ℥vij. L.; Rectified Spirit, ℥ij. E.]; Water, Cong. ij. [sufficient to prevent empyreuma, D.] Mix, and let a gallon distil. The *Dublin College* macerates first for twenty hours.)—Carminative. Employed for its flavouring, carminative, and stomachic properties, as a vehicle for stimulant, tonic, and purgative medicines. Dose, ℥j. to ℥ij. In the shops, it is usually prepared with the oil.

OTHER MEDICINAL MYRTACEÆ.

The substance called *Botany Bay Kino* is the astringent inspissated juice of EUCALYPTUS RESINIFERA or *Iron Bark*, a native of Australia and Van Diemen's Land. This tree, we are told, (White, *Journal of a Voyage to New South Wales*, p. 231, 1790,) sometimes yields on incision sixty gallons of juice. Botany Bay kino is imported in boxes. That which I have met with came from Van Diemen's Island. It occurs in irregular odourless masses, many of which are in the form of tears, somewhat resembling those of cherry-tree gum in form, and as large as the tears of Senegal gum. The purer pieces are vitreous, almost black in the mass, but transparent, and of a beautiful ruby-red in small and thin fragments. Some of the pieces, however, are opaque and dull, from the intermixture of wood and other impurities. When chewed it sticks to the teeth, and has an astringent taste. Digested in cold water it swells, becomes soft and gelatinous (like red-currant jelly), and yields a red liquid which reddens litmus, and yields precipitates with lime water, gelatin, acetate of lead, sesquichloride of iron, and, if caustic potash or ammonia be previously added, with the chloride of calcium. Alcohol and emetic tartar occasion no precipitate. Digested in rectified spirit, Botany Bay kino becomes gelatinous, as with water, and yields a similar red solution, from which water precipitates nothing, but which reddens litmus, and deposits a copious precipitate when potash, ammonia, or lime-water, is dropped in. From these and other experiments, I infer that Botany Bay kino consists principally of a peculiar substance (*Eucalyptin*) analogous somewhat to pectin and tannic acid. It has been used in diarrhœa. (White, *op. cit.*) Ainslie (*Mat. Indica*.) says it is the only kind employed in India; but I suspect there is some error in this statement.

ORDER LVIII. LYTHRACEÆ, Lindley.—THE LOOSESTRIPE TRIBE.

SALICARIE, Jussieu.—LYTHRARIÆ, De Candolle.

ESSENTIAL CHARACTER.—*Sepals* definite in number, coherent beyond the middle. *Calyx* free, tubular or campanulate; lobes valvate, or distant in aestivation; the sinuses being sometimes lengthened into conical lobes or external teeth. *Petals* inserted on the upper part of the tube of the calyx, between the lobes, various in number, sometimes none, generally very caducous. *Stamens* inserted into the tube of the calyx below the petals; equal, double, triple, or quadruple the number of petals, sometimes fewer. *Anthers* oval, bilocular, adnate. *Ovary* free; style filiform; stigma capitate. *Capsule* membranous, covered or surrounded by the calyx; of two to four carpels; while young generally (always?) two-celled by the slender margins of the carpels being inflexed; but when ripe one-celled by the disappearance of the dissepiments, either debiscing longitudinally, or more rarely and irregularly with a circumscissile dehiscence. *Placenta* central, adnate to the dissepiment when present, or free, thick, either compressed-cylindrical or obscurely trigonal or tetragonal; the apex with some threads, conveyers of the seminal aura, continuous with the base of the style. *Seeds* many, small, exalbuminous; *embryo* straight; *radicle* turned towards the hilum; *cotyledons* flat, foliaceous. (De Candolle.)

PROPERTIES.—Variable. Except *Lythrum Salicaria*, which is astringent, the medical properties of few species are well known. *Nesaea salicifolia* is said to be diuretic, diaphoretic, and purgative.

LYTHRUM SALICARIA, Linn. D.—SPIKED PURPLE LOOSESTRIFE.

Sex. Syst. Dodecandria Monogynia.

(Herba, D.)

HISTORY.—As this plant is a native of the Grecian Archipelago, it must have been known to the ancients; but hitherto it has not been satisfactorily identified with any plant described by them.

BOTANY.—**Gen. Char.**—*Calyx* cylindrical, striated, toothed at the apex; teeth eight to twelve, of which four to six are broader than the rest, and erect, and the remaining four to six alternate ones, subulate, often horn-shaped, sometimes not present, or very small. *Petals* four to six, arising from the apex of the tube, alternate with the erect teeth. *Stamens* arising from the middle or base of the calyx, double or equal the number of the petals, or by abortion fewer. *Style* filiform; *stigma* capitate. *Capsule* oblong, covered by the calyx, two-celled, many-seeded. *Placenta* thick, adhering to the dissepiment.—*Herbs*, or rarely *undershrubs*. *Leaves* entire. *Flowers* axillary, purple or white. (De Cand.)

Sp. Char.—*Leaves* lanceolate, cordate at the base. *Flowers* spiked, almost sessile. (De Cand.)

Stems two or three feet high, four-sided. *Spikes* very long. *Flowers* purple. *Petals* oblong, cuneiform. *Stamens* usually twelve, of which six are long and six short.

Hab.—Ditches and watery places of this and other countries of Europe, west of Asia, New Holland, and North America.

DESCRIPTION.—The herb (*Herba Salicaria* seu *Lysimachia purpurea*) when dry, is inodorous, but has an herbaceous, somewhat astringent taste, and by chewing becomes very mucilaginous. Its infusion is darkened by the ferruginous salts.

COMPOSITION.—I am unacquainted with any analysis of this plant. Its obvious constituents are *tannic acid*, *mucilage*, *chlorophylle*, and *woody fibre*.

PHYSIOLOGICAL EFFECTS.—Demulcent and astringent.

USES.—Principally employed in diarrhœa and dysentery. In the former of these complaints it was recommended by Bang, (*Act. Reg. Soc. Med. Havn.* vol. i. p. 100,) De Haen, (*Rat. Med.* iii. 196; and iv. 250, quoted by Murray, *App. Med.*) and others. In dysentery, it was spoken favourably of by Gardane (*Gazette de Santé*, 1773, p. 65, quoted by Murray,) and others.

ADMINISTRATION.—Dose of the powdered herb ℥j. twice or thrice a day. A decoction of the root, prepared by boiling ℥j. of the root in Oj. of boiling water, may be taken in doses of ℥ʒj. or ℥ʒij.

ORDER LIX.—GRANATEÆ, Don.—THE POMEGRANATE TRIBE.

ESSENTIAL CHARACTER.—Tube of the *calyx* turbinate; limb five or seven-cleft, coriaceous; lobes valvate by aestivation. *Petals* five or seven. *Stamens* indefinite; *filaments* free; *anthers* anteriorly two-celled, dehiscing by a double chink. *Style* filiform; *stigma* capitate, pimpled. *Fruit* large, spherical, crowned with the somewhat tubular limb of the calyx, coated with the tube of the calyx, indehiscent, unequally divided into two chambers by a horizontal diaphragm; the upper one five or nine-celled, the lower one smaller, three-celled; the dissepiments of both membranous. *Placenta* of the upper chamber fleshy, spreading from the sides to the centre; those of the lower chamber irregular processes from its base. *Seeds* innumerable, mixed with a pellucid somewhat crystalline pulp, exalbuminous; *embryo* oblong; *radicle* short, straight; *cotyledons* foliaceous, spirally convoluted.—*Trees* or *shrubs*. *Leaves* deciduous, opposite, oblong, entire, without dots. *Flowers* scarlet (De Cand.)

PROPERTIES.—See *Punica Granatum*.

PUNICA GRANATUM, Linn. L. E. D.—THE COMMON POMEGRANATE.

Sex. Syst. Icosandria, Monogynia.

(Fructus cortex, L.—Root-bark, E.—Baccæ tunica exterior; Radicis cortex; Flores, D.)

(Granati fructus Cortex, Granati Radicis Cortex, U. S.)

HISTORY.—The pomegranate is repeatedly referred to in the Bible. (*Numbers*, xiii. 23; *Deut.* viii. 8, &c.) Homer (*Odys.* vii. 120,) also mentions it. The leaves, the flowers, and the fruit, were employed in medicine by the ancients. (Dierbach, *Arzneim. d. Hippok.* 90; Dioscorides, lib. i. cap. 151 to 154; Pliny, *Hist. Nat.* xxiii. 57.)

BOTANY. Gen. Char.—Only one genus. (See the characters of the ORDER.)

Sp. Char.—Leaves lanceolate. Stem arborescent (De Cand.)

Small tree, with a brownish bark. Leaves on short stalks, smooth. Flowers terminal on the young branches. Calyx thick, fleshy, red. Petals much crumpled, membranous, rich scarlet. Stamina numerous,

inserted on the calyx; anthers yellow. Ovary roundish; style simple; stigma globular. Fruit larger than an orange, with a thick coriaceous rind, and crowned by the teeth of the calyx; cells several, arranged in two strata, one upper, the other lower, separated by a transverse diaphragm; lower stratum of three, upper one of from five to nine cells.—Some difficulty having been experienced in comprehending the structure of this anomalous fruit, Dr. Lindley (*Nat. Syst.* 2d ed. p. 44, and *Introd. to Bot.*) has explained it thus: within the calyx are two rows of carpella, a lower and inner one, consisting of three or four carpella surrounding the axis, and placed in the bottom of the calyx; and an upper and outer one, consisting of from five to ten carpella, surrounding the lower, but adherent to the upper part of the tube of the calyx. The two strata or tiers of cells in the pomegranate are formed by the two rows or tiers of carpella; the upper and outer row being forced to the top of the fruit by the contraction of the tube of the calyx from which they arise. The transverse diaphragm is formed by the adhesion of the upper to the lower stratum of carpella; and the outer part of the rind of the pomegranate is formed by the calyx which contains the carpella.

Hab.—Northern Africa, from whence it has been introduced into Europe, where it is now naturalized. Asia (Bengal, China, Persia).

DESCRIPTION.—The flowers, called *balaustine flowers* (*flores granati seu balustice*), are odourless, of a fine red colour, and slightly styptic taste. They communicate a reddish colour to the saliva. The rind of the fruit (*cortex granati: malicorium*), when dry, occurs in irregular arched, dry, brittle, odourless, very astringent, and slightly bitter fragments, which are brownish (more or less yellow or reddish), and paler within. The seeds (*semina granati*) are each surrounded by a thin vesicle filled with an acidulous styptic juice. The root (*radix granati*) is woody, knotty, hard, heavy, of a yellow colour, and astringent taste. Its bark (*cortex radices granati*) occurs in smallish fragments, of a yellowish or ash-gray colour externally, yellow within, brittle, not fibrous; of an astringent, but not bitter taste. By its want of bitterness it may be distinguished from the bark of the box-tree (*Buxus sempervirens*), which is said to be sometimes substituted for it. Moistened with water, and rubbed on paper, it leaves a yellow stain, which becomes deep-blue by the contact of sulphate of iron. (Guibourt, *Hist. des Drog.* i. 501.)

COMPOSITION.—Reuss (Gmelin, *Handb. d. Chem.* ii. 1272,) examined the watery extract of the rind of the fruit. The bark of the root has been analyzed

FIG. 217.



Punica Granatum.

by Wackenroder (*op. cit.*); in 1824 by Mitouart (*Journ. de Pharm.* x. 352); and, in 1831, by Latour de Trie (*op. cit.* xvii. 503, 601.)

Watery extract of Pomegranate Rind.		Bark of the Pomegranate Root.		
REUSS'S ANALYSIS.		WACKENRODER'S ANALYSIS.		LATOUR DE TRIE'S ANALYSIS.
Resin	0.92	Rancid fat oil.....	2.46	Fatty matter.
Tannin.....	27.78	Tannin.....	21.92	Tannin.
Oxidized tannin	10.19	Starch with some mucilage		Gallic acid
Extractive	21.76	of lime	26.00	Granadin (Mannite).
Gum.....	34.26	Woody fibre with albumen.	45.45	Resin (copious).
Loss	5.09	Loss	4.08	Wax.
				Chlorophylle.
				[Insoluble matters].
Extract of the Rind....	100.00	Dried Bark.....	100.00	Bark of the Root.

1. MANNITE (*Granadin*).—The sweet substance which Latour de Trie considered to be peculiar, and called *granadin*, has been satisfactorily shown (*Journ. de Pharm.* xxi. 169.) to be mannite (described at p. 372).

2. TANNIC ACID.—On this the astringency of the fruit and root almost solely depends. It is this principle which enables the infusion, or decoction, of the rind and bark to produce precipitates (*tannates*) with a solution of gelatine, and with the ferruginous salts.

3. RESIN.—Latour de Trie describes this as being without any remarkable odour and taste. It is insoluble in water, slightly so in cold alcohol, and more so in hot alcohol, and in small quantity in ether.

PHYSIOLOGICAL EFFECTS.—All parts of the plant (root-bark, rind of the fruit, juice surrounding the seeds, and flowers) possess astringency, owing principally to tannic acid, and in some slight degree to a minute quantity of gallic acid. The bark of the root, taken in *small quantities*, occasions no remarkable effects. In *full doses*, however, it causes nausea, vomiting, and purging, and occasionally giddiness and faintness.

USES.—Rarely employed in medicine. The *root-bark* has been occasionally used as a vermifuge. Celsus, Dioscorides, Pliny, and other ancient writers, speak of its anthelmintic qualities. The Indians, also, were acquainted with them at a very early period. Of late years attention has been again drawn to this bark as a remedy for tape-worm, by the recommendation of Dr. Fleming, (*Asiatic Researches*, vol. xi.) Dr. Buchanan, (*Ed. Med. and Surg. Journ.* vol. iii. 22.) Mr. Breton, (*Med. Chir. Trans.* vol. xi. p. 301.) Gomes, (*Journ. Complém. des Scienc. Méd.* xvi. 24.) Deslandes, and others; (Bayle, *Bibl. de Thérap.* i. 313.) but in this country it has been almost entirely superseded by oil of turpentine. The *rind of the fruit* has been employed on account of its astringency, in the form of decoction, as a gargle, in relaxed sore throat; as an injection, in leucorrhœa; and, internally, in diarrhœa, dysentery, and colliquative sweats. The powder of the rind may be administered as a tonic. The *flowers* are mild astringents, but are not employed in this country. The *fruit* may be eaten to allay thirst, and as a refreshing refrigerant and astringent in febrile disorders, especially those called bilious. It contains an acidulous styptic juice, which is inclosed in a thin vesicle surrounding the seeds.

ADMINISTRATION.—The *root-bark* is given in decoction. This is prepared by boiling ʒij. of the fresh bruised bark in Oij. of water to Oj.: the dose is a wine-glassful every half hour till the whole is taken. It usually occasions slight sickness, but seldom fails to destroy the worm. The patient should be prepared for the remedy by the use of a dose of castor oil and a strict regimen the day previously. The *rind of the fruit* may be given, as an astringent and tonic, in doses of ʒss. to ʒj.

ORDER LX.—ROSACEÆ, *Jussieu*.—THE ROSE TRIBE.

ESSENTIAL CHARACTER.—*Calyx* generally of five sepals, cohering at the base to form a tube; therefore five-lobed, generally persistent, usually free, sometimes adherent to the ovary. *Petals* as many as the sepals, rarely by abortion none, inserted on the calyx, quincuncial in aestivation, generally regular. *Stamens* inserted with the petals, mostly indefinite; *filaments*