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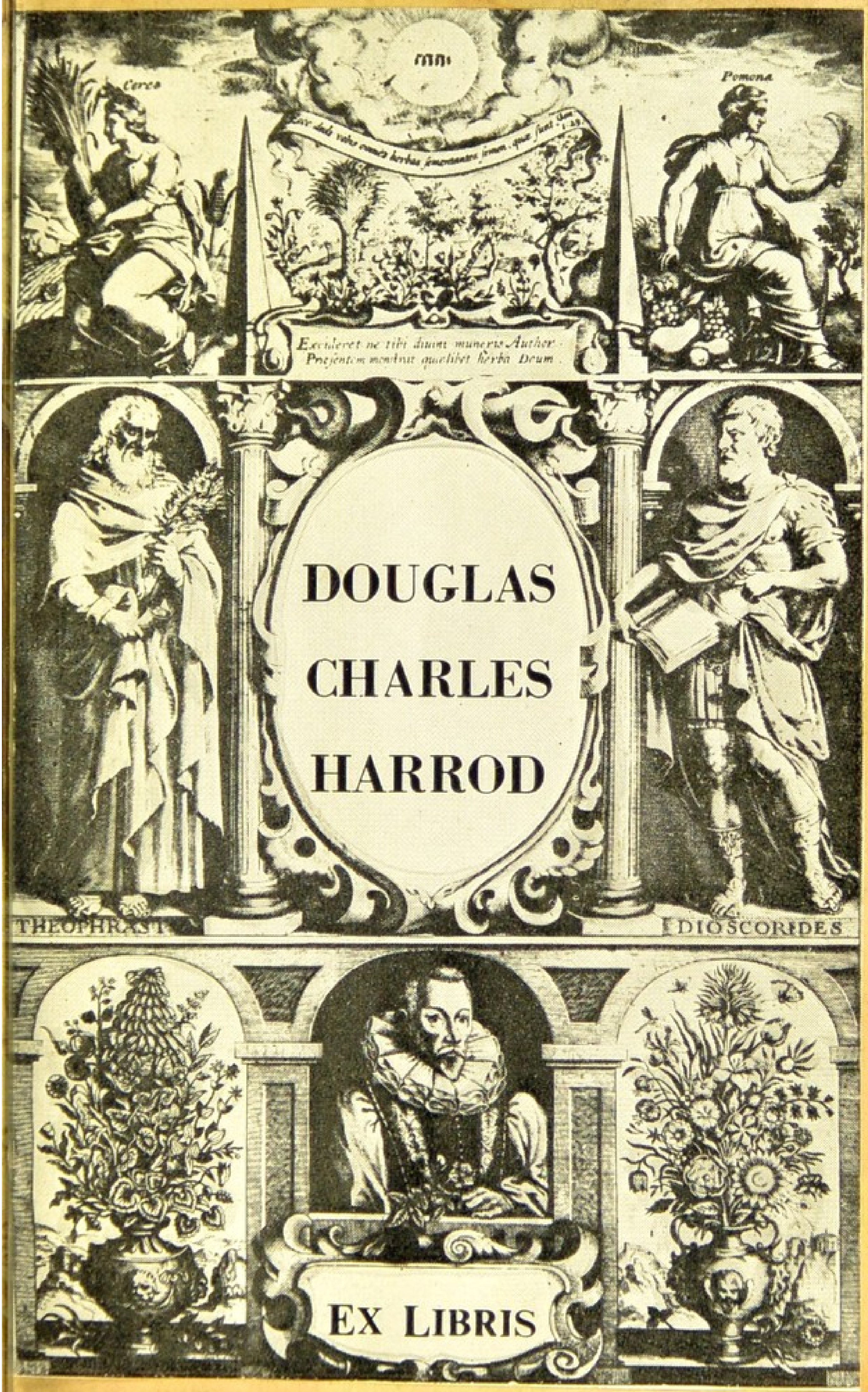
MATERIA MEDICA
AND PHARMACY



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MATERIA MEDICA
AND
PHARMACY

MATERIA MEDICA

OF

VEGETABLE AND ANIMAL ORIGIN

WITH NOTES ON THE

PHARMACY OF OFFICIAL DRUGS

BY

JOHN HUMPHREY

SECOND EDITION, ENLARGED

LONDON
HENRY KIMPTON
13 FURNIVAL STREET, HOLBORN, E.C.
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A. STENHOUSE, 40 AND 42 UNIVERSITY AVENUE
1907

METRIC MEASURES AND IMPERIAL EQUIVALENTS

Measures of Length

1 Metre (m.) = 39·370113 Inches.
1 Decimetre (dm.) = 0·1 m. = 3·937011 Inches.
1 Centimetre (cm.) = 0·1 dm. = 0·393701 Inch.
1 Millimetre (mm.) = 0·1 cm. = 0·039370 Inch.
1 Micron (μ) = 0·001 mm. = 0·0000394 Inch.

Measures of Mass

1 Gramme (gm.) = 15·4324 Grains.
1 Decigram (dgm.) = 0·1 gm. = 1·5432 Grains.
1 Centigram (cgm.) = 0·1 dgm. = 0·1543 Grain.
1 Milligram (mgm.) = 0·1 cgm. = 0·0154 Grain.
1 Microgram (γ) = 0·001 mgm. = 0·000015 Grain.

Measures of Volume

1 Litre (l.) = 35·1960 Fluid Ounces.
1 Mil (ml.) = 0·001 l. = 16·8941 Minims.
1 Decimil (d.) = 0·1 ml. = 1·6894 Minims.
1 Centimil (c.) = 0·1 d. = 0·1689 Minim.
1 Microl (λ) = 0·1 c. = 0·0169 Minim.

Note.—One fluid drachm is equal approximately to four mils, and two drops from a pipette made to deliver twenty drops to one gramme of distilled water are equal to one decimil.

ERRATA ET ADDENDA

Page 8 Line 18; for ‘1 in 8·75’ read ‘4 in 8·75.’
,, 5 ,, 19; for ‘dcm’ read ‘dm.’
,, 6 ,, 7; for ‘*napellus*’ read ‘*Napellus.*’
,, 7 ,, 3; for ‘*napellus*’ read ‘*Napellus.*’
,, 7 ,, 9; for ‘*napellus*’ read ‘*Napellus.*’
,, 7 ,, 22; for ‘*napellus*’ read ‘*Napellus.*’
,, 10 ,, 18; for ‘*calamus*’ read ‘*Calamus.*’
,, 15 ,, 4; after ‘Acanthaceæ’ add ‘a native of India.’
,, 28 ,, 6; delete ‘Emplastrum Galbani (1 in 11).
,, 31 ,, 26; Add ‘The oil is used for preparing Oleum Phosphoratum.’
,, 42 ,, 7; Add ‘Sapo Durus.’
,, 46 ,, 19; for ‘*armoracia*’ read ‘*Armoracia.*’
,, 56 ,, 26; for ‘0·5’ read ‘0·05.’
,, 76 ,, 35; Note that the supposed ‘berberine’ has been shown to consist of columbamine and other alkaloids.
,, 84 ,, 37; for ‘an anhydride’ read ‘a lactone.’
,, 84 ,, 44; after ‘ether’ add ‘glacial acetic acid.’
,, 95 ,, 36; for ‘roots’ read ‘cortex.’
,, 117 ,, 2; Note that cimicifugin is now understood to be a mixture.
,, 122 ,, 40; Add ‘Pulvis Cretæ Aromaticus (1 in 11½).’
,, 135 ,, 12; for ‘‘*Condurango*’ read ‘*Cundurango.*’
,, 168 ,, 10; Delete ‘contains much starch and’
,, 169 ,, 13; Note that ergotinine is now said to be almost inert, and that an amorphous alkaloid named ergotoxine is claimed to be the chief constituent of ergot, though a crystalline substance named clavine is also said to possess the characteristic action of the drug. Cornutine appears to be impure ergotoxine.
,, 174 ,, 35; for ‘ærial’ read ‘aerial.’
,, 177 ,, 9; after ‘Ruminantia’ add ‘or Ungulata.’
,, 179 ,, 8; after ‘Filicineæ’ add ‘or Polypodiaceæ.’
,, 195 ,, 6; Note that fresh gentian root is now said to contain three bitter principles—gentiopicrin, gentiin, and gentiamarin—but that only the last two are found in the dried root, the gentiopicrin being apparently hydrolysed during the process of drying.
,, 202 ,, 29; for ‘aklaloids’ read ‘alkaloids.’
,, 205 ,, 12; Note that the commercial drug is said to be obtained largely from *Grindelia camporum.*
,, 205 ,, 13; Note that the presence of saponin and alkaloidal matter has not been confirmed.
205 ,, 15; after ‘tannin’ delete rest of paragraph.
,, 208 ,, 42; after ‘making’ add ‘Mucilago Gummi Indici and’

Page 212 Line 21; Note that gynocardic acid is now understood to be a mixture, and that chaulmoogric acid is a constituent of the oil.

,, 219 ,, 8; Note that the exact number of the annulations or skin-rings has been proved to be one hundred and two, and that, in addition to the twenty-six true segments, there are seven segments fused together to form the posterior sucker of the leech.

,, 219 ,, 21; Note that the blood absorbed by the leech is prevented from clotting while digestion is proceeding by the action of a ferment secreted by certain glandular cells. The presence of hirudine has not been confirmed.

,, 219 ,, 28; for 'Timnobdella' read 'Limnobdella.'

,, 251 ,, 27; for '*jujuba*' read '*Jujuba*.

,, 258 ,, 20; Add 'It is an ingredient of Spiritus Lavandulæ (1 in 10), and of Tinctura Lavandulæ Composita.'

,, 259 ,, 21; Note that the taste is due to the presence of citric acid in the juice which, when freshly expressed, constitutes the official Succus Limonis.

,, 260 ,, 35; for 'occurs' read 'may occur.'

,, 260 ,, 37; for 'monyl' read 'nonyl.'

,, 264 ,, 34; for 'deep blue' read 'red.'

,, 264 ,, 35; for 'red' read 'deep blue.'

,, 273 ,, 20; for 'the Argentine Republic' read 'Argentina.'

,, 278 ,, 12; Delete 'of oil.'

,, 281 ,, 21; Note that cod-liver oil also contains palmitin.

,, 294 ,, 16; for 'Elix' read 'Aix.'

,, 297 ,, 33; for 'morpheine' read 'morphine.'

,, 298 ,, 44; for 'opuim' read 'opium.'

,, 306 ,, 1; Delete 'Bark.'

,, 309 ,, 35; for '*aries*' read '*Aries.*'

,, 309 ,, 36; for '*taurus*' read '*Taurus.*'

,, 335 ,, 4; after 'Cupuliferæ' add 'or Fagaceæ.'

,, 382 ,, 2; Add 'The drug is a bitter stomachic, and is used in the preparation of Infusum Serpentariæ, Liquor Serpentariæ Concentratus, and Tinctura Serpentariæ.

,, 383 ,, 10; Add 'Sapo Durus.'

,, 388 ,, 30; let 'the volatile oil' follow 'isothiocyanate.'

,, 394 ,, 22; Note that the seeds of *Strophanthus Kombé* are now obtainable in commerce.

,, 403 ,, 42; for 'are' read 'is'

,, 404 ,, 12; Add 'The oil possesses antiseptic, diuretic, and anthelmintic properties. It is used in the preparation of Linimentum Terebinthinæ, Linimentum Terebinthinæ Aceticum, and Terebenum.'

,, 415 ,, 33; for 'Seminæ' read 'Semina.'

,, 423 ,, 20; Add 'Syrupus Urgineæ (1 in 18).'

SYNOPSIS OF MATERIA MEDICA

OF

VEGETABLE AND ANIMAL ORIGIN

Name of Drug.	Natural Origin.	Family or Order.
Anthemidis Flores	*Anthemis nobilis*	Compositæ
Anthemidis Oleum	*Anthemis nobilis*	Compositæ
Arachis Oleum	*Arachis hypogæa*	Leguminosæ
Araroba	*Andira Araroba*	Leguminosæ
Arecæ Semina	*Areca Catechu*	Palmaceæ
Aristolochia	*Aristolochia indica*	Aristolochiaceæ
Armoraciæ Radix	*Cochlearia Armoracia*	Cruciferæ
Arnicæ Flores	*Arnica montana*	Compositæ
Arnicæ Rhizoma	*Arnica montana*	Compositæ
Asafetida	*Ferula fœtida*, and other species	Umbelliferæ
Aurantii Floris Aqua	*Citrus Aurantium*, var. *Bigaradia*	Rutaceæ
Aurantii Cortex	*Citrus Aurantium*, var. *Bigaradia*	Rutaceæ
Aurantii Cortex Indicus	*Citrus Aurantium*	Rutaceæ
Azadirachta Indica	*Melia Azadirachta*	Meliaceæ
Balsamum Peruvianum	*Myroxylon Pereiræ*	Leguminosæ
Balsamum Tolutanum	*Myroxylon Toluifera*	Leguminosæ
Bebeeru Cortex	*Nectrandra Rodiæi*	Lauraceæ
Belæ Fructus	*Ægle Marmelos*	Rutaceæ
Belladonnæ Folia	*Atropa Belladonna*	Solanaceæ
Belladonnæ Radix	*Atropa Belladonna*	Solanaceæ
Benzoinum	*Styrax Benzoin*, and other species	Styraceæ
Berberidis Cortex	*Berberis vulgaris*	Berberidaceæ
Berberis	*Berberis aristata*	Berberidaceæ
Betel	*Piper Betle*	Piperaceæ
Bryoniæ Radix	*Bryonia dioica*	Cucurbitaceæ
Buchu Folia	*Barosma betulina*	Rutaceæ
Buteæ Gummi	*Butea frondosa*	Leguminosæ
Buteæ Semina	*Butea frondosa*	Leguminosæ
Cadinum Oleum	*Juniperus Oxycedrus*, and other species	Coniferæ or Pinaceæ
Cajuputi Oleum	*Melaleuca leucadendron*	Myrtaceæ
Calendulæ Flores	*Calendula officinalis*	Compositæ
Calotropis	*Calotropis procera* and *Calotropis gigantea*	Asclepiadaceæ
Calumbæ Radix	*Jateorrhiza Columba*	Menispermaceæ

Geographical Source.	Brief Description.	Chief Constituents.
Belgium, France, etc.	Dried expanded flower-heads	Volatile oil.
England and Germany	Volatile oil	Alcohols and esters
India, China, and America	Fixed oil	Olein and other glycerides.
Bahia (Brazil)	Crude chrysarobin	Chrysarobin and chrysophanic acid.
India and the Philippine Islands	Ripe seeds	Arecoline and other alkaloids.
India and New Holland	Dried stem and root	Aristolochine and volatile oil.
Britain	Fresh root	Sinigrin and myrosin.
Central and Southern Europe	Dried flowers	Volatile oil, resin, and arnisterin.
Central and Southern Europe	Dried rhizome and rootlets	Volatile oil and arnisterin.
Persia and Afghanistan	Gum-resinous exudation from stem and root	Resin gum, and volatile oil.
South of Europe	Distilled water of flowers	Volatile oil.
Spain and Sicily	Fresh or dried outer part of rind	Volatile oil.
India and Ceylon	Fresh or dried outer part of rind	Volatile oil.
Southern India, Ceylon, etc.	Dried stem bark	Resin and margosine.
San Salvador	Balsam from trunk	Cinnamein.
New Granada	Balsam from trunk	Cinnamic acid and cinnamein.
Guiana	Dried bark	Beberine and other alkaloids.
India	Fresh half-ripe fruit	Mucilage and pectin.
Britain and Germany	Fresh leaves and branches	Hyoscyamine and atropine.
Britain and Germany	Dried root	Hyoscyamine and atropine
Siam and Sumatra	Balsamic resin	Benzoic and cinnamic acids.
Britain	Dried bark	Berberine and other alkaloids.
India and Ceylon	Dried stem	Berberine and other alkaloids.
India, Ceylon, etc.	Dried leaves	Volatile oil.
England and Central and Southern Europe	Fresh and dried root	Bryonin and bryoresin.
Cape Colony	Dried leaves	Volatile oil and mucilage.
India	Inspissated juice	Tannic and gallic acids.
India	Ripe seeds	Fixed oil.
South of France	Empyreumatic oily liquid	Cadinene.
East and West Indies	Volatile oil from leaves	Cineol (Eucalyptol.)
Levant and Southern Europe	Dried ray-florets	Volatile oil and resin.
India	Dried root-bark	Bitter and acid resins
Eastern Africa	Dried slices of root	Calumbic acid, calumbin and columbamine

Name of Drug.	Natural Origin.	Family or Order.
Cambogia	*Garcinia Hanburii*	Guttiferæ
Cambogia Indica	*Garcinia Morella*	Guttiferæ
Camphora	*Cinnamomum Camphora*	Lauraceæ
Canellæ Cortex	*Canella alba*	Canellaceæ
Cannabis Indica	*Cannabis sativa*	Urticaceæ
Cantharis	*Cantharis vesicatoria*	Coleoptera
Caoutchouc	*Hevea brasiliensis*	Euphorbiaceæ
Capsici Fructus	*Capsicum minimum*	Solanaceæ
Carbo Animalis	Bones	Various
Carbo Ligni	Wood	Various
Cardamomi Semina	*Elettaria Cardamomum*	Scitaminaceæ
Carui Fructus	*Carum Carvi*	Umbelliferæ
Carui Oleum	*Carum Carvi*	Umbelliferæ
Caryophylli Oleum	*Eugenia caryophyllata*	Myrtaceæ
Carophyllum	*Eugenia caryophyllata*	Myrtaceæ
Cascara Sagrada	*Rhamnus purshianus*	Rhamnaceæ
Cascarilla	*Croton Eluteria*	Euphorbiaceæ
Cassiæ Cortex	*Cinnamomum Cassia*	Lauraceæ
Cassiæ Flores	*Cinnamomum Cassia*, and other species	Lauraceæ
Cassiæ Pulpa	*Cassia Fistula*	Leguminosæ
Castor	*Castor Fiber*	Rodentia
Catechu	*Uncaria Gambier*	Rubiaceæ
Catechu Nigrum	*Acacia Catechu*	Leguminosæ
Cera Alba	*Apis mellifica*	Hymenoptera
Cera Flava	*Apis mellifica*	Hymenoptera
Cetaceum	*Physeter macrocephalus*	Cetacea
Cetraria	*Cetraria islandica*	Discomycetes or Discolichenes
Cevadilla	*Schœnocaulon officinalis*	Liliaceæ
Chenopodium	*Chenopodium ambrosioides* and *C. ambrosioides*, var. *anthelmintica*	Chenopodiaceæ
Chirata	*Swertia Chirata*	Gentianaceæ
Chondrus	*Chondrus Crispus*	Gigartinaceæ
Chrysarobinum	Araroba	Leguminosæ
Cimicifugæ Rhizoma	*Cimicifuga racemosa*	Ranunculaceæ

Geographical Source.	Brief Description.	Chief Constituents.
Siam	Gum-resin	Resin and gum.
India	Gum-resin	Resin and gum.
China, Formosa, and Japan	White crystalline solid	Ketone or keto-tetrahydrocymene.
West Indies	Dried bark	Volatile oil and bitter principle.
India	Dried flowering or fruiting tops of female plants	Cannabin.
Spain, France, Sicily, Hungary, and Southern Russia	Dried beetle	Cantharidin.
Brazil	Prepared milk juice	Caoutchouc.
Zanzibar, Sierra Leone, etc.	Dried ripe fruit	Capsaicin.
Britain	Carbonaceous residue of bones	Calcium phosphate and carbon.
Britain	Carbonaceous residue of wood	Carbon.
India and Ceylon	Dried ripe seeds	Volatile oil.
Europe	Dried fruit	Volatile oil.
Central and Northern Europe	Volatile oil from fruit	Carvone.
Britain and Germany	Volatile oil from flower-buds	Eugenol.
Zanzibar, Pemba, etc.	Dried flower-buds	Volatile oil.
North California	Dried bark	Bitter substance and emodin.
Bahama Islands	Dried bark	Cascarilline and volatile oil
Southern China	Dried bark	Volatile oil.
Southern China	Immature fruits	Volatile oil.
India	Pulp from the pods	Mucilage and pectin
Hudson's Bay Territory, etc.	Dried preputial follicles	Resin and volatile oil.
Malay Archipelago	Extract of leaves and young shoots	Catechin and catechu-tannic acid.
India and Burmah	Extract of heartwood	Catechu-tannic acid and acacatechin.
Britain, etc.	Bleached wax from honeycomb	Cerotic acid (Cerin), and myricin.
Britain, etc.	Wax from honeycomb	Cerotic acid and myricin.
Pacific and Indian Oceans	Concrete fatty substance	Cetyl palmitate (Cetin)
Britain, etc.	Dried lichen	Lichenin and isolichenin.
Mexico, Guatemala, and Venezuela	Dried ripe seeds	Veratrine.
United States	Dried fruit	Volatile oil.
Northern India	Dried plant	Ophelic acid and chiratin.
Ireland and Massachusetts	Dried plant	Carageenin and proteids.
Britain	Purified araroba	Chrysarobin and chrysophanic acid.
Canada and United States	Dried rhizome and roots	Cimicifugin and racemosin.

Name of Drug.	Natural Origin.	Family or Order.
Cinchonæ Flavæ Cortex	*Cinchona Calisaya*	Rubiaceæ
Cinchonæ Lancifoliæ Cortex	*Cinchona lancifolia*	Rubiaceæ
Cinchonæ Rubræ Cortex	*Cinchona succirubra*	Rubiaceæ
Cinnamodendron	*Cinnamodendron corticosum*	Canellaceæ
Cinnamomi Cortex	*Cinnamomum Zeylanicum*	Lauraceæ
Cinnamomi Oleum	*Cinnamomum Zeylanicum*	Lauraceæ
Cissampelos	*Cissampelos Pareira*	Menispermaceæ
Cocæ Folia	*Erythroxylon Coca*	Linaceæ
Cocculi Fructus	*Anamirta paniculata*	Menispermaceæ
Coccus	*Coccus Cacti*	Hemiptera
Cocos Oleum	*Cocos nucifera*	Palmaceæ
Colchici Cormus	*Colchicum autumnale*	Liliaceæ
Colchici Semina	*Colchicum autumnale*	Liliaceæ
Colocynthidis Pulpa	*Citrullus Colocynthis*	Cucurbitaceæ
Condurango Cortex	*Gonolobus Condurango*	Asclepiadaceæ
Conii Folia	*Conium maculatum*	Umbelliferæ
Conii Fructus	*Conium maculatum*	Umbelliferæ
Convallariæ Flores (Herba)	*Convallaria majalis*	Liliaceæ
Copaiba	*Copaifera Lansdorfii* and other species	Leguminosæ
Copaibæ Oleum	*Copaifera Lansdorfii* and other species	Leguminosæ
Coriandri Fructus	*Coriandrum sativum*	Umbelliferæ
Coriandri Oleum	*Coriandrum sativum*	Umbelliferæ
Coscinium	*Coscinium fenestratum*	Menispermaceæ
Coto	Unknown	Lauraceæ or Monimiaceæ
Crocus	*Crocus sativus*	Iridaceæ
Crotonis Oleum	*Croton Tiglium*	Euphorbiaceæ
Cubebæ Fructus	*Piper Cubeba*	Piperaceæ
Cubebæ Oleum	*Piper Cubeba*	Piperaceæ
Cucurbitæ Semina Præparata	*Cucurbita maxima*	Cucurbitaceæ
Cumini Fructus	*Cuminum Cyminum*	Umbelliferæ
Curara	*Strychnos toxifera*	Loganiaceæ
Curcumæ Rhizoma	*Curcuma longa*	Scitaminaceæ
Cuspariæ Cortex	*Cusparia febrifuga*	Rutaceæ
Cusso	*Brayera anthelmintica*	Rosaceæ

Geographical Source.	Brief Description.	Chief Constituents.
Bolivia and Southern Peru	Dried bark	Quinine and other alkaloids.
New Granada	Dried bark	Quinine and other alkaloids.
India, Jamaica, Ceylon, etc.	Dried bark of stem and branches of cultivated plants	Quinine, cinchonidine, cinchonine, quinidine, and other alkaloids.
Jamaica	Dried bark	Volatile oil and tannin.
Ceylon	Dried inner bark of shoots from truncated stocks	Volatile oil.
Ceylon and England	Volatile oil from bark	Cinnamic aldehyde and eugenol.
India	Dried root	Beberine (Pelosine).
Bolivia and Peru	Dried leaves	Cocaine and other alkaloids.
India and Malay Archipelago	Dried fruit	Picrotoxin.
Mexico and Canary Islands	Dried fecundated female insects	Carminic acid.
India, Ceylon, etc.	Solid white fat	Various glycerides.
England, Ireland, etc.	Fresh and dried corms	Colchicine.
England, Ireland, etc.	Dried ripe seeds	Colchicine.
Northern Africa, Syria, Spain, Cyprus, etc.	Dried pulp of fruit, freed from seeds	Colocynthin.
Ecuador	Dried bark	Condurangin.
Britain and Central Europe	Fresh leaves and young branches	Coniine and conhydrine.
Britain and Central Europe	Dried full-grown unripe fruits	Coniine and conhydrine.
England	Dried inflorescence or entire plant	Convallamarin and convallarin.
Central and South America	Oleo-resin from trunk	Volatile oil and resin.
Britain and Germany	Volatile oil from oleo-resin	Caryophyllene.
Russia, Thuringia, etc.	Dried ripe fruit	Volatile oil.
Britain and Germany	Volatile oil from fruit	Linalool (Coriandrol).
India and Ceylon	Dried stem	Berberine and saponin.
Bolivia	Dried bark	Cotoin.
Spain, France, Austria, and Italy	Dried stigmas and tops of styles	Volatile oil and crocin.
India and England	Expressed oil from seeds	Crotonoleic acid and croton-resin.
Java, Sumatra and Borneo	Dried full-grown unripe fruit	Volatile oil and cubebin.
England and Germany	Volatile oil from fruit	Cadinene.
Levant and India	Prepared fresh ripe seeds	Acrid resin.
Northern Africa, Sicily, Malta, and India	Dried fruit	Volatile oil.
South America	Extract from bark	Curarine and curine.
India, China, Java, etc.	Dried rhizome	Curcumin and volatile oil
Venezuela	Dried bark	Volatile oil, angusturin, and various alkaloids.
Abyssinia	Dried panicles of pistillate flowers	Kosotoxin and koussin.

Name of Drug.	Natural Origin.	Family or Order.
Cydoniæ Semina	*Pyrus Cydonia*	Rosaceæ
Damiana	*Turnera diffusa*, var. *aphrodisaica* and other species	Turneraceæ
Daturæ Folia	*Datura fastuosa*, var. *alba*, and *D. Metel*	Solanaceæ
Daturæ Semina	*Datura fastuosa*, var. *alba*	Solanaceæ
Digitalis Folia	*Digitalis purpurea*	Scrophulariaceæ
Dulcamaræ Stipites	*Solanum Dulcamara*	Solanaceæ
Elaterium	*Ecballium Elaterium*	Cucurbitaceæ
Elemi	*Canarium commune* and other species	Burseraceæ
Embelia	*Embelia Ribes and E. robusta*	Myrsinaceæ
Ergota	*Claviceps purpurea* and *Secale cereale*	Pyrenomycetes and Graminaceæ
Erythrophlei Cortex	*Erythrophlœum guineense*	Leguminosæ
Eucalypti Gummi	*Eucalytus rostrata* and other species	Myrtaceæ
Eucalypti Oleum	*Eucalyptus Globulus* and other species	Myrtaceæ
Euonymi Cortex	*Euonymus atropurpureus*	Celastraceæ
Euphorbiæ Herba	*Euphorbia pilulifera*	Euphorbiaceæ
Euphorbium	*Euphorbia resinifera*	Euphorbiaceæ
Fel Bovinum Purificatum	*Bos Taurus*	Ungulata or Ruminantia
Ficus	*Ficus Carica*	Urticaceæ
Filix Mas	*Aspidium Filix-mas*	Polypodiaceæ or Filicineæ
Fœniculi Fructus	*Fœniculum capillaceum*	Umbelliferæ
Fœni-græci Semina	*Trigonella Fœnum-græcum*	Leguminosæ
Frangulæ Cortex	*Rhamnus Frangula*	Rhamnaceæ
Fucus	*Fucus vesiculosis*	Fucaceæ
Galangæ Rhizoma	*Alpinia officinarum*	Scitaminaceæ
Galbanum	*Ferula galbaniflua* and other species	Umbelliferæ
Galla	*Cynips Gallæ tinctoriæ* and *Quercus infectoria*	Hymenoptera and Cupuliferæ or Fagaceæ
Gaultheriæ Oleum	*Gaultheria procumbens* or *Betula lenta.*	Ericaceæ or Betulaceæ
Gelatinum	Animal Tissues.	Various
Gelsemii Radix	*Gelsemium nitidum*	Loganiaceæ
Gentianæ Radix	*Gentiana lutea*	Gentianaceæ
Glucosum Liquidum	Starch	Various
Glycyrrhizæ Radix	*Glycyrrhiza glabra* and other species	Leguminosæ
Gossypii Radicis Cortex	*Gossypium herbaceum*	Malvaceæ
Gossypium	*Gossypium Barbadense* and other species	Malvaceæ

Geographical Source.	Brief Description.	Chief Constituents.
Persia and Central Europe	Dried ripe seeds	Cydonin and amygdalin.
South America and West Indies	Dried leaves	Bitter principle and volatile oil.
India	Dried leaves	Hyoscine.
India	Dried seeds	Hyoscine.
England and Germany.	Dried leaves	Digitoxin and digitalin.
England	Stems and branches	Dulcamarin.
England and Malta	Dried sediment from juice of fruit	Elaterin.
Philippine Islands	Oleo-resin	Volatile oil and resins.
East Indies	Dried fruit	Embelic acid.
Russia, Spain, Germany, etc.	Sclerotium of fungus	Ergotoxine, sclerotic acid and sphacelotoxin.
Upper Guinea and Senegambia	Dried bark	Erythrophleine.
Australia	Ruby-coloured exudation from bark	Kinotannic acid.
Australia and Tasmania	Volatile oil from fresh leaves	Cineol (Eucalyptol).
United States	Dried root-bark	Euonymin.
India, Australia, etc.	Aerial portion of plant.	Glucosidal matter.
Morocco	Gum-resin	Acrid resin.
Domesticated everywhere	Purified contents of gall-bladder	Sodium salts of glycocholic and taurocholic acids.
Smyrna and Greece	Dried fleshy receptacles	Grape sugar.
Britain	Dried rhizome	Filmaron and filicic acid.
France, Germany, Russia, etc.	Dried ripe fruit	Volatile oil.
India, Egypt, and Morocco	Dried seeds	Mucilage, fixed oil, and volatile oil.
Britain	Dried bark	Frangulin, emodin, and iso-emodin.
Britain	Dried seaweed	Algin and various salts.
China and Siam	Dried rhizome	Volatile oil and galangol.
Persia	Gum resin	Resin, gum, and volatile oil.
Asia Minor, Persia, and Greece	Excrescences on bark caused by development of eggs	Gallotannic and gallic acids.
United States and Canada	Volatile oil from leaves or bark	Methyl salicylate.
Britain, France, etc.	Horny sheets	Gelatin.
Southern United States	Dried rhizome and roots	Gelseminine and gelsemine.
Germany, Switzerland, France, and Spain	Dried rhizome and roots	Gentiopicrin.
United States	Syrupy liquid	Dextrose.
England, France, Spain, Russia, and Persia	Peeled root and subterranean stem	Glycyrrhizin.
India, Persia, and Southern Europe	Dried root-bark	Acid resin.
Tropical and sub-tropical countries	Hairs of seed	Cellulose.

Name of Drug.	Natural Origin.	Family or Order.
Graminis Citrati Oleum	*Andropogon citratis*	Graminaceæ
Granati Cortex	*Punica Granatum*	Lythrariaceæ
Granati Fructus	*Punica Granatum*	Lythrariaceæ
Grindelia	*Grindelia squarrosa* and *G. robusta*	Compositæ
Guaiaci Lignum	*Guaiacum officinale* or *G. sanctum*	Zygophyllaceæ
Guaiaci Resina	*Guaiacum officinale* or *G. sanctum*	Zygophyllaceæ
Guarana	*Paullinia Cupana*	Sapindaceæ
Gummi Indicum	*Anogeissus latifolia*	Combretaceæ
Gutta Percha	*Palaquium oblongifolium* and other species	Sapotaceæ
Gynocardiæ Oleum	*Taraktogenous Kurzii*	Bixaceæ
Hæmatoxyli Lignum	*Hæmatoxylon campechianum*	Leguminosæ
Hamamelidis Cortex	*Hamamelis virginiana*	Hamamelidaceæ
Hamamelidis Folia	*Hamamelis virginiana*	Hamamelidaceæ
Hellebori Nigri Rhizoma	*Helleborus niger*	Ranunculaceæ
Hemidesmi Radix	*Hemidesmus indicus*	Asclepiadaceæ
Hirudo	*Sanguisuga medicinalis* and *S. officinalis*	Hirudinea
Hirudo Australis	*Hirudo quinquestriata*	Hirudinea
Hordei Fructus	*Hordeum distichon*	Graminaceæ
Hydrastis Rhizoma	*Hydrastis Canadensis*	Ranunculaceæ
Hygrophila	*Hygrophila spinosa*	Acanthaceæ
Hyoscyami Folia	*Hyoscyamus niger*	Solanaceæ
Hyoscyami Semina	*Hyoscyamus niger*	Solanaceæ
Ichthyocolla	*Acipenser Huso* and other species	Sturiones
Ignatii Semina	*Strychnos Ignatii*	Loganiaceæ
Indigo	*Indigofera tinctoria* and *I. Anil*	Leguminosæ
Inulæ Radix	*Inula Helenium*	Compositæ
Ipecacuanhæ Radix	*Psychotria Ipecacuanha*	Rubiaceæ
Iridis Rhizoma	*Iris germanica, I. pallida* and *I. florentina*	Iridaceæ
Ispaghula	*Plantago ovata*	Plantaginaceæ
Jaborandi Folia	*Pilocarpus Jaborandi*	Rutaceæ
Jalapa	*Ipomœa Purga*	Convolvulaceæ
Juniperi Oleum	*Juniperus communis*	Coniferæ
Kaladana	*Ipomœa hederacea*	Convolvulaceæ
Kamala	*Mallotus Philippinensis*	Euphorbiaceæ

Geographical Source.	Brief Description.	Chief Constituents.
India	Volatile oil	Citral.
Southern Europe and Central Asia	Dried bark of stem and root	Pelletierine and other alkaloids.
Southern Europe and Central Asia	Dried rind of fruit	Gum, sugar, and tannic acid.
North America	Dried leaves and flowering-tops	Resin and volatile oil.
West Indies and South America	Heart-wood	Resin.
West Indies and South America	Resin from stem	Guaiaconic, guaiaretic, and guaiacic acids.
Brazil and Uruguay	Prepared seeds	Caffeine (Guararine).
India and Ceylon	Gummy exudation	Arabin.
Malay Archipelago	Dried and purified latex	Gutta.
Burmah	Fixed oil from seeds	Gynocardic acid, a mixture
Campeachy, Honduras, Jamaica, etc.	Heart-wood	Hæmatoxylin (Hæmatin).
United States and Canada	Dried bark	Hamamelo-tannic acid.
United States and Canada	Fresh or dried leaves	Hamamelo-tannic acid.
Central and Southern Europe	Dried rhizome and rootlets	Helleborin and helleborein.
India and Ceylon	Dried root	Coumarin.
Germany, France, Hungary, etc.	Aquatic worm	Ferment.
Australia	Aquatic worm	Ferment.
Britain	Fruit divested of integuments	Starch and albuminoids.
United States and Canada	Dried rhizome and roots	Berberine, hydrastine, and canadine.
India	Dried herb	Mucilage.
Britain and Germany	Fresh or dried leaves and flowers, with or without branches	Hyoscyamine and hyoscine
Britain and Germany	Dried seeds	Hyoscyamine and hyoscine
Caspian and Black Seas	Whitish shreds or horny sheets	Gelatin.
Philippine Islands	Dried seeds	Strychnine and brucine.
East and West Indies	Blue pigment	Indigotin.
Holland, Switzerland, and Thuringia	Dried root	Acrid resin and volatile oil
Brazil and Johore	Dried root	Emetine, cephaeline, and psychotrine.
Italy and Morocco	Dried rhizome	Iridin, fixed oil, and volatile oil.
India and Persia	Dried seeds	Mucilage.
Pernambuco and Ceara	Dried leaflets	Pilocarpine, isopilocarpine, and pilocarpidine
Mexico, Jamaica, and India	Dried tubercules	Jalapin and scammonin.
Northern Europe	Volatile oil from full-grown unripe fruit	Pinene and cadinene.
India	Dried seeds	Jalapin (Pharbitisin).
India, China, Ceylon, etc.	Glands and hairs from fruit	Rottlerin, iso-rottlerin, and resins.

Name of Drug.	Natural Origin.	Family or Order.
Kavæ Rhizoma	*Piper methysticum*	Piperaceæ
Kino	*Pterocarpus Marsupium*	Leguminosæ
Kino Eucalypti	*Eucalyptus* species	Myrtaceæ
Kolæ Semina	*Cola vera, C. acuminata* and other species	Sterculiaceæ
Krameriæ Radix	*Krameria triandra* and *K. argentea*	Polygalaceæ
Lacca	*Coccus Lacca*	Hemiptera
Lactuca	*Lactuca virosa*	Compositæ
Lactucarium	*Lactuca virosa*	Compositæ
Laricis Cortex	*Larix europæa*	Coniferæ
Lauri Fructus	*Lauris nobilis*	Lauraceæ
Laurocerasi Folia	*Prunus Laurocerasus*	Rosaceæ
Lavandulæ Oleum	*Lavandula vera*	Labiatæ
Limonis Cortex	*Citrus Medica*, var. β-*Limonum*	Rutaceæ
Limonis Oleum	*Citrus Medica*, var. β-*Limonum*	Rutaceæ
Limonis Succus	*Citrus Medica*, var. β-*Limonum*	Rutaceæ
Lini Oleum	*Linum usitatissimum*	Linaceæ
Linum	*Linum usitatissimum*	Linaceæ
Litmus	*Roccella tinctoria*	Discomycetes
Lobelia	*Lobelia inflata*	Lobeliaceæ
Lupulinum	*Humulus Lupulus*	Urticaceæ
Lupulus	*Humulus Lupulus*	Urticaceæ
Lycopodium	*Lycopodium clavatum*, and other species	Lycopodiaceæ
Manna	*Fraxinus Ornus*	Oleaceæ
Marrubii Herba	*Marrubium vulgare*	Labiatæ
Mastiche	*Pistacia Lentiscus*	Anacardiaceæ
Maté Folia	*Ilex paraguayensis*	Ilicaceæ
Maticæ Folia	*Piper angustifotium*	Piperaceæ
Mel Depuratum	*Apis mellifica*	Hymenoptera
Menthæ Piperitæ Oleum	*Mentha piperita*	Labiatæ

Geographical Source.	Brief Description.	Chief Constituents.
Sandwich Islands	Dried decorticated rhizome	Acrid resin.
Malabar	Dried exudation from stem	Kinotannic acid.
Australia	Dried exudation from stem	Kinotannic acid.
West Indies, Brazil, Java, etc.	Dried kernels of seeds	Caffeine.
Brazil, Peru and Bolivia	Dried root	Krameria - tannic (Ratanhia-tannic) acid.
East Indies and Ceylon	Resinous exudation in flakes	Resin and laccaic acid.
Britain, France, Germany, etc.	Fresh herb	Lactucarium.
Britain, France, Germany, etc.	Dried exudation from stem	Lactucin, lactucic acid and lactucopicrin.
England, Central and Southern Europe	Dried bark	Tannic acid.
Southern Europe and Syria	Ripe fruit	Fixed oil, volatile oil, and bitter principle
Britain and other temperate regions	Fresh leaves	Laurocerasin and emulsin
England, Southern Europe, and Northern Africa	Distilled oil from flowers	Linalool and linalyl acetate
Southern Europe	Fresh outer part of pericarp of fruit	Volatile oil.
Southern Europe	Volatile oil from peel	Citral, geraniol, etc.
Southern Europe and West Indies	Freshly expressed juice of ripe fruit	Citric acid.
Britain	Fixed oil from seeds	Linolein.
Britain, Holland, Russia, etc.	Dried ripe seeds, entire or in coarse powder	Fixed oil and mucilage.
European and African Coasts	Blue pigment	Azolitmin.
North America	Dried flowering herb	Lobeline.
England, Germany, etc.	Glands from strobiles	Volatile oil and lupamaric acid.
England, Germany, Russia, California, etc.	Dried strobiles	Lupulin.
Russia, Germany, and Switzerland	Pale yellowish spores	Fixed oil.
Calabria and Sicily	Concrete saccharine exudation	Mannite.
England and Southern France	Leaves and flowering tops	Marrubiin and volatile oil.
Grecian Archipelago	Concrete resinous exudation	Resin and volatile oil.
Brazil and Argentina	Dried leaves	Caffeine.
Peru, Bolivia, Brazil, etc.	Dried leaves	Volatile oil and tannin.
Domesticated everywhere	Saccharine secretion	Dextrose and levulose.
England, France, Germany, and United States	Volatile oil from fresh plants	Menthol.

Name of Drug.	Natural Origin.	Family or Order.
Menthæ Viridis Oleum	*Mentha viridis*	Labiatæ
Menthol	*Mentha arvensis*, vars. *piperascens* and *glabrata*, and *Mentha piperita*	Labiatæ
Mezerei Cortex	*Daphne, Mezereum, D. Laureola*, and *D. Gnidium*	Thymelaceæ
Morrhuæ Oleum	*Gadus Morrhua*	Teleostei
Moschus	*Moschus moschiferus*	Ungulata
Mucuna	*Mucuna pruriens*	Leguminosæ
Mylabris	*Mylabris phalerata*	Coleoptera
Myristica	*Myristica fragrans*	Myristicaceæ
Myristicæ Oleum	*Myristica fragrans*	Myristicaceæ
Myrobalanum	*Terminalia Chebula*	Combretaceæ
Myrrha	*Balsamodendron Myrrha*, and other species	Burseraceæ
Nux Vomica	*Strychnos Nux Vomica*	Loganiaceæ
Olibanum	*Boswellia Carterii*, and other species	Burseraceæ
Olivæ Oleum	*Olea europæa*	Oleaceæ
Oliveri Cortex	*Cinnamomum Oliveri*	Lauraceæ
Opium	*Papaver somniferum*	Papaveraceæ
Os Sepiæ	*Sepia officinalis*	Decapoda
Ovum	*Gallus Bankira*, var. *domestica*	Gallinæ
Pancreatinum	*Sus scrofa*	Ungulata
Papaveris Capsulæ	*Papaver somniferum*	Papaveraceæ
Paracoto	Unknown	Unknown
Paradisi Grana	*Amomum melegueta*	Scitaminaceæ
Pareiræ Radix	*Chondrodendron tomentosum*	Menispermaceæ
Pepsinum	*Sus scrofa, Ovis Aries*, or *Bos Taurus*	Ungulata
Physostigmatis Semen	*Physostigma venenosum*	Leguminosæ
Picrorhiza	*Picrorhiza Kurroa*	Scrophulariaceæ
Pimenta	*Pimenta officinalis*	Myrtaceæ
Pimentæ Oleum	*Pimenta officinalis*	Myrtaceæ
Pini Oleum	*Pinus Pumilio*	Coniferæ
Piper Longum	*Piper officinarum*, or *P. Longum*	Piperaceæ

Geographical Source.	Brief Description.	Chief Constituents.
England and United States	Volatile oil from fresh plants	Carvone.
Japan, China, and United States	Crystalline substance from peppermint oil	Menthol.
Britain, Thuringia, France, etc.	Dried bark	Mezerein.
Northern Atlantic Ocean, Norway, Newfoundland, etc.	Fixed oil from fresh livers	Jecolein and therapin.
Central Asia	Dried secretion from preputial follicles	Odorous principle.
Africa, India, and America	Hairs of fruit	Tannin and resin.
China, India, etc.	Dried beetle	Cantharidin.
Moluccas, Banda Islands, etc.	Dried seed divested of testa	Volatile and fixed oils.
Moluccas, Banda Islands, etc.	Volatile oil from seed	Pinene, dipentene, and myristicol.
India	Dried immature fruit	Tannic acid.
North-Eastern Africa and Southern Arabia	Gum-resin from stem	Resin, gum, and volatile oil.
Bengal, Madras, Ceylon, Siam, etc.	Dried ripe seeds	Strychnine and brucine.
Southern Arabia and Somaliland	Gum-resin	Resin and volatile oil.
Spain, France, Italy, California, etc.	Expressed oil from ripe fruit	Oleum, palmitin, and arachin.
New South Wales and Queensland	Dried bark	Volatile oil.
Asia Minor, Persia, India, etc.	Inspissated juice from unripe capsules	Morphine, codeine, and other alkaloids.
Mediterranean and Atlantic Oceans	Calcareous deposit	Calcium carbonate.
Domesticated everywhere	Egg	Albumin, proteids, and fats.
Domesticated everywhere	Mixture of enzymes	Trypsin and other ferments.
Britain and Asia Minor	Nearly ripe dried fruit	Morphine.
Bolivia	Dried bark	Paracotoin.
Western Africa	Dried seeds	Volatile oil and paradol.
Brazil and Peru	Dried root	Beberine (Pelosine).
Domesticated everywhere	Enzyme from mucous lining of fresh and healthy stomach	Pepsin.
Western Africa	Ripe seeds	Physostigmine (Eserine).
Alpine Himalaya	Dried rhizome	Picrorhizin.
West Indies, Mexico, Jamaica, etc.	Dried full-grown unripe fruit	Volatile oil.
West Indies, Mexico, Jamaica, etc.	Volatile oil from unripe fruit	Eugenol.
Central Europe	Volatile oil from fresh leaves and shoots	Bornyl acetate, pinene and other terpenes.
Malay Archipelago, or Bengal and Philippine Islands	Dried unripe fruit-spike	Volatile oil, piperine, and chavicin.

Name of Drug.	Natural Origin.	Family or Order.
Piper Nigrum	*Piper nigrum*	Piperaceæ
Pix Burgundica	*Picea excelsa*	Coniferæ
Pix Carbonis	Coal	Various
Pix Liquida	*Pinus sylvestris* and other species	Coniferæ
Podophylli Indica Resina	*Podophyllum Emodi*	Berberidaceæ
Podophylli Indica Rhizoma	*Podophyllum Emodi*	Berberidaceæ
Podophylli Resina	*Podophyllum peltatum*	Berberidaceæ
Podophylli Rhizoma	*Podophyllum peltatum*	Berberidaceæ
Populi Cortex	*Populus* species	Salicaceæ
PruniVirginianæCortex	*Prunus serotina*	Rosaceæ
Prunum	*Prunus domestica*	Rosaceæ
Pterocarpi Lignum	*Pterocarpus santalinus*	Leguminosæ
Pyrethri Flores	*Pyrethrum cinerariæfolium*, and other species	Compositæ
Pyrethri Radix	*Anacyclus Pyrethrum*	Compositæ
Quassiæ Lignum	*Picræna excelsa*	Simarubaceæ
Quercus Cortex	*Quercus Robur*	Cupuliferæ or Fagaceæ
Quillaiæ Cortex	*Quillaja saponaria*	Rosaceæ
Resina	*Pinus* species	Coniferæ
Rhei Radix	*Rheum palmatum. R. officinale*, and other species	Polygonaceæ
Rhœados Petala	*Papaver Rhœas*	Papaveraceæ
Ricini Oleum	*Cinus communis*	Euphorbiaceæ
Rosæ Caninæ Fructus	*Rosa canina*	Rosaceæ
Rosæ Centifoliæ Petala	*Rosa centifolia*	Rosaceæ
Rosæ Gallicæ Petala	*Rosa gallica*	Rosaceæ
Rosæ Oleum	*Rosa damascena*	Rosaceæ
Rosmarini Oleum	*Rosmarinus officinalis*	Labiatæ
Rutæ Herba	*Ruta graveolens*	Rutaceæ
Sabinæ Cacumina	*Juniperus Sabina*	Coniferæ
Saccharum Lactis	*Bos Taurus*	Ungulata

Geographical Source.	Brief Description.	Chief Constituents.
East Indies	Dried unripe fruit	Volatile oil, piperine, and chavacin.
Finland, Black Forest, and Jura Mountains	Resinous exudation from stem	Resin and volatile oils.
Britain	Nearly black viscid liquid	Phenol and its homologues.
Scotland, Denmark, Norway, and Russia	Bituminous liquid from wood	Guaiacol and its homologues.
Northern India	Precipitated resin	Podophyllotoxin and podophylloresin.
Northern India	Dried rhizome and roots	Podophyllin.
United States and Canada	Precipitated resin	Podophyllotoxin and podophylloresin.
United States and Canada	Dried rhizome and roots	Podophyllin.
Britain, Central and Southern Europe	Dried bark	Salicin.
North America	Dried bark	Amygdalin and emulsin.
South of France	Dried ripe fruit	Sugar and various acids.
India, Ceylon and Southern Philippines	Reddish heart-wood	Santalin.
Dalmatia, Persia, and California	Dried unexpanded flower-heads	Pyrethrotoxic acid and volatile oil
Northern Africa, Levant, and Southern Europe	Dried root	Pyrethrine, resin, and fixed oils.
Jamaica and Caribbean Islands	Wood of trunk and branches	Picrasmin.
Europe	Dried young bark	Quercitannic acid.
Chili and Peru	Inner part of bark	Sapotoxin and quillaic acid.
North America	Residue left after distillation of oil of turpentine	Abietic anhydride.
China and Thibet	Dried rhizome, deprived of cortex	Chrysophan, chrysophanic acid, emodin, glucogallin, and tetrarin.
Britain	Fresh petals	Rhœadic and papaveric acids.
India	Fixed oil from seeds	Ricinolein.
Britain	Dried ripe fruit	Citric and malic acids, sugar, and gum.
Western Asia and Europe	Fresh petals	Malic and tartaric acids, and volatile oil.
Southern Europe	Fresh and dried unexpanded petals	Red colouring matter and volatile oil.
Bulgaria, Persia, Cashmere, etc.	Volatile oil from fresh flowers	Geraniol, citronellol, and their esters.
England, Southern France, and Dalmatian Islands	Volatile oil from flowering tops	Borneol and its esters
England and Southern Europe	Dried stem, leaves, and fruit	Volatile oil.
Britain and Southern Europe	Dried young shoots	Volatile oil.
Domesticated everywhere	Crystallised sugar from whey of milk	Lactose.

Name of Drug.	Natural Origin.	Family or Order.
Saccharum Purificatum	*Saccharum officinarum*	Graminaceæ ....
Salicis Cortex..........	*Salix alba* and other species	Salicaceæ ....
Sambuci Flores........	*Sambucus nigra*............	Caprifoliaceæ..........
Sandaraca	*Callitris quadrivalvis*......	Coniferæ ....
Sanguinariæ Rhizoma..	*Sanguinaria canadensis*....	Papaveraceæ ....
Sanguis Draconis......	*Dæmonorops Draco*........	Palmaceæ ....
Santali Oleum	*Santalum album*	Santalaceæ ....
Santonica	*Artemisia maritima*, var. *Stechmanniana*	Compositæ ....
Sappan	*Cæsalpinia sappan*	Leguminosæ ....
Sarsæ Radix	*Smilax ornata*	Liliaceæ ....
Sassafras Radix	*Sassafras officinale*	Lauraceæ..............
Scammoniæ Radix	*Convolvulus Scammonia* ..	Convolvulaceæ ....
Scammoniæ Resina....	*Convolvulus Scammonia* ..	Convolvulaceæ ....
Scammonium..........	*Convolvulus Scammonia* ..	Convolvulaceæ ....
Scilla..................	*Urginea Scilla*	Liliaceæ ....
Scoparii Cacumina	*Cytisus scoparius*..........	Leguminosæ ....
Senegæ Radix	*Polygala Senega*	Polygalaceæ ....
Senna Alexandrina	*Cassia acutifolia*	Leguminosæ ....
Senna Indica	*Cassia angustifolia*	Leguminosæ ....
Serpentariæ Rhizoma..	*Aristolochia Serpentaria* or *A. reticulata*	Aristolochiaceæ ......
Sesami Oleum	*Sesamum indicum*..........	Pedaliaceæ ....
Sevum Præparatum ..	*Ovis Aries*	Ungulata ....
Simaruba Cortex	*Simaruba amara*, and *S. glauca*	Simarubaceæ ....
Sinapis	*Brassica alba*, and *B. nigra*	Cruciferæ..............
Sinapis Albæ Semina..	*Brassica alba*............	Cruciferæ..............
Sinapis Nigræ Semina..	*Brassica nigra*	Cruciferæ..............
Sinapis (Volatile) Oleum	*Brassica nigra*	Cruciferæ..............
Spigelia................	*Spigelia marilandica*	Loganiaceæ ....
Staphisagriæ Semina ..	*Delphinium Staphisagria* ..	Ranunculaceæ ....

Geographical Source.	Brief Description.	Chief Constituents.
West Indies, British Guiana, etc.	Crystallised sugar from juice of sugar-cane	Sucrose.
Britain, Central and Southern Europe	Dried bark	Salicin and tannin.
Britain	Fresh or dried flowers, separated from stalks	Volatile oil.
North-West Africa	Resinous tears	Resin acids and volatile oil.
Canada and United States	Dried rhizome	Sanguinarine, other alkaloids, and resins.
Borneo, Sumatra, etc.	Dried resinous secretion	Draco-resinotannol and draco-resin.
Southern India	Volatile oil from wood	Santalol, santalal and esters.
Northern Turkestan	Dried unexpanded flower-heads	Santonin, artemisin, and volatile oil.
India	Orange-red heart-wood	Sappanin (Brazilin).
South America, Costa Rica, etc.	Dried root	Parillin, sarsa-saponin, and smilacin.
North America	Dried root	Volatile oil and tannin.
Syria and Asia Minor	Dried root	Glucoresin, sugar, and starch.
Syria and Asia Minor	Glucosidal resin from root	Scammonin.
Syria and Asia Minor	Gum-resin from living root	Scammonin and gum.
Mediterranean Coasts	Dried bulb in slices	Scillitoxin, scillipicrin, and scillin.
England	Fresh and dried tops	Sparteine and volatile oil.
United States and British North America	Dried root	Senegin (Sapotoxin) and polygalic (quillaic) acid.
Middle and Upper Nile Territories	Dried leaflets	Emodin, cathartic acid, gluco-sennin, and anthragluco-sennin.
Southern Arabia and India	Dried leaflets	Emodin, cathartic acid, gluco-sennin, and anthra gluco-sennin.
United States	Dried rhizome and roots	Aristolochine and volatile oil.
India	Fixed oil from seeds	Olein and other glycerides.
Domesticated everywhere	Internal fat of abdomen	Stearin, palmitin, and olein.
Guiana and Northern Brazil, West Indies, and Florida	Dried bark	Quassin, or picrasmin.
England, Holland, Germany, etc.	Powdered ripe seeds	Fixed oil, sinigrin, sinalbin, and myrosin.
England, Holland, Germany, etc.	Dried ripe seeds	Fixed oil, sinalbin, and myrosin.
England, Holland, Germany, etc.	Dried ripe seeds	Fixed oil, sinigrin, and myrosin.
England, Holland, Germany, etc.	Volatile oil from seeds	Allyl isothiocyanate.
United States	Dried rhizome and rootlets, or entire plant	Spigeline, acrid bitter substance, and volatile oil.
Asia Minor and Southern Europe	Dried ripe seeds	Fixed oil and alkaloidal matter.

Name of Drug.	Natural Origin.	Family or Order.
Stramonii Folia	*Datura Stramonium*	Solanaceæ
Stramonii Semina	*Datura Stramonium*	Solanaceæ
Strophanthi Semina	*Strophanthus Kombé*	Apocynaceæ
Styrax Præparatus	*Liquidambar orientalis*	Hamamelidaceæ
Succinum	*Pinus succinifer*, and other species	Coniferæ
Sumbul Radix	*Ferula Sumbul*	Umbelliferæ
Tabaci Folia	*Nicotiana Tabacum*	Solanaceæ
Tamarindus	*Tamarindus indica*	Leguminosæ
Taraxaci Radix	*Taraxacum officinale*	Compositæ
Terebinthina Canadensis	*Abies balsamea*	Coniferæ
Terebinthinæ Oleum	*Pinus sylvestris*, and other species	Coniferæ
Theæ Folia	*Camellia Thea*	Ternstrœmiaceæ
Theobromatis Oleum	*Theobroma Cacao*	Sterculiaceæ
Theobromatis Semina.	*Theobroma Cacao*	Sterculiaceæ
Thus Americanum	*Pinus palustris* and *P. Tæda*	Coniferæ
Thymi Oleum	*Thymus vulgaris*	Labiatæ
Thymol	*Thymus vulgaris*, *Monarda punctata*, and *Carum copticum*	Labiatæ and Umbelliferæ
Thyroideum	*Ovis Aries*	Ungulata
Tinospora	*Tinospora cordifolia*	Menispermaceæ
Toddalia	*Toddalia aculeata*	Rutaceæ
Tonco Semina	*Dipteryx odorata* and *D. oppositifolia*	Leguminosæ
Tragacantha	*Astragalus gummifer*, and other species	Leguminosæ
Turpethum	*Ipomœa Turpethum*	Convolvulaceæ
Tussilago	*Tussilago Farfara*	Compositæ
Tylophoræ Folia	*Tylophora asthmatica*	Asclepiadaceæ
Ulmi Cortex	*Ulmus campestris*	Urticaceæ
Ulmi Fulvi Cortex	*Ulmus fulva*	Urticaceæ
Urginea	*Urginea indica* or *Scilla indica*	Liliaceæ

Geographical Source.	Brief Description.	Chief Constituents.
England, Germany, France, and Hungary	Dried leaves	Hyoscyamine, atropine, and hyoscine.
England, Germany, France, and Hungary	Dried ripe seeds	Hyoscyamine, atropine, and hyoscine.
East Africa	Dried ripe seeds freed from awns	Strophanthin.
Asia Minor	Purified balsam from trunk	Cinnamic acid, storesinol, and esters.
Baltic Coast (Prussia)	Fossil resin	Succino-abietic acid and succinin.
Turkestan	Dried transverse slices of root	Volatile oil and resin.
America	Dried leaves	Nicotine.
East and West Indies	Preserved fruits freed from brittle outer part of pericarp	Citric and tartaric acids.
Britain	Fresh and dried roots	Taraxacin, pectin, and inulin.
Canada, Nova Scotia, and United States	Oleo-resin from bark	Resins and volatile oil.
United States and France	Volatile oil from oleo-resin	Dextro-pinene and lævo-pinene.
China, Japan, India, Ceylon, etc.	Dried leaves	Caffeine and tannin.
Central and South America, West Indies, Ceylon, etc.	Concrete fixed oil from seeds	Stearin, palmitin, and olein.
Central and South America, West Indies, Ceylon, etc.	Prepared seeds	Theobromine and fixed oil.
Southern United States	Concrete oleo-resin	Abietic and pimaric acids, and volatile oil.
France and Germany	Fresh herb	Volatile oil.
Southern France, America, and India	Crystalline phenol from volatile oils	Isopropyl-meta-cresol.
Domesticated everywhere	Fresh and healthy thyroid gland	Iodo-globulin.
India	Dried stem	Berberine and bitter glucoside.
India and Ceylon	Dried root-bark	Bitter principle, resin, and volatile oil.
Guiana and Brazil	Dried seeds	Coumarin.
Southern and Eastern Europe, Asia Minor and Persia	Ribbon-shaped gummy flakes	Bassorin and oxybassorin.
India and Ceylon	Dried root and stem	Turpethin (Jalapin).
Britain	Dried leaves or flowering stems	Mucilage and bitter glucoside.
India, Ceylon, and Moluccas	Dried leaves	Tylophorine.
England, Central and Southern Europe	Dried bark	Mucilage, tannin, and bitter principle.
United States	Dried bark	Mucilage and tannin.
India	Dried young bulbs	Scillitoxin, scillipicrin, and scillin.

Name of Drug.	Natural Origin.	Family or Order.
Uvæ	*Vitis vinifera*	Ampelidaceæ
Uvæ Ursi Folia	*Arctostaphylos Uva-Ursi*	Ericaceæ
Valerianæ Indicæ Rhizoma	*Valeriana Wallachii*	Valerianaceæ
Valerianæ Rhizoma	*Valeriana officinalis*	Valerianaceæ
Vanillæ Fructus	*Vanilla planifolia*	Orchidaceæ
Veratri Alba Rhizoma	*Veratrum album*	Liliaceæ
Veratri Viridis Rhizoma	*Veratrum viride*	Liliaceæ
Viburnum	*Viburnum prunifolium*	Caprifoliaceæ
Wintera	*Drimys Winteri*	Magnoliaceæ
Zingiber	*Zingiber officinale*	Scitaminaceæ

Geographical Source.	Brief Description.	Chief Constituents.
Central and Southern Europe, California, and Australia	Dried ripe fruit........	Sugar and potassium acid tartrate.
Britain, Central and Northern Europe, and North America	Dried leaves	Arbutin and methyl-arbutin.
India	Dried rhizome and rootlets	Volatile oil and valerianic acid.
England, Holland, and Germany	Dried erect rhizome and roots	Volatile oil and valerianic acid.
Mexico, Mauritius, Java, etc.	Dried fruit	Vanillin and fixed oil.
Central and Southern Europe	Dried rhizome and rootlets	Jervine, protoveratrine, and other alkaloids.
United States..........	Dried rhizome and rootlets	Jervine, veratrine, and other alkaloids.
United States..........	Dried bark	Viburnin, tannin, and valerianic acid.
South America	Dried bark	Volatile oil and tannin.
West Indies, Cochin China, Africa, etc.	Dried scraped rhizome	Volatile oil and gingerol.

CONTENTS

Materia Medica

OF

VEGETABLE AND ANIMAL ORIGIN.

ACACIÆ CORTEX.

Acacia Bark ; Babul Bark.

THE bark of *Acacia Arabica*, Willdenow (N.O. Leguminosæ), or of *A. decurrens*, Willdenow, collected from wild or cultivated trees not less than seven years old, then dried, and kept for one year before use. The first-mentioned tree is a native of Arabia and Africa, and is also abundant in India, where the bark is known as "babul" bark ; *A. decurrens* is a native of Australia, and is described in the Indian and Colonial Addendum to the British Pharmacopœia as the Sydney, or the Victorian and Tasmanian black wattle, though the tree found in Tasmania is considered by some botanists to be a distinct species, *A. mollissima*, Willdenow. The two barks differ considerably in appearance, but are alike as regards their medicinal properties ; they are powerfully astringent, and are official in the Indian and Colonial Addendum, for use in India and in the Australian and Eastern Colonies, as equivalents of oak bark. The drug is used in the form of Decoctum Acaciæ Corticis (1 in 16).

Acacia bark, from *A. Arabica*, is hard, woody, and has a tendency to divide into several layers. It is of a rusty-brown colour externally, but older pieces of the bark are covered with a thick, blackish, rugged periderm, which is fissured longitudinally and transversely. Internally, the bark is smooth, longitudinally striate, and fibrous. The taste of the drug is astringent and mucilaginous. The bark obtained from *A. decurrens* occurs usually in somewhat twisted and incurved pieces, from 2·5 to 5 cm. broad, and varying in thickness from 1·5 to 3 mm. It is greyish-brown externally, but becomes darker with age, and is often marked with ashy-grey blotches, as well as irregular longitudinal ridges, while it sometimes shows transverse cracks. The inner surface of the bark is cinnamon colour or somewhat reddish, smooth, and longitudinally striate. The bark has an irregular, brittle, coarsely fibrous fracture, which is light-coloured when fresh. It has a faint tan-like odour, and an astringent taste.

The distinctive characters of acacia bark are its hard, woody nature, rusty-brown or greyish-brown colour, longitudinal striations internally, and astringent taste. The Indian bark, as already stated, is frequently covered with a thick, blackish periderm, while the Australian drug is somewhat twisted and incurved. The bark is richest in tannin when between six and ten years old, and may contain more than 22 per cent. of that substance. It also contains gallic acid, which appears to be converted into tannic acid on keeping, as the result of a process of fermentation. The gum produced in the stem and branches of acacia trees originates in the cells of the cortex and pericycle, being a product of the transformation (gummosis) of the cell-wall, caused by degeneration of the cellulose. It may be found immediately under the bark, where it sometimes collects in regular cavities, but it tends to exude spontaneously, hardening into tears on exposure. The appearance and characters of the gum vary according to the species from which it is obtained, that of *A. Arabica* or *A. decurrens* being darker coloured than gum acacia obtained from *A. Senegal* and other species.

ACACIÆ GUMMI.

Gum Acacia; Gum Arabic.

A DRIED gummy exudation from the stem and branches of *Acacia Senegal*, Willdenow (N.O. Leguminosæ), and of other species of *Acacia*. The trees yielding it grow freely in various parts of Africa, forming large forests in Western Africa, north of the River Senegal, and being also abundant in Eastern Africa, Kordofan, and Southern Nubia. The gum is a degradation product, apparently resulting from the hydrolysis of cellulose by an enzyme—probably a kind of cytase—which causes the cell-walls of the cortex and pericycle to swell enormously and, ultimately, dissolve. The product of this process of gummosis fills the lacunæ (gum-reservoirs) formed by the destruction of the cells, and tends to exude spontaneously from the stem and branches of the tree, but the outflow may be promoted by the attacks of ants and other insects, or by incision of the bark. When hard, the tears or masses of gum are detached from the bark, collected in baskets, and sent for export to Suakin, Alexandria, or St Louis (Senegambia). The gum is usually assorted before being placed on the market; Kordofan gum, exported from Alexandria, is considered the best, but the varieties known in commerce as "Turkey sorts" and "Trieste picked," which are brought from the Soudan by way of Suakin, are equally suitable for medicinal use. The gum possesses demulcent properties, and is used in the preparation of Mucilago Acaciæ (1 in 8·75), Pilula Ferri, Pulvis Amygdalæ Compositus, Pulvis Tragacanthæ Compositus, all the official Trochisci, and various syrups, pastes, and pastilles or jujubes. The mucilage of acacia is used for suspending insoluble powders in mixtures, for emulsifying oils and other liquids which are not miscible with water, and as an ingredient of cough linctuses.

Gum acacia occurs in rounded or ovoid, opaque, white or yellowish tears or masses, the largest of which are about the size of a hazel nut. The tears are opaque, owing to the presence of numerous minute external fissures. They are also very brittle, and the fragments of broken tears, which are more or less angular and quite transparent, show glistening vitreous surfaces. The gum has a very faint odour, and a bland, mucilaginous taste. It is practically entirely soluble in water (1 in 1), but only slightly soluble in alcohol or other liquids, unless there be a considerable quantity of water present. Thus, it is quite insoluble in 90 per cent. alcohol, but weaker alcohol dissolves the gum in proportion to the quantity of water it contains. When dissolved in its own weight of water, the gum forms a translucent viscid mucilage, which feebly reddens litmus, owing to the free acid present in the gum. If an inferior gum be used, the mucilage may be glairy or ropy, or yield a gelatinous deposit after dilution with water. By forming a copious gelatinous precipitate with basic lead acetate, but not with the normal acetate, gum acacia is distinguished from many other varieties of gum or mucilage. Another distinguishing feature of gum acacia is that mucilage prepared from it yields a gelatinous precipitate and forms a translucent white jelly on the addition of a concentrated solution of borax. Powdered gum acacia may be adulterated with starch or flour, both of which can be detected by means of solution of iodine, which colours starch blue in the presence of water, provided the liquids are cold, the blue colour with starch not being produced readily in hot solutions. An artificial gum has been prepared from commercial dextrin — a mixture of varying composition, which may contain unaltered starch and be coloured by iodine accordingly, but consists largely of erythrodextrin, which gives a reddish - brown colour with iodine in the cold, unless the reaction be obscured by the blue colour produced by a considerable proportion of soluble starch. Tannin is present in inferior gums, and can be detected by the bluish-black coloration produced on adding ferric chloride. Dextrin and certain sugars sometimes occur in artificial and powdered gums, but such impurities reduce Fehling's solution of potassio-cupric tartrate.

The opacity of gum acacia and the vitreous appearance of fractured surfaces are characteristic, when regarded in conjunction with the ready solubility of the gum in water, the adhesiveness of its aqueous solutions, and their precipitation by lead subacetate. Mogadore gum, from *Acacia gummifera*, Willdenow, closely resembles Kordofan gum in appearance, but Senegal gum has a yellowish or reddish colour, is less fissured, and often occurs in long cylindrical or curved pieces. Inferior gums of African, Australian, South American, or Indian origin are usually darker in colour and less soluble than gum acacia, while mucilage prepared from them is frequently glairy and ropy, lacking in adhesiveness, and may throw down a gelatinous deposit of insoluble gum on dilution with water. Australian gums frequently contain tannin. Ghatti gum (see Indicum Gummi), from *Anogeissu latifolia*, Wallich, yields only a slight precipitate with lea subacetate. The chief constituent of gum acacia is arabin an acid calcium salt of arabic acid, but it also contain magnesium and potassium arabates, and an active oxydas which acts on guaiacol in aqueous solution, causing brown coloration in the presence of hydrogen peroxid Arabic acid swells in water when pure, but does not dissolv unless an alkali be added; it is converted into sugar—arabinose and galactose—on boiling with dilute acids. Gum acacia also contains from 12 to 17 per cent. of moisture and a trace of sugar, and yields from 2·7 to 4 per cent. of ash, consisting almost entirely of calcium, magnesium, and potassium carbonates.

ACALYPHA.

Acalypha.

THE fresh or dried herb, *Acalypha indica*, Linné (N.O. Euphorbiaceæ), which is indigenous to the hotter parts of India. It possesses expectorant, emetic, and laxative properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of senega. The chief preparations of the drug are Succus Acalyphæ, which is prepared in the same way as Succus Scoparii, and Extractum Acalyphæ Liquidum (1 in 1), which is prepared by percolation with 90 per cent. alcohol.

Acalypha consists of the entire plant. The erect annual stem is from 3 to 6 dcm. high, and bears serrated, 3-nerved, smooth, ovate, broadly ovate, or rhomboid ovate leaves, about 4 cm. broad and 5 cm. long, on petioles about the same length, and without serrations on the lower tapering part. The flower spikes are axillary, the male flowers being uppermost, and the female flowers enclosed in a funnel-shaped serrated involucre opening on the inner side. Each spike bears many flowers, and is crowned with a body in the form of a cross, the arms of which are tubular, with fringed openings, while a style-like thread bearing a fringed stigma issues from the base of the cross on one side. The body of the cross contains an ovate seed-like growth. The flowers are small and green, and each one has from eight to sixteen stamens and three styles. The fruits are tricoccous, 3-celled, 1-seeded capsules.

The leaves of acalypha are distinguished by their smoothness and shape, and the fact that; of the three principal nerves which start from the base of each leaf, the two outer ones branch on the outer side only. Other species of *Acalypha* are used for medicinal purposes in India, but *A. paniculata*, Miquel, which possesses similar properties to *A. indica*, has long-petioled, ovate-acuminate, coarsely and equally serrated leaves. The chief constituents of acalypha are resin, tannin, volatile oil, an alkaloid named acalyphine, and probably saponin, but the drug requires further examination, as but little information concerning its constituents is available.

ACONITI FOLIA.

Aconite Leaves or Herb.

The fresh leaves and flowering tops of *Aconitum napellus*, Linné (N.O. Ranunculaceæ), a perennial herbaceous plant which grows abundantly in the mountainous districts of Europe, Asia, and North America. The leaves and flowering tops are collected preferably from plants cultivated in Britain, about the end of May or the beginning of June, when the flowers are beginning to expand. At that time, before any seeds have formed, the part of the plant above ground is richest in alkaloid. The leaves and other parts of the herb possess anodyne and antipyretic properties, and the fresh juice extracted from the plant was formerly used for preparing an extract.

Aconite leaves are stalked, roundish in general outline, and divided down to the leafstalk into three segments, the two lateral ones being again divided nearly to the leafstalk, thus making five principal divisions, which are wedge-shaped at the base. Each of those divisions, in turn, is subdivided twice or thrice into nearly opposite, linear, tapering, acute segments, the lower ones being the longer and somewhat spreading. The leaves are dark green on the upper surface, paler beneath, and glabrous, or nearly so. The epidermis of the leaf consists of sinuate tabular cells, which are comparatively large on the upper side, those on the under side being smaller, with thicker and more acutely sinuate walls. Stomata occur on the under side only. The upper part of the mesophyll contains a single layer of palisade cells, and the lower part consists of spongy parenchyma. The flowers are usually arranged in a simple raceme, though a few lateral branches are sometimes given off. The hood or helmet-shaped upper sepal of the blue calyx is shallow and semicircular, the two lateral sepals are broadly obovate and obtuse, and the two lower ones are elliptic-lanceolate and obtuse. Two of the petals form hammer-shaped tubular nectaries, which are hidden in the helmet-shaped sepal, while, normally, there are also three very small linear petals, distinguished from the pale filaments of the numerous stamens by their blue colour.

The fresh leaves of *A. napellus* have only a faint narcotic odour, which is more marked when they are rubbed; when they are chewed a bitter acrid taste is slowly developed, and a tingling sensation is produced on the tongue, lips, and fauces. The dried leaves have a similar taste, but their medicinal activity is impaired by long keeping. The leaves of *A. napellus* are distinguished by their shape and peculiar taste, while the flowers are distinguished by the shallow semicircular hood formed by the upper sepal. Other species of *Aconitum* differ in the shape of their leaves and flowers. The chief constituent of aconite is the extremely poisonous alkaloid aconitine, of which the dried leaves contain about 0·2 to 0·3 per cent., and the flower-buds about 0·4 per cent. It is believed to be present in combination with aconitic acid. Other constituents of the plant are tannin, gum, sugar, and the non-toxic alkaloids picraconitine and aconine.

ACONITI RADIX.

Aconite Root.

The dried root of *Aconitum napellus*, Linné (N.O. Ranunculaceæ), a perennial herbaceous plant which grows abundantly in the mountainous districts of Europe, Asia, and North America. The root should be collected in the autumn from plants cultivated in Britain, in order to insure that it is always grown under uniform conditions, and used only when it has attained perfection. On account of its extremely poisonous nature, it is important to guard against variation in the strength of the drug and its preparations. When the plant is in full growth, there are usually two roots joined together, the older one supporting the stem, and the younger root being destined to produce the stem of the following year. About October, when the old stem has died down, the young root has attained its maximum development, and should be collected before the bud from which the new stem would naturally proceed has begun to develop. When the plant is in flower the new root is formed, but only half grown. Old roots should be rejected. After collection, the roots are washed, freed from rootlets, and carefully dried, either entire, or after being sliced longitudinally so as to facilitate drying. The drug possesses anodyne and antipyretic properties, and is used in the preparation of Aconitine, Linimentum Aconiti (1 in 1·5), Tinctura Aconiti (1 in 20), and various non-official galenicals, including extract, chloroform, plasters, and lozenges.

Aconite root resembles an elongated cone in shape, and varies usually from 5 to 10 cm. in length; it measures from 12 to 18 mm. in diameter, and tapers very gradually downwards. Externally, the root is dark brown in colour, usually wrinkled longitudinally, and marked with the scars and bases of broken-off rootlets; it should also be crowned with scaly leaves enclosing an undeveloped bud. It breaks with a short fracture, and appears whitish internally, as it consists mainly of uniform parenchymatous cells loaded with starch granules. Hollow or spongy roots should be rejected, as their reserve material has been exhausted by the development of the flowering stem. The retention of any portions of stem also indicates that the root is old or has not been collected at the proper season, since the old stem must have died down and entirely disappeared by the time the new root attains its maximum development—being then plump and full of starch—and the new stem should not have begun to develop. If the root be transversely cut and the fresh surface examined with a lens, the stellate centre is seen to consist of large-celled, polyhedral parenchyma, containing an abundance of starch grains; it is divided from the thick parenchymatous cortex by a narrow irregular line—the cambial zone—which gives it the appearance of a star with five to seven rays, and at each angle of the figure thus formed occurs a small vascular bundle. No trace of cuticle is found except at the tips and adjoining parts of the roots; elsewhere it is replaced by brown parenchymatous cells, which have formed part of the primary cortex. The fresh root has only a very faint earthy odour, which has been incorrectly described as pungent or radish-like; there is, however, the faintest possible momentary irritation when the root is first smelled. The taste is at first slight, but a persistent sensation of tingling and numbness soon manifests itself in the mouth.

English aconite is distinguished by the elongated conical shape of the root, its starchy interior, stellate cambium, and the persistent tingling produced on tasting the drug.

The official description excludes German, Japanese, and Indian aconite roots, also English roots which are immature or exhausted of their reserve material. German aconite is collected from wild plants when in flower, and consists largely of the parent roots; it is usually smaller and more shrivelled than English aconite, and has a less starchy fracture. Japanese aconite is also smaller than English, less wrinkled, dark grey or brownish in colour, and very starchy. Indian aconite, from *Aconitum ferox*, Wallich, is much larger than English, contains pseudaconitine, and presents a horny appearance, owing to the starch having been gelatinised by the prolonged application of heat in drying. The chief constituent of aconite root is the extremely poisonous crystalline alkaloid aconitine (acetyl-benzoyl-aconine), which is believed to be present in combination with aconitic acid; other constituents are the amorphous, bitter, non-toxic alkaloids picraconitine (benzoyl-aconine) and aconine, together with resin, fat, sugar, and starch. The quantity of aconitine in the root is supposed to be greatest in the autumn, but that point has not yet been definitely established; the total alkaloid present has been stated to be about 0·07 per cent., about 0·03 per cent. consisting of aconitine, which can be extracted by exhausting the ground root with an alcoholic solution of tartaric acid and — after removal of resin, etc. — precipitating the aconitine from the solution, in which it exists as tartrate, by the addition of potassium carbonate. The impure aconitine so obtained may be purified by dissolving it in ether, adding an aqueous solution of tartaric acid, precipitating the base with sodium carbonate, again dissolving it in ether, and, finally, allowing it to crystallise from the ethereal solution. Further purification may be effected by converting the aconitine into hydrobromide, decomposing that salt — after recrystallisation — with sodium carbonate, and finally recrystallising the precipitated alkaloid from ether.

Crystalline aconitine is almost insoluble in water, but very soluble in chloroform (1 in 1), and also soluble in 90 per cent. alcohol (1 in 35), ether (1 in 45), and oleic acid. Its distinctive characters are its melting-point (189°–190° C.), and the persistent tingling sensation produced when a single drop of a very dilute solution of the alkaloid is placed upon the tongue. When hydrolysed it yields acetic acid and picraconitine (benzoyl-aconine), and the latter in turn yields benzoic acid and aconine. Both picraconitine and aconine are amorphous and non-poisonous. Pseudaconitine is a poisonous crystalline alkaloid (m.p. 201° C.) obtained from *Aconitum ferox.* Like aconitine, it is readily soluble in chloroform or alcohol, less readily in ether, and only slightly soluble in water. It can be distinguished from aconitine by the beautiful purple-red colour produced on adding a solution of potassium hydroxide in absolute alcohol to the yellow residue left on moistening a small quantity of the alkaloid with fuming nitric acid, and heating to dryness. Aqueous or alcoholic solutions of aconitine tend to decompose unless slightly acidified with hydrochloric acid, and solutions of the more stable crystallised aconitine nitrate are preferred for medicinal use.

ACORI CALAMI RHIZOMA.

Calamus Rhizome or Root; Sweet Flag Root.

The rhizome of the sweet flag or sedge, *Acorus calamus*, Linné (N.O. Aroidaceæ), also known as calamus or sweet flag root, a native of Eastern Europe and Central Asia, which has been widely diffused by cultivation, and is found wild in England. It is a perennial plant, and produces a horizontal, somewhat compressed rootstock or rhizome, about 1 m. or more in length, which gives off numerous round, yellowish or whitish rootlets on the under side, and bunches of brown fibres (leaf traces) from the leaf scars on the upper surface. The plant is cultivated for medicinal purposes in Holland and Germany, the rhizome being collected in the autumn, trimmed, sometimes scraped or peeled, then cut into short pieces, and dried. It possesses stimulant and tonic properties, and is used in the form of infusion or liquid extract (1 in 1).

Calamus rhizome occurs usually in subcylindrical, occasionally branched pieces, from 5 to 15 cm. or more in length, and from 12 to 25 mm. in greatest diameter. The pieces are often covered with a thin brownish or reddish-brown cork, and are much shrunken, bearing deep longitudinal wrinkles. The upper surface of the rhizome is marked with oblique leaf scars, to which fibrous leaf traces are frequently attached, the scars sometimes appearing to form large triangles. On the under surface occur small, raised, circular root scars, exhibiting a central stele surrounded by a narrow bark; the root scars are arranged in irregular wavy or zigzag lines. The scraped or peeled rhizome is of a pale brownish-buff or pinkish-white colour, and bears less conspicuous leaf and root scars than the unpeeled drug. Internally, the rhizome is pale brown or nearly white; it has a spongy texture and breaks with a short fracture. A transverse section exhibits a large stele or central cylinder, separated by a yellowish line from a thick bark which, like the stele, consists chiefly of parenchymatous tissue, traversed by numerous small, oval, scattered, fibro-vascular bundles. The cells of the ground-tissue contain starch or oil, the oil-cells being more numerous in the thick cortical zone. The drug has an agreeable aromatic odour, and a pungent, bitter taste.

The spongy texture of calamus rhizome, the large oblique leaf scars, zigzag line of root scars, and bitter pungent taste, serve to distinguish it from other drugs. The chief constituent of the drug is a volatile oil, of which the unpeeled rhizome contains from 1·5 to 3·5 per cent.; the oil (s.g. 0·960 to 0·970) contains 7 to 8 per cent. of asarone, heptylic and palmitic acids, eugenol, asaryl aldehyde, a crystalline body named calameone, and esters of palmitic and acetic acids. The drug also contains a bitter principle named acorin, which is said to yield a neutral resin—acoretin—on oxidation. Other constituents of the rhizome are resin, tannin, starch, mucilage, and traces of alkaloidal matter, including calamine, choline, and trimethylamine.

ADEPS.

Lard.

THE purified abdominal fat of the hog, *Sus scrofa*, Linné (Order Ungulata), which occurs in flat leafy masses known as the "flare." It is prepared by washing the flare with water until free from any salt that may have been used as a preservative, then removing the external membranes as far as possible, and exposing the fat to the air for some hours, in order to remove all traces of water, and so render the lard less liable to become rancid and mouldy. The purified flare is cut into small pieces and beaten in a mortar, or otherwise suitably treated, until the membranous vesicles are completely broken and the fat is entirely released, after which the mass is heated in a vessel surrounded by warm water, at a temperature not exceeding 57° C., and the melted fat separated from the membranous matter by straining it through linen or fine flannel. If heated to a higher temperature than that specified, the fat will acquire an unpleasant odour and taste. After straining, the lard is stirred gently till cool, to prevent granulation from the crystallisation of stearin and palmitin, care being taken to prevent the introduction of air into the melted fat, as that would tend to promote rancidity. By subjecting the purified fat thus obtained to pressure, a certain amount of oil (lard oil or lard olein) is removed and indurated lard (Adeps Induratus) remains. Lard is a useful emollient, and is sometimes added to poultices to prevent them drying and sticking to the skin; it is also used in the preparation of Adeps Benzoatus, Emplastrum Cantharidis, Pilula Phosphori, and various ointments.

Lard is a soft, white, fatty substance of uniform consistence, fusing at about 38° C., and forming a clear liquid at a somewhat higher temperature. It should be free from rancidity, and contain no free fatty acids. When pure, it is entirely soluble in ether (1 in 22), or oil of turpentine (1 in 16), but is almost insoluble in alcohol. The presence of common salt may be detected by boiling the lard with water, filtering when cool, acidifying the aqueous filtrate with nitric acid, and adding a few drops of silver nitrate solution, which gives the white curdy precipitate characteristic of chlorides. A clean platinum wire dipped into the liquid will indicate the presence of sodium by imparting a strong yellow coloration to the blue flame of a spirit-lamp or a Bunsen burner. If starch has been added to whiten the lard, the cooled filtrate will be coloured blue on adding a little iodine solution. Lard is sometimes adulterated with cotton-seed oil, the presence of which may be detected by heating a little of the melted fat on a water-bath with an alcoholic solution of silver nitrate, acidified with nitric acid, and shaking vigorously. The silver salt is reduced by cotton-seed oil, and the fatty layer which separates on standing is then of a dark colour; but it should be noted that this reaction may be given by pure lard which has been exposed to the air, while cotton-seed oil which has previously been heated fails to give it. Another indication of the presence of cotton-seed oil in lard is the decided pink coloration given when the lard is heated with a mixture of amylic alcohol and a solution of sulphur in carbon bisulphide.

Pure lard consists approximately of 40 per cent. of stearin and palmitin, mixed with 60 per cent. of olein. It requires about 20 per cent. of potassium hydroxide to effect complete saponification. Its specific gravity at 15° C. is about 0·934 to 0·938 when fresh, but varies more widely according to age. American lard frequently contains cotton-seed oil as an impurity, and, even when fresh, usually begins to melt below 36° C., owing to the presence of an unduly large proportion of olein. As the excess of olein tends to separate, such lard is unsuitable for making ointments, especially in hot climates, where indurated lard should be used. Rancidity occurs chiefly when lard is exposed to light, being due partly to hydrolysis and partly to oxidation induced by the action of fermentative organisms. The limit of acidity in lard is indicated by a permanent red colour being produced on dissolving the fat in a mixture of equal volumes of chloroform and 90 per cent. alcohol, adding a little phenol-phthalein solution, and then a little volumetric solution of sodium hydroxide. If any water be present in the lard, a clear solution will not be formed when it is dissolved in chloroform.

ADEPS LANÆ.

Wool Fat.

THE purified cholesterin-fat of the wool of the sheep, *Ovis aries*, Linné (Order Ungulata). Sheep's wool may contain as much as 30 per cent. of fat, but usually contains only from 10 to 15 per cent. The fat is readily extracted by simply kneading the wool with water, an emulsion being thus formed, from which the fat separates on heating, as a distinct layer at the surface of the liquid. It may be purified by repeated treatment with water in a centrifugal machine, or by some other suitable process, and can be freed entirely from water by heating until its weight is constant. The anhydrous fat is capable of incorporating more than its own weight of water, but Adeps Lanæ Hydrosus (7 in 10) contains only 30 per cent. of water, and is capable of mixing with about half its weight more. Wool-fat is an excellent emollient, and is very readily absorbed by the skin, the action of remedies combined with it being thus promoted. Hydrous wool fat is more suitable as an ointment basis, especially when mixed with an equal weight of soft paraffin, and is used in the preparation of Unguentum Conii and Unguentum Hamamelidis.

Wool fat is a yellowish, tenacious, unctuous substance, with a slight but peculiar odour; its melting-point varies from 40° to 44·4° C. The fat dissolves readily in ether or in chloroform, but is only partially soluble in alcohol, 1 gramme requiring 75 c.c. of boiling 90 per cent. alcohol to dissolve it " almost completely," while the greater part of the fat separates in flocks on cooling. When incinerated with free access of air, wool fat should not leave more than 0·3 per cent. of ash, and that should not be alkaline to litmus, thus indicating that the fat has been freed from the soap used in washing the wool. A solution of the fat in chloroform acquires a purple-red colour when poured gently over the surface of strong sulphuric acid, this reaction being characteristic of cholesterin. Absence of particles of wool and other nitrogenous animal matter is indicated by the absence of ammoniacal odour when the fat is heated with sodium hydroxide solution. The limit of acidity in wool fat is indicated by a permanent red colour being produced on dissolving the fat in ether, adding a little phenol-phthalein solution, and then a little volumetric solution of sodium hydroxide.

Purified wool fat is a mixture of varying composition, containing fatty alcohols—cholesterin, iso-cholesterin, etc., together with esters of those alcohols. Its saponification equivalent is equal to about 9 to 10 per cent. of potassium hydroxide. Cholesterin, the most prominent constituent of the fat, is a monatomic alcohol, of unknown constitution, which exists partly free and partly in the form of stearate and palmitate. The fat also contains a small quantity of ordinary glycerides; if it be saponified with alcoholic potash, and the alcohol be removed by evaporation, the resulting soap can be dissolved in water. The cholesterin can be extracted from the soap solution by agitation with ether and subsequent separation and evaporation of the ethereal layer, characteristic scaly crystals of cholesterin being left. The amount of water present in hydrous wool fat can be determined by heating a known quantity of the fat on a water-bath until the weight is constant, and then weighing the residue; but a better method is to dissolve the hydrous fat in an equal volume of chloroform, and measure the water which separates.

ADHATODA.

Adhatoda.

THE fresh or dried leaves of *Adhatoda Vasica*, Nees (N.O. Acanthaceæ), which is also known as *Justicia Adhatoda*, Linné. It is a small tree or large shrub, with a straight trunk, sub-erect branches, and smooth, ash-coloured bark. The leaves are opposite and shortly petioled. The plant flowers in the cold season, producing large white flowers with small ferruginous dots; the corolla is ringent, and the lower part of both lips is streaked with purple. The drug possesses expectorant and antispasmodic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, the chief preparations being Succus Adhatodæ, which is made from the bruised fresh leaves, and Extractum Adhatodæ Liquidum (1 in 1) and Tinctura Adhatodæ (1 in 8), which are made from the dried leaves.

Adhatoda leaves, when fresh, measure from 12·5 to 15 cm. long by about 4 cm. broad. They are lanceolate, entire, taper-pointed, and smooth on both sides. The dried leaves are of a somewhat dark green colour, but yield a powder of a lighter tint. They have a strong, characteristic, herb-like odour, and a bitter taste due to the presence of alkaloidal matter. When submitted to dry distillation, the leaves evolve substances similar to those given off by tobacco under the same conditions, water coming off first, then a yellow oily liquid, and, finally, a semi-crystalline brown solid; all the products of distillation are strongly alkaline.

In the Sutlej Valley the fresh leaves of adhatoda are scattered over recently flooded fields prepared for the rice crop, and native cultivators say that they act as a poison upon aquatic weeds which would otherwise injure the rice plants. Experiments have proved that an infusion of the leaves causes contraction of the contents of the cells of the aquatic weeds, and thus leads to their disintegration. Frogs, leeches, etc., are also killed by adhatoda, though the drug appears to have no poisonous effect on the higher animals. The chief constituent of adhatoda leaves is a bitter crystalline alkaloid named vasicine, which is believed to exist in combination with adhatodic acid. Another non-volatile alkaloid is said to exist in the leaves, together with an odorous volatile principle, one or more organic acids, sugar, mucilage, and a large proportion of mineral salts.

AGROPYRI RHIZOMA.

Couch Grass Rhizome; Tritici Rhizoma.

The rhizome of *Agropyrum repens*, Beauvois (N.O. Graminaceæ), formerly known as *Triticum repens,* Linné, a widely diffused weed which is abundant in fields and waste places in Britain and on the Continent of Europe, also in Northern Asia, Australasia, and America. The plant is characterised by its rough flat leaves, and by the awns, when present, being not more than half the length of the flower. It also has a slender creeping rhizome which may extend for a considerable distance just beneath the surface of the ground, giving off lateral branches occasionally, and marked at intervals of about 2·5 to 5 cm. by nodes from which leaf buds and slender branching roots are produced. The rhizome is collected in the autumn, freed from rootlets, cut into short pieces, and dried. The drug possesses diuretic and aperient properties. It is official in the Indian and Colonial Addendum, for use in the Australasian, Eastern, and North American Colonies. The chief preparations of the drug are Decoctum Agropyri (1 in 20) and Extractum Agropyri Liquidum (1 in 1).

Couch grass rhizome, as met with in commerce, is generally in stiff, smooth, shining, pale yellowish pieces, about 3 to 6 mm. long and 2 to 2·5 mm. in diameter. It is hollow except at the nodes, and is strongly furrowed longitudinally, bearing five or six longitudinal ridges; where the nodes occur, traces of rootlets may frequently be found on the under surface, and the persistent fibrous remains of sheathing leaf bases on the upper surface, but all traces of rootlets and leaves should be removed before use. When a transverse section of the rhizome is examined under a lens, it is seen to consist of a translucent yellowish bark, surrounding a narrow, pale, central cylinder or stele, which usually appears as a hollow ring, except when the section has been cut through a node. The cortical portion contains about six small woody bundles, but consists chiefly of large parenchymatous cells which contain no starch. The stelar portion consists, as a rule, of a narrow ring of parenchyma, which is bounded externally by a woody zone. The drug is without odour, but has a faint, sweetish taste.

The rhizome of couch grass is characterised by its small diameter, longitudinal furrows, translucent bark containing no starch, and the hollow stele. The rhizome of *Cynodon Dactylon*, Persoon, is somewhat stouter in appearance and contains much starch, as also do other rhizomes which have been confused with couch grass rhizome. The latter contains no starch, but about 7 to 8 per cent. of triticin, a carbohydrate resembling inulin and yielding levulose on hydrolysis ; sugar, inosite, mucilage, and acid malates are also constituents of the drug. Lactic acid and mannite may occur in an extract of the rhizome, but are understood to be fermentation products. The rhizome of *Carex arenaria*, Linné, which is much used in Germany for similar purposes to that of couch grass, is stated to contain asparagin (cynodin) or a substance of similar composition.

AJOWAN OLEUM.

Ajowan Oil ; Ptychotis Oil.

AN oil obtained by distillation from the fruit of *Carum copticum*, Bentham and Hooker filius (N.O. Umbelliferæ), one of the sources of thymol. The plant is a native of Africa, but also grows in Egypt, Persia, and Afghanistan, and is cultivated in India, the fruits being exported from Bombay. The comminuted fruit yields 3 to 4 per cent. of volatile oil on distillation. The oil possesses aromatic, stomachic, and stimulant properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies.

Ajowan oil (s.g. 0·917 to 0·930) is colourless and resembles thyme in odour and taste, the latter being pungent and aromatic. The oil rotates the plane of a ray of polarised light from 1·0° to 1·5° to the right in a tube 100 mm. long, and it should yield from 30 to 36 per cent. of crystalline thymol when cooled to 0° C. Complete separation of the thymol can be effected by shaking the oil with sodium hydroxide solution.

The fruits of *C. copticum* are greyish-brown in colour and resemble those of parsley, but are distinguished from the latter by their rough surface and thyme-like odour. They are about 2 mm. long, ovate, laterally compressed, and consist of two mericarps, each of which has five prominent ridges and six vittæ, four between the ridges and two on the commissural surface. The chief constituent of ajowan oil is thymol, which may be present to the extent of 45 to 55 per cent. The remaining portion of the oil, known as thymene, is a mixture of cymene and a terpene boiling at 172° C.

ALOE BARBADENSIS.

Barbados Aloes; Curaçao Aloes.

THE juice that flows from the transversely cut leaves of various species of *Aloe* (N.O. Liliaceæ), including *Aloe vera*, Linné, and *A. chinensis*, Baker, evaporated to dryness. The fleshy leaves of the plants contain a yellow juice in the cells of the pericycle, which escapes when the leaves are cut transversely. It is concentrated by boiling, and, when evaporation of moisture is nearly complete, the residue is poured into boxes or gourds and allowed to solidify. Very little of this variety of aloes is now produced in Barbados, most of it being obtained from *A. chinensis* in the Dutch islands of Aruba, Bonaire, and Curaçao. The drug is a bitter tonic and slow purgative, acting as a stomachic bitter in small doses. It is used in the preparation of Aloin, Extractum Aloes Barbadensis (1 = 1·5), Pilula Aloes Barbadensis (1 in 2), and Pilula Aloes et Ferri (1 in 4·5); it is also an ingredient of Pilula Cambogiæ Composita (1 in 6), Pilula Colocynthidis Composita (1 in 3), and Pilula Colocynthidis et Hyoscyami (1 in 4·5). The extract of aloes is used in the preparation of Decoctum Aloes Compositum (1 in 100), Extractum Colocynthidis Compositum (1 in 2), and Tinctura Aloes (1 in 40).

Barbados and Curaçao aloes occur in hard masses varying in colour from yellowish or reddish-brown to chocolate-brown or almost black. The fracture may be dull and waxy, or smooth and transparent, the differences in appearance being due to variations in the method of evaporating the juice. Small splinters of the opaque variety, when examined under the microscope, exhibit numerous minute crystals of aloin which are imbedded in a transparent mass, but similar splinters from the glassy variety are quite transparent. The drug has a disagreeable odour, and its taste is nauseous and bitter. The powder imparts an evanescent crimson colour to nitric acid, and yields only a slight bluish-green colour when the vapour of nitric acid is blown over the powdered drug mixed with sulphuric acid. The first reaction serves as a distinction from Socotrine and Zanzibar aloes, which impart to nitric acid a reddish-brown or yellowish-brown colour; the second distinguishes Barbados and Curaçao aloes from Natal aloes, which yields a bright blue colour under similar treatment. Barbados and Curaçao aloes are almost entirely soluble in 90 per cent. alcohol diluted with half its volume of water, and should contain not more than 30 per cent. of matter insoluble in cold water.

The odour of the drug, the evanescent crimson colour imparted to nitric acid, and the slight bluish-green colour produced with sulphuric acid and the vapour of nitric acid, are distinctive characters of Barbados and Curaçao aloes, but the colour tests are not infallible as means of identification. The opacity of the hepatic or livery variety of the drug is due to the fact that evaporation has been allowed to take place more slowly than in the case of the glassy or vitreous aloes, the conditions being therefore more favourable to the crystallisation of aloin. Rapid concentration of the juice to the extreme limit, succeeded by a quick cooling process, results in the formation of homogeneous transparent masses, which show no trace of crystals. Such masses, however, may become more or less opaque on keeping, owing to the slow crystallisation of the aloin. The only other variety commonly met with in the vitreous form is Cape aloes, which occurs in dark masses, often with a greenish tinge. It is easily distinguished by its marked sour odour, pale yellow powder, and the permanent green colour it imparts to nitric acid after standing a few minutes. The chief constituent of Barbados and Curaçao aloes is barbaloin, but the drugs also contain more or less iso-barbaloin, a minute quantity of a volatile oil to which the characteristic odour is due, a small quantity of emodin (trioxy-methyl-anthraquinone), and a resin which yields cinnamic acid and aloresinotannol on hydrolysis. The emodin (m.p. 223° to 224° C.) is the same as that found in senna leaves. It is formed from aloin by oxidation, and can be extracted by shaking the aloes with benzene. The yellow colour of the solution thus obtained is changed to reddish-violet by ammonia. Aloin is the generic term applied to the bitter, crystalline, purgative principles found in all varieties of aloes, but only that obtained from Barbados, Curaçao, Socotrine, or Zanzibar aloes is official. The aloins are anthracene derivatives, varying in composition according to their source. Barbados and Curaçao aloes yield barbaloin and iso-barbaloin, the proportion of the latter being about half in the Curaçao variety, though only traces may be found in Barbados aloes. Socotrine and Zanzibar aloes also contain barbaloin, with very little iso-barbaloin. The method of extracting aloin is to make the aloes into a thin paste with alcohol, and allow crystallisation to proceed, after which the aloin is purified by recrystallisation from alcohol and, subsequently, from water.

Aloin occurs usually in tufts of needle-shaped yellow crystals, which are inodorous, but possess the characteristic taste of aloes. They are sparingly soluble in cold water (1 in 120), more soluble in 90 per cent. alcohol (1 in 18), freely soluble in hot water or alcohol, but nearly insoluble in ether. Aloin is not altered readily in acid or neutral solutions, but it is changed rapidly in alkaline liquids, being decomposed into methyl-iso-oxychrysasin and a sugar named aloinose, which is also formed in alcoholic solutions of aloin when kept for a long time. When crystallised from absolute alcohol, aloin is anhydrous, but on re-crystallisation from water it takes up three molecules of that liquid. The amount of aloin contained in aloes varies considerably, increasing with the age of the drug. Curaçao aloes is chiefly, if not exclusively, used by manufacturers as the source of aloin, and yields about 30 per cent. of the crystalline product. The aloins obtained from the different official varieties of aloes are very similar in composition, but the variety obtained from Socotrine and Zanzibar aloes is said to give a distinct colour reaction with nitric acid. Thus, aloin from Barbados or Curaçao aloes—formerly known as α-barbaloin—gives a red colour with cold nitric acid (s.g. 1·42), but it is stated that the aloin from Socotrine and Zanzibar aloes—known as socaloin, zanaloin, or β-barbaloin—is not reddened by cold nitric acid, though it gives an orange-red coloration when heated with that reagent, whilst also giving a red coloration in the cold with fuming nitric acid. Aloin obtained from Socotrine aloes is not often seen, commercial aloin being almost invariably obtained (m.p. 147° C.) from Curaçao aloes.

ALOE CAPENSIS.

Cape Aloes.

THE juice of the leaves of *Aloe ferox,* Miller (N.O. Liliaceæ), *A. platylepis,* Miller, and other species of *Aloe,* evaporated to dryness. The leaves of the plants from which it is obtained are cut off near the stem and arranged around a hole in the ground, in which a sheep-skin is spread with the smooth side upwards. When a sufficient quantity of juice has drained from the leaves, it is concentrated by heating in iron cauldrons, and subsequently poured into boxes or skins, in which it solidifies on cooling. Large quantities of the drug are exported from Cape Town and Mossel Bay. Cape aloes possesses more powerful purgative properties than any other variety of the drug, but it is used chiefly for veterinary purposes in this country.

Cape aloes occurs in dark reddish or nearly black masses, which break with a clean, glassy fracture, freshly broken pieces having a greenish tinge and appearing translucent at the edges. Thin splinters are transparent, appear of a reddish-brown or amber colour by transmitted light, and exhibit no crystals when viewed under the microscope. The powdered drug is of a pale tawny-yellow colour. The taste of Cape aloes is more nauseous and bitter than that of other varieties of the drug; its unpleasant sour odour also distinguishes it. The powder imparts a permanent green colour to nitric acid, after standing a few minutes, but yields no blue coloration when it is mixed with sulphuric acid and the vapour of nitric acid blown over it, being thus distinguished from other varieties of aloes.

The glassy appearance, freedom from crystals, and peculiar sour odour of Cape aloes serve to distinguish it from other varieties of the drug. It seldom occurs in the opaque—" hepatic " or " livery "—condition, as the aloin it contains does not tend to crystallise readily in the mass. The sour odour of the drug and its colour when powdered distinguish it from all other glassy aloes. The aloin of Cape aloes consists of barbaloin and capaloin, and is the most powerful variety. Other constituents of the drug are a trace of volatile oil, emodin, and a resin which yields paracumaric acid and alo-resinotannol on hydrolysis, thus differing from the resin of Barbados aloes, which is a compound of cinnamic acid.

ALOE NATALENSIS.

Natal Aloes.

The juice of the leaves of one or more species of *Aloe* (N.O. Liliaceæ), probably including *Aloe ferox*, Miller. The aloes exported from Natal is prepared with greater care than Cape aloes, the leaves being cut obliquely into slices, and the juice allowed to exude in the hot sunshine, after which it is boiled down in iron pots, the liquid being stirred until it becomes thick, and then poured into wooden cases to solidify. Natal aloes is much weaker than any other variety, apparently because it contains no emodin.

Natal aloes occurs in irregular pieces, which are almost always opaque, and have a characteristic dull greenish-black or brown colour. The fracture is not glassy like that of Cape aloes, and the fractured surface has a greenish-slate hue. The drug is also much less soluble than Cape aloes. When powdered it is of a pale greyish-green or greenish-brown colour, and resembles Cape aloes in odour, but it is less bitter, though nauseous like all aloes. The powder imparts a permanent crimson colour to nitric acid, but a more definite reaction is the deep blue colour produced when the powder is mixed with sulphuric acid, and the vapour of nitric acid blown over it.

The opaque livery appearance, dull greenish-black or dull brown colour, greenish powder, and the reaction with sulphuric and nitric acids, are distinctive characters of Natal aloes. The drug resembles Cape aloes in odour, being thus distinguished from other hepatic aloes—Socotrine, Zanzibar, Barbados, and Curaçao. No other variety yields the bright blue coloration with sulphuric and nitric acids, though Barbados aloes may yield a slight bluish-green colour. The aloin of Natal aloes consists of nataloin and homo-nataloin. It has but little purgative action on human beings. and differs from barbaloin in not being reddened by nitric acid, even when heated with that reagent, while it yields a fine blue colour with sulphuric acid and nitric acid. Natal aloes also contains resin and a trace of volatile oil, but is free from emodin.

ALOE SOCOTRINA.

Socotrine Aloes; Zanzibar Aloes.

The juice that flows from the transversely cut leaves of *Aloe Perryi*, Baker (N.O. Liliaceæ), and other species of

Aloe, evaporated to dryness. As in the case of Barbados aloes, the juice is contained in the cells of the pericycle and escapes when the leaves are cut. It is collected in the island of Socotra and on the east coast of Africa, whence it is exported to Europe by way of Bombay. The juice is allowed to evaporate spontaneously, and arrives in this country in a semi-liquid or pasty condition; if the kegs or tins containing Socotrine aloes are allowed to remain undisturbed for a while, the brownish-yellow, viscid, opaque contents tend to separate into a clear, dark brown liquid and a dark yellow deposit of aloin in crystals. The odour of the fresh aloes is unpleasant, but an agreeable fragrance is developed on keeping. The product of *A. Perryi* is not now a commercial article, opaque hepatic aloes and the sometimes slightly translucent Zanzibar aloes being the only kinds usually obtainable. The properties of both drugs are the same as those of Barbados aloes, but the Socotrine and Zanzibar varieties are less purgative. They are used in the preparation of Aloin, Pilula Aloes et Asafetidæ (1 in 4), Pilula Aloes et Myrrhæ (1 in 2·25), and Pilula Aloes Socotrinæ (1 in 2); they are also used as an ingredient of Pilula Rhei Composita (1 in 5) and Tinctura Benzoini Composita (1 in 54·5).

Socotrine aloes, as imported, is usually more or less viscid and of a brownish-yellow colour, but when dried at a gentle heat it forms hard, dark brown or nearly black masses, which break with a dull, waxy, uneven fracture, and are characterised by a strong but not disagreeable odour and an extremely bitter, nauseous taste. Zanzibar aloes is usually imported in liver-brown masses, which break with a dull, waxy fracture, differing from that of Socotrine aloes in being nearly smooth and even. The odour of Zanzibar aloes is strong and characteristic, and its taste is nauseous and bitter. Both Socotrine and Zanzibar aloes are usually of the opaque hepatic variety, though they also occur in the vitreous form. Examined under the microscope they exhibit numerous minute crystals of aloin which are imbedded in a transparent mass. Both kinds impart to nitric acid a reddish-brown or yellowish-brown colour, thus differing from Barbados and Curaçao aloes; while, when the vapour of nitric acid is blown over the powder mixed with sulphuric acid, no blue coloration is produced, this test distinguishing the drugs from Natal aloes. Both Socotrine and Zanzibar aloes dissolve almost entirely in 60 per cent. alcohol or in 90 per cent. alcohol diluted with half its volume of water, and they should yield about 50 per cent. to water, leaving a practically inert residue.

The name "Socotrine Aloes" is officially applied to both Socotrine and Zanzibar aloes, and either may be used when Socotrine aloes is ordered. Socotrine and Zanzibar aloes are distinguished by their odour, fracture, the reddish-brown or yellowish-brown colour they impart to nitric acid, and the absence of any change in colour when the powdered drugs are treated with sulphuric acid and the vapour of nitric acid. The nitric acid colour-test is useful, as no true Socotrine or Zanzibar aloes imparts a crimson colour to the reagent. Garnet-coloured, translucent Socotrine aloes from *A. Perryi* is not now found in commerce, though fine qualities of Zanzibar aloes are sometimes slightly translucent. Samples of the drugs which are nearly black are unfit for pharmaceutical purposes. The chief constituent of both Socotrine and Zanzibar aloes is barbaloin, which is mixed with a little iso-barbaloin; other constituents are emodin, a volatile oil, and a similar resinous body to that found in Barbados aloes. It is stated that the aloin of Socotrine aloes is not reddened by cold nitric acid, but gives an orange-red coloration when heated with that acid, and a red coloration in the cold with fuming nitric acid. Commercial aloin, however, is obtained usually from Curaçao aloes.

ALSTONIA.

Alstonia.

THE bark of *Alstonia scholaris*, R. Brown (N.O. Apocynaceæ), a native of India, which also grows in the Philippine Islands and is known as "Dita"; an alternative source of the bark is *A. constricta*, F. von Mueller, an Australian plant, growing in New South Wales and Queensland, and known as "Australian Fever Bark." The specific name of *A. scholaris* is due to the fact that planks prepared from the tree are used in India as school-boards, being covered with a layer of sand in which children trace their letters. Both trees produce a thick bark which possesses astringent, tonic, alterative, anthelmintic, and antiperiodic properties. It is official in the Indian and Colonial Addendum, for use in India and in the

Australasian and Eastern Colonies, being used in the preparation of Infusum Alstoniæ (1 in 20) and Tinctura Alstoniæ (1 in 8). The bark of *A. scholaris* and preparations made therefrom are official in India and the Eastern Colonies, while the bark of *A. constricta* and its preparations are official in the Australasian Colonies.

Alstonia bark, from *A. scholaris*, occurs usually in irregular fragments, from 3 to 12 mm. thick, of a somewhat spongy texture, and breaking with a short, coarse fracture. The brownish-grey external layer of the bark bears occasional blackish spots and is unevenly rough and fissured; the internal layer is of a bright buff colour and, when a transverse section is examined with a lens, is seen to be finely marked with numerous small medullary rays. The drug is almost odourless, but develops a bitter taste when chewed, owing to the presence of alkaloidal matter. The bark obtained from *A. constricta* differs considerably in appearance, as it usually occurs in curved pieces or quills about 64 mm. or more in width, and from 2·5 to 6 mm. thick. It is of rusty-brown colour externally, strongly rugose, and marked with large, deeply fissured reticulations, while it sometimes bears small, white, foliaceous lichens. Internally, it is of a cinnamon-brown colour and marked with strong, coarse, longitudinal striæ. A transverse section, examined with a lens, exhibits the dark brown periderm, covering the inner orange-brown tissues, in which occur numerous small crystals of calcium oxalate. The fracture is short, granular in the outer layers of the bark, but fibrous in the liber portion. The drug has a faint aromatic odour, and a very bitter taste.

The two barks described under the name of "Alstonia" are very different in many respects. The bark of the Indian plant yields a bitter substance called ditain, which has been used largely as a tonic and febrifuge, producing similar effects to quinine. It appears to contain the alkaloids ditamine, echitamine, and echitenine, the first-mentioned base existing in the bark in the proportion of 0·04 per cent. It can be obtained in the form of a bitter crystalline powder. Echitamine is also crystalline, but echitenine is amorphous. Other constituents of the bark are three crystalline bodies, named echicerin, echitin, and echitein respectively, and two amorphous substances—echicaoutchin and echiretin. These substances are closely allied, and appear to be constituents of the milky juice contained in the laticiferous vessels of the liber. All parts of the plant contain the milky juice (latex), which forms a brownish mass on drying. The bark of *A. constricta* contains the alkaloids alstonine (chlorogenine), alstonicine, porphyrine, and alstonidine. These alkaloids and their salts show a decided blue fluorescence in acid solutions.

ALTHÆÆ RADIX.

Marshmallow Root.

THE root of *Althœa officinalis*, Linné (N.O. Malvaceæ), an herbaceous perennial plant, with woolly stems, which is found in moist or marshy places in the south of England, and is widely distributed throughout Central and Southern Europe. It is cultivated largely for medicinal use, particularly in Germany, Belgium, and France. The whole plant abounds in mucilage, but only the perpendicular branching roots are used for medicinal purposes. They are collected in the autumn from plants at least two years old, and are trimmed and scraped to remove the outer corky layer before being dried. In addition, the pieces of root are sometimes divided longitudinally or transversely. The drug possesses emollient and demulcent properties, and is used in the form of decoction (1 in 20), syrup, and lozenges.

Marshmallow root occurs usually in cylindrical or somewhat conical pieces, from 10 to 15 cm. long and 10 to 15 mm. in diameter; they are deeply wrinkled longitudinally, and free from the brown corky layer and small roots. The whitish surface of the root is marked with the brownish scars of lateral roots, and has a somewhat hairy appearance owing to the loosening of bast fibres during the process of scraping. The tough fibrous bark can readily be removed in long strips; the wood breaks with a short, granular, and mealy fracture. Internally, the root is whitish and fleshy or starchy; a smoothed transverse section exhibits a moderately thick bark, separated from the wood by a yellow sinuate cambium line, and a radiate structure is seen in both bark and wood, whilst numerous cells containing a translucent mucilage are also rendered visible, especially when the surface of the section is moistened. The root has a peculiar though faint odour, which is more pronounced in infusions; the taste of the drug is sweetish and mucilaginous.

The fibrous bark, yellow cambium line, radiate structure of the wood, and mawkish mucilaginous taste, are distinctive characters of marshmallow root. The unpeeled root somewhat resembles young belladonna root, but the bark of the latter is not so fibrous, the wood shows scarcely any radiate structure, and the root contains no mucilage. Liquorice root is distinguished from that of marshmallow by its yellow colour internally and its decidedly sweet taste. The chief constituent of marshmallow root is a mucilage, of which it may contain as much as 35 per cent.; other constituents are about 1 per cent. of asparagin, 8 per cent. of sugar, 10 per cent. of pectin, and 35 per cent. of starch. Traces of tannin occur in the outer bark of the root. The mucilage can be extracted by cold water, and differs from mucilage of acacia in giving a precipitate with neutral lead acetate. Asparagin or amido-succinamide is a derivative of succinic acid, and isomeric with malamide; it yields aspartic or amido-succinic acid on saponification, and appears to become converted readily into butyric acid in marshmallow root which has been imperfectly dried or kept in a damp place. The conversion is believed to be caused by a ferment, and the butyric acid formed is probably the cause of the peculiar odour of the drug.

AMMONIACUM.

Ammoniacum.

A GUM-RESIN which exudes from the flowering and fruiting stem of *Dorema Ammoniacum*, D. Don (N.O. Umbelliferæ), and probably other species, the plants that yield it being widely distributed throughout Persia and extending into Southern Siberia, though the drug is collected chiefly in Central Persia, and sent to Bombay for exportation. The stem of *D. Ammoniacum*, and especially the bark, abounds in a milky secretion, contained in large schizogenous ducts. During the fruiting season large numbers of boring beetles are attracted to the plant and puncture the stem, thus causing the secretion to exude in the form of milky drops, some of which harden into tear-shaped masses on the stem, while others fall to the ground and there become mixed with stones, dirt, stalks of the plant, mericarps of the fruit, and other impurities, the masses so formed being known in commerce as "lump ammoniacum." Towards the end of July the drug is collected by peasants, being afterwards shipped in a crude state from ports in the Gulf of Persia to

Bombay, where it is sorted before being exported to Europe. It possesses antispasmodic, stimulant, and expectorant properties, and is used in the preparation of Emplastrum Ammoniaci cum Hydrargyro (1 in 1·25) and Mistura Ammoniaci (1 in 32); it is also an ingredient of Emplastrum Galbani (1 in 11), Pilula Scillæ Composita (1 in 5·25), and Pilula Ipecacuanhæ cum Scilla (1 in 6).

Ammoniacum of good quality occurs in small, dull, pale yellowish or brownish tears, or in nodular or irregular rounded masses, varying from 6 to 26 mm. in diameter. It is hard and brittle when cold, but softens when warmed. Internally, the tears or masses are opaque, the colour varying from milky white to pale brownish-yellow, and darkening to brown on exposure. A freshly fractured surface has an opaque waxy appearance and is coloured yellow by solution of potassium hydroxide, or dark red or orange by solution of chlorinated soda. The drug possesses a faint, non-alliaceous, but characteristic odour, and a bitter acrid taste. It is only sparingly soluble in water, but when crushed and triturated with that liquid it forms a white emulsion, which assumes a transient violet colour, due to the presence of free salicylic acid, on adding solution of ferric chloride. When a small fragment of the gum-resin is heated strongly in a dry test-tube, and, after cooling, the contents of the tube are treated with boiling water, no blue fluorescence is exhibited on largely diluting the solution thus obtained with cold water, and making it alkaline with solution of ammonia. It is thus distinguished from asafetida and galbanum, both of which contain umbelliferone and exhibit a blue fluorescence when thus treated.

The characteristic odour of ammoniacum, the presence of free salicylic acid, and the occurrence of the drug in clean, hard pieces which do not crumble between the fingers, serve to distinguish it from other gum-resins. Though only sparingly soluble in water, it yields about 80 per cent. of its weight to 90 per cent. alcohol, and 60 per cent. to 60 per cent. alcohol. Ammoniacum of good quality contains 1 per cent., or more, of volatile oil, 65 to 70 per cent. of resin, about 20 per cent. of gum, traces of free salicylic acid, 2 to 12 per cent. of moisture, and 3·5 per cent. of insoluble residue; on incineration, it leaves from 1 to 3 per cent. of ash. The resin is a mixture of two resin-alcohols—ammo-resinotannol, which is peculiar to ammoniacum, and galba-resinotannol, which is also found in galbanum, and is combined with salicylic acid. The gum is an acid calcium salt of arabic acid, allied to gum acacia. African ammoniacum, the product of *Ferula tingitana*, Linné, contains umbelliferone and does not yield an orange-red colour with solution of chlorinated lime.

AMYGDALA AMARA.

Bitter Almonds.

THE ripe seeds of *Prunus Amygdalus*, Stokes, var. *amara*, Baillon (N.O. Rosaceæ), a native of Persia, Asia Minor, and Syria, which is naturalised in the Mediterranean basin and Central Europe, and matures its fruit in some parts of England. The fruit of the almond tree is a green velvety drupe, from which the fleshy mesocarp and thin epicarp separate as ripening proceeds, leaving the seed enclosed in the shell-like endocarp. There are several varieties of the bitter almond, the best being imported from the south of France, and others from Sicily and Northern Africa (Barbary). The seeds are used chiefly as a source of almond oil, but also yield a volatile oil, which is largely employed as a flavouring agent.

Bitter almonds are usually shorter, proportionately broader, and smaller and less regular than sweet almonds. They are exalbuminous, free from starch, contain two large, plano-convex, oily cotyledons, and are covered with a thin, rough, cinnamon-brown testa or seed-coat. The bitter taste of the seeds is characteristic, as is also the odour of hydrocyanic acid and benzaldehyde given off by the white emulsion formed when the seeds are triturated with water. The bitterness is due to the presence of amygdalin, a colourless crystalline glucoside, soluble in alcohol and water, which is decomposed in the presence of water by emulsin (synaptase), an enzyme found in both sweet and bitter almonds; dextrose, benzaldehyde (volatile oil), and hydrocyanic acid are the products of the reaction.

The small size, broadly ovoid shape, and bitter taste of bitter almonds distinguish them from sweet almonds, which are usually longer, nearly oblong in shape, and have a bland taste. Valencia almonds resemble bitter almonds closely in appearance, but the emulsion formed on triturating them with cold water has no marked odour. Bitter almonds contain various proteids, including the enzyme emulsin or synaptase, together with about 38 per cent. of a bland fixed oil, which can be separated by heavy pressure. They also yield nearly 0·9 per cent. of benzaldehyde (volatile oil), and 0·25 per cent. of hydrocyanic acid, both of which can be extracted from the cake left after expression of the fixed oil. They are formed as shown in the following equation:—

$$\underset{\text{Amygdalin}}{C_{20}H_{27}NO_{11}} + \underset{\text{Water}}{2H_2O} = \underset{\text{Dextrose}}{2C_6H_{12}O_6} + \underset{\text{Benzaldehyde}}{C_6H_5CHO} + \underset{\text{Hydrocyanic Acid}}{HCN}$$

The amygdalin contained in the seed is localised in the parenchyma of the cotyledons, while the emulsin resides in the axile parts of the embryo and the vascular bundles of the cotyledons, so that the two substances do not come in contact until the seeds are crushed and water is added.

AMYGDALA DULCIS.

Sweet Almonds.

THE ripe seeds of *Prunus Amygdalus*, Stokes, var. *dulcis*, Baillon (N.O. Rosaceæ), which is not distinguished from the bitter almond tree by any permanent character, but grows in the same districts, and is cultivated more largely. As the drupaceous fruit of the tree ripens, the firm, felt-like mesocarp dries and splits, leaving the seeds enclosed in the endocarps, which are usually removed before the almonds are exported, though almonds in the shell are also obtainable in commerce. The seeds known in commerce as Jordan almonds are alone official. Other varieties, named in the order of their value, are Valencia, Sicily, and Barbary almonds. Jordan almonds are exported from Malaga, free from the endocarps, and are distinguished from all others by their large size and long, narrow shape. They possess demulcent and nutrient properties, and are used in the preparation of Mistura Amygdalæ, Pulvis Amygdalæ Compositus (8 in 13), and almond oil.

Sweet almonds resemble the bitter variety in general appearance, the Valencia seeds being most like them. Jordan almonds, which alone are official, are 2·5 cm. or more in length, nearly oblong in outline, more or less compressed, pointed at one extremity and rounded at the other. They are exalbuminous, free from starch, contain two large, plano-convex, oily cotyledons, and are covered with a thin, rough, cinnamon-brown testa or seed-coat, which is readily removed by steeping them in cold water. Sweet almonds have a bland taste, and the white emulsion formed when they are triturated with water is characterised by no marked odour, the seeds being thus distinguished from bitter almonds.

The elongated shape and bland taste of Jordan almonds are characteristic, while they are further distinguished from bitter almonds by the freedom from marked odour of the emulsion formed on triturating the seeds with cold water. Sweet almonds contain about 20 per cent. of proteids, including the enzyme emulsin, together with about 45 per cent. of the same fixed oil that is found in bitter almonds; but they do not contain amygdalin and, consequently, yield no volatile oil or hydrocyanic acid when crushed and triturated with water. The fixed oil is extracted from both bitter and sweet almonds, but chiefly from the former, by grinding the seeds in a mill, after removing the reddish-brown powder adhering to them, and then subjecting them to hydraulic pressure, the expressed oil being afterwards filtered and bleached, preferably by exposure to light. Almond oil consists chiefly of olein, with a small proportion of the glyceride of linolic acid and other glycerides, but contains no stearin. It is thus very similar in composition to olive oil, but it is devoid of chlorophyll, and usually contains a somewhat larger proportion of olein than olive oil.

AMYLUM.

Starch.

A CONSTITUENT of the fruits or grains of common wheat, *Triticum sativum*, Lamarck; maize or cornflour, *Zea Mays*, Linné; or rice, *Oryza sativa*, Linné (N.O. Gramineæ). Wheat is cultivated largely in temperate climates, but maize and rice are grown usually in warmer or subtropical countries. The grains are crushed so as to rupture the cells containing the starch, the gluten and other soluble and insoluble matters being then separated by adding water to form a dough, from which the starch grains can be separated by kneading the mass in a stream of water, which washes the starch away and leaves the gluten, etc., behind. The gluten may also be removed from the crushed grains by dissolving it in dilute sodium hydroxide solution, or by allowing a mixture of crushed grains and water to undergo putrefactive decomposition, in which case the gluten is destroyed, while acetic, lactic, and other acids are formed. The starch is afterwards purified by washing repeatedly with cold water to remove any traces of cell débris, alkali, or acid. It possesses protective and absorbent properties, and is used in the preparation of Glycerinum Amyli (1 in 9) and Pulvis Tragacanthæ Compositus (1 in 6).

Starch occurs as a fine, white, inodorous powder, or in irregular angular or columnar masses which are readily reduced to powder. It is quite insoluble in cold water, leaves only a trace of ash when incinerated, and should be free from traces of acid or alkali, remaining as the result of imperfect washing during the process of purification. As a rule, however, starch is faintly alkaline. On boiling with water the starch grains are ruptured, and the gelatinous mixture which results is coloured blue when solution of iodine is added after cooling. Wheat starch occurs in grains which vary considerably in size, the larger usually measuring from 30μ to 38μ in diameter and the smaller from 6μ to 7μ, though both larger and smaller grains may be met with. The large granules show a central hilum surrounded by faint concentric striæ, and are either flattened or lens-shaped, appearing round or somewhat kidney-shaped when lying flat; when standing on edge they appear spindle-shaped. The hilum and striæ are less conspicuous in the smaller granules; those are round or oval, and occasionally two or three may be found combined in a compound grain. Maize starch consists of granules which are more uniform in size, measuring from 10μ to 25μ in diameter; they are round or polygonal with rounded angles, and have a very distinct hilum, usually with one or more small clefts radiating from it, but there are no striæ. Rice starch consists of still smaller granules, also very uniform in size, measuring from 4μ to 6μ in diameter; they are polygonal, with sharp angles, being in reality the fragments of large oval compound grains, and are usually without evident hilum, cleft, or striæ.

The shape and marking of the grains, and the formation of a deep blue addition compound with iodine, are distinctive characters of starch. Maize starch is the kind mostly used in pharmacy, but potato starch, from *Solanum tuberosum*, Linné (N.O. Solanaceæ), is employed largely for many purposes, and is frequently met with as an adulterant. It consists of flattened ovoid grains, usually measuring from 45μ to 75μ in length and from 45μ to 60μ in breadth, though both larger and smaller grains may be found. A small hilum is situated near the narrow extremity of each grain, and the concentric striæ are well marked. Maranta starch or arrowroot, from *Maranta arundinacea*, Linné (N.O. Marantaceæ), consists of irregularly ovoid grains which resemble those of potato starch in general appearance, but, as a rule, they measure only 30μ to 45μ in length and 24μ to 30μ in breadth. The concentric striæ are very distinct, and the position of the hilum is usually indicated by a cleft or radiating fissures near the broad end. Curcuma starch or East Indian arrowroot, from *Curcuma angustifolia*, Roxburgh, and *C. leucorhiza*, Roxburgh (N.O. Scitaminaceæ), consists of flat, elongated, irregularly ovate grains which measure from 36μ to 60μ in length, though both larger and smaller grains are common. The striæ are concentric, and the hilum is situated near the narrow end of the grain, but is often indistinct. Starch is a member of the cellulose group and is present in all assimilating plants, being formed in the chlorophyll granules from water and the carbon dioxide absorbed. The granules are enveloped in an insoluble coating which probably consists of cellulose, and they contain granulose, the substance which forms a jelly when starch is heated with water. When air-dried, starch contains from 12 to 16 per cent. of moisture.

ANCHUSÆ RADIX.

Alkanna Root; Alkanet Root.

THE root and rhizome of *Alkanna tinctoria*, Tausch (N.O. Boraginaceæ), formerly ascribed to *Anchusa tinctoria*, Linné. It is a small, perennial, herbaceous plant, which grows in Hungary, the Grecian Archipelago, and Asiatic Turkey. The plant produces a rootstock or erect rhizome, from which proceed long twisted roots; the whole of the subterranean portion is collected and exported, chiefly from Hungary. When fresh it has a faint odour and a bitterish astringent taste, but when dried it is nearly inodorous and tasteless. As seen in commerce, alkanna root is often in a more or less disintegrated condition, owing to the wedges of tissue constituting the woody ring having become separated from one another by the destruction of the medullary rays. It does not possess any medicinal properties, but is used for imparting a fine red colour to oils and tinctures.

Alkanna root occurs in deep reddish-purple pieces, about 10 to 15 cm. long and from 1 to 2 cm. thick, consisting usually of a stout rootstock, from which proceed long, thin, somewhat twisted and tapering roots or rootlets; the remains of leaves which bear numerous bristly hairs are frequently attached to the crown of the rootstock. The outer cortical layers of the drug readily exfoliate or peel off in scales or flakes, and the exterior surface of the roots as usually seen exhibits the inner layers of cortical tissue, with long strips of cork loosely attached. The exposed surface is deeply wrinkled or furrowed longitudinally, and the woody portion of the drug tends to become disintegrated into separate strands of tissue, owing to the decay of the cells constituting the medullary rays. A transverse section of the rootstock near the crown exhibits a purplish spot, surrounded by a yellowish-white woody ring which consists of several radiating strands of dense tissue, separated more or less completely by large wedge-shaped masses of parenchyma; the bark may appear yellowish near the wood, but it becomes reddish-purple and laminated towards the exterior. A transverse section of one of the twisted roots also shows a yellowish-white wood surrounded by the purplish bark, but a central purple spot is not invariably present.

The dark reddish-purple colour of the parenchymatous tissue, the yellowish-white wood, and the hairy remains of leaves at the crown of the rootstock, are the chief distinctive characters of alkanna root. The most important constituent of the root is alkannin (anchusin), an amorphous, resinous, colouring matter which is produced in the parenchymatous cells. Those cells perish as the formation of the resin proceeds, thus causing the outer corky layers of bark to exfoliate; for a similar reason the inner portion of the rootstock and older roots tends to become separated into strands of woody tissue, as the pith and medullary rays are gradually destroyed. In sections of the rootstock cut lower down than the crown the central purplish spot is frequently very large. The colouring matter in the bark also tends to penetrate deeper, until the inner and outer coloured zones unite and so complete the separation of the strands of woody tissue. The root also contains starch. Alkannin is a weak acid, insoluble in water, but soluble in alcohol, ether, fats, and certain volatile oils, to which it imparts a fine red colour, while alkalies form with alkannin neutral compounds of a blue colour. Alkannin appears to be chemically related to alizarin, the colouring matter of madder root, as it yields methyl-anthracene when strongly heated with zinc dust. It may be used as an indicator in place of litmus. The roots of *Onosma echioides*, Linné, and of *Macrotomia cephalotes*, De Candolle, contain a similar colouring matter.

ANDROGRAPHIS.

Andrographis.

The dried plant, *Andrographis paniculata*, Nees (N.O. Acanthaceæ), which grows wild in India, where the plant is also very commonly cultivated and known as " Kiryat " or " Creyat," a name loosely applied to many bitter drugs. It possesses bitter tonic and stomachic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of chiretta. The chief preparations of the drug are Infusum Andrographidis (1 in 20), Liquor Andrographidis Concentratus (1 in 2), and Tinctura Andrographidis (1 in 10), which are prepared by the same processes as the corresponding preparations of chiretta.

Andrographis consists of the entire plant. The smooth, dark green stem is from 3 dcm. to 1 m. high, obtusely quadrangular, longitudinally furrowed, and slightly winged in the upper portion. It bears opposite, shortly petiolate, entire, lanceolate leaves, the upper surface of which is dark green and shining, while the lower surface is somewhat paler and finely granular. The leaves are thin and brittle, and vary much in size, the larger ones attaining a length of 7·5 cm. and a width of about 25 mm. The small hairy calyx is deeply 5-cleft. The fruits are erect, somewhat cylindrical, 2-valved capsules, about 15 mm. long and 3 mm. wide. They taper towards the ends, and have a deep furrow passing longitudinally down the face of each valve. The root is simple, fusiform, and woody. The drug is without odour, but has an intensely bitter taste.

A preparation of andrographis has been offered under the name of " Halviva," as a substitute for quinine. The plant itself has been confounded with chiretta, from which it may be distinguished by the colour and shape of the stem, and the shortly petiolate leaves. A kindred species, *A. echioides*, Nees, which possesses similar properties, is known as "Peetumba." The chief constituent of andrographis is an indifferent, non-basic, bitter principle which gives a precipitate with tannic acid. The aqueous infusion of the herb has a slightly acid reaction, and contains a considerable amount of sodium chloride; it is not affected appreciably by salts of iron.

ANETHI FRUCTUS.

Dill Fruit.

THE dried ripe fruit of *Peucedanum graveolens*, Bentham and Hooker filius (N.O. Umbelliferæ), an annual herb indigenous to the Mediterranean districts and Southern Russia, but cultivated in England and certain parts of the Continent of Europe. The kinds met with in commerce are usually of British, German, or Indian origin, but the first two varieties alone meet official requirements. Dill fruit possesses stimulant, aromatic, and carminative properties, and it is sometimes given with sodium bicarbonate in cases of flatulency or hiccough, but it is used chiefly in the preparation of Aqua Anethi (1 to 10) and Oleum Anethi.

Dill fruit is an oblong or oval cremocarp, about 4 mm. long, dorsally compressed, but, as usually met with, occurs in the form of separate, smooth, brown, oval mericarps, freed from the pedicel. Each mericarp is about 4 mm. long and 2 to 3 mm. broad, with five equidistant filiform ridges, and so strongly compressed dorsally as to be almost flat. In transverse section each mericarp exhibits six vittæ or elongated oil-glands, four on the dorsal and two on the commissural surface. Three of the ridges are prominent—not inconspicuous, as officially stated—at the back, and the other two are merged in the broad thin margin or wings. The fruits have an agreeably aromatic odour and taste, due to the volatile oil they contain.

The very flat, usually separate, mericarps, with three dorsal ridges and two winged lateral ridges, distinguish dill fruit from other fruits. Indian dill, imported from Bombay, is more elliptical in form than British, more convex at the dorsal surface, and paler in colour; the mericarps of the fruits are frequently united and attached to the pedicels; they are also narrower and less prominently winged than those of the British fruits. The chief constituent of dill fruit is from 3 to 4 per cent. of volatile oil, which contains no anethol and is almost identical in composition with oil of caraway; the fruit also contains fixed oil and mucilage. The oil is obtained from the dried ripe fruit by distillation, that distilled in England being most esteemed, and usually having a higher specific gravity than German oil. The oil obtained from Indian dill contains much less carvone than ordinary oil of dill, and is said to contain dill-apiol, a body isomeric with ordinary apiol, the presence of which causes the specific gravity of the oil to be very high. Oil of dill (s.g. 0·905 to 0·920) is readily soluble in alcohol or ether. It consists almost entirely of dextro-limonene (carvene) and carvone (carvol), the latter being the most important constituent of the oil and present in good samples to the extent of 40 to 60 per cent. Traces of a paraffin hydrocarbon have also been found in the oil, while some English and Spanish oils have been found to contain phellandrene.

ANISI FRUCTUS.

Anise Fruit; Aniseed.

The dried ripe fruit of *Pimpinella Anisum*, Linné (N.O. Umbelliferæ), an annual plant indigenous to Greece, Egypt, and Asia Minor, but cultivated largely in Southern Russia, Germany, Spain, Italy, South America, etc. Russian, German (Thüringian), Greek, Maltese, Spanish (Alicante), Italian, and Chilian anise fruits differ from each other in size, colour, flavour, and relative freedom from impurity. The Russian and German fruits are greyish-green when fresh, while the Levant and Spanish fruits, which are larger than other varieties, are brownish-green and yellowish-green respectively, the greenish tints tending to become grey with age. Chilian fruits are so mixed with foreign matter that their colour is not readily discernible, and their mericarps are usually separated more or less. The commercial varieties differ considerably in size, and the larger varieties alone are official. Anise fruit possesses stimulant, aromatic, carminative, and slightly expectorant properties; it is used to relieve flatulence and the griping caused by purgative medicines. The preparations chiefly used are Aqua Anisi (1 to 10), Oleum Anisi, and Spiritus Anisi (1 of oil in 10).

Anise fruit consists usually of the entire cremocarp, which measures about 5 mm. in length and 2 mm. broad, is ovoid in form, greenish-brown or greyish-brown in colour, somewhat compressed laterally, and rough, owing to the presence of numerous short, cone-shaped, bristly hairs. Each mericarp is marked by five pale, slender, and entire ridges, two of which are lateral. In transverse section each mericarp of anise fruit exhibits from thirty to forty vittæ or oil-tubes, the largest occurring in the commissure. The fruit possesses an agreeably aromatic odour and aromatic sweet taste, due to the volatile oil contained in the vittæ. The short, stout, bristly hairs, the entire fruits, and the characteristic odour and taste of anise fruit are distinctive, as is also the absence of any deep groove in the endosperm, and of prominent crenations on the somewhat inconspicuous primary ridges. In hemlock fruit, which has been found mixed with German and Italian anise, the ridges exhibit prominent crenations; there are no hairs or vittæ, and the endosperm exhibits a deep groove on its commissural surface. Hemlock fruit is also virtually devoid of odour or taste, though, on crushing it and adding some potassium hydroxide solution, a strong mouse-like odour is developed.

The chief constituent of anise fruit is from 1·5 to 6 per cent. of volatile oil which is practically identical with the oil contained in large oil-cells in the fruit and seeds of the star anise, *Illicium verum*, Hooker filius (N.O. Magnoliaceæ), a small tree indigenous to the southern and south-western provinces of China; the fruit also contains fixed oil, choline, sugar, and mucilage. The oil is obtained from the dried ripe fruits by distillation, the bulk of the oil in commerce being distilled from star-anise fruit in China and Tonkin. Oil of anise (s.g. 0·975 to 0·990) dissolves in all proportions of absolute alcohol, in 3 to 4 parts of 90 per cent. alcohol, and in about 20 parts of 60 per cent. alcohol, the oil of star-anise being less soluble than the other variety. The chief constituent of oil of anise is anethol, which separates in the form of shining white scales on cooling the oil, and may be present to the extent of 90 per cent. Other constituents of the oil of *P. Anisum* are methyl-chavicol — an isomer of anethol, a dextro-rotatory terpene, anisic aldehyde, and anisic acid. Star anise oil contains from 80 to 90 per cent. of anethol, methyl-chavicol, dextro-pinene, traces of anisic aldehyde and anisic acid, lævo-phellandrene, the ethyl ether of hydroquinone, and probably safrol. The usual adulterants of oil of anise are petroleum, fennel oil or its stearoptene, and the waste liquid portion of oil of anise left after the extraction of anethol. Spermaceti, wax, and camphor are also said to have been found as adulterants of the oil, but spermaceti and wax are insoluble in alcohol, and camphor can be detected by its odour.

ANISI STELLATI FRUCTUS.

Star Anise Fruit.

The dried ripe fruit of *Illicium verum*, Hooker filius (N.O. Magnoliaceæ), a small tree indigenous to the southern and south-western provinces of China. The fruit is apocarpous and consists normally of eight one-seeded ovaries, which are erect in the flower, but bend outwards as the fruit ripens, and finally radiate from a central axis. The carpels become dark brown as ripening proceeds, and dehisce by the ventral suture, disclosing the shining brown seeds. Star anise fruit is used chiefly in Southern China and Tonkin for the distillation of the volatile oil it contains, but a small quantity of the dried fruit is exported from Pakhoi. It possesses stimulant, aromatic, and carminative properties, similar to those of ordinary anise fruit.

Star anise fruit is composed usually of eight fully-developed carpels, about 12 mm. or more in length, which diverge horizontally in a stellate manner from a short central column proceeding from a curved peduncle. Each carpel is boat-shaped, usually bluntly beaked, irregularly wrinkled, of a rusty-brown colour, and commonly split on its upper margin so as to expose its solitary, flattish, smooth, shining, somewhat oblique, reddish-brown seed, which has a hard brittle seed-coat, enclosing a large, soft, oily kernel. The odour and taste of both pericarp and seed closely resemble those of anise fruit.

Japanese star anise fruit, or sikimi fruit, from *Illicium religiosum*, Siebold, resembles true star anise fruit in appearance, but produces poisonous effects when eaten, owing to the presence of sikimin. It is smaller than the Chinese fruit, less regular in appearance, the carpels are more acutely beaked, and the peduncle is not curved.

Moreover, the carpels are more frequently detached in the Japanese fruit, the ventral suture is usually more open, the odour is not like that of anise, and the taste is disagreeably bitter. The chief constituent of star anise fruit is the volatile oil (see page 39), of which it contains from 2·5 to 5 per cent., secreted in large oil-cells in the pericarp of the fruit and the kernel of the seed.

ANTHEMIDIS FLORES.

Chamomile Flowers.

THE dried expanded flower-heads of *Anthemis nobilis*, Linné (N.O. Compositæ), the common or Roman chamomile, collected from plants cultivated in England, Belgium, France, Saxony, and Hungary. The flowers may occur in three forms—double, semi-double, and single or Scotch chamomiles, but the double and semi-double flowers alone are official. The English flowers yield most volatile oil when distilled, and are usually reserved for distillation purposes; those imported from Belgium, France, and Saxony are chiefly met with in commerce. The entire flower-heads are collected for medicinal use and dried in a warm room. Chamomile flowers possess tonic, aromatic, and stomachic properties, and produce an emetic effect in large doses. They are used in the preparation of Extractum Anthemidis and Oleum Anthemidis, both of which are frequently added to aperient medicines as correctives.

Chamomile flowers are from 12 to 20 mm. in diameter, hemispherical in shape, and white or nearly white in colour when fresh, becoming buff-coloured or yellow when kept. Each flower-head is surrounded by an involucre consisting of two or three rows of overlapping oblong bracts with membranous margins, but that is almost entirely concealed when dried by the reflexed outer florets, which are ligulate, white, and pistillate. The inner florets of the semi-double variety are tubular, yellow, and hermaphrodite, but in double chamomiles the florets are all white and ligulate. On carefully removing the florets from a flower-head, the solid conical receptacle is seen to be covered with concave, blunt, narrow, scaly bracts or paleæ, one of which occurs at the base of each floret. The calyx limb is completely adherent to the ovary, and indistinguishable owing to the absence of pappus, the calyx tube not being developed. The corolla is sprinkled with minute, yellowish, shining oil-glands on its lower part, as may be seen on examining it closely with a powerful lens. The flowers have a strong aromatic odour, and a bitter taste.

The solid, elongated, conical receptacle, and the presence of the blunt, narrow, scaly bracts or paleæ, are the chief distinctive characters of chamomile flowers. Single chamomiles have only a single outer row of white ligulate florets, the rest being tubular and yellow. In German chamomiles, from *Matricaria Chamomilla*, Linné, the conical receptacle is hollow and there are no paleæ; in feverfew, *Chrysanthemum* (*Pyrethrum*) *parthenium*, the receptacle is flat, and any paleæ which may be present are acute. The chief constituent of chamomile flowers is from 0·8 to 1 per cent. of volatile oil; they also contain a bitter principle named anthemic acid, resin, a little tannin, and a phytosterin. The oil is obtained from the dried flowers by distillation, and is known as Roman chamomile oil, in contra-distinction to German chamomile oil, distilled from the flowers of *Matricaria Chamomilla*, Linné. Oil of chamomile (s.g. 0·930 to 0·940) is freely soluble in 90 per cent. alcohol. It is pale blue or greenish-blue when freshly distilled, but becomes greenish-yellow to yellowish-brown on keeping. It contains isobutyl isobutyrate and angelate, amyl angelate and tiglate, hexyl angelate and tiglate, esters of an alcohol named anthemol, a crystalline hydrocarbon named anthemene, and usually traces of free alcohols and acids formed by decomposition of esters during distillation. German chamomile oil is a thick fluid containing esters of caproic acid, decomposition products of those esters, and a solid hydrocarbon, or mixture of hydrocarbons, of the paraffin series. The oils of cedar, lemon, turpentine, copaiba, and milfoil have been used to adulterate oil of chamomile.

ARACHIS OLEUM.

Arachis Oil; Earth-Nut, Ground-Nut, or Pea-Nut Oil.

An oil obtained by expression, without the aid of heat, from the seeds of *Arachis hypogæa*, Linné (N.O. Leguminosæ), a native of Africa, which is cultivated in India, China, and America. The fruit of the plant ripens under the surface of the ground, into which the pods penetrate during growth. They contain seeds—“pistaches” or “ground nuts”—which consist of a dry brittle envelope and a yellowish-white kernel containing about 45 per cent. of fixed oil. The oil is extracted by grinding the seeds into a paste, which is then subjected to pressure. It is official in the Indian and Colonial Addendum, for use in India and the African, Eastern, and Australasian Colonies, as a substitute for olive oil in making the official liniments, ointments, and plasters.

Arachis oil (s.g. 0·916 to 0·918) is pale yellow or greenish-yellow in colour, with a faint nut-like odour and a bland nutty taste. It becomes turbid at 3° C., and solidifies at −5° C., while on exposure to the air it very slowly thickens and becomes rancid. It is a non-drying oil, soluble in ether or chloroform, but insoluble in alcohol.

The chief constituent of the oil is olein—the glyceride of oleic acid, with which are associated the glycerides of hypogæic, arachidic, and lignoceric acids. Bleached ground-nut oil, manufactured in France, is nearly colourless, and almost free from taste; it has been used for adulterating lard oil and olive oil. The oil saponifies slowly, but yields a firm white soap, with very little odour.

ARAROBA.

Araroba; Goa Powder; Crude Chrysarobin.

A POWDER found in longitudinal fissures in the trunk of *Andira Araroba*, Aguiar (N.O. Leguminosæ), a large tree common in the damp forests of Bahia, Brazil. It is a pathological product, formed by the breaking down of the walls of parenchymatous and prosenchymatous cells and vessels, and fills the resulting cavities, which are often of considerable size. When a tree is felled, the trunk is sawn into lengths which are split longitudinally, after which the yellowish powder in the cavities is scraped out. It is roughly purified from fragments of wood and other débris by sifting, and is then dried and powdered. The drug is a powerful parasiticide, but is chiefly used in the preparation of chrysarobin, of which it yields from 55 to 80 per cent.

Araroba occurs as a fine powder, which varies in colour from brownish-yellow to umber-brown according to the relative proportions of chrysarobin and impurities present. On treatment with hot chloroform, the powder should yield not less than 50 per cent. of chrysarobin, which melts when heated, gives off yellow fumes, and finally burns, leaving not more than 1 per cent. of ash. Chrysarobin is entirely soluble in hot chloroform, almost entirely soluble in hot alcohol (90 per cent.), partially soluble in petroleum spirit or solution of potassium hydroxide, but only slightly soluble in water. It is rapidly oxidised to chrysophanic acid when dissolved by a strong alkali, the solution turning from yellowish-brown to deep red, a change which may be hastened by passing a current of air through the solution.

Crude chrysarobin or araroba is sometimes purified by extracting it with boiling chloroform or benzene, evaporating the solution to dryness, and powdering the residue, but the drug is not exhausted of its active constituents by this method. Much of the purified araroba of commerce is obtained by exhausting the crude drug with an aqueous solution of a caustic alkali, and subsequently precipitating the filtered liquid by adding an acid. In addition to chrysarobin, chrysophanic acid is found in the drug in varying quantities, together with an amorphous resin and a substance not soluble in chloroform. The chrysarobin of the British Pharmacopœia is prepared by extracting the crude drug with chloroform, evaporating the solution to dryness, and powdering the residue. The product is a crystalline, yellow, tasteless, inodorous powder, and consists chiefly of chrysarobin, but also contains a varying quantity of chrysophanic acid, which dissolves readily in dilute caustic alkalies, yielding deep red solutions.

ARECÆ SEMINA.

Areca Nuts; Betel Nuts.

The seeds of *Areca Catechu*, Linné (N.O. Palmaceæ), a native of Cochin China, the Malay Peninsula, and the Sunda Islands. The plant is now extensively cultivated throughout tropical India and in the Philippines. It produces an orange-yellow fruit about the size and shape of a small egg, with a fibrous, fleshy pericarp enveloping a single seed, the obscurely defined testa of which seems to be partially adherent to the endocarp and is inseparable from the nucleus. The ripe seeds are feebly astringent, and they also possess narcotic and anthelmintic properties. They are used chiefly in this country, in the form of powder, as a vermifuge for dogs, or for preparing tooth-paste. Mixed with the leaves of *Piper Betle*, Linné, and lime, areca nuts form the masticatory known as "Betel"; the red colour imparted to the saliva by that mixture is due to the formation of areca-red as a result of the decomposition of the tannic matter in the nuts by the lime.

Areca nuts are about 25 mm. long and the same in diameter, their shape being that of a very short rounded cone, depressed at the centre of the base. They are of a deep brown colour externally, but the surface is marked with a network of paler, depressed lines. The brown colour is due to the presence, in the outer cells of the seed-coat, of tannic matter which is coloured red by caustic alkalies. The veins forming the network proceed chiefly from the hilum, which is situated in the flattish portion of the seed, and represent folds of the seed-coats; they correspond in position to fibrovascular bundles that pass into the folds from the funiculus, and they follow the branching of those bundles. Portions of the endocarp, which are sometimes attached more or less firmly to the seed, are hard, brittle, and of a silvery-grey colour. Though hard, the seed can be cut with a knife, and then exhibits a ruminate or marbled endosperm or interior portion, dark brown lines—which appear slightly fissured when examined with a lens—alternating with opal-white portions, owing to the infolding of the dark inner layer of the seed-coat into the lighter-coloured endosperm. The small conical embryo is situated at the base of the seed, where the hilum occurs. The seed has a slight odour, which becomes more pronounced when it is broken; it also has a slightly astringent and somewhat acrid or bitter taste.

In addition to about 15 per cent. of red, amorphous, tannic matter, areca nuts contain about 14 per cent. of fat, together with resin, mucilage, colouring matter, and several alkaloids, including choline, arecoline, arecaine, arecaidine, guvacine, and an amorphous base which has not been fully examined. The chief of those is arecoline or methyl-arecaidine, a colourless, oily, toxic base, which possesses sialagogue and tænifuge properties, and appears to be the physiologically active constituent of the drug; it forms crystalline salts and resembles the pelletierine of pomegranate root-bark in its tænifuge action, composition, and properties. Arecaine, arecaidine, and guvacine are non-poisonous crystalline bases, closely related to arecoline. Arecaine resembles trigonelline (methyl-nicotinic acid), the alkaloid of fenugreek seeds, in its properties. Arecaidine (methyl-guvacine or tetrahydronicotinic acid) is an isomer of arecaine, and exists ready formed in areca nuts, but is also formed when arecoline is saponified by acids or bases, and has been prepared synthetically from nicotinic acid. The tannic matter of areca nuts yields pyrocatechin when submitted to destructive distillation, and is probably a phlobaphene like cinchona-red or krameria-red. The astringent matter of areca nuts is yielded to water, and an aqueous extract of the nuts, which may be black (" Kassu ") or yellowish-brown (" Coury "), according to the method of preparation, has the appearance and properties of catechu, though it contains no catechin.

ARISTOLOCHIA.

Aristolochia.

THE dried stem and root of *Aristolochia indica*, Linné (N.O. Aristolochiaceæ), a native of India and New Holland. It is a climbing plant, parts of which are much used for medicinal purposes. A liniment for snake-bites is prepared in Malabar by boiling the plant in oil, a lotion is used to relieve gouty pains, and a decoction or a paste made by mixing the powder with water is given internally for intermittent fever and affections of the intestines. The stem and root possess stimulant, tonic, and emmenagogue properties, and the drug is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of serpentary rhizome, the chief preparations of the drug being Liquor Aristolochiæ Concentratus (1 in 2) and Tinctura Aristolochiæ (1 in 5).

Aristolochia stem is about 15 mm. in diameter, and is usually seen in more or less cylindrical pieces, which are marked with the projecting scars of leaves and branches, and covered with a greyish-yellow bark. In the case of younger pieces of stem, the bark is marked with shallow longitudinal furrows and reticulations; but older pieces have a somewhat warty bark, with a few transverse fissures and longitudinal furrows. A transverse section of the stem exhibits a thickish bark, enclosing a woody cylinder composed of well-defined, wedge-shaped portions of xylem, containing large vessels which are separated from each other by radially fissured medullary rays. Aristolochia root is dark orange-brown in colour, undulated, and bears well-marked transverse constrictions. The root-bark is easily separated from the wood, and has often been removed in places, revealing the subjacent, twisted, woody bundles. The drug has a spicy and camphoraceous odour, and a bitter and camphoraceous taste.

The slender rhizome of serpentary, from the upper surface of which portions of stem are given off in close proximity, is easily distinguished from aristolochia stem and root. The active constituents of the two drugs are similar, the chief constituent of aristolochia being aristolochine, a bitter principle of alkaloidal nature, and a volatile oil, which—like the oil obtained from serpentary rhizome—probably contains borneol. The peculiar camphoraceous odour and taste of the drug are due to the presence of this oil. Other constituents of aristolochia are aristin, aristinic acid, resin, tannin, and starch.

ARMORACIÆ RADIX.

Horseradish Root.

THE fresh root of *Cochlearia armoracia*, Linné (N.O. Cruciferæ), a plant indigenous to Eastern Europe, but cultivated in Britain and other countries where it is naturalised, the roots of cultivated plants being alone official. The plant has a long root, which is enlarged and somewhat conical at the top, but nearly cylindrical throughout the greater part of its length and tapering towards the extremity. The root is obtainable in the fresh state all the year round, but it is most active in the autumn and early spring, before the leaves have appeared. It is sialagogue, stomachic, diuretic, and slightly diaphoretic, and is used externally as a rubefacient. The chief preparation of the root is Spiritus Armoraciæ Compositus (1 in 8).

Horseradish root is nearly cylindrical in shape, but somewhat enlarged at the crown, where it is marked with closely approximated leaf-scars which almost encircle the crown (semi - amplexicaul). The root has a few transverse markings, measures from 12 to 25 mm. in diameter and 30 cm. or more in length, and is not often branched. Externally it is pale yellowish - white or brownish-white; internally it is whitish. The root is inodorous when unbroken, but gives off a characteristic pungent odour, due to the formation of a volatile oil identical with that of black mustard seed, when it is scraped or bruised. The pungent taste of the root is also due to the volatile oil formed.

The pale yellowish colour, cylindrical shape, pungent odour when scraped, and pungent taste are distinctive characters of horseradish root. The root contains sinigrin or potassium myronate—a crystalline glucoside which is decomposed in the presence of water by myrosin, an enzyme also found in the root, the products of the reaction being allyl isothiocyanate (volatile oil), potassium acid sulphate, and dextrose, thus:—

$$\underset{\text{Sinigrin}}{C_{10}H_{16}NS_2KO_9} + \underset{\text{Water}}{H_2O} = \underset{\substack{\text{Allyl}\\\text{Thiocyanate}}}{CSNC_3H_5} + \underset{\text{Dextrose}}{C_6H_{12}O_6} + \underset{\substack{\text{Potassium}\\\text{Acid Sulphate}}}{KHSO_4}$$

The reaction does not take place in the root under normal conditions, because the sinigrin and myrosin exist in separate cells. The root yields about 0·05 per cent. of the volatile oil; it also contains resin, sugar, and starch.

ARNICÆ FLORES.

Arnica Flowers.

The dried flowers of *Arnica montana*, Linné (N.O. Compositæ), a small plant indigenous to the mountainous districts of Central and Southern Europe. It has a creeping perennial rhizome, which, together with the brittle wiry roots, is also used in medicine. The cylindrical, striated, hairy stem is about 30 cm. high, bears opposite lance-shaped leaves, and terminates in one to three peduncles, each of which bears a large orange-yellow flower-head. The flower-heads are usually collected entire and dried, but, as the receptacle is especially liable to be attacked by insects, that portion and the involucre are sometimes removed, the drug then consisting of the ligulate and tubular florets. The drug possesses stimulant and irritant properties, and produces a sternutatory effect when powdered. It is official in the Indian and Colonial Addendum, for use in the North American Colonies, and is used in the preparation of Tinctura Arnicæ Florum (1 in 10).

Arnica flowers are usually seen entire, and consist of depressed, roundish flower-heads about 3 cm. broad, with a green involucre, whitish bristly pappus, and shrivelled inconspicuous ray florets. The involucre consists of two rows of dark green, acute, linear-lanceolate, hairy bracts or scales, and the receptacle bears about sixteen strap-shaped ray florets, together with numerous tubular disc florets, having slender spindle-shaped achenes covered with appressed hairs and crowned by a hairy pappus. The ray florets are pistillate, arranged in a single row, and possess long, narrow, dark yellow, ligulate corollas which terminate in three teeth and exhibit from seven to nine veins when soaked in water and examined with a lens, minute glands being also visible. The disc florets are also dark yellow and bear minute glands on their outer surface. The receptacle is about 6 mm. in diameter, slightly arched or nearly flat, and after removal of the florets it exhibits depressions which are sometimes surrounded by short bristly hairs, while each has a stiff dark bristle in the centre. The odour of the dried flowers is somewhat aromatic, and the taste is acrid and bitter.

The flowers of arnica are distinguished by the narrow, ligulate, three-toothed corollas of the disc florets, the hairy receptacle, the straight, spindle-shaped, hairy fruit crowned with a whitish bristly pappus, and the hairy, linear-lanceolate, involucral bracts. These characters distinguish the flowers from those of *Calendula officinalis*, Linné, and various other composite flowers which have been substituted for or mixed with them. The chief constituents of arnica flowers are a volatile oil, resin, and a bitter crystalline phytosterin named arnisterin (arnicin), which is soluble in petroleum spirit, acetone, or boiling alcohol, but is insoluble in water.

ARNICÆ RHIZOMA.

Arnica Rhizome; Arnica Root.

The dried rhizome and rootlets of *Arnica montana*, Linné (N.O. Compositæ), collected in the mountainous parts of Central and Southern Europe. It should be collected in the autumn, after the flowering stem has died down, or in the spring, as soon as the new plant makes its appearance above ground, and before the leaves appear. The drug possesses stimulant and irritant properties, and is used in the preparation of Tinctura Arnicæ (1 in 20), which is a popular remedy for bruises. It is not often given internally.

Arnica rhizome is cylindrical, horizontal, and dark brown in colour. It is curved and rough, from 2·5 to 5 cm. in length, and from 4 to 6 mm. in thickness. At intervals the rhizome may give off branches which give it a jointed appearance; it also bears on its under surface numerous brittle, wiry rootlets, and on the upper surface are found scars encircling the rhizome (amplexicaul), indicating where scales or cataphyllary leaves have fallen off. The rhizome is usually terminated by the hairy remains of the stem and leaves. It breaks with a short fracture, is often discoloured internally, and is shrivelled longitudinally. The drug has a faintly aromatic, apple-like odour, and a bitter, acrid taste.

The curved rhizome with wiry rootlets, and the appearance of transverse sections, suffice to distinguish arnica from other drugs. A transverse section of a rhizome or root shows a thick whitish or yellowish bark encircling a ring of dark oleo-resin ducts near the yellowish wood. In addition, the rhizome has a large whitish pith and broad medullary rays. The chief constituents of arnica rhizome are from 0·5 to 1 per cent. of volatile oil, and a bitter crystalline phytosterin named arnisterin (arnicin). The drug also contains inulin and tannin. It is free from starch, a distinction being thus afforded between arnica and any starch-containing rhizome.

ASAFETIDA.

Asafetida.

A GUM-RESIN obtained from the root of *Ferula fœtida*, Regel (N.O. Umbelliferæ), and probably other species growing in Eastern Persia and Western Afghanistan. The cortex of the stem and root contains numerous large schizogenous ducts, filled with a milky emulsion; on incision, or on cutting off the stem close to the crown of the root, the milky juice exudes and hardens to form the gum-resin, which is collected and conveyed to Bombay, whence it is exported to Europe. The drug possesses nervine stimulant, expectorant, and laxative properties, and it is useful in cases of flatulence or in hysteric paroxysms. It is used in the preparation of Tinctura Asafetidæ (1 in 5), and is an ingredient of Pilula Aloes et Asafetidæ (1 in 4), Pilula Galbani Composita (1 in 3·5), and Spiritus Ammoniæ Fetidus (1 in 13·3).

Asafetida occurs in rounded or flattened tears, from 12 to 25 mm. in diameter, or in masses of agglutinated tears, but ordinary lump asafetida is excluded by the official description. When fresh, the tears are usually tough at ordinary temperatures, becoming harder when cooled and softer when warmed. The dull yellow colour of the fresh tears darkens and changes to reddish-brown on keeping. Internally the tears may be yellowish and translucent, or milky white and opaque, the difference in this respect probably depending upon the relative freedom from moisture. The freshly exposed surfaces of broken tears gradually assume a pink colour, which changes to red and finally to reddish-brown, probably owing to oxidation of the volatile oil present. The drug has a strong, persistent, alliaceous odour, and a bitter, acrid, alliaceous taste, due to the volatile oil and resin. When triturated with water, it forms a white emulsion, as it contains both resin and gum. Asafetida of good quality contains about 60 per cent. of resin and other matter, soluble in 90 per cent. alcohol, and usually yields more than 10 per cent. of ash when incinerated.

The fine, evanescent, green colour assumed by asafetida when the freshly fractured surface of a tear is touched with nitric acid diluted with an equal volume of water, distinguishes the gum-resin from galbanum, while the presence of umbelliferone, or of a substance yielding it, serves as a distinction from ammoniacum, a blue fluorescence being produced when a small fragment of asafetida is strongly heated in a dry test-tube, and, after cooling, treated with boiling water, the solution thus obtained being subsequently largely diluted with cold water, and made alkaline with solution of ammonia. Umbelliferone also occurs in African ammoniacum and galbanum. The chief constituent of asafetida is an ether-soluble resin —the ferulic, or ferulaic, acid ester of asa-resinotannol— of which it may contain 60 per cent. or more. The drug also contains a small quantity of resin (free resinotannol) which is insoluble in ether, 20 to 30 per cent. of gum, and 3 to 9 per cent. of a volatile oil containing 20 to 25 per cent. of sulphur, probably in the form of hexenyl sulphide and disulphide. Other constituents of asafetida are free ferulic (ferulaic) acid, moisture, and various mechanical impurities, such as calcium sulphate, and carbonate, sand, and stones.

AURANTII CORTEX.

Bitter-Orange Peel.

THE fresh or dried outer part of the pericarp of the Seville orange, the fruit of *Citrus Aurantium*, var. *Bigaradia*, Hooker filius (N.O. Rutaceæ), a small tree which is grown especially in the countries bordering on the Mediterranean. The fruit is a superior, polycarpellary, syncarpous berry (hesperidium), pulpy within, and covered externally with a tough rind or pericarp. It is collected and exported before it is quite ripe, the process of ripening being completed during the voyage from the south of Spain (Seville), whence the best oranges for medicinal purposes come, or from Sicily (Palermo). The outer part of the rind alone is official, and is usually removed from the fruit after it arrives in this country, care being taken to avoid rupturing the oil-glands in the epicarp. The fresh peel is not readily obtainable except during February, March, and April. The peel is a mild tonic, aromatic, and stomachic bitter, and is largely used as a flavouring agent. The chief preparations of the fresh peel are Tinctura Aurantii (1 in 4) and Vinum Aurantii; the tincture is an ingredient of Syrupus Aromaticus (1 in 4), Syrupus Aurantii (1 in 8), Syrupus Cascaræ Aromaticus (1 in 10), and Tinctura Quininæ. The dried peel is imported largely from Malta and Spain, the Maltese product forming the bulk of the imports. It is used in the preparation of Infusum Aurantii (1 in 20), Infusum Aurantii Compositum (1 in 40), Infusum Gentianæ Compositum (1 in 20), Spiritus Armoraciæ Compositus (1 in 8), Tinctura Cinchonæ Composita (1 in 20), and Tinctura Gentianæ Composita (1 in 13·3).

Fresh bitter-orange peel is deep orange-red or red in colour externally, and generally rough and glandular, the glands containing the volatile oil. The peel should have but a very small portion of the thick, white, spongy " zest " or mesocarp attached, as it is insipid, inodorous, and lacking in bitterness. The peel has a pleasant aromatic odour, and bitter taste. Orange wine is made by fermenting a saccharine solution to which fresh bitter-orange peel has been added. It may be prepared by pouring boiling syrup containing about one-fifth its weight of sugar upon the freshly removed rinds of bitter oranges and allowing the whole to stand for twelve hours; yeast must then be added and fermentation allowed to proceed for three days at 18° to 21° C., after which the wine should be strained into a barrel and the alcohol strength brought up, if necessary, to the required percentage by the addition of rectified spirit. Orange wine which is weak in alcohol is sometimes preserved by the addition of salicylic acid or sulphites, but such additions are not permissible in the case of wines intended for medicinal purposes. Dried bitter-orange peel should be in thin strips, the outer surface of which is deep orange-red in colour, rough, and glandular. As in the case of the fresh peel, and for the same reason, the dried peel should be as free as possible from the white spongy portion of the pericarp. The odour and taste resemble those of the fresh peel, but the dried peel is less aromatic.

The fresh or dried outer part of the pericarp of varieties of *Citrus Aurantium* grown in India and Ceylon is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, in making the preparations of the British Pharmacopœia, for which fresh or dried bitter-orange peel is directed to be used. The peel of the sweet orange, *Citrus Aurantium*, Linné, which is sometimes substituted for bitter-orange peel, is usually paler, more yellow in colour, thinner, and smoother. The chief constituent of bitter-orange peel is a volatile oil (s.g. 0·848 to 0·852), which consists of about 90 per cent. of d-limonene (hesperidene), together with various aldehydes and esters. It differs from the volatile oil of sweet-orange peel in odour and taste only. The bitter principle of the fruit is an amorphous glucoside, named aurantiamarin. Other constituents of the peel are two crystalline glucosides — hesperidin and isohesperidin, also a non-crystalline resinous body having a composition approximating to that of hesperetic acid, aurantiamaric acid, gum, resin, albumin, and a trace of fixed oil. Hesperidin exists chiefly in the white spongy mesocarp, and is most abundant in the peel of unripe oranges. It is darkened by alcoholic solution of ferric chloride, and it is decomposed by the action of very dilute sulphuric acid into hesperetin and glucose, while hesperetin, in turn, yields hesperetic acid and phloroglucin when treated with potassium hydroxide. Isohesperidin is hydrolysed by the action of acids.

AZADIRACHTA INDICA.

Indian Azadirach; Neem or Margosa Bark.

The dried bark of the stem of *Melia Azadirachta*, Linné (N.O. Meliaceæ), a native of India. The tree occurs wild in the forests of Southern India, Ceylon, and the Malay Archipelago, but it is also much planted in avenues for ornamental purposes. The drug is also known as "Neem Bark" or "Margosa Bark." It possesses tonic and antiperiodic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of quassia. It is used in the preparation of Infusum Azadirachtæ Indicæ (1 in 100) and Tinctura Azadirachtæ Indicæ (1 in 10).

Indian azadirach is coarsely fibrous and of a rusty-grey colour externally, but yellowish and much foliated internally. It occurs in slightly channelled pieces, about 5 mm. thick and from 5 to 8 cm. wide, with a rough, cracked outer surface. The bark varies in structure and thickness according to age, is without odour, and has a bitter, slightly astringent taste, due to the presence of resin and tannin.

The cause of the variation of Indian azadirach in structure and thickness is the gradual development of secondary layers of cork. The chief constituent of the bark is a bitter, amorphous, indifferent resin which fuses at 92° C., but it also contains a crystalline, bitter alkaloid named margosine, and a substance named margosic acid, together with tannin and a crystalline body melting at 175° C. Margosa oil or Neem oil is obtained from the seeds of the plant. It is a fixed oil with a bitter taste and an alliaceous odour, and has been found to contain resin and alkaloidal matter.

BALSAMUM PERUVIANUM.

Balsam of Peru.

A balsam exuded from the trunk of *Myroxylon Pereiræ*, Klotzsch (N.O. Leguminosæ), a tree which grows in various parts of Central America, particularly in the forests of San Salvador, on the so-called "balsam coast." The balsam is a pathological product and not a normal secretion, its production being induced by beating the bark, and stimulated by subsequent scorching of the trunk with torches. Cotton rags are inserted beneath the loosened bark, to absorb the exuding thick resinous liquid, and afterwards boiled with water, the separated balsam being subsequently removed by straining, or allowed to deposit by standing. It owes its name to the fact that it was formerly exported from Peru, but it is now shipped from Acajutla and Belize to New York and Hamburg. The balsam possesses stimulant and disinfectant expectorant properties; it is usually given as an emulsion, or applied externally as an ointment.

Balsam of Peru is a viscid liquid (s.g. 1·137 to 1·150) which appears nearly black in bulk, but is transparent and of a deep orange-brown or reddish-brown colour in thin layers. It has a fragrant, agreeable odour and an acrid taste, a burning sensation being left in the throat after swallowing the drug. The balsam is practically insoluble in water, which only dissolves a little of the cinnamic acid present and traces of benzoic acid, but it is soluble in all proportions in chloroform. When mixed with an equal volume of 90 per cent. alcohol it forms a clear solution; but when the alcohol is added in the proportion of more than 3 to 1 of balsam, the mixture becomes turbid. The absence of copaiba and resins, with which balsam of Peru is sometimes adulterated, is supposed to be indicated by the production of a permanently soft mixture on triturating the balsam with lime, but the test is unsatisfactory, as pure balsam of Peru becomes hard on keeping, whether lime be added or not. The presence of castor oil or other fatty oil is indicated by a fatty odour on warming a mixture of balsam and lime until all volatile matter is driven off and charring commences. If ethylic alcohol has been added to the balsam, a diminution in volume will be caused on shaking the drug with an equal bulk of water.

The absence of gurjun oil, which is sometimes used to adulterate balsam of Peru, may be proved by shaking the balsam with three times its volume of carbon bisulphide, when about 40 per cent. of resin should separate, and the clear supernatant liquid should be of a pale brown colour with only a slight fluorescence. If gurjun oil be present, a violet coloration will be produced on adding

5 per cent. of a freshly prepared and cooled mixture of nitric and sulphuric acids to the impure drug, but a similar colour is occasionally yielded by genuine balsam. The chief constituent of the balsam is about 60 per cent. of cinnamein—a colourless aromatic oil which consists chiefly of benzyl benzoate, but also contains a small quantity of benzyl cinnamate, an ester which can be separated in crystalline form; other constituents of the balsam are traces of vanillin and free cinnamic acid, together with about 32 per cent. of resin, consisting of peru-resinotannol combined with cinnamic and benzoic acids. It should be noted that the specific gravity of balsam of Peru is lowered by the addition of alcohol, fixed oils, turpentine, copaiba, etc. The quantitative determination of the resin and aromatic constituents present afford most information, both regarding probable adulteration and the actual value of the drug.

BALSAMUM TOLUTANUM.

Balsam of Tolu.

A BALSAM obtained from the trunk of *Myroxylon Toluifera*, H. B. and Kunth (N.O. Leguminosæ), a native of New Granada. It is a pathological product formed by the transformation of part of the young wood or bark tissue, as a result of irritation set up by making incisions in the tree. The balsam flows from the incisions, and is collected in gourds, which are subsequently emptied into skin bags or tins. It derives its name from Tolu, a small town near Cartagena, and is exported chiefly from Savanilla and other Colombian ports to New York. The balsam possesses stimulant and disinfectant expectorant properties. It is used in the preparation of Syrupus Tolutanus (1 in 9·5), Tinctura Benzoini Composita (1 in 40), and Tinctura Tolutana (1 in 10); the syrup is an ingredient of Mistura Ammoniaci (1 in 16), and the tincture is used in the preparation of a basis for lozenges.

Balsam of tolu is a soft and tenacious solid (s.g. 1·230 to 1·258) when first imported, but it hardens gradually on keeping, forming a brownish mass, which becomes brittle and is easily powdered in cold weather, but softens readily when warmed. In thin films it appears transparent and of a yellowish-brown colour, while, if a small piece be warmed and pressed between two glass slides, so that a very thin film is obtained, numerous colourless crystals of cinnamic acid and some vegetable débris can be seen, imbedded in a transparent mass, on examining the specimen with a lens or microscope. The aromatic constituents of the balsam impart to it an agreeably fragrant odour, which is especially marked when the drug is warmed; the taste is also somewhat aromatic and slightly acid. The balsam is soluble in 90 per cent. alcohol (1 in 1), glacial acetic acid (1 in 1), chloroform (2 in 1), or benzol (1 in 3), but it is insoluble in petroleum spirit, and nearly so in carbon bisulphide, yielding cinnamic acid principally to the last-named solvent. The alcoholic solution has an acid reaction, owing to the presence of cinnamic and benzoic acids.

The odour, taste, and slight solubility in carbon bisulphide are distinctive characters of balsam of tolu, which is more liable to adulteration than balsam of Peru. Among the substances which have been employed as adulterants are exhausted balsam of tolu and dried Canada turpentine. If balsam of tolu should be adulterated with resinous substances soluble in carbon bisulphide, they will leave a resinous instead of a crystalline residue on evaporation, and require less potassium hydroxide to effect complete saponification. The chief constituents of the balsam are 12 to 15 per cent. of free cinnamic acid, 0·5 per cent. of vanillin, and about 7·5 per cent. of cinnamein—an aromatic oily liquid, consisting principally of benzyl benzoate with a little benzyl cinnamate. The resinous portion of the drug, amounting to about 80 per cent., yields on saponification an alcohol (tolu-resinotannol) and cinnamic acid, together with a little benzoic acid.

BEBEERU CORTEX.

Bebeeru Bark; Bibiru or Greenheart Bark.

The bark of the greenheart or sipiri tree, *Nectandra Rodiœi*, Hooker (N.O. Lauraceæ), a native of Guiana and the neighbouring parts of South America. The tree attains a height of 20 m. or more, and is distinguished by having a very hard wood and a smooth greyish-brown bark, which has been used as a substitute for cinchona bark. The bark possesses tonic, febrifuge, and anti-periodic properties, but is used chiefly in the preparation of beberine sulphate, which occurs in thin, dark brown, translucent scales, or as a bitter yellow powder.

Bebeeru bark occurs in hard, flat, heavy pieces, from 10 to 12 cm. or more in length, 5 to 7·5 cm. wide, and 3 to 9 mm. thick. The outer surface is of a greyish-brown colour, and is frequently marked with broad shallow depressions, indicating where portions of the outer bark have been detached in scales or flakes (exfoliation) owing to the formation of bands of cork; the exfoliated portions are occasionally found adhering to the bark. The thin, greyish-brown, warty cork is easily scraped off the outer surface, and discloses a darker brown inner portion; internally, the bark is of a dark cinnamon colour, with broad, shallow, longitudinal depressions and coarse longitudinal striations, due to strands of sclerenchymatous tissue. The bark breaks with a short granular fracture, and a smooth transverse section, when examined under a lens, exhibits a very narrow, pale grey cork, external to a mass of bast tissue traversed by closely approximated, yellowish, wavy medullary rays, between which are numerous minute groups of sclerenchymatous cells arranged in radial lines. The bark has a strong bitter taste, but no odour.

The occurrence of bebeeru bark in flat heavy pieces, its thin greyish cork, and its structure as revealed in a transverse section, distinguish it from other barks. In appearance it differs considerably from sassy bark, which exhibits numerous large groups of sclerenchymatous cells in a transverse section, and is but rarely seen in flat pieces. Bebeeru bark is also readily distinguished from coto bark, which has a reddish-brown cork and is usually much thicker, besides having a characteristic taste. Elm bark is much paler in colour than bebeeru bark and distinctly fibrous. The chief constituents of bebeeru bark are various alkaloids, including beberine (bebirine or bebeerine), a colourless crystalline base, believed to be identical with buxine obtained from the bark and leaves of *Buxus sempervirens*, and pelosine obtained from the root of *Cissampelos Pareira*. A second alkaloid, siperine (sipirine or sepeerine), is a yellow or reddish-brown amorphous base, and may be an impure or decomposition product; it appears to correspond to the flavobuxine found in the bark and leaves of *Buxus sempervirens* and the pelluteine found in the root of *Cissampelos Pareira*.

BELÆ FRUCTUS.

Bael Fruit; Indian Bael.

THE fruit of *Ægle Marmelos*, Correa (N.O. Rutaceæ), a native of India, where the tree grows both wild and cultivated. It attains a height of 12 m., and produces a fruit about the size of a large orange, which has an aromatic flavour and is highly esteemed for its refreshing and astringent properties. The half-ripe fruit is collected from cultivated trees, and the pulp eaten while fresh, as a remedy for diarrhœa and dysentery. The fruit is frequently imported in dried transverse slices which resemble transverse sections of the whole fruit in appearance, the pulp being usually firmly adherent to the rind, and darker externally than internally. Unripe fruits or slices therefrom are less aromatic than ripe fruits, and may be distinguished by the presence of small undeveloped seeds. The dried half-ripe fruit was formerly official in the British Pharmacopœia, and the fresh half-ripe fruit is now official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. It is used in the preparation of Extractum Belæ Liquidum (1 in 1).

Bael fruit is about 7 or 8 cm. in diameter, globular, ovoid, or pear-shaped, and covered with a hard woody rind with a nearly smooth, pale yellowish-brown or greyish-brown, firmly adherent epicarp. The rind consists of two layers, the outer one containing oil-cells and the inner layer consisting of sclerenchyma. It bears a circular scar where the peduncle has been attached, and is too hard to cut with a knife. When, however, it is sawn across transversely, the woody rind appears reddish, and is seen to enclose ten to fifteen cells, each of which contains several compressed seeds covered with whitish woolly hairs, imbedded in a juicy, mucilaginous, yellowish or reddish aromatic pulp, and each surrounded by a clear tenacious mucus. The pulp becomes hard and brittle on drying, frequently breaking away from the rind, and acquiring an orange-brown or cherry-red colour externally. The dried pulp retains a faint aromatic odour, resembling that of elemi, and has a mucilaginous, slightly acid, and faintly astringent taste.

The smooth hard rind with firmly adherent reddish pulp, the numerous carpels, and the hairy seeds imbedded in mucilage, are distinctive characters of bael fruit.

Several substitutes for bael have been met with, but all differ in appearance from the genuine fruit. Thus, Mangosteen fruit, from *Garcinia Mangostana*, Linné (N.O. Guttiferæ), has a dark rind to which the pulp is not firmly adherent. The rind of pomegranate fruit, from *Punica Granatum*, Linné (N.O. Lythrariaceæ), has a powerfully astringent taste, and exhibits the distinct, shallow, angular depressions left by the seeds. The wood apple, from *Feronia elephantum*, Correa (N.O. Rutaceæ), has a rough exterior and is five-lobed but one-celled. The chief constituent of bael fruit is the exceedingly tenacious pulp, which becomes hard and transparent when dried. Moistened with water, the dried pulp yields a red liquid containing mucilage and pectin, without any appreciable quantity of tannin, but the ripe fruits appear to contain tannin, the reaction with ferric chloride being most marked in those portions of the pulp next to the rind.

BELLADONNÆ FOLIA.

Belladonna Leaves.

THE fresh leaves and branches of the deadly nightshade, *Atropa Belladonna*, Linné (Solanaceæ), a tall branching herb with a perennial root, which is widely distributed over Central and Southern Europe, and cultivated for medicinal purposes in the south of England and Germany. The fresh leaves, with the branches to which they are attached, are collected when the plant is in flower, as they are then richest in alkaloid. The arrangement of the upper leaves of belladonna in unequal pairs, the glabrous surface, and the presence of whitish raised points on the dried leaves, should be specially noted. Carefully dried leaves should be of a pale greyish-green hue rather than brownish, also very thin and brittle. The drug possesses anodyne, antispasmodic, mydriatic, and diuretic properties. It is used in the preparation of Atropine, Extractum Belladonnæ Viride, and Succus Belladonnæ.

Belladonna leaves have short stalks, the lower ones being arranged alternately, while the upper leaves are in unequal pairs. They are broadly ovate, varying from oval-lanceolate to ovate-lanceolate, acute at the apex, entire at the margin, and tapering at the base into a slightly winged petiole. The leaves vary in length from 8 to 20 cm., and appear quite glabrous as a rule, though a few hairs may usually be found near the midrib, while hairs occur in abundance on the pedicel and calyx of the flowers and on the upper portion of the stem. The midrib of the leaf is prominent below, but depressed on the upper surface, and a transverse section of the leaf, when examined under the microscope, exhibits bi-collateral bundles in the midrib, strands of bast occurring both above and below the wood. The lateral veins leave the midrib at an angle of about 45° to 60°. The fresh leaves are somewhat fleshy, and the mesophyll contains numerous very minute sandy crystals of calcium oxalate, the shrinkage of the tissue when the leaves are dried causing the cells filled with the crystals to appear as whitish prominences. Dried stramonium leaves somewhat resemble those of belladonna, but they become curled and twisted as they dry; their lateral veins make a more acute angle with the midrib than those of belladonna, and the leaves have a characteristic disagreeable odour. Digitalis and hyoscyamus leaves are readily distinguished from belladonna leaves, as they are hairy.

The chief constituents of belladonna leaves are the alkaloid hyoscyamine and its isomer atropine. The proportion of total alkaloid present in the dried leaves varies from 0·3 to 0·7 per cent., but the greater proportion consists of hyoscyamine, which becomes converted into atropine during the process of extraction from the drug. Belladonnine (oxyatropine) and apoatropine may also be formed during extraction, while the leaves contain various other compounds, including β-methyl-æsculetin or chrysatropic acid — a fluorescent principle which is also found in gelsemium root. Atropine may be extracted from belladonna leaves or root by percolating the powdered drug with alcohol, reducing the bulk of the resulting tincture by distillation, and adding diluted sulphuric acid in slight excess to decompose the alkaloidal salt in solution. The liquid is then evaporated to small bulk and filtered after the addition of an equal quantity of water. Solution of potassium hydroxide in slight excess is next added to decompose the sulphate which has been formed, and the liberated alkaloid is then shaken out with chloroform; finally, the chloroformic solution is allowed to evaporate spontaneously, the atropine being left in the form of colourless acicular crystals (m.p. 115° to 115·5° C.) which are soluble in water (1 in 500), more soluble in 90 per cent. alcohol (1 in 3), chloroform (1 in 1), ether (1 in 25), glycerin (1 in 52), or oleic acid (1 in 15). Commercial atropine frequently contains traces of unconverted hyoscyamine, from which it differs in being optically inactive. Homatropine hydrobromide is the salt of an alkaloid which does not occur naturally in belladonna but is prepared artificially from atropine.

BELLADONNÆ RADIX.

Belladonna Root.

THE root of *Atropa Belladonna*, Linné (N.O. Solanaceæ), usually from plants cultivated in England or Germany. The stout branching tap-root is collected in the autumn when about three or four years old, and carefully dried. The plant is most active when about four years old, and wild specimens are somewhat richer in alkaloid than cultivated ones. Old and exhausted roots, which may be distinguished by their prominently radiate structure, should not be used, as they are deficient in alkaloid. Belladonna root possesses similar properties to the leaves, but it is usually stronger in alkaloid. It is used in the preparation of Atropine and Extractum Belladonnæ Liquidum (0·75 per cent. of alkaloid), from which are prepared Emplastrum Belladonnæ (0·5 per cent.), Extractum Belladonnæ Alcoholicum (1 per cent.), Linimentum Belladonnæ (1 in 2), Tinctura Belladonnæ (1 in 15), and Unguentum Belladonnæ (0·6 per cent.). The alcoholic extract is used in the preparation of Suppositoria Belladonnæ (1·5 grain).

Belladonna root occurs in nearly cylindrical pieces, varying in diameter from 10 to 20 mm., and in length from 15 to 30 cm. or more. It is of a pale greyish-brown colour externally, finely wrinkled or striated longitudinally, is often marked with short transverse scars, and frequently has a powdery or mealy surface, owing to the thin epidermis being easily abraded and starchy matter beneath becoming detached. The transverse fracture is short and not at all fibrous, but in badly dried belladonna root the transverse fracture often appears brownish, hard, and resinous, and the epidermis is not easily abraded. The interior of the root is whitish, owing to the presence of small compound starch-grains in the parenchymatous cells of both bark and wood. Other cells are filled with numerous very minute sandy crystals of calcium oxalate, both those and the muller-shaped starch-grains being revealed under the microscope. A transverse section of a young root exhibits a greyish non-fibrous bark, separated by a dark cambium layer from the whitish wood, to which it adheres closely; near the cambium ring the wood exhibits numerous scattered dark groups of large porous vessels and fibres, which are seldom arranged in more than an indistinctly radiate manner, except near the crown of the root, where it passes imperceptibly into the rhizome and one or more rings of radiate yellowish wood may be found, as well as an evident pith.

The root of *Atropa Belladonna* collected in spring is deficient in alkaloid, and contains sugar, but very little starch, while its outer surface is shrunken, and the interior is dark-coloured and spongy. Several roots may be mistaken for that of belladonna. That of elecampane (*Inula Helenium*, Linné) contains oil-glands, and the groups of vessels are inconspicuous; poke root (*Phytolacca decandra*, Linné) presents a series of concentric rings; small pieces of scammony root have a very characteristic structure; marshmallow root has a fibrous bark, and radiate wood in which scattered groups of vessels are not visible; liquorice root is yellowish internally, and possesses a characteristic sweet taste. The chief constituents of belladonna root are the two alkaloids, hyoscyamine and its isomer atropine. Young roots contain hyoscyamine only, but older ones contain atropine also. In addition, belladonna root contains β-methyl-æsculetin or chrysatropic acid—a fluorescent principle, whilst traces of scopolamine may be found, and belladonnine (oxyatropine) and apoatropine appear to be formed in the course of isolating the more important bases. The total alkaloid present varies, as a rule, between 0·4 and 0·6 per cent., but as much as 1·0 per cent. has been found.

BENZOINUM.

Benzoin.

A BALSAMIC resin obtained from *Styrax Benzoin*, Dryander (N.O. Styraceæ), and probably other species of *Styrax*. The resin is a pathological product, formed by the resinification of the parenchymatous cells of the medullary rays, and the contents and walls of the cells of the bast parenchyma and wood. The fluid resin exudes from incisions made in the bark, or accumulates between the bark and the trunk, and gradually hardens. When quite firm, the benzoin is collected, softened by the aid of heat, and packed in boxes, together with a varying proportion of vegetable débris. Sumatra benzoin is obtained from *S. Benzoin*, and is exported from Padang, on the west coast of Sumatra; while Siam benzoin is collected from an unknown species of *Styrax* growing in the province of Luang Prabang, on the Mekong River. Siam benzoin is the better for making pharmaceutical preparations, since the Sumatra variety rarely answers the official requirements. The drug possesses expectorant, styptic, and antiseptic properties, and is used in making Benzoic Acid, Adeps Benzoatus, Tinctura Benzoini Composita (1 in 10), and Unguentum Cetacei.

Siam benzoin occurs in flat or curved (concavo-convex) tears, or in masses. The tears vary considerably in size, but rarely exceed 5 cm. in length and 12 mm. in thickness. The shape of the curved pieces is due to the resin accumulating between the bark and trunk of the tree. The tears are brittle, but soften when warmed and, when further heated, give off fumes of benzoic acid. They are opaque and milky-white internally, but are usually covered with a coating of yellowish or reddish-brown resin, which increases in thickness with age, probably as the result of chemical changes brought about by oxidation. Block Siam benzoin consists of small tears, more or less closely cemented together by a glassy, reddish-brown, transparent or translucent resin, the proportion of which increases with age. Siam benzoin is characterised by its agreeable odour, recalling that of vanilla, and is almost entirely soluble in solution of potassium hydroxide, or in 5 parts of 90 per cent. alcohol. It yields only about 1 to 2·5 per cent. of insoluble residue, and not more than 1·5 per cent. of ash. Sumatra benzoin occurs only in masses, consisting of white tears imbedded in a dull reddish-brown or greyish-brown opaque resin, and having an odour recalling that of storax. It is soluble to the extent of 70 to 80 per cent. in 90 per cent. alcohol, and should not yield more than 1·5 per cent. of ash.

There are several commercial varieties of benzoin, but only the Siam and Sumatra drugs are recognised in the British Pharmacopœia. The distinctive characters of Siam benzoin are the bold tears in which it occurs and its vanilla-like odour; Sumatra benzoin is distinguished by the dull appearance of the resin in which the tears are imbedded, its storax-like odour, and the presence of cinnamic acid. Other varieties are Penang and Palembang benzoins, both of which are collected in the south-east districts of Sumatra. Penang benzoin also has the storax odour, and is sometimes offered as Sumatra, but it is easily distinguished by its fused and glassy appearance when fractured. Palembang benzoin is a mixture of resin and woody matter, and is probably of similar origin to Penang benzoin. The chief constituent of Siam benzoin is about 38 per cent. of benzoic acid, partly free and the remainder combined with the two alcohols—benzo-resinol and sia-resinotannol—of which the resin mainly consists; it also contains 0·15 per cent. of vanillin, and 0·3 per cent. of an oily aromatic liquid—probably an ester of benzoic acid, but no cinnamic acid. Sumatra benzoin yields about 18 per cent. of benzoic acid and 20 per cent. of cinnamic acid, both of which are partly free and partly combined with two alcohols—benzo-resinol and suma-resinotannol; it also contains 1 per cent. of vanillin, and traces of benzaldehyde, styrol, styracin, phenyl-propyl cinnamate, etc., all of which tend to modify its odour. The presence of cinnamic acid is indicated by the evolution of benzaldehyde when a little powdered Sumatra benzoin is boiled in acidulated solution of potassium permanganate. If subjected to dry distillation, benzoin yields benzoic acid, together with various empyreumatic products, including styrol.

BERBERIDIS CORTEX.

Barberry Bark.

THE bark of the stem of the common barberry, *Berberis vulgaris*, Linné (N.O. Berberidaceæ), a spreading shrub about 2 m. high, which grows wild in Great Britain and is distributed over the greater part of Europe and Western Asia. The plant is distinguished by the three-lobed spines or thorns at the bases of the tufts of leaves, and bears drooping racemes of yellow flowers, which are succeeded by slightly curved, oblong, scarlet berries. The fruits contain citric and malic acids, and possess astringent and antiscorbutic properties. The root and bark contain berberine, and have been used for dyeing yellow. Both stem-and root-barks are used in medicine, the former being collected by shaving the trunk. The drug possesses tonic and febrifuge properties, and produces a laxative effect if given in large doses. It is used in the form of liquid extract (1 in 1).

Barberry bark obtained from the stem occurs in thin, nearly flat pieces, which are not more than 5 cm. long or 12 mm. in breadth. It is of a dark yellowish-grey colour externally, and is marked with shallow longitudinal furrows; it tends to become scaly, and frequently bears the minute black apothecia or cup-shaped "fruits" of lichens. Internally, the bark is dark yellowish-brown, fibrous, and longitudinally striated, with fragments of yellowish wood occasionally adhering to it. The outer portion of the bark breaks with a short fracture, but the fracture of the inner (bast) portion is fibrous and strongly laminated. When a transverse section is examined under a lens, it exhibits a thin cork, and a dark brown bast or inner layer, which is traversed by paler yellow medullary rays. The laminated appearance of the fractured bark is produced by the separation in strands of the rays of narrow, tangentially elongated bundles of bast fibres from the bast parenchyma. The bark has a bitter taste, and colours the saliva yellow when chewed.

The yellowish colour of barberry stem-bark is distinctive, but the drug is also characterised by the presence of minute lichens, and strongly laminated bast. The root-bark is greyish externally and bears no lichens, but appears to contain the same constituents as the stem-bark and possesses similar properties. The chief constituent of barberry bark is berberine, a yellow, crystalline, bitter alkaloid, which also occurs in calumba root and in hydrastis rhizome. Other constituents are oxyacanthine, berbamine, other alkaloidal matter, a little tannin, also wax, fat, resin, albumin, gum, and starch. Oxyacanthine can be obtained in colourless bitter crystals, and berbamine is also a colourless crystalline alkaloid.

BERBERIS.

Berberis.

THE dried stem of the Nepal barberry, *Berberis aristata*, De Candolle (N.O. Berberidaceæ), a shrub indigenous to India and Ceylon. It is known as "Dárlahad," under which name are also included the dried stems of *B. lycium*, Royle, and *B. asiatica*, Roxburgh, but only the stem of *B. aristata* is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. It is a bitter tonic, antiperiodic, and diaphoretic, and is used in the form of Liquor Berberidis Concentratus (1 in 2) and Tinctura Berberidis (1 in 10).

Berberis occurs in undulating pieces from 2·5 to 5 cm. in diameter, with an orange-brown periderm, which has been removed in places, disclosing the darker brown underlying tissues of the cortex. The periderm is marked with slightly wavy, longitudinal striæ, and occasional longitudinal depressions. A transverse section of the stem shows an outer, narrow, brown periderm, surrounding a broad, dark brown liber, which is traversed by somewhat lighter medullary rays, and encloses a bright yellow wood, the colour of which is somewhat lighter in the portion next to the liber. The woody cylinder is composed of narrow vascular wedges, which contain numerous vessels and are separated by narrow, paler-coloured medullary rays. The drug has a faint odour and a bitter taste.

The chief constituents of the stem of *Berberis aristata* are the same as those of common barberry bark, the bitter principle being the alkaloid berberine, which is present in considerable quantity, together with tannin, resin, gum, starch, and other alkaloidal matter—probably including oxyacanthine and berbamine. A dark brown extract, prepared from the wood or roots of different species of *Berberis*, is known in India as " Rusot " ; it has the consistence of opium, and a bitter, astringent taste.

BETEL.

Betel.

THE leaves of *Piper Betle*, Linné (N.O. Piperaceæ), a climbing shrub indigenous to and cultivated in India, Ceylon, and the Malay Islands. The leaves are plucked while green, pressed closely together by means of stones or other heavy weights, and ripened by the aid of heat, becoming pale yellow and brittle in the process. The leaves are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, and are frequently found in commerce tied up or stitched together into packets. They possess stimulant, narcotic, and antidysenteric properties. The leaves are largely used as a masticatory, mixed with lime, catechu, and areca nuts; cardamoms, nutmegs, cloves, camphor, and other aromatics are sometimes added to increase the stimulant and exhilarant effect produced when the leaves are chewed.

Betel leaves are broadly ovate, acuminate, obliquely cordate at the base, and five- or seven-nerved. They are yellow and brittle, and as usually seen are packed and stitched closely together. The leaves are thin and dull in appearance, rather than coriaceous, and are not glossy on the upper surface, as stated in the Indian and Colonial Addendum. The warm aromatic taste of the leaves is due to the presence of volatile oil.

The most important constituent of betel is the volatile oil (s.g. 0·958 to 1·044), which consists chiefly of chavibetol (betel-phenol or methoxy-chavicol), an isomer of eugenol; the oil also contains the sesquiterpene cadinene, and may contain chavicol, several terpenes, and other constituents, the composition of the oil varying according as it is obtained from leaves grown in Siam, Java, or elsewhere. It is of interest to note that slices of areca nut (*Areca Catechu*, Linné), mixed with catechu and spices, and wrapped in a betel leaf previously smeared with a little "Chunam" or shell-lime, constitute the masticatory known as "Betel," which is extensively chewed in India.

BRYONIÆ RADIX.

Bryony Root.

THE root of *Bryonia dioica*, Jacquin (N.O. Cucurbitaceæ), a perennial climbing and trailing plant, with rough, hairy leaves, which is common in the south of England, and is also found in Central and Southern Europe. The plant has diœcious flowers and scarlet berries, and produces a large tuberous rootstock which is continuous with a thick fleshy root; the subterranean part of the plant often measures 5 to 10 cm. in diameter at the upper extremity, and attains a length of 50 to 60 cm. It is collected in the autumn and used both in the fresh and dried states, acting as an emmenagogue and a hydragogue cathartic; it also has an irritant effect when applied to the skin, and may cause vesication. The fresh root is used in the form of a tincture (1 in 10).

Bryony root is nearly cylindrical and sometimes branched, though usually simple; when fresh, it is of a dirty yellow or yellowish-white colour externally, and marked at close intervals with prominent, transverse, corky ridges which often extend half round the root and give it the appearance of being circularly wrinkled. Internally it is whitish, succulent, and fleshy, with a nauseous odour—which disappears in great measure on drying the root—and a bitter, acrid taste. The juice which exudes on cutting the root is milky, owing to the presence of numerous minute starch grains. A transverse section of the root exhibits a narrow bark separated by a fine line from a large fleshy wood, which contains small groups of vessels radiately arranged and extending from the centre to the circumference of the section. The dried root occurs in circular, transverse, brittle slices about 5 cm. in diameter, with a thin, yellowish-grey or greyish-brown, longitudinally wrinkled bark, and a whitish or greyish central portion, from which project numerous small groups of vessels arranged in circles and radiating lines.

The large size, tapering shape, transverse corky ridges, and nauseously bitter taste of bryony root are distinctive. Small specimens may resemble horseradish root, but that is cylindrical and smooth, and has a pungent taste. The root of *Bryonia alba*, Linné, a plant which bears monœcious flowers and black berries, but is not indigenous to Britain, is very similar to that of *B. dioica*. The chief constituent of bryony root is a bitter white glucoside named bryonin and an acid resinous substance bryoresin; on hydrolysis bryonin yields glucose and a yellowish amorphous resin bryogenin. Other constituents of the root are starch, sugar, and gum. The root of *B. alba* contains the same substances, but is also stated to contain a glucoside brein, which causes the drug to produce a somewhat different physiological effect.

BUCHU FOLIA.

Buchu Leaves.

The dried leaves of *Barosma betulina*, Bartling and Wendland (N.O. Rutaceæ), a small shrubby plant which is indigenous to Cape Colony. The leaves are collected while the plant is flowering and fruiting, and then dried. They are exported from Cape Town, and are known in commerce as "short buchu," while the leaves of *B. serratifolia*, Willdenow, and *B. crenulata*, Hooker, also natives of

South Africa, are known commercially as "long buchu," and yield an oil containing little or no diosphenol when cooled. The drug possesses tonic, stomachic, diuretic, and diaphoretic properties. It is used chiefly in the form of Infusum Buchu (1 in 20) and Tinctura Buchu (1 in 5).

Buchu leaves are roundish (rhomboid-obovate) in shape, from 12 to 20 mm. long, pale green or yellowish-green in colour, rigid and brittle when dry, but cartilaginous when moist. The surface of the leaves is glabrous, finely wrinkled below, and marked with small wart-like prominences above, owing to the elevation of the epidermis by subjacent oil-glands. The margin is usually sharply denticulate, showing numerous minute sharp teeth, and the apex is blunt and recurved. On examination with a lens, by transmitted light, numerous oil-glands are distinctly visible, especially near the margin of the leaves, one being situated near the base of each indentation. A transverse section of a leaf exhibits an epidermis of five- or six-sided tabular cells, containing yellow amorphous masses or sphero-crystals of hesperidin, while the thick inner walls of the cells are rich in mucilage and swell in the presence of water. The odour of buchu, which is particularly marked when the leaves are crushed, is reminiscent of a mixture of peppermint and black currant; the strong and aromatic taste is due to the presence of volatile oil.

The roundish shape and recurved apex of buchu leaves from *Barosma betulina*, as also the distribution of the oil-glands and the characteristic odour and taste of the drug, are characteristic. Bearberry leaves, which somewhat resemble buchu leaves, are spoon-shaped, rounded at the apex, and destitute of oil-glands; while the leaves of *Empleurum serrulatum* and of other species of *Buchu* differ from those of *B. betulina* in shape, margin, distribution of oil-glands, absence of diosphenol, etc. The leaves of *B. serratifolia* are from 25 to 38 mm. long, and linear-lanceolate in outline, with a serrate margin and distinctly truncate apex. The leaves of *B. crenulata* are rather broader than those of *B. serratifolia*, varying in outline from lanceolate to oval-oblong, with a minutely serrate margin and a blunt but not recurved apex. Karoo buchu, from *Diosma succulenta*, Berg, var. *Bergiana*, consists of nearly oval coriaceous leaves which are from 3 to 6 mm. long and about 1·75 mm. broad, with an entire margin and an acute and slightly recurved apex. The leaves yield mucilage and a volatile oil which appears to contain diosphenol. Buchu leaves, from *B. betulina*, should yield from 1 to 2 per cent. of a volatile oil containing about 30 per cent. of crystalline diosphenol, an optically inactive compound; the oil also contains menthone and a hydrocarbon with a pinene-like odour. Other constituents of buchu leaves are resin, mucilage, and the yellow, physiologically inactive, crystalline substance (hesperidin) which forms the sphero-crystals.

BUTEÆ GUMMI.

Butea Gum; Bengal Kino.

AN inspissated juice obtained from incisions in the stem of *Butea frondosa*, Roxburgh (N.O. Leguminosæ), the "Dhak-tree" of India. The juice flows from natural fissures, as well as from incisions made in the stem artificially. It hardens quickly in the form of small, elongated, brittle tears, but it occurs usually in commerce in small fragments of irregular shape. When fresh it is ruby-coloured and almost entirely soluble in water, but it darkens in colour on keeping, and becomes more or less insoluble, the fragments swelling up in water, like bassorin. It possesses astringent properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as a substitute for East Indian, Malabar, or Madras kino, in making official preparations for which ordinary kino is directed to be used.

Butea gum occurs in small, irregular, shining fragments of a very dark ruby colour, which appear opaque, though very thin flakes are translucent when examined by transmitted light. The fragments are only partially soluble in water, but yield about 40 per cent. to 90 per cent. alcohol, the solution being almost colourless. The drug should be free from corky or woody particles. It is odourless, but has an astringent taste, owing to the presence of tannin. It tends to become dull and blackish on keeping. Portions of light grey corky bark are frequently found adhering to fragments of butea gum, but must be removed before use, together with any particles of wood, sand, etc., which may be present.

The characters and properties of Butea gum are much the same as those of ordinary kino. A purified specimen has been found to contain more than 73 per cent. of tannin, nearly 22 per cent. of gum, also gallic acid, and other soluble substances, and about 5 per cent. of extractive matter which dissolved with difficulty. But the proportion of tannin may vary from about 15 to 62 per cent., and that of other soluble matters from about 3·5 to 11 per cent., while from 10 to 46 per cent. may consist of insoluble matter. As the soluble tannin readily becomes converted into a substance which is insoluble in alcohol, owing to the action of an oxydase (see Kino), old samples of the drug are not suitable for preparing tinctures. The fact that the insoluble substance dissolves in warm sodium hydroxide solution, with the formation of traces of pyrocatechin, has been supposed to indicate the existence of a catechol-tannic acid altered by oxidation, but no such substance could be detected in a sample of fresh Butea gum.

BUTEÆ SEMINA.

Butea Seeds.

THE seeds of *Butea frondosa*, Roxburgh (N.O. Leguminosæ), a native of India, where it is known as the "Dhak-tree." The seeds, and a powder (Pulvis Buteæ Seminum) prepared therefrom, are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, where they are employed as an equivalent of santonin. The seeds possess aperient and anthelmintic properties, and they also act as a rubefacient when pounded with lemon juice and applied to the skin.

Butea seeds are flat and reniform in shape, from 25 to 38 mm. long, 16 to 25 mm. wide, and 1·5 to 2 mm. thick. The thin, glossy, dark reddish-brown testa is veined and wrinkled, and encloses two large, leafy, yellow cotyledons, while there is a large prominent hilum situated near the middle of the concave edge of the seed. The seeds have a faint odour and a slightly acrid taste.

It is not clear to what the activity of butea seeds is due, but they yield a tasteless, yellow fixed oil (s.g. 0·917 to 0·927) which solidifies at 10° C. No alkaloidal or glucosidal matter has been found in the seeds, but they contain 18·2 per cent. of fat, 19·6 per cent. of albuminoids, and 10·10 per cent. of metarabic acid and phlobaphene, together with glucose, mucilage, 4 per cent. of organic acids, and small quantities of wax and a substance, apparently nitrogenated, which is soluble in alcohol.

CADINUM OLEUM.

Oil of Cade; Juniper Tar Oil.

An empyreumatic oily liquid obtained by the destructive distillation of the woody portions of the prickly cedar, *Juniperus Oxycedrus*, Linné (N.O. Coniferæ), and some other species of *Juniperus.* The *J. Oxycedrus* is a short or small tree indigenous to the countries bordering the Mediterranean, and the oil is prepared chiefly in the south of France, near Nismes and Toulon, by a process of downward distillation similar to that employed in preparing tar. The heartwood and other woody portions of the trees are cut into small pieces and laid carefully upon one another in such a way that combustion can take place freely when the pile is ignited, without too free access of air being permitted, the burning pile being kept enclosed in a covered pit or kept covered up with earth, and the product of distillation collected as it descends. The oil is used as a stimulant in cases of skin disease, being applied in the form of ointment, or emulsified and added to baths.

Oil of cade (s.g. 0·990) is a dark reddish-brown or nearly black, more or less viscid, oily liquid, with a distinctive, empyreumatic or tarry odour and a somewhat aromatic, bitter, acrid taste. It mixes in all proportions with ether or chloroform, and is almost wholly soluble in hot 90 per cent. alcohol, though only partially soluble in cold alcohol. The oil is very slightly soluble in water, a filtered aqueous solution or extract being yellowish or almost colourless and possessing an acid reaction, owing to the presence of acetic acid, while it assumes a reddish colour when treated with a very dilute solution (0·1 per cent.) of ferric chloride.

An aqueous solution of coal-tar is darker coloured than a similar solution of oil of cade, and possesses an alkaline reaction, while a similar extract of birch tar assumes a greenish colour when treated with a very dilute solution of ferric chloride. Wood-tar is more viscid and of higher specific gravity (1·02 to 1·15) than oil of cade, the specific gravity of which may be slightly higher than 0·990 in old specimens. Pine and beech tars are completely soluble in 95 per cent. acetic acid, but oil of cade is only partially soluble. The chief constituent of the oil is the sesquiterpene cadinene, of which it contains a large proportion, together with certain phenols.

CAJUPUTI OLEUM.

Oil of Cajuput.

The oil distilled from the leaves of *Melaleuca Leucadendron*, Linné (N.O. Myrtaceæ), a tree of considerable size which is common in the Indian Archipelago and the Malayan Peninsula, and is also found in Northern Australia, Queensland, and New South Wales. The oil is prepared largely in the islands of Amboyna, Banda, and Bouro, and is imported chiefly from Batavia and Singapore. It is a powerful topical and general stimulant, antispasmodic, and diaphoretic. The oil is given on sugar or in pills, or used in the form of Spiritus Cajuputi (1 in 10); it is also an ingredient of Linimentum Crotonis (7 in 16).

Oil of cajuput (s.g. 0·922 to 0·930) has a fine bluish-green colour, and an agreeable, penetrating, camphoraceous odour. The taste is aromatic, somewhat bitter, and also camphoraceous. The oil is soluble in all proportions of 90 per cent. alcohol, and should become semi-solid on being stirred, when cold, with one-third or one-half its volume of phosphoric acid (s.g. 1·750), thus indicating the presence of a due proportion of cineol, with which the acid forms a crystalline compound.

The chief constituent of oil of cajuput is cineol (cajuputol or eucalyptol), which may be present to the extent of 55 to 65 per cent. Other constituents of the oil are terpineol, terpinyl acetate, butyric, valeric, and benzoic aldehydes, and lævo-pinene. The specific gravity of the oil is lowered by adulteration with turpentine or by abstraction of cineol. Oils which are very similar in composition to that obtained from *M. Leucadendron* are yielded by other species of *Melaleuca*, including *M. minor*, *M. uncinata*, *M. acuminata*, and *M. viridiflora*, but they all differ more or less in their physical characters.

CALENDULÆ FLORES.

Calendula ; Marigold Florets.

The florets of the common marigold, *Calendula officinalis*, Linné (N.O. Compositæ), a native of the Levant and Southern Europe, which is cultivated widely as a garden plant. It has a rough and somewhat angular stem about 50 cm. high, and thickish alternate leaves, which are hairy, spathulate or oblanceolate, and entire or slightly toothed, the upper ones being sessile and amplexicaul. The plant bears orange-yellow flower-heads about 5 cm. in diameter, with two rows of equal, lanceolate, acute, and hairy involucral scales, and a flat naked receptacle on which are arranged numerous sterile disc florets, and one or more rows of fertile ligulate ray florets. The fruits are incurved muricate achenes without a pappus. When the flower-heads are fully expanded, the ray florets are collected and dried. They possess stimulant, resolvent, and vulnerary properties, and are used in the form of extract, infusion, or tincture (1 in 5), chiefly in applications for sprains and bruises.

Calendula consists chiefly of the yellow or orange-coloured ligulate corollas of the ray florets, which are about 12 mm. or more in length and about 3 mm. broad, the short hairy tube enclosing the remains of a filiform style which terminates in two elongated branches. The limb of the corolla has three teeth at the apex and is delicately veined in a longitudinal direction, four principal veins being seen on examination with a lens. The odour of the drug is slightly aromatic, and the taste distinctly bitter. The dried florets become whitish on exposure to the sun, and the odour is less pronounced in the dry than in the fresh florets.

The ligulate ray florets of *Arnica montana* are yellow and three-toothed, but are distinguished from marigold florets by having from seven to nine veins, while those of the dandelion, *Taraxacum officinale,* have five teeth. The flower-heads of the French and African marigolds (*Tagetes patula* and *T. erecta,* Linné) are distinguished from those of calendula by the tubular involucre, the straight, slender, flattish achenes with a chaffy pappus, and the broadly strap-shaped ray florets of a light or deep orange colour, sometimes striped with red. Dried marigold florets have been used for adulterating saffron, but can easily be distinguished from that drug by allowing them to expand in water. They contain a tasteless yellow substance, named calendulin, which swells in water like bassorin, but is soluble in alcohol; other constituents of the drug are a bitter principle, volatile oil, fixed oil, resin, sugar, and gum.

CALOTROPIS.

Calotropis ; Mudar or Madar.

THE dried root-bark of *Calotropis procera*, R. Brown (N.O. Asclepiadaceæ), and of *C. gigantea*, R. Brown, trees indigenous to India and other Eastern countries. They contain a milky juice which is regarded as a drastic purgative and caustic. The root-bark, freed from its outer corky layer, is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. The drug possesses tonic and emetic properties, and is given in the form of powder or Tinctura Calotropis (1 in 10).

Calotropis occurs in short, more or less quilled pieces, from 2 to 5 mm. thick, and not exceeding 3·7 cm. in width. They are covered with a soft, greyish-buff, strongly furrowed and reticulated periderm, from 1 to 2 mm. thick, which is easily separable from the underlying yellowish-white tissues, and must be removed before the bark is powdered for use. The inner surface of the bark is somewhat granular and of a pale brown colour. A transverse section of the drug exhibits narrow, indistinct, pale brown phloem rays in the inner liber. The bark breaks with a mealy fracture, and has only a faint odour ; its taste is mucilaginous, bitter, and acrid.

The barks of the two species of *Calotropis* are mixed together in commercial specimens of the drug, and are similar in appearance, while both varieties possess similar properties. The chief constituents of the drug are a yellow bitter resin, a black acid resin, a colourless crystalline body named madaralban, an amber-coloured viscid substance named madarfluavil, and caoutchouc. Madaralban and madarfluavil are analogous to alban and fluavil, two resinous constituents of gutta-percha.

CALUMBÆ RADIX.

Calumba Root ; Colombo Root.

THE dried, transversely cut slices of the root of *Jateorhiza Columba*, Miers (N.O. Menispermaceæ), a lofty climbing plant indigenous to Portuguese East Africa. It produces swollen fleshy roots, which are dug up in the dry season, cut into transverse slices, and dried. The drug is a bitter stomachic and tonic, and is used in the preparation of Infusum Calumbæ (1 in 20), Liquor Calumbæ Concentratus (1 in 2), and Tinctura Calumbæ (1 in 10).

Calumba root occurs in irregular, flattish, circular, or somewhat oval slices, which are usually from about 2·5 to 5 cm. in diameter, and from 3 to 12 mm. in thickness, though both larger and thicker pieces may be found. They are more or less uniformly yellow in colour, break with a short starchy fracture, have a feeble, musty odour and a marked, bitter taste. If the dull greyish or greenish-yellow surface be shaved off with a knife, the colour will be found to be much brighter inside, and the yellow tint most marked near the cork and the cambium. The circumference of the sections consists of a thin, dark brown, wrinkled, corky layer. The cork is easily separated from the yellowish-brown bark which occupies about one-fifth of the diameter of the root; the bark is marked with radiating lines of sieve tissue, and is divided from the central woody portion by the dark cambium line. The wood is of a lighter colour than the bark, and contains vessels arranged in narrow, radially elongated groups. The parenchymatous tissue is largely developed, and contains numerous starch-grains, both in the wood and bark; the starch-grains are mostly simple, with an eccentric or non-central hilum.

The slices of calumba root are usually somewhat shrunken and depressed in the centre, the greater contraction there on drying being probably due to the central tissue being less woody and less loaded with starch than the outer portions. Slices of the stem of *Coscinium fenestratum* are distinguished from calumba by being dark yellow in colour, hard and woody, free from starch, and not depressed in the centre; slices of the root of *Frasera caroliniensis* contain tannin, and are usually smaller and thicker than those of calumba, besides being free from starch. Calumba root contains three bitter principles—calumbic acid and its anhydride calumbin, both of which are colourless crystalline bodies, and the yellow crystalline alkaloid berberine, to which the colour of the root is chiefly due. Much starch is also present in the drug, together with mucilage and a fluorescent body, but tannin is absent.

CAMBOGIA.

Gamboge.

A GUM-RESIN obtained from *Garcinia Hanburii*, Hooker filius (N.O. Guttiferæ), a tree found in Siam, near the south-west coast of Cambodia, and on some of the adjacent islands, as well as in the southern parts of Cochin China. The tree produces a yellow opaque juice in the secretory ducts which exist in the cortex and bast, those two systems of tissue being connected at the nodes of the stem by transverse canals. The juice issues in drops on breaking off the leaves and shoots, but it is collected systematically during the rainy season, when spiral cuts are made in the bark in a longitudinal direction, to a height of about 3 metres above the ground, and the milky gum-resin is received as it exudes in hollow bamboos, from which it is transferred to smaller ones in which it is allowed to solidify, any water present being driven off by mild continuous heat. After the lapse of a month, the solidified gamboge is removed from the bamboos by heating the latter over a fire until they crack and peel off. The pipes or cylinders of gum-resin, which are often more or less hollow owing to contraction during drying, are allowed to harden before being packed, and are then conveyed to Bangkok for exportation to Singapore and Europe. Sometimes the pipes are agglutinated into masses, in which traces of the pipe formation are still evident. An inferior variety of the gum-resin, known as cake or lump gamboge, is exported from Saigon in cakes or masses which bear the impression of leaves in which they have been wrapped whilst soft. The drug is a powerful hydragogue cathartic, but acts as a diuretic in small doses; it is used in the preparation of Pilula Cambogiæ Composita (1 in 6).

Gamboge of the best quality occurs in cylindrical solid or hollow rolls, which are longitudinally striated on the surface, and may be more or less agglutinated into masses. The pieces show a smooth, uniform, conchoidal or shell-like fracture when broken, the freshly broken surface having a dull gloss and being of a uniform reddish-yellow or brownish-orange colour. The drug is easily reduced to a bright yellow powder, and possesses little or no odour, but has a very acrid taste. When rubbed with water, a yellow emulsion is formed, the gum dissolving, and the resulting mucilage holding the resin and other constituents of the drug in suspension. The resin is soluble in alkaline solutions, but gamboge is only partially soluble in 90 per cent. alcohol, the residue being soluble in water. Powdered gamboge is sometimes adulterated with starch, the presence of which can be detected by making a decoction with boiling water, allowing it to cool, and adding solution of iodine; if more than traces of starch be present, the cooled decoction turns green, owing to the blue colour of the starch iodide blending with the yellow of the decoction. When incinerated, gamboge should not yield more than 3 per cent. of ash.

Roll or pipe gamboge occurs in pieces from about 2·5 to 5 cm. in thickness, and from 10 to 20 cm. in length, the pipes being marked with longitudinal furrows caused by ridges on the inner surface of the bamboos in which they have been dried, and revealing traces of the pipe formation even when agglutinated into masses. Cake gamboge occurs in irregular masses of 1 to 1·5 kilogrammes or more, the masses often containing sticks and other impurities; they also contain many air-cells, and are less dense, less uniform in texture, and less brittle than pipe gamboge. Inferior gamboge, whether in pipes or cakes, is of a dark brownish colour, and breaks with a dull, rough, splintery fracture, the fractured surface often exhibiting small cavities. Gamboge of good quality contains from 66 to 82 per cent. of an acrid resin named cambogic acid, 15 to 25 per cent. of gum, 4 per cent. of wax, 2·5 per cent. of moisture, and traces of starch. The chief adulterants of gamboge are starch, sand, vegetable débris, etc., all of which are insoluble in alcohol and water, or in dilute ammonia. The presence of starch can be detected by the iodine test, while inorganic substances, if present, will increase the percentage of ash left upon incineration.

CAMBOGIA INDICA.

Indian Gamboge.

THE gum-resin obtained from *Garcinia Morella*, Desrousseaux (N.O. Guttiferæ), a tree which is indigenous to India The drug possesses hydragogue cathartic properties simila to those of Siam gamboge, and it is official in the Indian and Colonial Addendum, for use as an equivalent of Siam gamboge in India and the Eastern Colonies.

Indian gamboge occurs in irregular fragments, bu should have all the important characters of Siam gamboge, as described at page 77. It should als respond to all the tests for Siam gamboge and b free from particles of wood, leaves, and simila extraneous matters.

The finest Indian gamboge has the colour and consistence of Siam gamboge, but it is apt to contain many foreign substances, and, as usually collected, is too impure for medicinal purposes. Its chemical composition is essentially the same as that of Siam gamboge, one sample examined having been shown to contain 80·4 per cent. of resin and 13·0 per cent. of gum.

CAMPHORA.

Camphor.

A WHITE crystalline substance obtained from *Cinnamomum Camphora*, Nees and Ebermaier (N.O. Lauraceæ), a large tree found native in Formosa, Japan, and China. It has also been introduced into India, Australia, New Zealand, and Florida, but the bulk of the camphor supply comes from Formosa and Japan, and only a small quantity from China. Though the volatile oil of which camphor is one of the constituents exists in all parts of the tree, the drug is obtained almost exclusively from the wood, which is reduced to chips after the tree has been felled, and heated with water in a rude still, the camphor being carried over with the water-vapour and sublimed in an earthenware dome. The crude camphor thus obtained is purified in Formosa, or exported in tubs to London or Hamburg and there purified by re-sublimation. The drug is a stimulant sedative and a feeble antiseptic, possessing antispasmodic, carminative, expectorant, diaphoretic, and anaphrodisaic properties. It is used in the preparation of Aquæ Camphoræ (1 in 1000), Linimentum Camphoræ (1 in 5), Linimentum Camphoræ Ammoniatum (1 in 8), Spiritus Camphoræ (1 in 10), and Tinctura Camphoræ Composita (1 in 290). Camphor is also an ingredient of Linimentum Aconiti (1 in 30), Linimentum Belladonnæ (1 in 20), Linimentum Opii (1 in 46), Linimentum Saponis (1 in 23), Linimentum Sinapis (1 in 18), Linimentum Terebinthinæ (1 in 20), and Unguentum Hydrargyri Compositum (1 in $8\frac{1}{3}$), while the linimentum of camphor is used in the preparation of Linimentum Chloroformi (1 in 2), Linimentum Hydrargyri (1 in $1\frac{1}{2}$), and Linimentum Terebinthinæ Aceticum (1 in $2\frac{1}{4}$).

Camphor occurs in solid, colourless, transparent, crystalline pieces or " bells " of tough consistence, in rectangular masses, and in pulverulent masses known as " flowers of camphor." It melts at 175° C., boils at 204° C., and its specific gravity varies from 0·986 to 0·996. Camphor has a powerful, penetrating odour, and a pungent, somewhat bitter taste, which is followed by a sensation of cold. It burns readily with a bright, smoky flame, volatilises at ordinary temperatures, and sublimes when heated, without leaving any residue. It is soluble in water (1 in 700), 90 per cent. alcohol (1 in 1¼), and olive oil (1 in 4); also in chloroform (4 in 1), ether (12 in 7), oil of turpentine (1 in 1½), and glacial acetic acid (2 in 1). On triturating camphor with an equal weight of chloral hydrate or with one-third its weight of phenol, an oily liquid is formed; a similar result is attained by triturating it with menthol or thymol.

Crude camphor occurs mixed with a yellowish oil (camphor oil) which contains camphor, acetaldehyde, terpineol, eugenol, safrol, cineol, pinene, phellandrene, dipentene, and cadinene. The lighter fractions of the oil are used for perfuming ordinary soaps, or as a solvent for resins, etc., while heavy camphor oil is chiefly valuable as a source of safrol, which is used in large quantities in the preparation of synthetic heliotropin. The relative proportions of camphor and camphor oil in crude camphor vary considerably, but the drug should neither be distinctly oily nor excessively brittle. Camphor appears to be a ketone or a keto-tetrahydro-cymene, and it may be prepared artificially by oxidising camphene or iso-borneol.

CANELLÆ CORTEX.

Canella Bark; Wild Cinnamon Bark.

The bark of the wild cinnamon, *Canella alba*, Murray (N.O. Canellaceæ), a tree from 6 to 16 m. high, indigenous to Florida and the Bahama and West Indian Islands. A thick outer layer of ash-grey cork is first removed from the bark by beating it gently with a stick, and, after further beating, the bark is loosened, separated from the tree, and dried. It possesses tonic and stimulant properties, and is sometimes given in powder or used as an ingredient of tinctures. It has also been employed as a condiment.

Canella bark occurs in single quills about 3 mm. thick and 6 to 25 mm. in diameter, or in channelled pieces about 6 mm. thick, from 5 to 20 cm. or more in length, and from 1 to 5 cm. in width. The pieces are frequently irregularly fractured longitudinally, as the result of the beating to which they have been subjected. The outer surface is hard, of a pale buff colour, and usually marked with circular scars or whitish spots, and numerous shallow, transverse or longitudinal depressions. Internally, the bark is often of a chalky white colour, and it is finely striated longitudinally. It breaks with a very short granular fracture. A smooth transverse section, examined under a lens, exhibits a narrow, irregular, translucent, brown phelloderm or outer layer of sclerenchymatous cells, a paler cortex containing numerous brown oil-cells, and white wavy medullary rays in the bast. The bark has an aromatic odour, and a pungent, bitter taste.

The bark of the wild cinnamon is distinguished by its hard buff outer surface marked with scars or spots, the oil-cells and medullary rays in a transverse section, and the peculiar odour and taste. The chief constituent of canella bark is about 1 per cent. of a volatile oil (s.g. 0·920 to 0·935), the odour of which is similar to that of a mixture of clove and cajuput oils. It is slightly dextrorotatory, and contains eugenol, lævo-pinene, cineol, and caryophyllene. Other constituents of the bark are a bitter principle, resin, mannite, starch, calcium oxalate, etc. It contains no tannin, and is thus distinguished from false Winter's bark, derived from *Cinnamodendron corticosum*, Miers.

CANNABIS INDICA.

Indian Hemp ; Ganja or Guaza.

The dried flowering or fruiting tops of the female plant of *Cannabis sativa*, Linné (N.O. Urticaceæ), grown in India. The plant is an annual diœcious herb indigenous to Central and Western Asia, and is cultivated largely in temperate climates for the sake of its strong fibres (hemp) and oily seeds, but only the pistillate plants grown in tropical India are used in medicine, as those alone produce any appreciable quantity of the oily resinous secretion to which the peculiar effects of the drug are due. The secretion is formed in glands on the stem and leaves, apparently as a bye-product of metabolism, in a similar manner to that by which the contents of the glands of the hop plant are produced. When the secretion is collected from the fresh flowering tops and allowed to consolidate into an oily resinous mass, it constitutes the greenish-brown substance known as "charas." The larger leaves of the plant, collected separately and dried, are known as "bhang" or "hashish." The female plants are pruned so as to induce the production of flowering branches, and, after collection, the flowering or fruiting tops are pressed into the more or less compact masses known commercially as "ganja," "gunjah," or "guaza," which contain the whole of the resinous secretion. The drug possesses anodyne, sedative, hypnotic, and antispasmodic properties. It is used to prepare Extractum Cannabis Indicæ, from which Tinctura Cannabis Indicæ (1 in 20) is prepared; the tincture is an ingredient of Tinctura Chloroformi et Morphinæ Composita (1 in 10).

Indian hemp occurs in compressed, rough, dusky-green, flattened masses, from 5 to 30 cm. long, consisting of the branched upper part of the stem of the plant, and bearing leaves and pistillate flowers or fruits, which are matted together by a resinous secretion. The stem is straight, with ascending branches, is longitudinally furrowed, and bears numerous small, one-celled, curved, appressed hairs and occasional stalked glands. The upper leaves are simple, alternate, and 1 to 3-partite; the lower leaves are opposite, digitate, and consist of five to seven linear-lanceolate leaflets with distantly serrate margins. The pistillate flowers are small, and the single ovary in each flower is surrounded by a perianth and supported by a bract, beyond which protrude two long brown stigmas. The fruit is ovoid, slightly reticulated, contains a single oily seed, and is supported by an ovate-lanceolate bract. Both leaves and bracts bear numerous hairs and glands, like those on the stem. The hairs are enlarged at the base, and contain cystoliths; the glands secrete a viscid adhesive resin. The drug has a powerful odour, but is almost devoid of taste.

The masses in which Indian hemp occurs are characterised by their roughness and green colour, the curved appressed hairs on the stems, and the linear-lanceolate leaflets of the lower leaves. The fresh drug yields, on distillation, a small quantity of volatile oil, which consists chiefly of a sesquiterpene (cannabene), but sometimes also contains traces of a crystalline paraffin. The exhilarating effect of fresh ganja has been ascribed to this oil, which disappears on keeping the drug under ordinary conditions for twelve months, but the narcotic effect of Indian hemp is due to the resin present in the peculiar viscid secretion of the plant. The resin (cannabin or cannabinon) has been obtained as a soft, brown, neutral substance, soluble in 90 per cent. alcohol, ether, benzene, and other organic solvents. When unaltered, it is capable of producing a powerful narcotic effect, but it tends to become inert on exposure to the air, its loss of activity being apparently due to oxidation. The potency of ganja diminishes in a similar manner when the drug is stored under ordinary conditions, and it has been found that, in proportion as the drug becomes less active, the quantity of inert resin it contains increases. In addition to the resin, of which the drug yields from 15 to 20 per cent., the secretion of the hemp plant contains volatile oil, fat, wax, and choline, while an inactive resin-acid has also been extracted from it. The chief constituent of the resin is cannabinol, which has been extracted from charas in the form of a reddish oil, and from hashish as a thick, pale yellow liquid which oxidises readily and acquires a brown tint in the presence of air. It has a powerful narcotic action, but—like the resin itself—gradually becomes inactive when exposed to the air, owing to its conversion into an inert substance. It is soluble in alcohol, ether, chloroform, benzene, and other organic solvents. No peculiar alkaloid has been found in Indian hemp, the supposed alkaloid "tetano-cannabine" being probably choline, while a substance to which the name "cannabinine" has been applied appears to be trimethylamine, produced by the action of alkalies upon choline.

CANTHARIS.

Cantharides; Spanish Flies.

The dried beetle, *Cantharis vesicatoria*, Latreille (Order Coleoptera), a native of Southern Europe. It is widely distributed and is collected in Spain, France, Russia, Sicily, and Hungary. The beetles are gregarious insects which attach themselves to the white poplar, privet, ash, elder, lilac, and other trees, upon the leaves of which they feed. They are collected by shaking them from the trees on to linen cloths before sunrise, whilst they are torpid with cold and unable to use their wings. They are then killed by plunging them into diluted vinegar, or by exposing them in sieves to the vapour of boiling vinegar, or by subjecting them to the fumes of ammonia or of burning sulphur. The insects are then dried carefully and protected from access of atmospheric moisture. They possess rubefacient, irritant, and vesicant properties, and are sometimes used as a diuretic and aphrodisiac. The chief preparations of the drug are Acetum Cantharidis (1 in 10), Emplastrum Calefaciens (1 in 25), Emplastrum Cantharidis (1 in 3), Liquor Epispasticus (1 in 2), Tinctura Cantharidis (1 in 80), and Unguentum Cantharidis (1 in 10), while Collodium Vesicans is made by dissolving pyroxylin in Liquor Epispasticus (1 in 40).

Cantharides are from 18 to 25 mm. long, about 6 mm. broad, and have a strong, disagreeable, mouse-like odour, which diminishes on keeping. The beetle has a large heart-shaped head, with two thread-like, black, jointed feelers, a short quadrilateral thorax, and two long narrow elytra or wing-sheaths of a shining green or coppery-green colour, under which are concealed two thin, brownish, transparent, membranous wings. Several other blistering beetles are known and sometimes found in commerce, but all of them differ markedly in appearance from cantharides. The rose beetle (*Cetonia aurata*, Linné) is similar in colour to cantharides, but broader; Chinese blistering beetles (*Mylabris* sp.) are shorter, and their wing cases are marked with transverse black and yellow bands. Exhausted cantharides, which have been treated with a solvent to extract the cantharidin, are sometimes mixed with the entire insects as an adulterant.

The chief constituent of cantharides is 0·5 to 1 per cent. of cantharidin, to which their vesicant properties are due; they also contain 12 per cent. of fixed oil, a volatile principle to which their fetid odour is due, acetic acid, phosphates, and inert extractive matter. Cantharidin is an anhydride of cantharidic acid. It takes up a molecule of water under the influence of alkalies, and is converted into salts of cantharidic acid, cantharidin being re-precipitated from the solutions and water liberated on the addition of acids. Though cantharidin is insoluble in water, its potassium and sodium compounds are soluble in that liquid. Cantharidin is only sparingly soluble in alcohol, but it dissolves readily in acetic ether, chloroform, or acetone. It exists chiefly in the soft parts of the insect, partly in the free state and partly in the form of compounds soluble in water.

CAOUTCHOUC.

Caoutchouc; India-rubber.

The prepared milk-juice of *Hevea brasiliensis*, Mueller Arg. (N.O. Euphorbiaceæ), a large tree found in the valley of the Amazon, and of other species indigenous to Brazil, the finest quality being that known in commerce as pure Para rubber. It occurs associated with fat, albumin, resin, etc., in the latex of the plants. On being wounded by incision, the trees emit the milky juice, which concretes on exposure by coagulation of the albumin it contains, the process of coagulation being facilitated by allowing the smoke from burning wood to come in contact with the latex, or by other suitable means. The suspended particles of caoutchouc are thus collected in a curdy mass, which becomes tough and elastic when dry. The product is used in making Liquor Caoutchouc (1 in 20) and various plasters; the solution is used in the preparation of Charta Sinapis.

Para rubber occurs in elastic masses of varying form and size, which are brownish-black externally, the colour shading off into a paler tint internally. Each mass consists of a number of thin layers, which appear to be separated by dark lines, the superposition being due to the coagulation of successive coats of the alkaline latex by exposure to the acid vapours in the smoke from burning wood. Some rubber is milk-white internally, but it is usually of a light brownish tint, and rarely mottled. India-rubber is insoluble in water, ethylic alcohol, alkaline solutions, or dilute acids, but it swells and becomes soft and gelatinous in chloroform, oil of turpentine, carbon bisulphide, benzol, and petroleum spirit, a portion of it dissolving, whilst the rest remains in a more or less disintegrated condition. The more soluble portion is soft and ductile, the rest being tenacious and elastic. India-rubber has a characteristic somewhat empyreumatic odour, is nearly tasteless, and melts at about 125° C., remaining soft and adhesive after cooling.

Inferior varieties of india-rubber are produced by species of *Castilloa* and other plants growing in tropical climates. The chief constituent of india-rubber is the hydrocarbon caoutchouc, which is transparent in thin layers when pure, and can be obtained as a white or colourless amorphous mass by dissolving crude india-rubber in chloroform and precipitating with alcohol. Other constituents of india-rubber are about 1·5 per cent. of resin soluble in alcohol, fat, volatile oil, albumin, colouring matters, and mineral substances. Caoutchouc appears to be an isomer of gutta, and is converted into resin by oxidation. When subjected to dry distillation, it yields oil of caoutchouc—a mixture of various hydrocarbons, including isoprene caoutchine, and heveene.

CAPSICI FRUCTUS.

Capsicum ; Cayenne Pepper.

THE dried ripe fruit of *Capsicum minimum*, Roxburgh (N.O. Solanaceæ), a small erect shrub with spreading branches. It is a native of Southern India, and is widely cultivated in India, Eastern Africa, South America, and other tropical countries. The fruit is collected when ripe and dried. It is imported chiefly from Zanzibar, and known in commerce as Guinea pepper, chillies, or bird pepper, while the powder is sold as cayenne pepper. Nepaul pepper has the finest flavour. The drug possesses stimulant, stomachic, and tonic properties, but is chiefly employed as a condiment. It is used in the preparation of Tinctura Capsici (1 in 20) and Unguentum Capsici (1 in $5\frac{1}{6}$), while the tincture is an ingredient of Tinctura Chloroformi et Morphinæ Composita (1 in 40).

Capsicum fruit is scarlet when fresh, but of a dull orange-red colour when dried. It is oblong-conical in shape, obtuse at the apex, from 12 to 20 mm. in length, and does not exceed 6 mm. in diameter. The fruit is superior, and sometimes remains attached to a small, inconspicuous, five-toothed, inferior calyx, and a straight slender peduncle about the same length as the fruit, or rather longer. The pericarp of the fruit is somewhat shrivelled and flattened ; it is glabrous, shining, more or less translucent, and leathery in texture. A transverse section of the fruit shows that it is two-celled, each cell containing from five to ten small, flat, whitish seeds, either loose or attached to the thin, reddish, membranous dissepiment which separates the two cells. The seeds are nearly circular in shape, and have a characteristic thickened margin. The odour of capsicum fruit is characteristic and the taste intensely pungent, being most marked in the dissepiment that divides the fruit. Powdered capsicum is sometimes adulterated with inorganic substances, but should not yield more than 6 per cent. of ash on incineration.

The fruit of *C. minimum* is distinguished from that of other varieties by its shape and size, also by the shape and size of the peduncle, the thin reddish dissepiment, and the shape of the seeds. The fruit of *C. annuum*, Linné, a variety cultivated in Europe, is large, with a short peduncle and conspicuous green calyx; but the fruits of *C. frutescens*, Linné, and other species cultivated in tropical countries, can only be distinguished from those of *C. minimum* by minute differences in their external appearance. The chief constituent of capsicum fruit is about 0·02 per cent. of capsaicin, which has been isolated in crystalline form, and to which the pungency of the drug is due. It is contained chiefly in the dissepiment, being secreted by the cells of the epidermis, between the cuticle and the outer cell-wall. Other constituents of the fruit are fixed oil, oleic, stearic, and palmitic acids, volatile oil, wax, colouring matter, resin, and a volatile alkaloid resembling coniine in odour.

CARBO ANIMALIS.

Animal Charcoal.

THE residue of bones which have been exposed to a red heat without access of air. The crude charcoal is known as bone-black, and consists chiefly of calcium phosphate and carbonate, which can be removed by treatment with hydrochloric acid. Animal charcoal is used for decolorising organic acids, alkaloids, and other vegetable principles, and is also employed as a deodoriser, as an antidote for vegetable poisons, and as a pill excipient.

Animal charcoal occurs in dull black, granular fragments, or as a dull black powder. It should be odourless and nearly tasteless, and is insoluble in water, alcohol, or other solvents. When ignited, it leaves about 85 per cent. of greyish or yellowish-white ash, which is almost entirely soluble in hydrochloric acid. Purified animal charcoal is prepared by digesting the crude material in hydrochloric acid diluted with twice its volume of water, until all earthy salts are removed, then drying the residue and heating it to redness in a closely covered crucible. The product should be a dull black, odourless, and nearly tasteless powder, which leaves not more than about 2 per cent. of ash when burned with free access of air.

Bone-black contains about 90 per cent. of calcium phosphate and carbonate, and only 10 per cent. of carbon. The purified animal charcoal obtained on removing the earthy salts consists almost entirely of carbon, but is difficult to obtain free from taste and odour. When used as a decolorising agent, animal charcoal tends to absorb alkaloids and other active principles, much loss being often incurred owing to this property of the substance.

CARBO LIGNI.

Wood Charcoal.

The carbonaceous residue of wood charred by exposure to a red heat without access of air, the wood of the oak, beech, hazel, poplar, and willow being employed for the purpose. The billets of wood are piled in the form of a cone and covered with earth and sods, several holes being left at the bottom and one at the top of the pile, in order to produce a draught to start the combustion. The wood is kindled from the bottom and the hole at the top is closed after a short interval, the holes at the bottom being also stopped when ignition is complete. Combustion takes place with a smothered flame, the volatile portions of the wood being dissipated, while most of the carbon remains, the yield of charcoal being about 17 or 18 per cent. If, however, the wood be charred in iron cylinders, the yield of charcoal is greater (22 to 23 per cent.), while the volatile products—pyroligneous acid, tar, etc.—can be collected. Fresh wood charcoal possesses antiseptic, absorbent, and deodorising properties. It is given usually in the form of powders, capsules, cachets, or biscuits.

Wood charcoal is a black, tasteless, and odourless powder, free from gritty matter. When heated to a high temperature, with free access of air, it should not leave more than 7·5 per cent. of ash, and may leave considerably less. If exposed to the air after ignition, it increases rapidly in weight by absorption of moisture. It can be freed from inorganic salts by digestion in diluted hydrochloric acid, and should be free from any marked odour or taste.

As usually prepared, wood charcoal contains the incombustible part of wood, but this inorganic material can be removed by digesting the powder in diluted hydrochloric acid, and afterwards washing it through with boiling water. Freshly prepared charcoal is capable of absorbing from 12 to 14 per cent. of water if exposed to the air. The quantity of ash left on ignition depends chiefly upon the kind of wood from which the charcoal is prepared, but the limit of 7·5 per cent. serves to distinguish wood charcoal from bone-black and animal charcoal, prepared by heating bones in partly closed iron vessels, as those substances may contain as much as 90 per cent. of calcium phosphate. Bone-black and animal charcoal are also readily distinguished from wood charcoal by the fact that they are not free from taste and odour, even when purified.

CARDAMOMI SEMINA.

Cardamom Seeds.

THE dried ripe seeds of *Elettaria Cardamomum*, Maton (N.O. Scitaminaceæ), a perennial plant which grows wild in the forests of Southern India, and sends up numerous stems, 2 to 4 m. high, from a tuberous rhizome. It is cultivated near the Malabar coast and in Ceylon. The seeds are contained in small, inferior, three-celled, capsular fruits, each cell containing two rows of seeds attached to axile placentas. The fruits are collected before they are quite ripe, then bleached and cured by exposure to the sun whilst wet, the bleaching being sometimes facilitated by subjecting the fruits to the action of steam and afterwards exposing them to the vapour of sulphurous acid. When cured, the fruits are trimmed, freed from impurities by picking, and preserved intact until the seeds are required for use, as they retain their aromatic properties best if enclosed in the capsules. If the fruits are allowed to ripen on the plant, they open and discharge the seeds. Such seeds are sold without the pericarps, but should not be used for medicinal purposes. The drug is a stomachic, carminative, and stimulant, and is a useful adjuvant to purgatives, to prevent griping. The seeds are used in the preparation of Tinctura Cardamomi Composita (1 in 80), and are contained in Extractum Colocynthidis Compositum (1 in 24), Pulvis Cinnamomi Compositus (1 in 3), Pulvis Cretæ Aromaticus (1 in 45½), Pulvis Cretæ Aromaticus cum Opio (1 in 46⅔), Tinctura Gentianæ Composita (1 in 80), and Tinctura Rhei Composita (1 in 80); the tincture is an ingredient of Decoctum Aloes Compositum (3 in 10) and Mistura Sennæ Composita (1 in 10).

Cardamom fruits vary usually from 10 to 20 mm. in length. They are ovoid or oblong in shape, bluntly triangular in section, usually shortly beaked at the apex with the remains of the calyx, pale buff or yellowish in colour, and longitudinally striated, though sometimes they are nearly smooth, the striations having disappeared during the process of bleaching. The small, dark reddish-brown seeds are about 3 mm. in diameter, irregularly angular in shape, transversely wrinkled, and enclosed in thin, colourless, membranous arils, which become more evident when the seeds are soaked in water. The hilum is depressed, and the position of the raphe is indicated by a channel extending from the base to the apex of the seed on one side. A transverse section of a seed shows a thin dark seed-coat, enclosing a whitish perisperm grooved on one side, a small yellowish translucent endosperm, and a minute embryo. The odour and taste of the seeds are agreeably warm and aromatic, owing to the presence of volatile oil. Cardamom seeds of good quality may yield as much as 5·5 per cent. of ash on incineration.

Three varieties of cardamom fruits are suitable for medicinal use—Mysore and Malabar cardamoms, imported from Ceylon, and Mangalore cardamoms, imported from India. Mysore cardamoms are the largest, varying from about 6 to 20 mm. in length; their cream colour and the smoothness of their pericarps are due to the use of artificial bleaching agents. Malabar cardamoms are somewhat smaller, rarely exceeding 12 mm. in length; they are generally pale brown or yellowish in colour, have a pointed apex, and are longitudinally striated. Mangalore cardamoms are less common than the other two varieties; they resemble the Malabar fruits, but are small and almost globular in shape. Grey cardamom seeds and shrivelled (unripe) seeds are inferior and should not be used. Wild cardamom fruits from Ceylon, the product of *Elettaria Cardamomum*, var. *β-major*, Smith, vary in length from 25 to 38 mm., are commonly greyish-brown in colour, and not plump in appearance; the seeds are larger and paler than those of Malabar cardamoms. Siam cardamoms, from *Amomum Cardamonum*, Linné, and Korarima cardamoms, from *A. Korarima*, Pereira, are also occasionally met with. Grains of Paradise (*Amomum* sp.) are distinguished from cardamom seeds by their rich reddish-brown colour, minutely and irregularly wrinkled surface, and the presence of the remains of a thick fibrous funicle. The chief constituent of cardamom seeds is from 4 to 5 per cent. of a volatile oil, containing terpinene, terpineol, and either limonene or dipentene; other constituents of the seeds are 10 to 11 per cent. of fixed oil, starch, albuminoids, mucilage, and sometimes cobalt or manganese. The mineral constituents of the seeds are not constant, even in one and the same variety, and the amount of ash yielded on incineration varies considerably.

CARUI FRUCTUS.

Caraway Fruit.

THE dried fruit of *Carum Carvi*, Linné (N.O. Umbelliferæ), an erect biennial herb naturalised in Britain and distributed over Central and Northern Europe. The plant is cultivated in England, Holland, Germany, Sweden, Norway, Russia, France, and Mogador. It is cut when the fruit is ripe, and the fruit separated by threshing. It is a cremocarp (schizocarp), the component carpels (mericarps) of which separate by splitting away from the central axis or carpophore, without liberating the seeds. The drug possesses aromatic, stomachic, and carminative properties; it is used as an adjuvant to other medicines, and prevents the griping of purgatives. The chief preparations of the fruit are Aqua Carui (1 in 10) and Oleum Carui, but it is also contained in Confectio Piperis (3 in 20), Pulvis Opii Compositus (6 in 15), Tinctura Cardamomi Composita (1 in 80), and Tinctura Sennæ Composita (1 in 40); the oil is an ingredient of Pilula Aloes Barbadensis (1 in 33).

Caraway fruit consists usually of the separate mericarps, which are each 4 to 6 mm. long and about 1 mm. broad. They are brown in colour, glabrous, slightly curved, tapering towards the ends, and traversed from base to apex by five narrow, yellow, primary ridges. Each ridge contains a fibro-vascular bundle, and is thus distinguished from the secondary ridges on coriander and other

Umbelliferous fruits. There are no secondary ridges on caraway fruit, but in the depressions between the primary ridges are situated elongated vittæ or oil-glands, imbedded in the pericarp and extending from base to apex of the fruits, four such vittæ occurring on the dorsal or outer side of the mericarp between the ridges, and two on the commissural or inner surface, by which it was originally attached to the carpophore. The vittæ are best seen in a transverse section, appearing as minute dark brown spots or cavities. Such a section also exhibits the narrow pericarp, enclosing a large oily endosperm which is not grooved near the commissural surface; the embryo occurs near the apex. The fruit has an agreeable aromatic odour and taste, due to the presence of volatile oil. Caraway fruit or powder should not leave more than 8 per cent. of ash on incineration.

The glabrous surface of the mericarps, the presence of six vittæ in each mericarp, and the ungrooved endosperm are distinctive characters of caraway fruit. The chief supply of the fruit comes from Holland, only a small quantity being produced in England. The Dutch fruit is of a dark brown colour, English caraways being of a brighter tint. Russian fruit is smaller and often mixed with much dirt and débris of the fruit stalks, while Mogador fruits are large and pale in colour. Caraways yield about 3 to 7 per cent. of volatile oil; they also contain fixed oil, resin, sugar, mucilage, and a little tannin. Oil of caraway (s.g. 0·910 to 0·920) is obtained by distillation, that extracted from English and Dutch fruit being most esteemed. It is a colourless or pale yellow oil, darkening with age, and has the characteristic odour of caraway fruit and a mild spicy taste. The chief constituent of the oil is the ketone carvone (carvol), which may be present to the extent of 50 to 60 per cent. Other constituents of the oil are dextro-limonene (carvene) and traces of carvacrol. Carvone is miscible in all proportions with 90 per cent. alcohol, and forms a clear solution with twice its volume or less of 70 per cent. alcohol, or with fifteen to twenty volumes of 50 per cent. alcohol, but carvone containing 2 per cent. of limonene forms a clear solution with twenty parts of 50 per cent. alcohol. German oil of caraway is frequently deficient in carvone, and is therefore of lower specific gravity than 0·910, and less soluble than other varieties in 50 per cent. alcohol.

CARYOPHYLLUM.

Cloves.

The dried flower-buds of *Eugenia caryophyllata*, Thunberg (N.O. Myrtaceæ), an evergreen tree found native in the Molucca Islands, where it is also cultivated, though most of the cloves now produced come from the islands of Zanzibar and Pemba, small quantities being also exported from Java, Ceylon, the Seychelles, etc. The plant produces white buds which turn green as they develop, and finally become crimson. They are collected before the corolla expands and dried in the sun, the crimson colour changing to dark reddish-brown in the process. Cloves possess stimulant, aromatic, carminative, antispasmodic, and antiseptic properties, but are employed chiefly as an adjuvant to other medicines. They are used in the preparation of Infusum Aurantii Compositum (1 in 160), Infusum Caryophylli (1 in 40), and Pulvis Cretæ Aromaticus (1 in 30), while the oil is an ingredient of Pilula Colocynthidis Composita (1 in 24) and Pilula Colocynthidis et Hyoscyami (1 in 36).

Cloves are about 15 mm. long, and consist of the dark brown, wrinkled, nearly cylindrical, but somewhat angular calyx tubes, which taper downwards and are each crowned by four thick, rigid, divergent teeth, within which appear four paler-coloured, unexpanded, overlapping (imbricated) petals, enclosing numerous stamens and a single style. On removing the petals, after soaking in water, the stiff, erect style and numerous stamens are readily seen, the style being situated upon a small disc, below which is a two-celled ovary containing numerous ovules. The solid, fleshy, lower part of the clove contains a large number of oil-glands, and similar glands occur in the calyx-teeth and petals. The volatile oil, which is emitted on indenting the cloves with the finger-nail, imparts a fragrant, spicy odour and a pungent, aromatic taste. On incineration, cloves should not leave more than 7 per cent. of ash.

The best cloves are those imported from the Molucca Islands (Amboyna cloves); they are thicker, darker, heavier, more oily, and more highly aromatic than those cultivated elsewhere. Those which come from Penang are larger and of a bright brown colour; Zanzibar and Pemba cloves are smaller and darker coloured than Amboyna cloves, while the buds are frequently broken, and intermixed with stalks and foreign matters. Spent cloves, "clove stalks" or peduncles, and "mother cloves" or ripe clove fruits, have been used as adulterants of whole and powdered cloves. The first emit no oil when indented with the finger-nail, and do not sink in water; the other two adulterants are distinguished readily by their general appearance, also by their microscopical characters. Clove stalks are dry and woody, contain much less oil than cloves, and yield a greater percentage of ash; the ripe fruits or "mother cloves" are ovoid in shape, brown, about 25 mm. long, and yield very little oil, but contain starch, which is not present in the flower-buds. The chief constituent of cloves is the volatile oil, but they also contain tannin, gum, resin, wax, caryophyllin, and eugenin.

Oil of cloves (s.g. 1·050 to 1·070) is obtained by distilling the dried cloves with water, as much as 15 to 20 per cent. being obtained from the buds, though the dried peduncles, or "clove-stalks," do not yield more than about 6 per cent. The oil is colourless or pale yellow when recently distilled, but it gradually becomes reddish-brown on keeping. It is soluble in two parts of 70 per cent. alcohol, and in all proportions of 90 per cent. alcohol, ether, or strong acetic acid. The strong odour and taste of the oil resemble those of cloves. The chief constituent of oil of cloves is the phenol eugenol, of which it contains from 80 to 95 per cent. Other constituents of the oil are the sesquiterpene caryophyllene, and traces of methyl alcohol, furfurol, acetyl-eugenol, eugenol acetyl-salicylate, amyl methyl ketone, and vanillin. If alcohol be present as an adulterant of oil of cloves, it will distil below 100° C., whereas oil of cloves yields no considerable fraction below 245° C. Absence of turpentine, petroleum, and most fixed oils is proved by the ready solubility of the oil in 90 per cent. alcohol. Other possible adulterants are the oils of pimento and copaiba, the addition of which, or of fixed oils, causes the specific gravity and boiling-point of oil of cloves to vary.

CASCARA SAGRADA.

Cascara Sagrada; Sacred Bark.

THE dried bark of *Rhamnus purshianus*, De Candolle (N.O. Rhamnaceæ), a shrub which grows freely in North California and in the states of Oregon and Washington, U.S.A.

The bark is collected in the spring and early summer, when it is easily peeled from the wood, and curls into quills on drying. If collected later, the bark must be cut away, and portions of wood are then frequently removed with it. It has been stated that the action of the bark is milder and less emetic if kept for a year or more before use, as in the case of frangula bark. The drug is a tonic laxative, and is usually given in the form of Extractum Cascaræ Sagradæ, Extractum Cascaræ Sagradæ Liquidum (1 in 1), or Syrupus Cascaræ Aromaticus (1 of liquid extract in 2½).

Cascara sagrada occurs in straight, stiff, single quills, or in channeled or nearly flat pieces, about 10 cm. long, 18 mm. wide, and 1·5 mm. thick. The quills vary from 6 to 25 mm. in diameter, and pieces may be obtained 10 cm. wide, 15 cm. long, and 4·5 mm. thick, but the thinner bark is preferable. The corky outer layer of the bark is nearly smooth, of a dark purplish-brown colour, and marked with scattered, transversely elongated, whitish lenticels. Beneath the cork is a yellowish-grey cortex, in which groups of sclerenchymatous cells form dark, translucent points, while wavy medullary rays may be perceived in the brownish-yellow bast when a smoothed transverse section is examined by the aid of a lens. The greyish-white appearance of the drug in places is due to patches of silvery-grey lichen, which conceal the cork and lenticels; when the patches are removed by scraping, the exposed cork appears at first of a brownish-red colour. The inner surface of the bark is dark reddish-brown, with faint transverse corrugations and longitudinal striations. The bark breaks with a short fracture, which is somewhat fibrous near the inner surface, where the bast occurs. The characteristic odour of the drug is not very powerful, but its taste is persistent, nauseous, and bitter.

The bark of *R. purshianus* is characterised by its purplish cork and the grey lichens covering it, the groups of sclerenchymatous cells in the roots, and the peculiar odour and taste of the drug. The bark of *R. californicus*, which is known in California as "cascara sagrada," has sometimes been substituted for that of *R. purshianus*; it is distinguishable by the uniform coat of lichen, the somewhat reddish, dull grey cork, the small number of lenticels, and the paler inner surface. The chief constituent of cascara sagrada is a bitter substance, probably an anhydride or lactone which, in the presence of an alkali, can be converted into a salt devoid of bitterness, though still retaining to some extent the purgative property of the original bitter substance. The bark also contains emodin, iso-emodin, glucose, 2 per cent. of fat, a hydrolytic enzyme which decomposes amygdalin, and a small quantity of a substance which yields syringic acid by treatment with acids, while other constituents soluble in water are decomposed by acids with the formation of insoluble resins. The emodin in the bark is insoluble in water, though soluble in an aqueous extract of the drug. The fat consists of rhamnol arachidate, free arachidic acid, and the glycerides of linolic and myristic acids. The constituents of the bark of *R. californicus* are the same as those of *R. purshianus.*

CASCARILLA.

Cascarilla.

THE dried bark of *Croton Eluteria,* J. J. Bennett (N.O. Euphorbiaceæ), a shrub or small tree which is indigenous to the Bahama Islands. The bark is taken from twigs, branches, and small stems. It possesses aromatic and stomachic properties, and is used as a bitter tonic, chiefly in the form of Infusum Cascarillæ (1 in 20) and Tinctura Cascarillæ (1 in 5). Diluted mineral acids cause a separation of resin when added to the tincture of cascarilla; the infusion tends to change rapidly, but keeps well if mixed with an aromatic tincture.

Cascarilla occurs in single quills, from 2·5 to 7·5 cm. or more in length, and from 4 to 12 mm. in diameter; also in small curved or channeled pieces. The outer layer of the bark is dull brown or dark grey in colour, longitudinally wrinkled, and frequently marked with small transverse and longitudinal cracks, which give it a chequered appearance. The bark also appears chalky, owing to the presence in the cells of numerous crystals of calcium oxalate. In places the dark-coloured cortex shows through the white or greyish-white cork, while the minute apothecia of a small lichen form black dots on larger pieces of the bark. The cork is easily separated, and reveals the brown or dark grey cortex marked with longitudinal and transverse furrows. The bark breaks with a short and resinous fracture; a transverse section exhibits under a lens the pale cork layer, dark brown cortex, and dark reddish-brown bast traversed by numerous thin, whitish medullary rays. No groups of sclerenchymatous cells can be detected, cascarilla being thus distinguished from other barks which are sometimes mixed with it. The drug has an agreeable aromatic odour, which is more marked when the bark is burned; the taste is also aromatic, but disagreeably bitter.

The chalky cork, wrinkles, fissures, and short resinous fracture are characteristic of cascarilla bark. The barks of other species of *Croton*, which have been mixed with or substituted for cascarilla, are distinguished from it by the absence of the peculiar aromatic odour and bitter taste, and by the presence of sclerenchymatous cells. The chief constituent of cascarilla is cascarilline—a crystallisable bitter alkaloid; the bark also contains betaine—a base akin to choline, together with resin, starch, gum, pectin, a little tannin, and from 1 to 3 per cent. of volatile oil (s.g. 0·890 to 0·925). The oil consists chiefly of cymene, sesquiterpenes, alcohols, l-limonene, and a terpene boiling at 155°–157° C., together with traces of eugenol, cresol, resin, and cascarillic, palmitic, and stearic acids.

CASSIÆ CORTEX.

Cassia Bark; Chinese Cinnamon.

The bark of *Cinnamomum Cassia*, Blume (N.O. Lauraceæ), an evergreen tree from 6 m. to 10 m. high, the foliage and inflorescence of which differ from those of *C. zeylanicum*, the source of Ceylon cinnamon. The tree is a native of Cochin China, but it also grows in other parts of Eastern Asia, and is cultivated in Southern China for the sake of the bark, which is exported from Canton. It is collected from cultivated trees about six years old, the branches of which are cut off and freed from small twigs and leaves, after which the bark is slit longitudinally in two opposite places, while three or four transverse incisions are made round the circumference of the branch, so that the bark can be removed in pieces about 40 cm. long, and half the circumference of the branch. The cork and part of the cortex are next removed more or less completely from the outer surface of the pieces by means of a small plane, and the bark is then made into bundles, each weighing about 500 gm., for exportation. The drug possesses carminative, astringent, and aromatic properties, similar to those of cinnamon bark, but is used chiefly as a spice or for the distillation of oil of cassia.

Cassia bark is seen usually in channeled pieces or single quills, from 5 cm. to 40 cm. long, about 12 mm. to 18 mm. in diameter, and from 1 mm. to 3 mm. in thickness; double quills may occur, but they are very rare. The bark is smooth and of a dark earthy-brown colour, with occasional patches of thin greyish cork adhering to the outer surface. It breaks with a short fracture, which is not splintery like that of cinnamon bark, and a transverse section exhibits fewer bast fibres and more mucilage cells than cinnamon bark; the sclerenchymatous cells are also scattered through the tissue in irregular groups, though thicker pieces show a faint white line of such cells running parallel with the outer surface of the bark. The odour and taste of cassia bark, which are due to the volatile oil it contains, resemble those of cinnamon, but the odour is less fragrant, and the taste is more mucilaginous than astringent. The distinctive characters of cassia bark are its thickness, dark colour, occurrence in simple channeled pieces or single quills, and the presence of occasional patches of cork. Ceylon cinnamon bark is lighter in colour, much thinner, and marked with narrow, wavy, longitudinal lines; the sticks also consist of several quills packed inside one another, and the bark is quite free from traces of cork.

Saigon cinnamon or cassia is obtained from *Cinnamomum loureirii*, Nees. It occurs in much broken pieces, or in quills about 15 cm. long and 10 to 15 mm. in diameter, the bark being from 2 to 3 cm. thick. The outer surface of the bark is grey or light greyish-brown, with whitish patches. It is also more or less rough from numerous warts, and bears some transverse ridges and fine longitudinal wrinkles; the inner surface is cinnamon-brown or dark brown, granular, and slightly striate. The bark breaks with a short granular fracture, and a transverse section exhibits an outer cinnamon-coloured layer, in which numerous whitish striæ form an almost uninterrupted line. The odour of Saigon cinnamon is fragrant, and its taste sweet, warmly aromatic, and somewhat astringent. It yields a volatile oil (s.g. 0·982), known as Japanese cinnamon oil, which consists chiefly of cinnamic aldehyde and a terpene. Cassia bark contains from 1 to 2 per cent. of volatile oil, also tannin, sugar, mucilage, colouring matter, etc. The oil (s.g. 1·055–1·065) is optically inactive, or has only a slight rotatory power to the right or left, and is readily soluble in 1 or 2 parts of 80 per cent. alcohol. It consists of about 75 to 90 per cent. of cinnamic aldehyde, together with free cinnamic acid formed from the aldehyde by oxidation, a terpene, a compound of cinnamic and acetic acids, cinnamyl acetate and other cinnamic esters, and "cassia stearoptene" or ortho-methyl-cumaric aldehyde.

CASSIÆ FLORES.

Cassia Buds.

THE buds of one or more species of *Cinnamomum* (N.O. Lauraceæ), both *C. Cassia*, Blume, and *C. loureirii*, Nees, having been described as sources of the so-called "buds," which consist really of immature fruits. The trees are natives of Cochin China, and are grown largely in Southern China, large quantities of the "buds" being brought to Canton from the districts whence cassia bark is obtained. They possess similar properties to cassia bark, and are used as a spice.

Cassia buds resemble cloves in appearance, and may be compared to small nails with round heads. They have a brown colour, and are about 10 mm. in length and 1 to 5 mm. in thickness. Usually each bud consists of a calyx surrounding a young ovary, but the ovary has sometimes been removed, and the bud is then cup-shaped at the top. The odour and taste of the buds, resembling those of cassia or cinnamon bark, are due to the volatile oil present.

The clove-like appearance, aromatic odour, and hot taste of cassia buds distinguish them readily. The chief constituent of the buds is a volatile oil, which is similar in properties and aldehyde content to that yielded by cassia bark, consisting chiefly of cinnamic aldehyde. The buds are stated to yield 1·6 per cent. of oil (s.g. 1·026) with an aldehyde content of 80 per cent., while the stalks from the buds yield 1·7 per cent. of oil (s.g. 1·046) with an aldehyde content of 92 per cent.

CASSIÆ PULPA.

Cassia Pulp; Purging Cassia.

THE pulp obtained from the pods or fruits of *Cassia Fistula*, Linné (N.O. Leguminosæ), a tree indigenous to India. The inflorescence of the tree is a pendulous raceme, and each flower has a one-celled, many-seeded ovary, which develops into a long pod, with a thin, hard, and woody pericarp. The ripe pod differs from an ordinary legume in being indehiscent as well as many-celled, the seeds becoming separated from one another as the fruit ripens, by the formation of spurious dissepiments. The pulp is extracted from the pods by opening them at the suture and removing the contents with a spatula, or by bruising the pods, then boiling them in water, and afterwards evaporating the decoction. The pulp possesses laxative properties, and is used in the preparation of Confectio Sennæ (1 in 8).

Cassia pods are from 35 to 50 cm. long, and from 18 to 25 mm. in diameter. They are nearly straight and cylindrical in shape, shortly stalked, of a dark chocolate-brown colour, and very hard. The dorsal and ventral sutures are marked by two smooth bands running the whole length of the fruit. Each pod is divided internally into numerous compartments by thin transverse partitions or spurious dissepiments, about 6 mm. apart, each division containing a single smooth, flattish-oval, reddish-brown seed, attached to the ventral suture by a long, dark, thread-like funiculus. The nearly black viscid pulp, which adheres to the membranous partitions in thin layers, has a faint, somewhat sickly odour and a sweetish taste.

The pods of *C. Fistula* are distinguished by their smooth surface, long cylindrical shape, and spurious dissepiments with adhering pulp. The pods of *C. grandis* are usually longer, thicker, and heavier than those of *C. Fistula*, with a rough surface, laterally compressed seeds, one prominent ridge on the dorsal suture and two on the ventral suture. The pods of *C. moschata* are smaller and narrower than the pods of *C. Fistula*, while the pulp is paler in colour and exhales a musky odour when warmed. Cassia pulp, of which the pods yield about 30 per cent., contains more than half its weight of sugar, together with mucilage, pectin, calcium oxalate, and albuminoid matter.

CASTOREUM.

Castor.

The dried preputial follicles of the beaver, *Castor Fiber*, Linné (Order Rodentia), an animal found in the Northern Hemisphere, between 33° and 68° north latitude, chiefly in the Hudson's Bay Territory, but also in Western Russia, Siberia, etc. Both the male and female animals have two pairs of membranous follicles between the anus and the external genitals, but only the two glands or sacs which open into the preputial or vaginal canal are used for medicinal purposes. They contain a whitish or yellowish, creamy, odorous secretion, which becomes dark-coloured on drying the glands, and constitutes the active portion of the drug. There are two varieties of castor, the Canadian or American variety being much more common than the Russian or Siberian. The drug possesses stimulant, antispasmodic, and emmenagogue properties, and is used in the form of tincture (1 in 20).

Castor occurs in firm, solid, heavy, dark brown or greyish, pear-shaped or club-shaped masses, about 5 to 7·5 cm. long. They are much flattened and wrinkled, frequently united in pairs by a portion of the preputial or vaginal tissue which has been cut away with them, and one sac in each pair is usually larger than the other. The sacs have an iridescent, glandular, and much-folded inner coat, and they are divided internally into numerous cells which contain a resinous secretion, intermingled more or less with the membranes forming the cells. The secretion may be pale and soft, or dark reddish-brown, hard, and friable; it has a peculiar, empyreumatic, somewhat disagreeable odour, and a bitter, acrid, and nauseous taste. On examination under the microscope the secretion may be found to contain spherical grains of crystalline calcium carbonate. Alcohol dissolves about one-half of the drug, forming a brownish tincture, while an aqueous decoction is of a light brownish-yellow colour, becoming turbid on cooling, and darkening on the addition of ferric chloride.

Canadian castor consists of follicles which weigh from 30 to 125 gm., and have firmly adhering membranes, while the contents are often somewhat glossy; Russian castor consists of follicles weighing from 75 to 250 gm., with more readily separable outer membranes, and contents which have a more agreeable odour than in the case of the Canadian drug. The Russian variety may be distinguished from the Canadian by the cloudy mixture produced on adding water to the tincture becoming clear on the addition of ammonia. It is also stated that an aqueous decoction of Canadian castor yields an orange precipitate on the addition of ammonia, while a decoction of Russian castor yields a white precipitate. The composition of castor varies considerably, according to the age of the animal from which it has been obtained, the time of year at which it has been collected, and the length of time the drug has been kept. The chief constituent is about 40 to 70 per cent. of resinous matter soluble in alcohol; other constituents are phenol, salicin, benzoic acid, a crystalline cholesterin-like substance named castorin, a volatile oil to which the characteristic odour is due, and various salts. The presence of calcium carbonate indicates that the castor has been obtained from a diseased animal.

CATECHU.

Catechu ; Pale Catechu ; Gambier or Terra Japonica.

An extract prepared from the leaves and young shoots of *Uncaria Gambier*, Roxburgh (N.O. Rubiaceæ), a climbing shrub indigenous to the Malay Archipelago and largely cultivated in many of the islands. The leaves and young shoots are boiled with water, the resulting decoction is evaporated to a syrupy consistence and cooled, and crystallisation induced in the resulting soft clayey mass by agitation. The crystalline mass is allowed to drain, then cut into small cubes, strips, plates, or discs, and dried. The product is a powerful astringent; it is used in the preparation of Pulvis Catechu Compositus (1 in 2½), Tinctura Catechu (1 in 5), and Trochiscus Catechu (1 grain).

Catechu occurs usually in more or less agglutinated cubes, measuring about 25 mm. each way. They are fairly regular in shape, deep reddish-brown externally, pale cinnamon-brown internally, porous, friable, and very light. When examined under a microscope, particularly after mixing with a drop of oil, the extract is seen to consist chiefly of minute acicular crystals of catechin. It is free from any marked odour, but has a peculiar taste, being at first bitter and astringent, and afterwards sweetish. The drug should dissolve almost entirely in boiling water and yield 70 per cent. of soluble matter to 90 per cent. alcohol. It should contain no starch, and leave not more than 5 per cent. of ash upon incineration.

Pale catechu is sometimes adulterated with starch, clay, or other inorganic matter, or with other plant extracts. Starch can be detected by submitting the residue left after exhausting the drug with cold water to microscopical examination; clay and other inorganic matters increase the amount of ash left on incineration: other plant extracts differ in solubility and do not contain any fluorescent substance. The chief constituents of pale catechu are from 7 to 33 per cent. of catechin (catechuin or catechuic acid), and from 22 to 50 per cent. of catechu-tannic acid, the proportions varying according to the care with which the drug has been prepared. It also contains quercetin, catechu-red—a decomposition product of catechu-tannic acid to which the reddish colour of the drug is due—and a fluorescent substance which is not found in black catechu or similar extracts. Catechin (m.p. 175° to 177° C.) has a sweetish taste, the astringency of the drug being due to catechu-tannic acid, which appears to be formed from catechin by loss of a molecule of water (see Catechu Nigrum).

CATECHU NIGRUM.

Black Catechu; Cutch.

An extract prepared from the heartwood of *Acacia Catechu*, Willdenow (N.O. Leguminosæ), a tree of small or medium size which is indigenous to India and Burmah. After the tree is felled, the bark and whitish sapwood are removed from the trunk, and the brown or dark red heartwood is cut into chips and boiled with water until all soluble matter is dissolved. The resulting decoction is strained and evaporated, with constant stirring, until it attains a thick syrupy consistence. The residue is then allowed to cool somewhat, spread upon leaves arranged within wooden moulds, and left to harden, the resulting solid extract forming large brick-like masses, which are broken up and exported in pieces of irregular shape, to which fragments of the leaves may often be found adhering. Sometimes the extract is spread out to dry upon a mat or cloth, and divided by means of a string, while yet soft, into more or less square or oblong pieces, but catechu prepared by this method is usually of inferior quality. The extract possesses tonic and astringent properties, and is official in the Indian and Colonial Addendum, for use in India, the Eastern Colonies, and the North American Colonies, as a substitute for pale catechu, but it is used chiefly in the dyeing and tanning industries.

Black catechu occurs usually in irregular, dark brown or nearly black masses, to which fragments of leaves are often found adhering. The masses are hard and brittle externally, breaking easily with a porous, glossy, somewhat conchoidal fracture, but are sometimes soft internally. The drug yields a dull reddish-brown powder and, when macerated with cold water, forms a brown magma, in which minute acicular crystals of acacatechin can be detected under the microscope. Black catechu is partially soluble in cold water, almost entirely soluble in boiling water, and yields not less than 80 per cent. to 90 per cent. alcohol. The catechu-tannic acid present causes a dilute aqueous solution to give a dark green colour with aqueous ferric chloride solution (5 per cent.), the colour changing to purple when the liquid is made alkaline with sodium hydroxide solution. A solution made with boiling water deposits a crystalline sediment of acacatechin on cooling. Black catechu is odourless, but has a sweetish, astringent taste, due to the presence of acacatechin and catechu-tannic acid respectively. The extract should not leave more than 6 per cent. of ash when incinerated.

The colour, glossy fracture, and freedom from any fluorescent constituent distinguish black catechu, as a rule, from gambier or pale catechu, but it is sometimes prepared in India by allowing the syrupy decoction to crystallise, and the product then closely resembles gambier. It can always, however, be distinguished from the latter by the absence of the fluorescent substance which can be extracted from an alkaline solution of gambier by shaking with petroleum spirit. Otherwise, the composition of the two drugs is very similar, the chief constituent of black catechu being about 35 per cent. of catechu-tannic acid, while catechin (acacatechin), quercetin, and catechu-red are also present, together with gum, colouring matter, etc. Catechu-tannic acid is an astringent brown substance, distinguished from gallotannic acid by forming a greenish-black precipitate with ferric salts, and by not yielding gallic acid on exposure to the air. It appears to be produced from acacatechin by loss of a molecule of water, and is converted into soluble catechu-red on hydrolysis. Acacatechin (m.p. 204° to 205° C.) forms white needle-shaped crystals, which have a sweetish taste, and, on dry distillation, yield pyrocatechin (catechol), phenol, and acetic acid; fused with potash it yields phloroglucin and protocatechuic acid. Quercetin is a yellowish-white substance, which can be formed by hydrolysis from quercitrin.

CERA.

Wax ; Beeswax.

A SECRETION formed by the hive bee, *Apis mellifica*, Linné (Order Hymenoptera), and used by the insect to construct the walls of the cells of which honeycomb consists. After the honey has been extracted, the wax is melted with water, separated, and strained. Beeswax possesses emollient properties, and is used in the preparation of Cera Alba, Emplastrum Calefaciens, Emplastrum Cantharidis, Emplastrum Menthol, Emplastrum Picis, Unguentum Hydrargyri Compositum, Unguentum Picis Liquidæ, Unguentum Resinæ, and Unguentum Staphisagriæ. White beeswax (Cera Alba) is prepared by exposing thin bands of the natural yellow wax for several weeks to the action of air, sunlight, and moisture, and remelting it so as to expose fresh surfaces. The bleached product is contained in Pilula Phosphori, Suppositoria Acidi Carbolici, Unguentum Aquæ Rosæ, and Unguentum Cetacei. Inferior qualities of white beeswax are bleached by the aid of chemicals, such as chromic and nitric acids, but they are not suitable for medicinal use.

Beeswax, when pure, is firm and breaks with a granular fracture ; it is yellowish in colour, possesses an agreeable honey-like odour, and is not unctuous to the touch. It should dissolve readily and entirely in hot oil of turpentine, but should not yield more than 50 per cent. to cold ether, nor more than 3 per cent. to cold 90 per cent. alcohol. It is quite insoluble in water or boiling sodium hydroxide solution. The specific gravity of beeswax varies from 0·960 to 0·970, and its melting-point from 62·5° to 64° C., the solidifying point being two or three degrees lower. White beeswax occurs in hard, nearly white, translucent masses. It is entirely soluble in oil of turpentine, but insoluble in cold 90 per cent. alcohol, though soluble to a slight but variable extent in cold ether.

Indian beeswax is the product of *A. dorsata*, *A. indica*, and *A. florea*, and has a lower acid value than European beeswax. The chief adulterants of yellow beeswax are mineral substances, resin, paraffin, other waxes, etc. Possible adulterants of white beeswax are lard, tallow, paraffin, starch, or mineral substances, such as kaolin. Mineral substances used as adulterants are insoluble in hot oil of turpentine, as are also starch, flour, etc. Starch also gives a characteristic blue coloration when the wax containing it is boiled with water, and solution of iodine added to the cooled and filtered liquid. Resin and stearic acid are soluble in 90 per cent. alcohol; soap dissolves in hot water, and the solution becomes cloudy on adding hydrochloric acid, owing to the separation of fatty acids; paraffin reduces the density of the wax and the amount of potassium hydroxide required for complete saponification, whereas lard, tallow, and other fats require more alkali to effect complete saponification than is needed in the case of beeswax. Aqueous solution of sodium hydroxide saponifies tallow, suet, Japan wax, fats, etc., but an alcoholic solution is required to saponify beeswax. Lard or tallow also renders the wax soft and lessens its specific gravity. Any beeswax below specific gravity 0·960 is probably adulterated with paraffin, which separates unaltered if the mixture be heated with strong sulphuric acid, though the beeswax is completely charred by the acid. The chief constituents of beeswax are about 15 per cent. of cerotic acid or cerin, a homologue of acetic acid, and more than 80 per cent. of myricin or myricyl palmitate, the palmitic ester of myricyl alcohol, a homologue of ethyl alcohol. An aromatic body, cerolein, is also found in beeswax, as well as colouring matter and traces of hydrocarbons.

CETACEUM.

Spermaceti.

A CONCRETE fatty substance obtained, mixed with oil, from the head of the sperm whale, *Physeter macrocephalus*, Linné (Order Cetacea), an inhabitant of the Pacific and Indian Oceans. The oil is contained chiefly in a large cavity in the head of the whale, but also occurs in smaller cavities in the body. The crystalline matter deposited on keeping the oil is separated by filtration, pressed, melted, and purified from the last traces of oil by washing it with diluted sodium hydroxide solution, being subsequently separated from the soap produced, and freed from excess of alkali. The product possesses emollient properties, and is used in the preparation of Unguentum Aquæ Rosæ, Unguentum Capsici, and Unguentum Cetacei.

Spermaceti occurs in crystalline, pearly-white, glistening masses, which are translucent, slightly unctuous to the touch, and have but little taste or odour. It can be reduced to powder by the aid of a little 90 per cent. alcohol. It is insoluble in water, nearly insoluble in cold 90 per cent. alcohol, but soluble in ether, chloroform, boiling alcohol, and in fixed or volatile oils. It should melt at 46° to 50° C., and should be free from stearic or other fatty acid, the presence of which can be detected by the acid neutralising sodium hydroxide when the latter is added to an alcoholic solution of spermaceti. Stearic acid, if present, is also precipitated on boiling spermaceti with 90 per cent. alcohol, cooling the mixture, filtering to remove the separated spermaceti, and adding water to the filtrate.

The pearly crystalline appearance of spermaceti and the absence of free fatty acid are distinctive characters of the substance. The chief constituent of spermaceti is cetyl palmitate or cetin, the palmitic ester of cetyl alcohol, of which it consists almost entirely, but it also contains small quantities of closely allied homologous esters. As it contains no glycerides, it yields no glycerin on saponification, potassium palmitate and cetyl alcohol being the chief products when spermaceti is saponified by alcoholic potash. The behaviour of spermaceti with cold and hot alcohol is specially worthy of note. It is dissolved by hot 90 per cent. alcohol, and deposited practically entirely on cooling, the presence of paraffin wax and several other possible adulterants being detected by this test. Unless rancid, spermaceti contains no free acid, and its solution in hot alcohol should therefore be rendered alkaline by the addition of a single drop of normal sodium hydroxide solution.

CETRARIA.

Iceland Moss.

A LICHEN, *Cetraria islandica*, Acharius (N.O. Discomycetes, or Discolichenes), indigenous to Britain, and distributed widely over the Northern Hemisphere. It grows usually among moss and grass on lower mountain slopes, and is collected chiefly in Scandinavia, or the German, Swiss, and Austrian Alps. The plant occupies an intermediate position between the fructicose and foliaceous lichens, having a divided, foliaceous, but partially erect thallus of a light bluish-green or brown colour, which is whitish on the under side. The dark reddish-brown apothecia of the plant are about 6 mm. in diameter, and occur on the surface of the thallus near the margin, but they are not often to be found. Though commonly described as a moss, the plant belongs to the Lichenes, a class of symbiotic organisms which consist of higher Fungi and unicellular or filamentous Algæ, living in intimate connection and forming a compound thallus or consortium. In the formation of the thallus the algal cells become enveloped by the mycelium of the fungus in a felted mass of hyphæ, the fungus deriving its nourishment saprophytically from the organic matter produced by the assimilating alga, without interfering with the vegetative activity of the latter, while the alga receives inorganic matter and water from the fungus. The result of the symbiosis is the production of a dual organism with a distinctive thallus, the form of which, being influenced by the mode of nutrition of the independently assimilating alga, differs greatly from that of other non-symbiotic Hyphomycetes, which have thalli consisting solely of profusely branched hyphæ. The lichen possesses demulcent, tonic, and nutritive properties, and is used chiefly in the form of a decoction (1 in 20), jelly, or jujubes.

Iceland moss consists of the dried, thin, leafy thallus, which is brownish or greenish-brown above and greyish below, the under surface being marked with numerous small, white, depressed spots. The thallus is irregularly branched into fringed and channeled, fan-like, curled or flattened, papery lobes, which are about 6 mm. broad and fringed with minute projections. It is remarkably harsh and springy to the touch, soft and cartilaginous when slightly moist, but brittle when quite dry. The drug is almost without odour, but its taste, when chewed, is mucilaginous and bitter. When macerated in water it absorbs rather more than its own weight of the liquid. Boiling water extracts all the soluble principles of the lichen, the decoction being bitter and thickening on cooling, acquiring a gelatinous consistency resembling that of starch jelly, but without the viscidity of the latter. Some of the dissolved matter separates on standing, and, when dried, forms semi-transparent masses of lichen starch, which is insoluble in cold water, alcohol, or ether, but soluble in boiling water, the solution being coloured reddish or blue by solution of iodine.

The brownish upper surface, greyish under surface, and the very thin papery lobes into which the thallus is divided, are distinctive characters of Iceland moss. The thalli of lichens are attached to the substratum by rhizoid holdfasts (rhizines), which consist of hyphæ resembling root-hairs. Many lichens are able to multiply in a purely vegetative manner, by means of loosened pieces of thallus, which continue their growth, and attach themselves to the substratum with new rhizines. The fructifications of lichens are produced by the consorting Fungi, which belong chiefly to the Discomycetes, and not by the vegetating Algæ. As the ascus-fruit of their fungus, the Discomycetous lichens (Discolichenes) produce chiefly cupular or discoid apothecia, which are sessile or somewhat depressed on the thallus. In addition, however, to the ascogenous fructifications, the lichens produce accessory fructifications in the form of pycnidia, and, in the case of *Cetraria islandica*, such are produced on the margin of the thallus in small wart-like protuberances. The chief constituent of Iceland moss is from 50 to 70 per cent. of lichen starch, which resembles ordinary starch in its general characters, but differs from it in some respects. It is perfectly devoid of structure, and appears to consist of two distinct substances, lichenin and iso-lichenin (dextro-lichenin). Lichenin is insoluble in cold water, but dissolves in hot water, separating from the solution after a time as a non-adhesive jelly which can be dried in the form of semi-transparent masses ; it is only tinged by iodine, and can be combined with bases. Iso-lichenin is soluble in cold water, behaving as a soluble modification of ordinary starch, being coloured blue by iodine and not capable of combining with bases. Other constituents of Iceland moss are cetraric acid or cetrarin—a crystalline bitter principle, licheno-stearic acid, and a green colouring substance named thallochlor, together with fumaric acid, lichenic acid, oxalic acid, sugar, cellulose, and various salts, the yield of ash being from 1 to 2 per cent. The bitterness of Iceland moss may be removed to some extent by repeated maceration in water, while it can be removed entirely by macerating the powdered drug twice in a dilute aqueous solution (1 in 400) of an alkaline carbonate.

CEVADILLA.

Sabadilla.

The dried ripe seeds of *Schœnocaulon officinale*, A. Gray (N.O. Liliaceæ), a tall herbaceous plant which grows on low mountain slopes in Mexico, Guatemala, and Venezuela. It produces a tall raceme of yellowish flowers, which are succeeded by small three-celled capsular fruits. As ripening proceeds, each capsule splits through the dissepiments or partitions (septicidally) into three monocarpellary follicles or fruits, each of which contains from one to six seeds. The seeds are imported usually without the thin, brown, papery pericarps. They are of a glossy, dark brown or nearly black colour, about 6 mm. long but much narrower, and taper gradually to an acute point at one extremity, though more obtuse at the opposite extremity, where the hilum and micropyle are situated. A longitudinal depression with acute edges is usually visible on one side, and the seeds are also slightly curved. On examination with a lens, the surface is seen to be finely wrinkled and, in a transverse section near the obtuse end of a seed, a minute embryo can be detected, imbedded in a large, dark, oily endosperm. The drug is a powerful irritant poison, and is used chiefly in the preparation of veratrine, which is employed in the form of Unguentum Veratrinæ (1 in 50), as an analgesic in neuralgia.

Sabadilla seeds are without odour, but they have an unpleasant bitter and acrid taste, due to the presence of veratrine, which is also the cause of the violent sneezing produced by the powdered seeds. They contain less than 1 per cent. of total alkaloid, which is extracted in an impure condition by exhausting the powdered seeds with 90 per cent. alcohol, the resulting tincture containing the veratrine and other alkaloids, combined with a vegetable acid or acids, as they exist in the seeds. The tincture is concentrated until a precipitate begins to fall, and then poured into water, the resin and oil of the seeds being thus thrown out of solution, together with a portion of the colouring matter. The liquid is next filtered and solution of ammonia added to the filtrate to decompose the alkaloidal salts, after which the precipitated alkaloids are slightly washed with cold water to free them from adhering impurities, very little water being employed, because the alkaloids are partly soluble in that liquid. The moist precipitate is then suspended in distilled water and dissolved by adding hydrochloric acid, the solution of hydrochlorides being subsequently decolorised by means of animal charcoal, and the alkaloids again precipitated by adding solution of ammonia to the filtrate. Finally, the precipitate is collected on a filter and dried, after being freed from the ammonium chloride by washing with cold distilled water. The product, though known as veratrine, is really a mixture of alkaloids and, probably, of their derivatives.

Commercial veratrine is a pale grey, inodorous, amorphous powder, which causes intense irritation in the nostrils and produces violent sneezing. It is strongly and persistently bitter and intensely acrid. The powder is insoluble, or practically so, in cold water, but soluble in boiling water (1 in 1000), in 90 per cent. alcohol (1 in 3), chloroform (1 in 3), ether (1 in 6), or olive oil (1 in 80) ; it is only sparingly soluble in glycerin, but readily soluble in diluted acids, leaving slight traces of an insoluble, brown, resinous matter. Commercial veratrine yields a yellow solution when dissolved in strong nitric acid, and it dissolves with production of a persistent blood-red colour when warmed with strong hydrochloric acid, while it turns yellow when treated with fifty or sixty times its weight of strong sulphuric acid, the mixture subsequently acquiring a yellowish-green fluorescence which becomes more distinct on the addition of more acid, and slowly changes to bright red or, if warmed, to violet-red. The absence of any mineral impurity is shown by " veratrine," when heated with access of air, first melting to a yellow liquid, and then burning away, without leaving any appreciable residue. The chief constituents of commercial veratrine are the crystalline alkaloid veratrine (cevadine), and amorphous veratridine, the first being present in larger proportion. Sabadilla also contains free cevadic and veratric acids, together with fixed oil, resin, and the alkaloids cevadilline (sabadilline), sabadine, and sabadinine. The name " sabatrine " has been applied to an amorphous mixture of decomposition products obtained from sabadilla.

CHENOPODIUM.

Chenopodium ; American Wormseed.

THE fruit of *Chenopodium ambrosioides*, Linné (N.O. Chenopodiaceæ), and of *C. ambrosioides*, var. *anthelmin-*

ticum, Gray, natives of the West Indies and Central America, which are naturalised in the United States. They are perennial herbaceous plants, with stems from 60 to 150 cm. high, and alternate or scattered, sessile, oblong-lanceolate, yellowish-green leaves, dotted on the under surface. The flowers are small, very numerous, yellowish-green in colour, and occur in numerous small clusters, or globose spikes, arranged in the axils of slender, lateral, leafy branches. The plants flower from July to September, and the fruits, which ripen successively through the autumn, are collected in October. The whole herb has a strong, peculiar, somewhat aromatic odour, which is due to the presence of volatile oil, and is retained on drying. All parts of the plants possess anthelmintic properties, but the fruits alone are employed as a rule, being administered usually in the form of powder or electuary.

American wormseed, as found in commerce, consists of small, light, dull greenish-yellow or brownish grains, nearly 2 mm. in diameter. They are of a depressed globular shape, glandular, with a bitterish, aromatic, pungent taste, and a peculiar, somewhat terebinthinate odour, both taste and odour being due to the presence of volatile oil. Each fruit contains a lenticular, obtusely edged, glossy, black seed, which can be freed from its integuments by rubbing the fruit in the hand. The seed contains a strongly curved embryo.

The distinctive characters of American wormseed are the friable integuments or capsular covering investing the seed proper, the glossy black seed, and the peculiar taste and odour of the drug. The active constituent of *C. ambrosioides* is a volatile oil (s.g. 0·943) which possesses a strong aromatic odour and a bitter, burning taste. The fruits of *C. ambrosioides*, var. *anthelminticum*, yield from 0·6 to 1 per cent. of a similar volatile oil (s.g. 0·97), which appears to consist of limonene and a liquid oxygenated substance.

CHIRATA.

Chiretta; Chirayta.

THE dried plant, *Swertia Chirata*, Hamilton (N.O. Gentianaceæ), an erect herb indigenous to the mountainous districts of Northern India. It has a tapering root, which attains a length of about 10 cm., and may measure about 12 mm. in thickness at the crown; it is less frequently branched than the stem, but always bears some rootlets. In stronger specimens the root is somewhat oblique, the stem in such cases being probably the product of a second year's growth. The entire plant is collected and dried when flowering is well advanced and many fruits are formed, being afterwards made into bundles about a metre in length, and weighing from 700 to 900 grammes each. The drug is a bitter tonic and stomachic, without astringency. It is used in the preparation of Infusum Chiratæ (1 in 20), Liquor Chiratæ Concentratus (1 in 2), and Tinctura Chiratæ (1 in 10).

Chiretta has a smooth yellowish-brown or purplish-brown stem, about a metre in length, slightly winged and much branched above, and rounded below. It contains a large, continuous, easily separable pith, enclosed by a narrow ring of wood and a very thin bark. The slender, elongated branches are arranged with successive opposite pairs at right angles to each other (decussate); the branches in turn ramify further and bear numerous flowers and fruits. The few leaves usually found in the drug are opposite and sessile, ovate to lanceolate in shape, and taper-pointed. The surface of the leaf is smooth, the margin entire, and there are usually three to seven lateral veins. Very few flowers are present in the drug; they are small, with a yellow rotate corolla, and the inflorescence is a panicled cyme. The superior unilocular or one-celled fruits are formed from two carpels, and contain numerous minute reticulated seeds. The drug has no marked odour, but an extremely bitter taste.

The brown colour of the stem, large continuous pith, intensely bitter taste, opposite leaves, and bicarpellary, unilocular fruits, distinguish chiretta from other drugs. Other species of *Swertia*, which are sometimes found mixed with chiretta, can be distinguished from it by the first three characters; the other two serve to distinguish chiretta from plants belonging to other natural orders, such as *Andrographis paniculata*, Nees (N.O. Acanthaceæ). The root of *Rubia cordifolia*, Linné (N.O. Rubiaceæ), has also been found included in bundles of chiretta, as well as the root of the plant from which the genuine drug is obtained. The chief constituents of chiretta are two intensely bitter substances — ophelic acid and a yellow crystalline substance named chiratin, which is decomposed by acids into ophelic acid and chiratogenin. Other constituents of the drug are sugar, wax, resin, and tannin.

CHONDRUS.

Carrageen; Irish Moss.

A SEAWEED, *Chondrus crispus*, Stackhouse (N.O. Gigartinaceæ), found on the northern shores of the Atlantic Ocean, the entire plant being collected for medicinal purposes chiefly on the north-western coast of Ireland and the southern coast of Massachusetts. Though popularly described as a moss, carrageen belongs to the Rhodophyceæ or Red Algæ (Florideæ), a class in which the thallus exhibits a great variety of forms, the chromatophores being flat, discoid, oval, or irregular-shaped bodies, closely crowded together in large numbers in the cells and containing a red pigment, phycoerythrin, which completely masks the chlorophyll present. The cells of *C. crispus* may contain one or several nuclei, and reproduction is effected either asexually by means of non-motile spores, or sexually by the fertilisation of female organs by male cells. All the Florideæ are attached at the base by means of rhizoidal filaments or discoid hold-fasts, and their spores are produced in groups of four (tetraspores), the sporangia or cystocarps being nearly spherical or oval bodies imbedded in the thallus. The plant yielding carrageen grows just below low-water mark upon rocks and stones, from which it is torn during storms and thrown up on the shore, but it is also collected by raking. When fresh, it varies in colour from green to dark purplish-brown; but the colouring matter is partly destroyed and partly washed out by exposing the seaweed to the sun and watering it. Bleaching has also been effected by means of potassium permanganate and sodium hyposulphite, but the seaweed so prepared tends to develop an odour of sulphurous acid. After bleaching, the plant is dried, and then constitutes the Irish moss of commerce. It possesses demulcent and somewhat nutritive properties, and is used chiefly in the form of a decoction or jelly.

Carrageen consists of the dried, yellowish or yellowish-white, slender, horny, translucent frond or thallus, which may be from 5 to 30 cm. long, and has a cartilaginous consistency when softened in water. The thallus is rounded near the point by which it has been attached to the rocks or stones upon which it has grown, but the upper part is flattened and repeatedly branched in a dichotomous manner, the branches being either narrow, linear, and ribbon-like, or broadly wedge-shaped and fan-like in appearance, with an emarginate or two-lobed apex. The capsules or spore-vessels are imbedded in the frond. The drug has a slight seaweed odour and a mucilaginous, somewhat saline taste. When boiled for ten minutes with thirty parts of water, it yields a solution which is gelatinous on cooling and is not coloured blue by solution of iodine.

The yellowish colour, translucent appearance, and the shape of the segments of the thallus are the distinctive characters of carrageen. Another seaweed, named *Gigartina* (*Chondrus*) *mamillosa*, is occasionally found mixed with carrageen; it may be distinguished by its wart-shaped cystocarps, which occur as papillæ covering the surface and margin of the fronds. It resembles carrageen in composition and possesses similar properties. The chief constituent of carrageen is about 64 per cent. of a complicated carbohydrate named carrageenin, which is said to be composed of galactose, glucose, and fructose, with a small quantity of pectose; the plant also contains about 7 per cent. of proteids, and yields from 8 to 15 per cent. of ash, consisting chiefly of chlorides, sulphates, and phosphates, with traces of bromides and iodides. Carrageenin is distinguished from pectin by yielding no precipitate with lead acetate and no mucic acid when treated with nitric acid; it differs from gum by its aqueous solution affording no precipitate with alcohol, and from starch by not being coloured blue with iodine. True starch is never formed as a product of assimilation in the Rhodophyceæ, its place being taken by other substances, including the so-called Floridean or Rhodophycean starch, the colourless granules of which correspond in most of their chemical characters—especially in their behaviour with potassium hydroxide or hot water—with ordinary starch; they also show a similarly oriented cross to that of ordinary starch when examined under the polarising microscope. With iodine, however, the granules of Floridean starch usually assume only a yellowish-brown to a brownish-red colour, though the younger starch grains in many of the Florideæ are said to be coloured blue by iodine.

CIMICIFUGÆ RHIZOMA.

Cimicifuga; Actææ Racemosæ Radix; Black Snakeroot.

THE dried rhizome and roots of *Cimicifuga racemosa*, Nuttall (N.O. Ranunculaceæ), a tall herbaceous plant which grows freely in shady woods in Canada and the United States. The plant produces a stout rhizome, which is collected in the autumn, after the fruit has formed and the leaves have died down, then cut into pieces and dried. The drug is a bitter stomachic, analgesic, and expectorant. It is used in the preparation of Extractum Cimicifugæ Liquidum (1 in 1) and Tinctura Cimicifugæ (1 in 10).

Cimicifuga is a thick, hard, and knotty horizontal rhizome, from 5 to 15 cm. long, and from 12 to 25 mm. in diameter. It is nearly cylindrical in shape, and bears the remains of numerous stout ascending branches, which are about 25 mm. or more in length, about 9 mm. in thickness, and so close together as almost to conceal the rhizome. The branches curve upwards and terminate in the remains of a bud, or in a circular cup-shaped scar which exhibits a distinctly radiate structure. Encircling scars of cataphyllary leaves mark the rhizome and its branches, being more conspicuous on the latter. The straight, stout, dark brown roots, which are given off from the under surface of the rhizome, are obscurely quadrangular or longitudinally furrowed; they are brittle, usually broken off quite close to the rhizome, and exhibit in transverse section from three to five, or even six—but usually three or four—wedge-shaped bundles of porous whitish wood, separated by broad and dark medullary rays. A similar section of the rhizome or one of its branches exhibits a large, dark-coloured, horny pith, surrounded by a ring of numerous pale wedges of wood, alternating with wide dark medullary rays, outside which is a thin, dark, horny bark or cortex. The odour of cimicifuga is faint, but the drug has a bitter and acrid taste.

The rhizome of cimicifuga is distinguished by the numerous stout branches curving upwards, and the appearance of transverse sections of the rhizome and roots. Black hellebore rhizome, which has been confused with it, is tortuous, and its irregular branches are not prominently curved upwards; sections of the rhizome show a thicker bark and fewer wood-bundles than cimicifuga, and in sections of the roots the wood is much less distinctly cruciate. The chief constituent of cimicifuga is the amorphous, resinous substance known as cimicifugin or macrotin, of which it contains about 18 per cent., but the bitter taste of the drug is due to a crystalline principle named racemosin. The drug also contains two resins, together with fat, wax, starch, gum, sugar, and an astringent substance allied to quercitrin, which is the cause of the darkening when test-solution of ferric chloride is applied to the rhizome or roots, this reaction distinguishing the drug from black hellebore.

CINCHONÆ FLAVÆ CORTEX.

Calisaya Bark ; Yellow Cinchona Bark.

THE bark of *Cinchona Calisaya*, Weddell (N.O. Rubiaceæ), a native of Bolivia and Southern Peru, which grows at an elevation of 1500 to 1800 m. It is a tall tree with a trunk often exceeding 60 cm. in diameter, and is largely cultivated in South America, Java, and India, for the sake of the bark, which occurs both in quills and flat pieces. The drug possesses bitter stomachic, tonic, and astringent properties, and is used chiefly in the preparation of the salts of quinine. The alkaloid may be extracted by alcohol or petroleum spirit after adding lime to the powdered bark, or by the action of alkali on an acidulated aqueous infusion, the liberated alkaloid being subsequently neutralised by sulphuric or hydrochloric acid, and the resulting salt purified by crystallisation.

Calisaya bark occurs chiefly in quills, which may vary from 12 to 75 mm. in diameter, and from 30 to 60 cm. in length. Externally, the quills are of a dull dark-grey or brownish colour, marked with lighter, whitish patches. The rugged outer layer, which tends to exfoliate in flakes, exhibits shallow but rather broad longitudinal fissures of a brownish colour and transverse cracks marking the bark at distances of 6 to 12 mm., more or less oblong meshes with slightly raised edges being thus formed. When the outer layer is removed, the inner portion of the bark appears nearly smooth, of a dull yellowish-brown colour, and bears impressions corresponding to the cracks of the cork. The flat pieces of calisaya bark are from 15 to 20 cm. or more in length, from 5 to 10 cm. in width, and from 6 to 12 mm. in thickness. The outer surface is of a dark tawny yellowish-brown colour, and marked with broad, shallow, longitudinal depressions (digital furrows) which have been caused by the formation of concave lines of cork, by which shallow curved pieces of bark have been exfoliated. The outer brown corky layer has usually been removed from the bark before exportation. The inner surface of the flat pieces is of a lighter tawny yellowish-brown colour, and shows a close fibrous structure, a wavy appearance being often communicated to the bark owing to the undulating course of the fibres. Calisaya bark breaks with a shortly fibrous fracture; a smooth transverse section exhibits a narrow, dark brown, outer corky layer, a brown inner portion, and numerous very short, rigid, glistening fibres. Young bark consists of a layer of primary cork without stone cells, but with one or two circles of large laticiferous ducts near the bast rays; the flat bark consists of bast only, with bands of secondary cork, the fibres being arranged, singly or in pairs, in radial lines.

The bark of *C. Calisaya* is distinguished, especially when in quills, by the longitudinal furrows, transverse cracks, and exfoliating cork. It is a firm hard bark, whereas that of *Cinchona succirubra* in quills is more or less spongy, besides being marked with longitudinal wrinkles and reddish warts, whilst flat pieces of red cinchona bark are thick, of a darker colour, with reddish warts and raised ridges. Pale cinchona or crown bark, from *C. officinalis*, occurs in small rough quills which are firm and bear numerous small transverse and longitudinal cracks. The bark of *C. lancifolia* occurs in quills with a more or less uniformly smooth surface, bearing patches of silvery-grey cork, or in flat pieces which also exhibit the characteristic silvery cork. The constituents of calisaya bark are practically the same as those of red cinchona bark, the various alkaloids, of which the chief is quinine, being combined with cinchotannic acid, and existing in the parenchymatous tissue of the bark. The total alkaloids may be partly extracted from the bark by treatment with acidulated water, and precipitated from the liquor by the addition of sodium hydroxide. By dissolving the precipitate in sulphuric acid, neutralising with an alkali, and bleaching with charcoal, the quinine sulphate may be separated from the solution of mixed sulphates by fractional crystallisation, since it is much less soluble in water than are the sulphates of the accompanying alkaloids. This process, however, is never carried out on a manufacturing scale. Quinine hydrochloride may be obtained by neutralising quinine with hydrochloric acid and crystallising the product. It is sometimes used in preference to quinine sulphate, on account of its greater solubility. Quinine acid hydrochloride may be obtained by dissolving quinine in an excess of hydrochloric acid and crystallising the salt from the solution, or by double decomposition between quinine sulphate and barium chloride in presence of hydrochloric acid. The acid hydrochloride is very soluble in water.

CINCHONÆ LANCIFOLIÆ CORTEX.

Colombian Bark; Carthagena or Caqueta Bark.

THE bark of *Cinchona lancifolia,* Mutis (N.O. Rubiaceæ), a native of New Granada (Colombia), which is exported thence in large quantities for the manufacture of quinine. There are two well-marked varieties of the drug, known as soft Colombian and hard Carthagena bark respectively. The first is soft and fibrous; the second hard and tough. The bark occurs in quills or curved pieces, and is frequently very rich in alkaloids, though liable to great variation in that respect. It possesses similar properties to other varieties of cinchona bark, and is used chiefly in the preparation of the salts of quinine.

Colombian bark occurs in single quills or curved pieces, which are usually reddish-brown or yellowish-brown in colour, and somewhat spongy in texture. The quills have a more or less uniformly smooth surface, and both quills and curved pieces are characterised by the presence of patches of shining silver-grey cork, which scale off easily. The inner surface of the bark is cinnamon-brown, with an orange or reddish tint, and the inner portion breaks with a fibrous fracture. Numerous cells of the middle cortical layer and of the medullary rays have somewhat thick walls, and contain either a soft brown mass (resin cells) or crystals of calcium oxalate (crystal cells). Such cells are mostly isolated, and their walls are not strongly thickened as in true sclerenchymatous tissue. The bark has a slightly astringent and bitter taste.

The bark of *C. lancifolia* is distinguished by the patches of silver-grey cork on both quills and curved pieces, the smooth surface of the quills, and the spongy texture of the drug. Red cinchona bark is also of a more or less spongy texture, but the quills are marked with longitudinal wrinkles and reddish warts. Calisaya bark is firm, hard, and, especially when in quills, distinguished by its longitudinal furrows, transverse cracks, and exfoliating cork. Pale cinchona or crown bark, from *C. officinalis*, is firm and occurs in small rough quills, with numerous small transverse and longitudinal cracks. Colombian bark contains quinine, cinchonine, and other alkaloids, combined with cinchotannic acid, and existing in the parenchymatous tissue of the bark.

CINCHONÆ RUBRÆ CORTEX.

Red Cinchona Bark.

THE dried bark of the stem and branches of *Cinchona succirubra*, Pavon (N.O. Rubiaceæ), a native of South America, but now cultivated largely in India, Jamaica, Ceylon, and elsewhere, the bark being obtained chiefly from plants cultivated in India, whence it is imported. When used for making galenical preparations, the bark should yield from 5 to 6 per cent. of total alkaloids, of which not less than half should consist of quinine and cinchonidine. Red cinchona bark of average quality contains about 1·5 per cent. of quinine, 2·5 per cent. of cinchonidine, 1·0 per cent. of cinchonine, and 0·8 per cent. of amorphous alkaloids ; total alkaloid, 5·8 per cent. The alkaloid used chiefly in medicine is quinine, the sulphate, hydrochloride, and acid hydrochloride being the best-known salts of that base. The bark possesses tonic, bitter stomachic, and astringent properties. It is used in the preparation of quinine, Extractum Cinchonæ Liquidum, Infusum Cinchonæ Acidum (1 in 20), Tinctura Cinchonæ (1 p.c. of alkaloids), and Tinctura Cinchonæ Composita (0·5 p.c. of alkaloids).

Red cinchona bark occurs in quilled or more or less incurved pieces, coated with the periderm and varying in length from 5 to 30 cm. or more. The bark is usually from 2·5 to 6 mm. thick, and the quills vary in size, but are often about 35 mm. in diameter. The outer surface of the bark is brownish or reddish-brown, and often bears greyish lichens ; it is also more or less rough from longitudinal ridges and numerous reddish warts or enlarged lenticels, which often run into lines in the larger pieces of bark. The ridges are most apparent in the bark obtained from the branches; in some varieties (*e.g.* Jamaica bark, from *C. succirubra*, var. *subpubescens*) there are numerous transverse cracks, the edges of which are not thickened or raised. The inner surface of the bark is brick-red or deep reddish-brown, but when the exposed portion is cut away, the surface appears of a yellowish-brown colour, which darkens on exposure owing to oxidation of the tannin of the bark, by which a reddish phlobaphene is produced. Other features of the bark are the irregularly and coarsely striated appearance of its inner surface, the fibrous fracture—short in smaller and fine in larger pieces, the brownish or reddish-brown colour of the powder, the bitter and astringent taste, and the absence of any marked odour.

The distinctive characters of red cinchona bark are its quilled or incurved appearance, more or less spongy nature, longitudinal wrinkles, and reddish warts. The bark of *C. Calisaya* occurs in firm and hard quills, with longitudinal furrows, transverse cracks, and an outer corky layer which shows a tendency to exfoliate in flakes. The bark of *C. officinalis* is also firm, but has numerous small transverse and longitudinal cracks, and the quills are usually small and rough, with thickened edges. The bark of *C. lancifolia* has a more or less uniformly smooth surface, with patches of silvery-grey cork and a very fibrous fracture. The chief constituents of red cinchona bark are the alkaloids quinine, cinchonidine, cinchonine, and quinidine; other constituents are hydroquinine, hydrocinchonidine, quinamine, homocinchonidine, quinovin—a bitter amorphous glucoside, quinic or kinic acid, cinchotannic acid (the peculiar tannin which yields, on oxidation, the reddish phlobaphene cinchona-red), starch, calcium oxalate, gum, sugar, wax, and a trace of volatile oil. In addition to the alkaloids named, which exist in the parenchymatous tissue of the bark, combined with cinchotannic acid, various others have been produced by the action of heat or different reagents on the normal constituents of the bark.

CINNAMODENDRON.

Cinnamodendron Bark; False Winter's Bark.

The dried bark of *Cinnamodendron corticosum*, Miers (N.O. Canellaceæ), a tree which is indigenous to Jamaica. The bark has been confounded with that of canella (*Canella* *alba*, Murray), and has also been employed as a substitute for Winter's bark, obtained from *Drimys Winteri*, Forster (N.O. Magnoliaceæ). It possesses tonic and stimulant properties, but is now rarely met with.

Cinnamodendron bark occurs in nearly smooth channeled pieces or single quills, about 3 mm. thick, with a dingy brownish-grey outer surface, marked with circular rusty-brown spots and occasional shallow transverse depressions. The inner surface is reddish-brown, with longitudinal striations. The bark breaks with a short fracture, and a smooth transverse section exhibits a dark phelloderm or outer layer, a reddish or dark reddish-brown cortex containing still darker oil-cells, and pale wavy medullary rays. The odour of the bark recalls that of coriander, while the taste is extremely pungent and slightly bitter.

The dark colour, coriander-like odour, and structure of cinnamodendron bark distinguish it from canella bark and Winter's bark. The chief constituent of the drug is a volatile oil, but it also contains tannin, and is thus distinguished from canella bark. Other constituents of the bark are resin, a bitter principle, and calcium oxalate. A cooled decoction of cinnamodendron bark gives a deep red or purplish-brown coloration with solution of iodine, a reaction which is not given by a decoction of true Winter's bark.

CINNAMOMI CORTEX.

Cinnamon Bark.

The dried inner bark of shoots from the truncated stocks of *Cinnamomum zeylanicum*, Breyne (N.O. Lauraceæ), a small evergreen tree indigenous to Ceylon, the bark being obtained from trees cultivated in that island. The shoots are cut down when nearly two years old and from 1 to 2 metres long; the bark is then removed in strips, which are exposed in heaps for about twenty-four hours, and afterwards freed from the epidermis and cortex by scraping, the strips being then packed inside one another, rolled into sticks, and dried. The bark is a carminative, astringent, aromatic stimulant, and antiseptic, and is employed as an adjuvant to other medicines. It is used in the preparation of Aqua Cinnamomi (1 in 10), Oleum Cinnamomi, Pulvis Cinnamomi Compositus (1 in 3), and Tinctura Cinnamomi (1 in 5); the oil is employed in making Spiritus Cinnamomi

(1 in 10), while the water, compound powder, and spirit are ingredients of various official preparations.

Cinnamon bark occurs in closely rolled quills, about a metre or more in length, from 6 to 9 mm. in diameter, and containing numerous smaller and very short quills or channeled pieces. The quills are dull pale yellowish-brown externally, and somewhat darker on the inner surface. They are extremely thin, brittle, splintery, and marked by small scars or holes (indicating the insertion of leaves or lateral shoots), and faint shining wavy lines, formed by bundles of bast fibres. A transverse section of the bark shows an outer pale layer of sclerenchymatous cells and an inner dark layer of bast. The fragrant odour and warm, sweet, aromatic taste are due to the presence of volatile oil. Ceylon cinnamon is distinguished by the compound quills in which it usually occurs, its uniform colour, and the absence of cork. The commercial varieties of cinnamon differ in the thinness and smoothness of the quills, which also vary considerably in size. Cinnamon of good quality comes from Southern India, and inferior varieties from Brazil, the West Indies, and Java, but that imported from Ceylon is alone official.

Cassia bark, from *Cinnamomum Cassia*, resembles cinnamon bark in odour and taste, but is less delicate in aroma and more mucilaginous and astringent. It occurs in thicker, usually single quills, which are darker in colour than cinnamon and bear patches of cork. The chief constituent of cinnamon bark is the volatile oil, of which it yields 0·5 to 1·0 per cent.; other constituents are an acid, tannin, mucilage, and colouring matter. Oil of cinnamon (s.g. 1·025 to 1·035) is obtained by distillation, being prepared in Ceylon from the small fragments or chips left after preparing the bark for market, or from inferior kinds of cinnamon, the pieces being coarsely powdered, macerated in sea-water for two or three days, and then submitted to distillation. The trimmings (cinnamon chips) are sometimes exported as such, and the oil is distilled from them in England. The oil possesses the aromatic and antiseptic properties of the drug without its astringency, and also has the fragrant, characteristic odour, and the warm, sweet, aromatic taste of cinnamon bark. It is yellow when freshly distilled, but gradually becomes reddish on keeping. The oil is very soluble in 90 per cent. alcohol (10 in 3), and also soluble in 70 per cent. alcohol (1 in 2). It contains about 50 per cent. of cinnamic aldehyde, a compound which may be converted into cinnamic and benzoic acids by oxidation. Other constituents of the oil are phellandrene and about 8 per cent. of eugenol, in addition to small quantities of pinene, cymene, benzaldehyde, linalool, caryophyllene, and various other compounds. Cinnamon leaf oil (s.g. 1·045 to 1·060) contains from 75 to 85 per cent. of eugenol, together with about 1 per cent. of cinnamic aldehyde and traces of safrol, benzoic aldehyde, and benzoic acid. Oil of cassia (s.g. 1·050 to 1·065) is almost identical in composition with oil of cinnamon, but is richer in cinnamic aldehyde, of which it may contain from 75 to 90 per cent.

CISSAMPELOS.

Cissampelos.

The dried root of *Cissampelos Pareira*, Linné (N.O. Menispermaceæ), a native of tropical and sub-tropical India. The plant was formerly regarded as the source of pareira root, and is now official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of that drug, its chief preparations being Decoctum Cissampeli (1 in 8) and Extractum Cissampeli Liquidum (1 in 1).

Cissampelos occurs in India in slightly compressed, undulating pieces about 12 mm. in diameter, but much larger pieces have been imported from Jamaica. The root is covered with a dark brown bark, which is marked with broad, shallow, longitudinal furrows and fine transverse cracks; the bark is easily separable from the underlying fibrous wood. A transverse section of the root exhibits a yellowish-brown woody column consisting of ten to twenty radial wedges which are separated by distinct, narrow medullary rays and surrounded by the narrow bark; the vessels in the xylem are sufficiently large to be seen without the aid of a lens. The drug breaks with a fibrous fracture; it has no odour, but a very bitter taste.

The root of cissampelos is distinguished by the dark brown bark, the single ring of radial woody wedges, and the narrow but distinct medullary rays. The chief constituent of the drug, to which its extremely bitter taste is due, is the alkaloid pelosine (cissampeline, beberine, bebeerine, or buxine), which also occurs in true pareira root. Cissampelos was at one time used in this country as a substitute for pareira root, owing to the difficulty of obtaining the latter, and for some years the stem and root of another Menispermaceous plant (see Pareiræ Radix), the source of which is unknown, were sold as cissampelos.

COCÆ FOLIA.

Coca Leaves.

THE dried leaves of *Erythroxylum Coca*, Lamarck (N.O. Linaceæ), and its varieties. The plants are shrubs which grow wild in various parts of South America, and are cultivated in Bolivia, Peru, India, Ceylon, and Java. The leaves are picked twice a year, or oftener, and dried, those imported from Bolivia and Peru constituting well-marked varieties and being known commercially as Huanuco (Bolivian) and Truxillo (Peruvian) coca leaves. The first-mentioned is the product of *E. Coca*, var. *Bolivianum*, Burck, while Truxillo coca leaves are obtained from *E. Coca*, var. *Novo-granatense*, Morris, the leaves of *E. Coca*, Lamarck, not being obtainable in commerce. Other kinds—such as Java and Ceylon coca—are not suitable for medicinal purposes, the quantity of cocaine they contain being less constant, while they are more likely to contain other alkaloids of a toxic nature. Java coca leaves, from *E. Coca*, var. *Spruceanum*, Burck, resemble the Truxillo variety in appearance ; they are light green in colour above and paler below, without any ridge on the upper surface of the midrib, and tapering more towards the base. Indian and Ceylon coca leaves, from *E. Bolivianum*, Burck, resemble the Huanuco drug, having a prominent ridge on the upper surface of the midrib and an elliptical outline. The flowers of a species of *Inga* are frequently found in Truxillo coca, being apparently added with the view of improving the drug ; they are about an inch long, with a yellowish-brown, tubular, hairy calyx and numerous deep red filaments forming a plume. Coca is a nervine and muscular tonic, stimulant, and restorative. It is used in the preparation of Cocaine, Cocaine Hydrochloride, and Extractum Cocainæ Liquidum (1 in 1).

Bolivian (Huanuco) coca leaves vary usually from 3·5 to 7 cm. in length, and from 25 to 35 mm. in breadth, but much smaller leaves may be found. They have a characteristic brownish-green colour, oval outline, and entire margin; both surfaces are glabrous, and the upper surface bears a distinct ridge about the midrib, while the under surface shows two curved lines near the midrib, running from the base to the acute apex of the leaf. The blade tapers in both directions, the midrib projecting at the apex in the form of a minute horny apiculus or point, which, however, is frequently broken off. In a transverse section of the leaf, examined under the microscope, most of the epidermal cells of the under surface are seen to project in the form of small papillæ. Peruvian (Truxillo) coca leaves are somewhat smaller, narrower, and more fragile than those imported from Bolivia, pale green in colour, without the prominent ridge above the midrib on the upper surface, and with less distinct curved lines near the midrib on the under surface. The odour of coca leaves is faint but characteristic, and its slightly bitter taste is succeeded by a sensation of numbness in the mouth, owing to the anæsthetic action of the cocaine they contain. Unless the leaves are preserved carefully, they tend to become coated with mildew, and the alkaloid present diminishes in quantity rapidly.

The curved lines on the under surface, the minute horny apiculus, and the characteristic odour and taste are distinctive characters of coca leaves. The midrib in Huanuco coca lies in a slight depression, as may usually be seen on examining the upper surface of a leaf with the aid of a lens. The two curved lines are much less distinct on the under surface of Truxillo coca, while there is no ridge above the midrib on the upper surface, and the network of small veins is less close and less prominent. Coca leaves usually contain from 0·5 to 1·5 of alkaloidal matter, of which about two-thirds may be cocaine (methyl-benzoyl-ecgonine), the most important constituent of the drug. Other constituents usually present are cinnamyl-cocaine, isatropyl-cocaine (truxilline or cocamine), benzoyl-ecgonine, cocatannic acid, methyl salicylate, and wax. The alkaloid in Huanuco coca consists principally of cocaine, but about half of that in Truxillo coca consists of cinnamyl-cocaine and other bases. Java coca contains less cocaine than the Huanuco and Truxillo varieties, being richer in isatropyl-cocaine, while it also contains benzoyl-pseudo-tropeine, which yields benzoic acid and pseudo-tropine—an isomer of tropine—on hydrolysis. Ceylon coca leaves are also less rich in cocaine than Huanuco and Truxillo coca, although sometimes richer in total alkaloid. Cocaine can be extracted from the leaves, or from a concentrated aqueous extract of the drug, by treatment with diluted sulphuric acid and subsequent agitation with petroleum spirit, the resulting solution being subsequently freed from colouring matter, etc., and the alkaloid precipitated by the addition of excess of sodium carbonate, after which it is purified by crystallisation from ether or other suitable solvent. Since the alkaloidal matter contained in the leaves suffers some decomposition during the voyage, the crude alkaloid is usually extracted in South America and purified in Europe. Cocaine hydrochloride is prepared by neutralising the freshly precipitated alkaloid with hydrochloric acid, and then crystallising. When hydrolysed by heating to 100° C. with hydrochloric acid, cocaine yields methyl alcohol, benzoic acid, and a crystalline alkaloid—ecgonine, which is very closely allied to tropine. In the case of cinnamyl-cocaine the result is similar, except that cinnamic acid is formed in place of benzoic acid, while isatropyl-cocaine yields isatropic (truxillic or cocaic) acid. Benzoyl-ecgonine is an intermediate product of the complete hydrolysis of cocaine, and can be split into benzoic acid and ecgonine; by methylation it can be converted into cocaine.

COCCULI FRUCTUS.

Cocculus Indicus; Levant Berries.

THE fruit of *Anamirta paniculata*, Colebrooke (N.O. Menispermaceæ), a tall, woody, climbing shrub indigenous to Eastern India and the Malay Archipelago. The plant produces small dark brown or nearly black drupaceous fruits, which are collected when ripe. The seeds contain a poisonous substance named picrotoxin, which stupefies fish when cocculus indicus is thrown into water containing them. The drug is used chiefly in the preparation of picrotoxin, which possesses anhydrotic properties and is given to prevent immoderate sweating in phthisis; the powder is employed in the form of ointment (8 grains in 1 ounce) to destroy pediculi, but must be applied with caution.

Cocculus indicus consists of small dark brown or nearly black fruits about 12 mm. in length. They are more or less reniform in shape, flattened or slightly concave on one side, and boldly arched on the opposite side. The thin woody pericarp is rough and finely wrinkled, and encloses a single oily seed which exhibits a crescent-shaped section when cut longitudinally or transversely. The fruit has no odour and the pericarp is tasteless, but the seed is very bitter, owing to the presence of picrotoxin.

The chief constituent of cocculus indicus is picrotoxin, a poisonous bitter substance which can be obtained in crystals by exhausting the drug with alcohol, evaporating the liquid, separating the fat which is present, adding water to the filtrate, and acidifying the solution. The crystals are soluble in water (1 in 334), 90 per cent. alcohol (1 in 13½), or potassium hydroxide solution (1 in 10). Picrotoxin is a mixture of 66 per cent. of picrotoxinin and 34 per cent. of picrotin. It is accompanied in the seeds by a tasteless crystalline body, anamirtin or cocculin, and a large proportion of fat, while two alkaloids—menispermine and para-menispermine—are present in the pericarp of the fruit.

COCCUS.

Cochineal.

THE dried fecundated female insect, *Coccus Cacti*, Linné (Order Hemiptera), a native of Central America and Mexico. The insect is bred in the Canary Islands, being reared upon the fleshy branches of *Nopalea coccinellifera*, Salm-Dyck (N.O. Cactaceæ), and other species of Nopalea. The insects are normally of a bluish-red colour, and about 1·25 mm. in length, the males alone being provided with wings. The females increase in size rapidly after fecundation, and are then brushed off the plants, killed, and dried, being thus reduced to one-third their original size or less. An abundance of red colouring matter is formed in the insects as they increase in size, though a waxy secretion with which their bodies are covered gives them a whitish appearance. If the insects are killed by the fumes of burning sulphur or charcoal, and dried in the sun, the waxy secretion remains on the bodies, and "silver-grain" cochineal is produced, while "black-grain" cochineal is obtained when the insects are killed by being placed in hot water or in an oven, the waxy secretion being melted by the artificial heat, and the colour of the insects changing to a reddish or purplish black. Cochineal is employed chiefly as a colouring agent, being used in the preparation of Tinctura Cocci (1 in 10), Tinctura Cardamomi Composita, and Tinctura Cinchonæ Composita.

Cochineal insects, when dried, are about 5 mm. long, oval in outline, flattish or slightly concave on one side, convex or arched on the other. They are purplish-grey or purplish-black in colour, and, if properly dried, they can easily be reduced to a puce-coloured or dark red powder. The dried insects are transversely wrinkled, and swell considerably when macerated in water, three pairs of legs being then rendered visible in each case. When cochineal is macerated in water, no insoluble powder should separate, and on incineration with free access of air the insects should yield not more than 6 per cent. of ash. Cochineal is sometimes faced with inorganic matter—in the case of the "silver-grain" variety, with barium or lead carbonate or sulphate, whilst "black-grain" cochineal may be faced with black lead, ivory black, or manganese dioxide. All such additions can be detected by macerating the cochineal in water, as the insoluble powders then separate. Inorganic impurities also increase the amount of ash left on incineration.

The chief constituent of cochineal is about 10 per cent. of a red colouring matter—carminic acid—which is obtainable in small, red, prismatic crystals, and is soluble in water, alcohol, and alkaline solutions. Carmine contains about 50 per cent. of carminic acid, and is obtained by precipitating a decoction of cochineal with alum, potassium bitartrate, etc., in the presence of lime salts and albumin or gelatin. Other constituents of cochineal are about 10 per cent. of myristin, together with liquid fat and fatty acids, 2 per cent. of wax (coccerin), various albuminoids, and inorganic matter.

COCOS OLEUM.

Coco-Nut Oil.

A FAT obtained from the kernels of coco-nuts, the fruits of *Cocos nucifera*, Linné (N.O. Palmaceæ), the coco-nut palm, a native of India, Ceylon, and other tropical countries. The oil can be extracted by simply subjecting the kernels to pressure, but it is usual to boil them with water before expression. Three qualities of the oil are distinguished in commerce—Cochin (Malabar) oil, the finest and whitest; Ceylon oil, chiefly imported from

Ceylon, where the fat is produced on a large scale; and copra oil, prepared in Europe from sun-dried or kiln-dried "copra" or coco-nut kernels. The oil possesses demulcent properties, and is used chiefly in the manufacture of soap and night-lights, but it has also been used as a substitute for cod liver oil or lard, and, when freed from soft fat ("coco-nut olein") by hydraulic pressure, it yields the so-called "coco-nut stearin," which is useful for making suppositories, as a substitute for, or mixed with, oil of theobroma.

Coco-nut oil is a solid white fat with a bland taste and peculiar, though not unpleasant, odour when fresh. At ordinary temperatures it is of the consistence of lard, but it becomes hard like suet between 4° C. and 10° C., and melts between 23° C. and 28° C. It becomes rancid rapidly, acquiring at the same time a disagreeable flavour and an acrid taste. The oil is soluble in two volumes of 90 per cent. alcohol at 60° C., and requires strong alkaline lyes for saponification. The distinctive characters of the oil are its colour, consistence, and peculiar odour. Oil obtained from the kernels by cold expression solidifies at about 12° C. and melts at 20° C., but is not a commercial article.

An oil without odour is yielded by the "King Coco-nut," which grows in Ceylon, and a variety which has been deodorised by artificial means, sold under the name of "nucoline," is used as a butter substitute. Ordinary coco-nut oil resembles palm-nut oil in chemical composition, containing large proportions of the glycerides of lauric and myristic acids, with smaller quantities of the glycerides of palmitic and oleic acids, and of the volatile caproic, caprylic, and capric acids. Free fatty acids are also commonly present, copra oil having been found to contain as much as 25 per cent. of such acids, while Ceylon oil as a rule contains only 5 to 10 per cent.

COLCHICI CORMUS.

Colchicum Corm.

The fresh corm of the meadow saffron, *Colchicum autumnale*, Linné (N.O. Liliaceæ), a plant which is widely distributed over Central and Southern Europe, and abundant in moist meadows and pastures in many parts of England and Ireland. The short, fleshy, bulb-shaped underground stem of the plant is collected in early summer, when it is filled with reserve material stored up by the aid of the leaves. At a later period, a new corm begins to form at the lateral inferior portion of the older one, and the reserve material in the latter is gradually used up as the flowers develop, the original corm shrivelling meanwhile, and ultimately decaying, so that the only trace of its existence is a rounded cicatrix upon the new corm, marking the point of attachment to its predecessor. It is usual to dig up the corms after the decay of the foliage, either before the appearance of the flowers, or soon after the flower has appeared, an advantage of the latter course being that the plants are then less difficult to find. After collection, the fresh corms are stripped of their membranous coats and cut into transverse slices, which are dried at a temperature not exceeding 65·5° C., so as to avoid causing gelatinisation of the starch present, and freed from the remains of the membranous coats by winnowing. The drug is a powerful stimulant of the liver and intestine, causes increased action of the kidneys, and is much employed in gout. It is used in the form of Extractum Colchici and Vinum Colchici (1 in 5).

Colchicum corm, when fresh, is about 35 mm. long and 25 mm. broad, bluntly conical in shape, rounded on one side and flattened or hollowed on the other, where there is a new corm in process of development. It is covered with an outer, thin, brown membranous coat and inner reddish-yellow one, both being derived from the leaves of the plant, which have decayed prior to the collection of the drug. Internally the corm is firm, white, and solid, but a bitter milky juice with a disagreeable odour exudes when it is cut, the milkiness being due to the presence of numerous starch grains. The disagreeable odour of the juice is apparently due to a volatile body which disappears from the corm on drying. The dried slices are reniform or kidney-shaped in outline, from 2 to 3 mm. thick, while their shortest diameter is from 1 to 2 cm. The slices break readily with a short fracture, and, when the fractured surface is smoothed, numerous fibro-vascular bundles are seen as scattered points darker than the root of the surface. The margin of each slice is slightly raised owing to the greater shrinkage of the firm, whitish, starchy central portion in drying, and presents on its outer surface a yellowish or dull pale-brown epidermis. The dried slices have the same bitter taste as the fresh corm or juice, but they are free from the disagreeable odour.

The fresh colchicum corm is distinguished by its peculiar shape, bitter taste, disagreeable odour, and milky juice, which contains numerous starch grains. When sliced and dried, the corm appears to lose a volatile body to which its peculiar odour is due; it also loses about 70 per cent. of water. The dried slices are characterised by their kidney-shaped outline, short starchy fracture, and bitter taste. The chief constituent of the drug is the poisonous, yellow, amorphous alkaloid colchicine, of which, when dried, it contains 0·5 to 0·6 per cent. Other constituents of the drug are starch, gum, sugar, resin, tannin, and fat. The alkaloidal content of the drug is said to decrease if the dried corm is kept for any considerable length of time.

COLCHICI SEMINA.

Colchicum Seeds.

THE dried ripe seeds of the meadow saffron, *Colchicum autumnale*, Linné (N.O. Liliaceæ), a plant which is widely distributed over Central and Southern Europe, and common in moist meadows and pastures in England and Ireland. The reddish-purple flower, which springs from the side of the corm or bulb-shaped underground stem, has a superior ovary, which is raised to the surface of the ground as development of the flower proceeds, by elongation of the peduncle. After fertilisation the fruit forms as a three-celled capsule, which ripens during the summer, dehisces septicidally, and discloses numerous pale seeds, which darken as they dry and become covered with a saccharine exudation. The seeds possess similar properties to colchicum corm, but are thought to be milder in operation and more certain in effect. They are used in the preparation of Tinctura Colchici Seminum (1 in 5).

Colchicum seeds are about 2·5 mm. in diameter, nearly spherical in shape, but slightly pointed at the hilum, where can be seen the remains of the thick funiculus or stalk by which the seed has been attached to the placenta in the fruit. The seeds are of a dull reddish-brown colour and rough, owing to the presence of minute pits on the surface. They are also very hard and tough, and must be soaked in water before they can be cut. A transverse section shows a yellowish oily endosperm, consisting of cells with thickened walls and large pits, the minute embryo being situated near the margin opposite the hilum. The seeds have a bitter, acrid taste, but no odour.

The rough surface, hard horny endosperm, and the remains of the thick funiculus are distinctive characters of colchicum seeds. Several seeds resemble them more or less remotely, but black mustard seeds are much smaller and softer, henbane seeds are kidney-shaped, and grains of paradise are larger and paler, with a soft white endosperm and pungent taste. The chief constituent of colchicum seeds is from 0·6 to 1 per cent. of colchicine; they also contain 6 to 8 per cent. of fixed oil, gum, starch, sugar, etc., together with colchicoresin, β-colchicoresin, and colchicein (trimethyl-acetyl-colchicinic acid), a white crystalline body of which colchicine is the methyl ester.

COLOCYNTHIDIS PULPA.

Colocynth Pulp; Bitter Apple.

THE dried pulp of the fruit of *Citrullus Colocynthis*, Schrader (N.O. Cucurbitaceæ), freed from seeds. The plant is a native of Turkey, but is widely distributed throughout Northern Africa, Syria, North-Western India, Persia, and elsewhere, while it is cultivated to some extent in Spain, Cyprus, and North-Western India. The fruit is a gourd or globular pepo, about the size and shape of an orange, with a smooth marbled-green surface which changes to yellow as ripening proceeds. It is at first three-celled, bearing numerous seeds attached to axile fleshy placentas, but, as development proceeds, the carpellary walls disappear, and the fruit then becomes spuriously one-celled. At the same time, the placentas grow from the centre of the fruit towards the circumference, and each placenta divides into two when near the pericarp, the two halves curving inwards and bearing the seeds on their margins. The fruit is collected when ripe, freed from the thin rind by peeling with a sharp knife, and dried. The peeled fruit is imported chiefly from Smyrna, Trieste, France, Spain, and, less frequently, from Persia; unpeeled colocynth is imported occasionally from Mogadore. The spongy, pith-like pulp consists chiefly of the placentas, which split usually in a radial direction throughout almost their entire length, and appear deeply fissured in the dried fruit. The seeds are removed from the fruit after it arrives in this country. The pulp is a powerfully drastic hydragogue cathartic, and is dangerous in large doses. It is used in the preparation of Extractum Colocynthidis Compositum (1 in 4), Pilula Colocynthidis Composita (1 in 6), and Pilula Colocynthidis et Hyoscyami (1 in 9).

Colocynth fruit is usually imported peeled, in more or less broken balls, about 5 cm. or less in diameter. The outer surface of the peeled fruit is formed by part of the thin whitish mesocarp, the seeds and fleshy placentas being visible at points where the mesocarp has been removed. On cutting a fruit transversely, the placentas are generally exhibited as radiating fissures dividing the fruit into three parts. In each part, near the periphery, half of each placenta curves inwards and bears on its inner margin several vertical rows of seeds. The flattened ovoid seeds, which number from two to three hundred in each fruit, are yellowish-white to dark brown in colour, according to the degree of ripeness. The pith-like pulp, which alone should be used for medicinal purposes, constitutes about one-fourth the weight of the peeled fruit; it is very light, spongy, and whitish, with a very slight odour, but an intensely bitter taste. It should not yield the characteristic reactions with tests for starch, since colocynth fruit does not contain that substance. Neither should the powdered pulp yield more than traces of fixed oil to ether, thus showing that the seeds have been entirely removed. The seeds contain a large proportion of fixed oil, whereas the pulp alone does not yield to ether more than 3 to 5 per cent. of extractive of an oily nature. When dried at 100° C. and incinerated, the pulp should yield not less than 9 per cent. of ash, that proportion usually indicating the absence of seeds.

The light weight and intensely bitter taste of Colocynth pulp are very distinctive characters. There are several commercial varieties of the drug, Turkey colocynth, imported from the Levant, being the finest, while Spanish comes next in value, and the poorest variety is Persian colocynth, which is only occasionally met with. The chief constituent of the drug is a bitter principle named colocynthin, an amorphous yellow glucoside which is found in the pulp to the extent of about 0·6 per cent., but does not occur in the seeds. It yields resinous colocynthein and sugar when hydrolysed by dilute acids or alkalies. The name "colocynthitin" has been applied to a tasteless crystalline resin found in the pulp, and other constituents of the drug are pectin, gum, and traces of fixed oil. The seeds contain but little of the bitter principle but as much as 15 to 17 per cent. of fixed oil, and 6 per cent. of albuminoids. The ash of colocynth may vary from 4·5 to nearly 6 per cent. in the entire fruit as imported. But whilst the pulp yields from 9 to 13·5 per cent. of ash, the seeds yield only from 2 to 5 per cent., the proportion being greatest in the case of unripe seeds.

CONDURANGO CORTEX.

Condurango; Condurango Bark.

THE bark of *Gonolobus Condurango*, Triana (N.O. Asclepiadaceæ), a native of Ecuador. The name "condurango" is applied in Colombia to several different plants, but *G. Condurango* is the only one of medicinal importance. It is a climbing plant, with a stem from 2·5 to 5 cm. in diameter, from which the bark is separated by pounding it with a mallet, after which it is dried in the sun. When thus obtained, it has an external surface of an ash-grey colour, but, if allowed to dry on the stem, it becomes much darker in colour. The drug possesses alterative and tonic properties, and is used in the form of liquid extract (1 in 1).

Condurango bark occurs in quills or curved pieces about 5 to 10 cm. long and from 2 to 6 mm. thick. It is brownish or ash-grey externally, wrinkled and slightly warty, and sometimes bears greenish or blackish lichens. The inner surface is pale brownish and striate. The bark breaks with a granular, slightly fibrous fracture. A smoothed transverse section of the drug shows scattered latex tubes and brownish-yellow groups of stone cells in the wavy bast wedges, while the parenchyma contains starch and raphides. The bark is nearly inodorous, but has a slightly bitter and somewhat acrid taste.

The colour, wrinkled and warty appearance, and granular fracture of condurango bark distinguish it readily from other drugs. A variety known as Guayaquil condurango consists of pieces of bark and woody fragments which appear to be obtained from a plant belonging to a genus closely related to *Gonolobus*; Mexican condurango consists of split stems or thin bark, and is understood to be the product of an *Aristolochia*. The chief constituent of true condurango is a poisonous substance named condurangin, which is closely allied to vincetoxin, and is said to consist of two glucosides, one only of which is soluble in water. Other constituents of the drug are tannin, resin, starch, and gum.

CONII FOLIA.

Conium Leaves; Hemlock Herb.

THE fresh leaves and young branches of the spotted hemlock, *Conium maculatum*, Linné (N.O. Umbelliferæ), a biennial plant which grows wild in Great Britain and is distributed widely over Central Europe; it is also cultivated for medicinal purposes. The inflorescence of hemlock is an umbel, with about twelve rays and both general and partial involucres, the latter consisting of three short lanceolate bracts directed outwards. The broadly ovoid fruits have irregular crenate ridges and a grooved endosperm. The fresh leaves, with the branches to which they are attached, are collected from both wild and cultivated plants when the fruit begins to form. The drug possesses sedative and antispasmodic properties, and is used in the form of Succus Conii, from which Unguentum Conii is prepared.

Conium leaves are more or less divided in a pinnate manner, dark green on the upper surface, paler on the under surface, and glabrous. They are attached to the stem by amplexicaul or clasping petioles of varying length, those of the lower leaves being hollow. The lower leaves are decompound, and sometimes nearly 70 cm. in length, but the upper ones are less divided and smaller; the ultimate ovate or lanceolate segments or divisions of all the leaves terminate in smooth, colourless, horny points. The stem is smooth, hollow, and marked on its lower part with dark purple spots which tend to disappear on drying. The plant has a bitter taste and a strong, disagreeable, mouse-like odour, which is more pronounced when the plant is crushed and rubbed with solution of potassium hydroxide, owing to the liberation of coniine. The smooth, spotted, hollow stem of hemlock is characteristic; the plant is also distinguished by the much-divided glabrous leaves with their ultimate divisions terminating in smooth colourless points, the presence of both general and partial involucres, and the crenate ridges and grooved endosperm of the fruit.

In general appearance fool's parsley, *Æthusa Cynapium*, Linné, somewhat resembles hemlock, but the ultimate divisions of the leaves in fool's parsley terminate in short brownish points, while the umbel has no general involucre, and the bracts of the partial involucre are long and narrow; in wild chervil, *Anthriscus sylvestris*, Hoffmann, the leaves are hairy, the partial involucre is not directed outwards, and the fruit is elongated. The chief constituents of hemlock are the alkaloids coniine and conhydrine, which are present in largest proportion when the plant is in full bloom, the stem then containing about 0·064 per cent. of alkaloid, the leaves 0·187 per cent., and the flowers and flower-stalks 0·236 per cent. Other constituents of the plant are ethyl-piperidine, methyl-coniine, pseudo-conhydrine, volatile oil, albumin, mucilage, etc. Coniine or *α*-normal-propyl-piperidine is a colourless, oily, volatile liquid, of disagreeable mouse-like odour, has an acrid taste, and possesses poisonous properties. Conhydrine or oxy-coniine, which is less poisonous, occurs in glittering plates or scales, and yields coniceine on heating with phosphoric anhydride. Methyl-coniine resembles coniine, but is of minor importance. Pseudo-conhydrine is an isomer of conhydrine.

CONII FRUCTUS.

Conium Fruit; Hemlock Fruit.

The dried, full-grown, unripe fruits of *Conium maculatum*, Linné (N.O. Umbelliferæ), a biennial plant which grows wild in Great Britain and is distributed widely over Central Europe. The plant is sometimes cultivated for medicinal purposes, but the fruits are best collected from wild plants when full-grown, before the colour has changed from greenish-grey to yellowish-grey, and should then be dried and carefully preserved. The seeds possess sedative and antispasmodic properties similar to those of conium leaves, and are used in the preparation of Tinctura Conii (1 in 5).

Conium fruits are broadly ovoid in shape, greenish-grey in colour, about 3 mm. in length and breadth, slightly compressed laterally, and crowned by the small depressed stylopod bearing the remains of the stigmas. The two glabrous mericarps of which each fruit consists are usually separated in the drug as met with in commerce; each mericarp has five irregular, more or less crenate or wavy primary ridges, which are paler than the rest of the mericarp and sharply prominent. When a mericarp is cut transversely and examined with a lens, the endosperm is seen to be deeply grooved on the commissural surface, but no vittæ are visible. The fruit has no marked taste or odour, but a strong, disagreeable, mouse-like odour is produced on rubbing it with solution of potassium hydroxide, owing to the liberation of coniine.

The glabrous surface of conium fruit, with irregular crenate ridges, the grooved endosperm, the absence of vittæ, and the mouse-like odour given off on rubbing with solution of potassium hydroxide, distinguish it from all other fruits. Anise fruit (*Pimpinella Anisum*) somewhat resembles it, but has short bristly hairs, numerous vittæ, and an ungrooved endosperm which is nearly flat on the commissural surface; the fruit of fool's parsley, *Æthusa Cynapium*, also contains vittæ, besides differing considerably in shape from that of conium. The chief constituent of conium fruit is the poisonous, volatile, liquid alkaloid coniine, of which it may contain as much as 3·36 per cent., but the quantity diminishes rapidly as the fruit ripens. The peculiar mouse-like odour produced on rubbing the fruit with potassium hydroxide solution is due to the liberation of coniine from the combinations with vegetable acids in which it occurs naturally. Other constituents of the fruit are methyl-coniine—an oily liquid resembling coniine, conhydrine, pseudo-conhydrine, and volatile and fixed oils.

CONVALLARIÆ FLORES.

Convallaria; Lily of the Valley.

THE dried inflorescence, or entire plant, of *Convallaria majalis*, Linné (N.O. Liliaceæ), a small herbaceous plant which is indigenous to England and widely distributed over Europe. The plant has a perennial creeping rhizome or rootstock, which gives off long branching rootlets and bears a scaly, sheathing bud at the thicker end, from which are sent up in the spring two smooth, broadly elliptical, bright green leaves, the long sheathing petioles of which are so enrolled as to appear like a stalk. In the late spring or early summer the plant produces a flowering scape, on which small, white, pedicellate, campanulate flowers are borne in the axils of small bracts, forming a one-sided raceme. The whole plant is collected when in flower and dried for medicinal use, but the inflorescence is preferred, on account of its greater activity. The drug is a cardiac tonic and diuretic, and has been employed as a substitute for digitalis. The chief preparations of the dried flowers and stalks are an extract and tincture (1 in 8), while a liquid extract (1 in 1) is prepared from the rhizome and roots, or from the entire herb.

Convallaria consists of the entire plant, or of the dried inflorescence only. The dried rhizome is about 3 mm. thick, cylindrical, wrinkled, whitish, and marked with a few circular scars; the internodes are from 2 cm. to 6 cm. long, with annulate joints, from which are given off eight or ten long, thin, branching rootlets, about 1 mm. thick, which form a contorted and almost fibrous mass. The rhizome has a somewhat fibrous fracture, is white internally, has a peculiar but pleasant odour, and a sweetish yet bitter and somewhat acrid taste. The leaves are broadly elliptical, entire, with long sheathing petioles, and appear of a brownish-green colour when dried. The slender scape bears from three to eight pedicellate campanulate flowers, which are brownish-yellow when dried. The perianth has six recurved teeth, and bears on its inner surface six large anthers; the superior three-celled ovary has four to six ovules in each cell, and develops into a berry containing a few red seeds. The dried flowers retain a trace of the fragrant odour which characterises them when fresh, and have a bitter taste resembling that of the rhizome.

The whitish cylindrical rhizome covered with a mass of fine contorted rootlets, the fragrant odour of the flowers, and the peculiar bitter taste, are the chief distinctive characters of convallaria. The chief constituents of the drug are two glucosides named convallamarin and convallarin, the first of which acts upon the heart like digitalin and produces vomiting, while the second has a purgative action. Convallamarin is amorphous and occurs as a white powder, which tastes bitter at first but afterwards sweetish; it is soluble in water and alcohol, but not in ether, and is converted on hydrolysis into convallamaretin and sugar. Convallarin is crystalline, has an acrid taste, is freely soluble in alcohol and slightly so in water, the aqueous solution foaming like soap and water when shaken; on hydrolysis it is converted into convallaretin and sugar. The drug also contains a trace of volatile oil, tannin, salts, etc. It has been stated that the best results can be obtained with an extract of convallaria prepared from the freshly gathered flowers and stalks, dried with one-third their weight of the rhizome and leaves, but the flowers alone are preferred as a rule.

COPAIBA.

Copaiba; Copaiva.

An oleo-resin obtained from the trunk of *Copaifera Lansdorfii*, Desfontaines (N.O. Leguminosæ), and other species of *Copaifera*, Linné, the plants being indigenous to Brazil, Venezuela, New Granada, and other parts of Central and South America. They are large trees, with an extensive network of anastomosing, schizogenous secretion ducts in the secondary wood of the stem and root. The oleo-resin occurs in those ducts and in lysigenous cavities formed by the breaking down of cell walls which appear to be transformed into resinous or oleo-resinous substances. The method of collection adopted usually is to cut cavities in the trunks of the trees near the base, and allow the oleo-resin to drain into them, as much as 48 litres having been thus obtained from one tree. Though frequently termed a "balsam," copaiba cannot properly be regarded as such, since it contains neither cinnamic nor benzoic acid. There are several commercial varieties of the drug, named after the ports—Maracaibo, Para, Maranham, Savanilla, Angostura, etc.—whence they are shipped. Maracaibo copaiba, which is supposed to be most efficacious, is much more viscid than Para copaiba, and its specific gravity is higher; but the specific gravity of any variety of copaiba tends to increase on keeping, owing to the liquid becoming denser by resinification of the volatile oil it contains. The drug possesses stimulant, antiseptic, and diuretic properties, and is used in the preparation of Oleum Copaibæ. It is given suspended in mixtures by the aid of mucilage, or in the form of pills, paste, or capsules; the oil and resin of copaiba are also given suspended in mixtures.

Copaiba is a more or less viscid liquid, generally transparent and not fluorescent, though some varieties are opalescent and occasionally slightly fluorescent. It has a characteristic aromatic odour, a persistent acrid, somewhat bitter taste, and varies in colour from light yellow to pale golden-brown. The specific gravity of the oleo-resin varies from 0·916 to 0·993, according to the proportion of volatile oil it contains; when kept, it becomes thicker by resinification of the volatile oil, and the specific gravity is thus increased. The proportion of volatile oil present should not be less than 40 per cent. Pure copaiba is soluble in 90 per cent. alcohol (1 in 1), and in all proportions of absolute alcohol, ether, benzol, carbon bisulphide, and fixed and volatile oils; it is also soluble in glacial acetic acid (1 in 2) and in petroleum spirit (1 in 4), only a filmy deposit being yielded by the latter solution on standing. Possible adulterants of copaiba are castor and other fixed oils, oil of turpentine, gurjun oil, and hydrocarbon oils. The absence of fixed oils is shown by the copaiba yielding a hard residue which is easily reduced to powder when heated until all volatile oil is removed and then cooled. Oil of turpentine, if present, will affect the odour of the oil volatilised during the operation, and it will also lower the boiling-point of the oil. Hydrocarbon oils form a separate layer at the bottom of a test-tube on warming the copaiba with alcohol. If gurjun oil be present, a transient violet colour will be produced on dissolving the impure copaiba in carbon bisulphide, and adding a cooled mixture of nitric and sulphuric acids in equal parts, while a reddish or purple colour will be produced on carefully adding a little of the impure copaiba to a mixture of glacial acetic acid and nitric acid.

An oleo-resin (s.g. 0·985 to 1·000) of African origin has been imported from the Niger district and offered as copaiba. African copaiba is slightly fluorescent, has an aromatic, Piperaceous smell, and yields a volatile oil which differs considerably from that of genuine copaiba. Gurjun oil, also known as "gurjun balsam" or "wood oil," is an oleo-resin obtained from *Dipterocarpus turbinatus*, Gaertner (N.O. Dipterocarpaceæ), and other species of *Dipterocarpus*, indigenous to Eastern India and Burmah. It somewhat resembles copaiba in odour and taste, but is usually of a dark red colour and fluorescent. The chief constituents of copaiba are the volatile oil and resin, the proportion of the former varying from 20 to 80 per cent., though it is usually between 40 and 60 per cent. A bitter principle is also present in small quantity, and can be removed by boiling the drug with water. The hard, brittle, amorphous mass left after removal of the volatile oil is a mixture of acid resins, including copaivic, oxycopaivic, and metacopaivic acids. Oxycopaivic acid has been extracted from Para copaiba, which is a thin yellowish liquid, and metacopaivic acid from the Maracaibo drug, which is viscid like treacle, brownish-yellow in colour, and occasionally slightly fluorescent. The oil of copaiba (s.g. 0·900 to 0·910) is obtained by distillation of the oleo-resin, the oil which first comes over being colourless, while the later fractions have a fine greenish hue, which must be removed by redistillation. The oil should be colourless or pale yellow, with the odour and taste of the oleo-resin from which it is obtained, and is distinguished from that of African copaiba by turning the plane of a ray of polarised light to the left instead of the right, and by dissolving in its own volume of absolute alcohol. The chief constituent of oil of copaiba is a sesquiterpene, said to be identical with the caryophyllene in oil of cloves.

CORIANDRI FRUCTUS.

Coriander Fruit.

THE dried ripe fruit of *Coriandrum sativum*, Linné (N.O. Umbelliferæ), an erect herbaceous annual. The plant is a native of Southern Europe, and is cultivated in Russia, Thüringia, Northern Africa, Malta, and India. The fruit is a cremocarp, and is collected when ripe and dried entire. It possesses stimulant, aromatic, and carminative properties, and is used in the form of Oleum Coriandri to render medicines more palatable, and to prevent griping; the fruit is also an ingredient of Confectio Sennæ (1 in 25), Syrupus Rhei (1 in 20), Tinctura Rhei Composita (1 in 80), and Tinctura Sennæ Composita (1 in 40), while the oil is an ingredient of Syrupus Sennæ.

Coriander fruit is nearly globular in shape, and about 5 mm. in diameter, the two mericarps of which it consists being firmly united by their margins and enclosing between them a small cavity. It is brownish-yellow in colour, quite glabrous, and crowned with the remains of the calyx teeth and styles. Each mericarp bears five inconspicuous wavy primary ridges, which contain fibro-vascular bundles and alternate with four prominent, straight, secondary ridges. A transverse section exhibits two vittæ on the commissural or inner surface of each mericarp, and both transverse and radial sections show the curved endosperm. The fruit has an agreeable taste and an aromatic odour, which is more marked when bruised, owing to liberation of the volatile oil it contains.

The nearly globular shape of coriander fruit, the firmly united mericarps, the wavy primary and straight secondary ridges, and the presence of two vittæ on each commissural surface, are distinctive characters. The unripe fruit and the oil distilled from it have a disagreeable fetid odour, which disappears from the fruit as it ripens, and from the oil on keeping. Indian coriander fruit is ovoid instead of globular in shape. The chief constituent of coriander fruit is the volatile oil, which is present in the ripe fruit to the extent of nearly 1 per cent.; other constituents are fat and mucilage. Oil of coriander (s.g. 0·870 to 0·885) is obtained by distillation from the dried ripe fruit. It is colourless or pale yellow, with the odour and flavour of coriander fruit, and dissolves in half its volume of 90 per cent. alcohol, or in 75 parts of 60 per cent. alcohol. The chief constituents of the oil are the alcohol linalool (coriandrol) and the terpene d-pinene.

COSCINIUM.

Coscinium.

The dried stem of *Coscinium fenestratum*, Colebrook (N.O. Menispermaceæ), a native of India and Ceylon. It is known as "calumba wood" or "false calumba," slices of the stem having been used at times as an adulterant of calumba root. It is now official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, where the drug is used as an equivalent of true calumba. It is a bitter tonic, and is used in the form of Infusum Coscinii (1 in 20), Liquor Coscinii Concentratus (1 in 2), and Tinctura Coscinii (1 in 10).

Coscinium occurs in woody, cylindrical, straight, or twisted pieces of variable length, which may measure 10 cm. in diameter. They are covered with a pale yellowish-grey cork, the subjacent brown cortical tissues being exposed in places where the bark has been removed. The pieces are furrowed longitudinally, and may bear narrow transverse fissures. A transverse section of the stem shows a very small pith, surrounded by a single ring of wedge-shaped bundles containing many large vessels, the bundles being separated by well-defined medullary rays of lighter colour; the cortex varies in thickness according to the age of the stem. The drug breaks with a splintery fracture; it has no odour, but a bitter taste.

Pieces of coscinium are distinguished by the yellowish-grey cork, longitudinal furrows, the single ring of wedge-shaped bundles, and the well-defined medullary rays, which appear wider near the circumference. The drug is distinguished from calumba by its dark yellow colour, hard and woody character, and freedom from starch. The chief constituent of coscinium, to which its bitter taste is due, is the yellow crystalline alkaloid berberine, which is also present in calumba root. The stem of coscinium also contains a saponin (coscinium-saponin) which is more or less toxic.

COTO.

Coto Bark.

A BARK of unknown botanical source, which is probably obtained from a large tree belonging to the N.O. Lauraceæ or N.O. Monimiaceæ. The bark originally imported from Bolivia is not always obtainable in commerce, and has been replaced largely by another bark of unknown source—known as paracoto bark—which resembles it closely and has similar constituents and properties. True coto bark possesses aromatic stimulant and astringent properties, and a tincture of coto (1 in 10) is used in medicine.

Coto bark occurs in hard, heavy, flat or slightly curved pieces, about 60 cm. or less in length, 6 cm. broad, and 8 to 14 mm. thick. The outer surface is of a reddish-cinnamon colour and smooth, the outer corky layer having been removed; the inner surface is darker in colour. The fracture of the outer bark is short and granular, while that of the inner bark is coarsely fibrous and tough, leaving an uneven and jagged fracture. In a transverse section the outer layer of the bark exhibits a number of large, thin-walled, colourless cells of equal diameter, between which occur a larger number of yellowish sclerenchymatous cells, which are isolated or arranged in irregular, tangentially elongated groups or bands; the inner layer is distinguished by the presence of numerous bundles of bast cells which traverse it in straight lines. The bark has a very pungent and aromatic odour, which disappears on keeping. It also has a pungent, cinnamon-like taste.

Paracoto bark closely resembles coto bark, but is usually thicker and marked with deep white furrows on the outer surface, while the inner surface is rougher, and the taste different. Sassy bark has a nearly black inner surface and fewer and larger groups of sclerenchymatous cells. Bebeeru bark is smoother than coto or paracoto bark, exhibits distinct medullary rays, and contains inconspicuous masses of parenchyma. Flat pieces of red cinchona bark are distinguished from coto and paracoto barks by their rusty red colour, reddish warts, and bitter astringent taste. The chief constituent of coto bark is cotoin, the monomethyl ether of benzoyl-phloro-glucinol, a crystalline bitter principle which can be obtained in pale yellow prisms, and gives a blood-red coloration with nitric acid in the cold; other constituents are piperonylic (methylene-protocatechuic) acid, volatile oil, resin, tannin, and starch. Another substance extracted from the bark, and known as dicotoin, is a mixture. Paracoto bark contains paracotoin, which differs from cotoin by giving a yellowish-brown coloration when heated with nitric acid.

CROCUS.

Saffron; Hay Saffron.

The dried stigmas and tops of the styles of *Crocus sativus*, Linné (N.O. Iridaceæ), a plant cultivated in Spain, France, Austria, and Italy. It produces a pale, purplish-violet flower, which has a long, pale yellow style, terminating in three deep red, elongated, protruding, and pendulous stigmas. The flowers are collected in the autumn, and the stigmas and upper part of the style separated and dried, the product being known as "hay saffron." Though saffron is imported from France and Italy, the drug is produced chiefly in Spain, being exported usually from Valencia and Alicante, whence the two most important commercial varieties take their names. Valencia saffron is much superior to the Alicante variety. Different qualities of the drug vary in the size of the stigmas, in their relative freedom from the stamens and other useless parts of the flower, and from inorganic substances added as adulterants. The drug is employed chiefly for colouring and flavouring medicines, and is used in the preparation of Tinctura Croci (1 in 20), Decoctum Aloes Compositum (1 in 200), and Tinctura Cinchonæ Composita (1 in 160).

Saffron of good quality occurs in pieces about 25 mm. or more in length, consisting of single orange-red or reddish-brown stigmas, or three stigmas attached to the top of the yellow style. The stigmas are thickened and tubular above, each having a slit on the inner side near the upper extremity, and its mouth being jagged or irregularly notched. If thrown on the surface of water, the dry stigmas expand and their shape is clearly revealed, while the liquid surrounding them assumes a deep yellow colour. Unless quite dry, the loosely matted mass of stigmas is flexible and unctuous to the touch. The drug has a strong, peculiar, aromatic odour, and a bitter, somewhat aromatic taste. If rubbed on the wet finger, it leaves an intense orange-yellow tint on the skin, but it should leave no oily stain when pressed between folds of white filter paper, thus showing freedom from added vegetable or mineral oil. Warm water in which saffron is soaked should be coloured orange-yellow, the saffron itself becoming paler and not depositing any white or coloured powder. The drug should not lose more than 12·5 per cent. of moisture when dried at 100° C., and the dried saffron should not deflagrate when incinerated with free access of air, thus indicating absence of nitrates; neither should it yield more than about 7 per cent. of ash.

If warm water in which saffron is soaked assumes a red or pink colour, and the saffron yields colour freely to ether or petroleum spirit, the drug has probably been exhausted and afterwards coloured artificially with aniline dyes, logwood, Brazil wood, or the yellow or orange salts of dinitrocresylic acid. Any white or coloured powder which may be deposited consists usually of calcium carbonate, barium sulphate, ferric oxide, or other inorganic impurity with which the saffron has been dusted after being damped with glycerin, honey, or glucose and water. The presence of glycerin or other substances which are soluble in water and leave no ash when incinerated will be indicated by the proportion of water-soluble substances yielded by the drug exceeding 15 per cent. The stamens or portions of the perianth of saffron and other flowers have been used to adulterate the drug, as well as the florets of safflower and calendula, arnica flowers, the slender stems and roots of monocotyledonous plants, etc. All such adulterants may be detected by allowing the drug to expand in water and noting the shapes of the pieces. The chief constituents of saffron are 1 per cent. or more of an odorous volatile oil, and about 60 per cent. of a reddish-orange colouring matter named crocin (polychroit), which is soluble in water or diluted alcohol, but less soluble in absolute alcohol, and insoluble in ether; the drug also contains fixed oil, phytosterin, mucilage, sugar, proteids, and a colourless, crystalline, bitter principle named picrocrocin. Both crocin and picrocrocin are decomposed by mineral acids, the latter yielding dextrose and volatile oil of saffron on hydrolysis, while crocin is partly converted into a red colouring matter named crocetin, which resembles carotin, and is insoluble in water but very soluble in alcohol or dilute alkalies.

CROTONIS OLEUM.

Croton Oil.

THE oil expressed from the seeds of *Croton Tiglium*, Linné (N.O. Euphorbiaceæ), a small tree or shrub which is cultivated in India, where it is indigenous. It produces a three-celled, three-seeded capsular fruit resembling that of the castor-oil plant, but croton seeds differ markedly in colour from castor-oil seeds. They are oblong in outline and of a dull cinnamon-brown colour, with an oily kernel which consists of a large endosperm enclosing papery cotyledons and a small radicle. The seeds contain toxic albumoses resembling ricin and more than 50 per cent. of fixed oil, which is extracted by expression, in India or England, after removal of the shells. The oil is a drastic cathartic, acting with great rapidity. It is given in pills, or used externally as a counter-irritant in the form of Linimentum Crotonis (1 in 8).

Croton oil (s.g. 0·940 to 0·960) is a viscid, brownish-yellow to dark reddish-brown fluid, with a disagreeable odour and an acrid, burning taste. It is freely soluble in ether, chloroform, carbon bisulphide, and fixed or volatile oils, but only partially soluble in 90 per cent. alcohol. The solubility in alcohol depends upon the proportion of free acids present, and increases with the age of the oil. Since old oil is acid and more irritant than the nearly neutral, freshly expressed oil, it is desirable to avoid the use of croton oil which reddens moistened blue litmus paper when dissolved in alcohol. Croton oil may be adulterated with castor oil and other fixed oils, the presence of which can be detected by solidification taking place on shaking the oil vigorously with its own volume of a mixture of fuming nitric acid and water in equal parts. In the case of pure croton oil the mixture should only thicken slightly after standing for two days.

The chief constituent of croton oil is crotonoleic acid, a viscid oily mixture containing several inactive oily acids, and a powerfully vesicant substance named croton-resin—a lactone or anhydride of complicated structure. It can be obtained as a hard, pale yellow, brittle substance, nearly insoluble in water, light petroleum, or benzene, but readily soluble in alcohol, ether, or chloroform. The vesicating power of the resin is destroyed by ebullition with alkalies, the products of the decomposition which takes place being several acids, some of which are members of the acetic series. The oil may also contain various free fatty acids—stearic, palmitic, myristic, lauric, valeric, butyric, acetic, formic, oleic, and tiglic, together with glycerides of those acids.

CUBEBÆ FRUCTUS.

Cubebs; Tailed Pepper.

THE dried, full-grown, unripe fruit of *Piper Cubeba*, Linné (N.O. Piperaceæ), a diœcious woody climber which is indigenous to, and cultivated in, Java, Sumatra, and Borneo. As the fruits mature, they become elevated on slender stalks produced by abnormal development of the base of the pericarp. They are collected when full-grown, but whilst still green and unripe, dried in the sun, and exported from Batavia or Singapore to Amsterdam and London. The drug possesses aromatic, stimulant, and antiseptic diuretic properties. It is used chiefly in the form of Oleum Cubebæ and Tinctura Cubebæ (1 in 5). Oil of cubebs (s.g. 0·910 to 0·930) is obtained by distillation, and has the characteristic odour and camphoraceous taste of cubeb fruit. It is greenish or greenish-blue when freshly distilled, but tends to become yellowish on keeping. It can be obtained free from colour on redistillation, by rejecting the last portions of the distillate, which are blue and therefore affect the colour of the oil unless separated.

Cubebs are about 4 mm. in diameter, greyish-brown or nearly black in colour, and nearly globular in shape. The fruit contains a single seed attached by the base, and bears the minute remains of three or four stigmas at the apex. If depressed at the base, the fruit is immature. The thin brittle pericarp is reticulately wrinkled, owing to shrinkage during the drying of the fruit, and it is abruptly prolonged at the base into a slender, rounded or slightly flattened stalk about 6 mm. in length. The fully developed seed is reddish-brown in colour, with a very small embryo imbedded near the apex in a somewhat scanty endosperm surrounded by a copious perisperm. Frequently the fruit contains only the dark shrunken remains of a partially developed seed. A transverse section of the pericarp of cubeb fruit exhibits two layers of much thickened and lignified parenchymatous cells, one layer being near the epidermis, the other constituting the smooth, hard inner surface or endocarp, and consisting of radially elongated cells. The presence of these two layers, which can only be detected under the microscope, helps to distinguish cubebs from fruits of similar appearance. The crushed fruit imparts a crimson colour to sulphuric acid, while most of the substitutes for cubebs yield only a brownish-red colour under similar conditions. The characteristic strong and aromatic odour of cubebs is more marked when the fruit is crushed; the taste of the drug is warm, aromatic, and somewhat bitter.

The fruit of *Piper Cubeba* is readily distinguished by its slender and not easily detachable stalk, the attachment of the seed to the pericarp by the base only, and the characteristic odour and taste of the drug. Portions of the rachis on which the fruit is borne may be found mixed with the fruits, and many fruits of similar appearance have been used to adulterate the drug, but none possesses the same histological characters, whilst also yielding the distinctive crimson colour with sulphuric acid. The chief constituent of cubebs is from 10 to 18 per cent. of volatile oil, which occurs chiefly in cells of the pericarp and perisperm, though a small quantity—less than 2 per cent.—can also be obtained from the rachis, stem, leaves, etc. The oil is soluble in 90 per cent. alcohol (1 in 18) and in all proportions of absolute alcohol. The chief constituent of the oil is the sesquiterpene cadinene; the oil also contains the terpene dipentene and other terpenes or sesquiterpenes, together with a small quantity of cubeb camphor—a crystalline alcohol derived from the sesquiterpenes by oxidation and therefore more abundant in old samples of oil. Other constituents of cubebs are fat, wax, starch, cubebin, cubebic acid, and an indifferent resin. Cubebin is a bitter, colourless, crystalline substance which gives a cherry-red colour with sulphuric acid, while cubebic acid gives a crimson colour with sulphuric acid.

CUCURBITÆ SEMINA PRÆPARATA.

Melon Pumpkin Seeds.

The prepared fresh ripe seeds of cultivated plants of *Cucurbita maxima*, Duchesne (N.O. Cucurbitaceæ), also known as *C. Pepo*, Linné, a native of the Levant. The seeds are official in the Indian and Colonial Addendum, for use in the Mediterranean Colonies. They possess anthelmintic and tænifuge properties, and are given in the form of a creamy paste, prepared by bruising them with a little milk or water.

Melon pumpkin seeds are flat, ovate, and exalbuminous, consisting of two easily separable fleshy cotyledons enclosed in a yellowish membranous testa or outer coat, and a thin brownish tegmen or inner coat. They measure from 8 to 20 mm. in length, and from 9 to 12 mm. in breadth. For medicinal purposes, the seeds should have been freshly deprived of both testa and tegmen. When fresh they have only a faint odour and a very slight taste.

The distinctive characters of melon pumpkin seeds are their shape, odour, and taste. They should not be used if more than a month old, because older seeds are less active. The chief constituent of the seeds is an acrid resin to which their peculiar properties are due; other constituents are 30 per cent. or more of fixed oil, together with proteids (myosin and vitellin), sugar, and starch. The alleged existence in the seeds of an alkaloid named cucurbitine has not been confirmed.

CUMINI FRUCTUS.

Cummin Fruit.

The fruit of *Cuminum Cyminum*, Linné (N.O. Umbelliferæ), a small annual plant indigenous to the Upper

Nile territory, and cultivated in Northern Africa, Sicily, Malta, and India. The plant is about 15 to 20 cm. high, and has a round, slender, branching stem, with numerous narrow, linear, pointed, smooth, grass-like leaves, of a deep green colour. It bears white or purple flowers arranged in numerous terminal umbels, and the flowers are succeeded by elongated-oval fruits which somewhat resemble caraway fruits in appearance, odour, and taste, and are sometimes incorrectly described as seeds. The ovary is inferior and two-celled, developing as it ripens into a schizocarp, the component carpels of which tend to separate as they ripen, by splitting away from the central axis or carpophore. The entire fruit is a cremocarp, and the two mericarps of which it consists are attached to the carpophore by their commissures or flat inner surfaces. The plants are cut down and threshed when the fruit is ripe. The fruit possesses stimulant, carminative, and antispasmodic properties, but it is employed chiefly in veterinary medicine.

Cummin fruits are of a light brown colour, about 4 to 6 mm. long, and of elongated-oval or elliptical shape, tapering towards both ends, and somewhat compressed laterally. The two mericarps of which the fruit consists are sometimes free, but they may remain united and attached to a short stalk. They are nearly straight, and each one bears five yellowish primary ridges, which alternate with four brownish secondary ridges, furnished with short bristly hairs. When examined with a lens, a transverse section of a mericarp exhibits an oily endosperm and six vittæ—four on the dorsal surface, below the bristly secondary ridges, and two on the commissure. The odour and taste of cummin fruit somewhat resembles those of caraways, but are less agreeable.

The straight mericarps, the bristles on the secondary ridges, and the characteristic odour are distinctive characters of cummin fruits. In the case of caraway fruits the mericarps are curved, smooth, and nearly always separate. The chief constituent of cummin fruit is from 3 to 4 per cent. of a volatile oil (s.g. 0·893 to 0·93), the chief constituent of which is cumic aldehyde (cuminol), other constituents being cymene and a terpene. The odour and peculiar properties of the oil are due to cumic aldehyde, and the solubility and specific gravity of the oil vary with the amount of that constituent present. Other constituents of cummin fruit are fixed oil, resin, and mucilage.

CURARA.

Curare.

An extract of the bark of *Strychnos toxifera*, Schomburgk (N.O. Loganiaceæ), and other South American species of *Strychnos*, with which are mixed various other ingredients, chiefly of vegetable origin. It is prepared for use as an arrow-poison by tribes of Indians, in British Guiana, French Guiana, Venezuela, Northern Brazil, and the United States of Colombia. An infusion or decoction is made, evaporated to a suitable consistence, and formed into gourds, bamboos, or gourd-shaped earthen jars. The extract varies considerably in composition and strength, different ingredients being used in different districts, though most of the curare imported into England is prepared chiefly from the bark of *S. toxifera*. It is used in the treatment of chorea and hydrophobia, in the form of hypodermic injections, but requires great care in administration, on account of its extremely poisonous character.

Curare occurs in brownish-black, shining, brittle, resinous masses, resembling black catechu in appearance. The masses imported in gourds and jars often contain small cavities, and bamboo curare is usually more granular than other varieties, while broken fragments of the drug frequently exhibit small crystals. Curare has a bitter taste, and may be almost entirely soluble in water or diluted alcohol, but it is only sparingly soluble in absolute alcohol. The variation in strength of curare renders it desirable that each parcel of the drug should be tested separately, as a means of determining how much may be administered with safety. The solubility of curare varies, gourd curare yielding from 34 to 75 per cent. to water, tube curare from 84 to 88 per cent., and jar curare from 50 to 87 per cent.

The chief constituent of gourd curare is the extremely poisonous alkaloid curarine, which is soluble in water or alcohol, but insoluble in ether. It occurs usually as a yellowish-brown powder, with an intensely bitter taste. The drug also contains the less active and ether-soluble alkaloid curine, together with resin, fat, gum, and inorganic matters. Tube curare (para-curare), from the Amazon district, contains the alkaloids tubo-curarine (9·2 to 11·8 per cent.) and curine, also quercetin, resin, etc. Jar curare frequently has a peculiar aromatic odour, and contains the alkaloids protocurarine, protocurine, and protocuridine—a non-toxic base.

CURCUMÆ RHIZOMA.

Turmeric Rhizome ; Turmeric Root.

THE dried rhizome of *Curcuma longa*, Linné (N.O. Scitaminaceæ), a native of Southern Asia. The plant is not known in the wild state, but is cultivated largely in India, China, Java, and other tropical countries. It is a perennial plant, with a short, thick, herbaceous scape or flower-stem, thickening at the base into an ovate or bulb-shaped rootstock or rhizome, which throws out lateral shoots. The lateral or secondary rhizomes give off roots which branch into fibres, or are sometimes enlarged into colourless spindle-shaped tubers, rich in starch. As growth proceeds, some of the lateral rhizomes tend to curve upwards and thicken, assuming the bulb shape characteristic of the primary rhizome, and from these thickened portions proceed the aerial stems of the following year. The rhizomes are dug up after the scapes have died down, and dried in the sun or in an oven, after their vitality has been destroyed by steaming or boiling in water for a prolonged period. The so-called "fingers" consist of the lateral secondary rhizomes, the stem-producing rhizomes being known as "bulb" turmeric. Though formerly employed as a remedy for jaundice, turmeric is now used exclusively as a condiment, or for colouring purposes. A tincture (1 in 6) prepared from the bruised rhizome is used as an indicator, the deep yellow colour of the liquid being changed to reddish-brown by boric acid or alkalies. A test paper for alkalies is prepared by soaking unglazed white paper in the tincture and drying.

Turmeric occurs in long, curved, or nearly straight subcylindrical pieces (fingers), bluntly tapering at each end, or in shorter and thicker ovate pieces (bulbs). The pieces are hard and heavy, of a deep yellowish-brown colour externally, longitudinally wrinkled, and marked with transverse annular leaf-scars, while, occasionally, they bear short knob-like branches, or show large circular scars where such branches have been broken off. The dried rhizome is tough and horny, breaks with a short fracture, and is of a uniform dull brownish-yellow colour internally, with a waxy appearance. Owing to the prolonged boiling to which the rhizome is usually subjected immediately after collection, a smoothed transverse section shows only a paler, or sometimes a darker, ring separating the stele from the bark, the effect of the boiling being to gelatinise the starch present and to impart a horny consistence, while the colouring matter is liberated from the cells in which it occurs naturally, and diffused uniformly throughout the rhizome. The aromatic odour and taste of turmeric are due to the volatile oil it contains; the colouring matter also present colours the saliva yellow when the rhizome is chewed.

The yellowish-brown colour, horny consistence, and waxy appearance when broken, are the distinctive characters of turmeric. The chief commercial varieties are known as Madras, Bengal, Malabar, and Cochin turmeric, but the last-named variety is believed to be the product of some other species of *Curcuma* than *C. longa.* Certain species — including *C. angustifolia,* Roxburgh, and *C. leucorhiza,* Roxburgh—have paler-coloured rhizomes than *C. longa,* and the starch from their radical tubers is utilised in India for the production of the so-called "East Indian Arrowroot." The chief constituents of turmeric are a yellow crystalline body named curcumin and about 5 per cent. of a volatile oil which contains an alcohol (turmerol), valerianic and capronic acids, and phellandrene. Other constituents of the rhizome are starch, resin, etc. Curcumin is an orange-yellow resinous substance, insoluble in water, but soluble in alcohol, ether, or alkalies. It imparts a reddish-brown colour to alkaline solutions and is also coloured reddish-brown by boric acid Traces of an alkaloid are said to have been found i turmeric, but that statement requires confirmation.

CUSPARIÆ CORTEX.

Cusparia Bark ; Angostura Bark.

The dried bark of *Cusparia febrifuga,* De Candol (N.O. Rutaceæ), a small tree indigenous to the mountai of Venezuela. The bark is imported from the We Indies, and is known as Angostura bark because it w originally sent from Angostura to Trinidad, wher it was exported to Europe. The bark is not very easily detached from the tree, its close adherence to the wood being indicated by the rough, slightly exfoliating inner surface, and by the fact that strips of wood are occasionally found attached to it. The drug is an aromatic bitter tonic, but it is not now much employed in medicine. It is used in the preparation of Infusum Cuspariæ (1 in 20) and Liquor Cuspariæ Concentratus (1 in 2).

Cusparia bark occurs in quills or in somewhat thin flattened or curved pieces, with an obliquely cut edge, generally from 10 to 12 cm. or more in length, 25 mm. wide, and 2 mm. thick. The outer corky layer of the bark is grey or yellowish, being soft and friable in the latter case, easily removed by the finger-nail, and then revealing a dark brown, resinous under-surface; the greyish cork, however, is thin and firmly adherent, the difference being due to the production of alternate layers of thin- and thick-walled cork-cells. There is a hard, dark brown cortex below to the cork, while the inner surface of the bark consists of light cinnamon or chocolate-brown bast, which is finely striated, frequently exhibits a laminated structure, and exhibits numerous short, white, longitudinally arranged lines, when examined under a lens. The lines are formed by axially elongated cells filled with acicular crystals of calcium oxalate, white masses of which can also be seen in radial or transverse sections. The bark breaks with a short resinous fracture, the calcium oxalate appearing on the fractured surface as white points. The drug has a musty odour and bitter taste.

The frequently spongy appearance of the cork, the laminated inner surface of the bark, its peculiar odour, and the absence of lines of sclerenchymatous cells, are characteristic of cusparia bark. The bark of *Strychnos Nux-vomica*, Linné, which has been substituted for it accidentally, is harder, thicker, and occurs in small pieces which are often recurved. Other barks resembling cusparia are distinguished from it by the presence of sclerenchymatous tissue. A transverse section of cusparia bark exhibits the grey or buff-coloured cork with the adjoining yellowish-brown cortex, and next to that the bast, in which yellowish oblique or wavy medullary rays alternate with darker bast rays. The cells containing calcium oxalate occur throughout both cortex and bast, as well as minute dark cells or glands filled with oil. Usually no sclerenchymatous tissue is present, other than small isolated groups of bast fibres. The chief constituents of cusparia bark are 1·5 per cent. of volatile oil and a crystalline bitter principle named angosturin, which is soluble in water or alcohol. Other constituents of the bark are about 2·4 per cent. of bitter crystalline alkaloids—galipine, cusparine, galipidine, and cusparidine, also certain amorphous alkaloids, and a glucoside which yields a fluorescent substance when boiled with diluted sulphuric acid.

CUSSO.

Kousso.

THE dried panicles of pistillate flowers of *Brayera anthelmintica*, Kunth (N.O. Rosaceæ), a native of North-eastern Africa. The tree is cultivated in Abyssinia, whence the drug is exported, and bears long panicles of pistillate flowers, which are collected after fertilisation, dried, and packed into cylindrical rolls or "hanks," which are bound round with the flexible stem of a monocotyledonous plant. The inflorescence has a stout main axis, which branches repeatedly and bears numerous small, shortly stalked flowers. The flowers stripped from the panicles are sometimes dried and exported as "loose kousso." The staminate flowers are also collected, but are not used in medicine. The drug possesses anthelmintic properties, and is usually given in coarse powder, mixed with warm water.

Kousso occurs usually in more or less cylindrical rolls, from 3 to 6 dcm. in length, composed of the dull reddish panicles of pistillate flowers. The main axis is covered with shaggy brown hairs and branches repeatedly, the branches arising from the axils of large sheathing bracts, and being more or less covered with brownish or greyish hairs and glands, the latter appearing under a lens as a brownish powder adhering to the surface. The flowers have short stalks, and are mostly unisexual, with two roundish membranous veined bracts at the base of each. The pistillate flowers bear a caducous white corolla and abortive stamens, but no trace of either can be found in the drug; they are also distinguished by two monocarpellary ovaries enclosed in the calyx tube. The calyx consists of two alternating whorls of five segments each, the conspicuous outer sepals being reddish-veined and externally hairy, whilst those constituting the inner whorl are curved inwards over the young fruit and shrivelled. The drug has a slight tea-like odour, and a bitter, acrid taste which is due to the presence of resin.

The reddish colour of kousso, the enlarged reddish-veined outer sepals, and the inner sepals curved over the immature fruit, serve to distinguish the pistillate from the greenish staminate flowers, which are said to be much less active. The staminate flowers are often unexpanded, and their small outer sepals are densely covered with short hairs, while their stamens are fertile. Loose kousso frequently contains a considerable admixture of staminate flowers. The chief constituent of kousso is kosotoxin, an amorphous substance which acts as a strong muscle poison. Other constituents of the drug are an inactive crystalline substance named protokosin, a yellowish, bitter, acrid resin known as koussin or tæniin, a tasteless resin, tannin, and a little volatile oil.

CYDONIÆ SEMINA.

Quince Seeds.

THE seeds of *Pyrus Cydonia*, Linné (N.O. Rosaceæ), a small tree which is indigenous to Persia, and cultivated in Central Europe and other warm countries. It bears a fruit which resembles a pear in shape and size, and contains five carpellary cavities, in each of which a number of seeds are packed closely in two vertical rows. The seeds are separated from the fruit when ripe, and adhere together more or less firmly when dried, owing to the mucilaginous nature of the membrane with which each seed is surrounded. They possess demulcent properties, and are used in the form of mucilage, or decoction (1 to 80).

Quince seeds resemble apple pips in size and appearance, being about 6 mm. long, dark brown in colour, and of an ovate or ovate-oblong shape. Owing to mutual pressure in the fruit, the seeds are triangularly compressed, being distinctly flattened on two sides. The seeds adhere by a whitish mucilaginous covering derived from the cells of the epidermis of the seed-coat, which appears as whitish flakes on the surface of the seeds, and in the spaces between them. On immersion in water, the mucilaginous coating of the seeds swells and forms a gelatinous zone.

The seeds are pointed at one end, where the hilum occurs as a minute spot, paler coloured than the rest of the seed, but they are obtuse at the other extremity, where the chalaza is situated. A transverse section through a seed exhibits two firm, yellowish-white, oily cotyledons, with a very narrow endosperm. The unbroken seeds have an insipid mucilaginous taste, but the cotyledons have a faint taste resembling that of bitter almonds.

The angular shape, mucilaginous covering, and the taste of the cotyledons are the distinctive characters of quince seeds. The chief constituent of the seeds is about 20 per cent. of cydonin, a mucilage which is contained in the cells of the outer epidermis of the seed-coat, and swells and dissolves when the seeds are soaked in water; other constituents—found in the cotyledons—are fixed oil, proteids, and small proportions of amygdalin and emulsin or an allied ferment. As the result of the action of the ferment upon amygdalin, in the presence of water, the seeds yield small quantities of benzaldehyde and hydrocyanic acid. The mucilage differs from that of acacia in not being precipitated by borax, and may be regarded as a soluble modification of cellulose.

DAMIANA.

Damiana; Turnera.

THE leaves of *Turnera diffusa*, Willdenow, var. *aphrodisaica*, Urban (N.O. Turneraceæ), and probably other species of *Turnera*. The plants are herbs or undershrubs indigenous to South America and the West Indies, the leaves, mixed with a certain proportion of the stems flowers, and fruits, being imported from Mexico and California. The drug possesses stimulant, tonic, and laxative properties, and has been recommended as an aphrodisiac, being used in the form of extract or liquid extract (1 in 1).

Damiana consists of light green, nearly smooth leaves, which are shortly petiolate, obovate, lanceolate, or oblong, from 10 to 25 mm. long and from 5 to 10 mm. broad. They are rather obtuse, with a wedge-shaped base and from three to six teeth on each side of the margin. The pinnate veins are prominent on the under side. The stems are fine, woody, much-branched, reddish, and hairy at the ends. The yellow flowers are pentamerous, and the fruit is a three-valved capsule. The drug has a somewhat aromatic odour and taste, due to the presence of volatile oil.

The shape of the leaves, the reddish woody stems, and the pentamerous flowers are the chief distinctive characters of damiana. The leaves of false damiana, from *Aplopappus discoideus,* De Candolle (N.O. Compositæ), are lanceolate or oblong-lanceolate, acute, with one to three teeth on each side of the margin, and somewhat rough and minutely dotted; the flower-heads of the plant have an imbricate involucre, the florets are yellow, and the pappus is hairy. The chief constituents of true damiana are a bitter principle and from 0·5 to 1 per cent. of volatile oil; other constituents of the drug are tannin and two tasteless resins. The volatile oil (s.g. 0·970) has an aromatic odour, and a warm, camphor-like, bitter taste.

DATURÆ FOLIA.

Datura Leaves.

THE dried leaves of *Datura fastuosa*, Linné, var. *alba*, Nees (N.O. Solanaceæ), or of *Datura Metel*, Linné, annual plants indigenous to India. The leaves are official in the Indian and Colonial Addendum, for use in India and the Eastern and West Indian Colonies, as an equivalent of belladonna and stramonium leaves. They possess anodyne properties, and are used in the form of extract, plaster, poultice, and tincture.

Datura leaves are ovate, acuminate, and unequal at the base, with long petioles and sinuate-dentate margins. They vary in size greatly, the largest leaves being from 17 to 20 cm. long and 10 to 12·5 cm. broad. The young leaves of *D. fastuosa* are glabrous, but those of *D. Metel* are generally pubescent. When fresh, the leaves are firm and juicy, with a disagreeable, fetid odour, which disappears largely on drying, as in the case of stramonium. The leaves have a bitter taste, which is due to the alkaloids they contain.

Both kinds of datura leaves are very similar in appearance to those of *Datura Stramonium,* but the flowers of *D. Stramonium* are white, while those of *D. fastuosa* vary much in colour and are often double, and the flowers of *D. Metel* are purplish-white. The fruits and seeds of the three species also differ, and the chief constituent of the two Indian species is hyoscine, only traces of hyoscyamine and atropine being obtained from them. The flowers of *Datura alba*, Nees, have been shown to contain 0·51 per cent. of hyoscine, but only 0·03 per cent. of hyoscyamine and 0·01 per cent. of atropine, the hyoscine thus constituting 92 per cent. of the total alkaloid present.

DATURÆ SEMINA.

Datura Seeds.

THE seeds of *Datura fastuosa*, Linné, var. *alba*, Nees (N.O. Solanaceæ), an annual plant indigenous to India. The seeds possess diuretic and narcotic properties, and are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of stramonium seeds, the chief preparation of the drug being Tinctura Daturæ Seminum (1 in 4).

Datura seeds are from 4 to 5 mm. broad and about 1 mm. thick, somewhat wedge-shaped, with rounded, thickened, furrowed, wavy margins, and strongly compressed laterally. They have a thick, dull yellowish-brown, finely pitted and reticulated testa, enclosing a narrow translucent endosperm which surrounds a curved embryo. The hilum is situated on one edge of the seed, extending from about the middle to the acute end. The seeds are without odour, but possess a somewhat bitter taste, due to the presence of alkaloids.

The chief constituent of datura seeds is the alkaloid hyoscine, but they also contain traces of hyoscyamine and atropine, together with resin and a fixed oil which has a slight odour of valeric acid.

DIGITALIS FOLIA.

Digitalis Leaves ; Foxglove Leaves.

THE dried leaves of *Digitalis purpurea*, Linné (N.O. Scrophulariaceæ), a biennial herb which is widely distributed throughout Europe. It is very common in many parts of England, and is often cultivated in gardens, but the dried leaves are imported largely from Germany. The plant produces a rosette of leaves during the first year of its growth, but flowering does not occur until the second year. The leaves should be collected when the plant commences to flower, as they are then considered to be most active, while the presence of the flower prevents the risk of the leaves of other plants being collected by mistake. The leaves should be dried immediately after collection. The drug is a cardiac and circulatory tonic, and is used chiefly in the form of Infusum Digitalis (1 in 146) and Tinctura Digitalis (1 in 8).

Digitalis leaves are from 10 to 30 cm. or more in length, and may be from 12·5 to 15 cm. in breadth. They are broadly ovate or ovate-lanceolate in shape, with a blunt or subacute apex, and a crenate or irregularly crenate-dentate margin, the leaves on the upper part of the stem being narrower than the lower leaves. The lamina is contracted towards the base of the leaf, and passes into a winged petiole of varying length, the lower veins on which are usually decurrent; the petioles are longest on the lower leaves. The upper, somewhat rugose, surface of the leaves is dull green in colour, and bears short, glandular, simple, usually three-celled hairs; the under surface is paler and densely pubescent, the hairs being simple and unbranched. The midrib is prominent on the under surface, and the majority of the lateral veins leave it at a rather acute angle, gradually curving round towards the apex and passing into smaller ramifications near the margin. A transverse section of a leaf shows that the mesophyll contains no crystals of calcium oxalate. The drug has a faint herb-like odour, and a very bitter taste.

The crenate margin, winged petiole with decurrent veins, simple unbranched hairs, and the course taken by the lateral veins, are distinctive characters of digitalis leaves. The leaves of several plants may be mistaken for those of digitalis, though readily distinguished from them on careful examination. Thus, matico leaves, from *Piper angustifolium*, have veinlets which are depressed on the upper surface, giving it a tessellated appearance; mullein leaves, from *Verbascum thapsus*, are woolly, with branched hairs; comfrey leaves, from *Symphytum officinale*, are lanceolate and bear isolated stiff hairs; primrose leaves, from *Primula vulgaris*, are nearly spatulate or spoon-shaped, with straight lateral veins which divide near the margin; ploughman's spikenard leaves, from *Inula Conyza*, have a more or less denticulate margin, with horny points to the teeth, when present. The chief constituents of digitalis leaves are the glucosides digitoxin and digitalin, digitoxin being the constituent which possesses the most definite and constant therapeutic action. Digitoxin is crystalline and extremely poisonous, and uncertain and cumulative in its action, while digitalin is amorphous and less toxic, but produces a similar medicinal action to the crude drug. Other constituents of the leaves are volatile oil, fatty matter, starch, gum, sugar, and a saponin-like body named digitonin, which possesses none of the physiological action peculiar to digitalis. Digitalein is an amorphous mixture of digitonin and digitalin, while commercial digitalin may consist of mixtures of digitoxin or digitonin with true digitalin.

DULCAMARÆ STIPITES.

Dulcamara; Bitter-Sweet.

THE stems and branches of the bitter-sweet or woody nightshade, *Solanum Dulcamara,* Linné (N.O. Solanaceæ), a perennial shrubby plant with long climbing or straggling stems, which is common in England in hedges and thickets. The stems are at first green and hairy, but become woody and smooth as they grow older. They bear dull green, alternate, petiolate, ovate, pointed leaves, which are sometimes furnished with lateral projections that give them an auriculate form. The flowers are purplish-blue with large lemon-yellow anthers, and are arranged in clusters opposite to the leaves; the fruits are oval berries of a bright scarlet colour, and remain after the leaves have fallen. The shoots, preferably the extreme branches, are collected when a year or two old, after the leaves have fallen, then cut into short pieces, and dried. The drug possesses feeble narcotic properties, with the power of increasing the secretions, particularly those of the skin and kidneys. It is used in the preparation of a liquid extract (1 in 1) and an infusion (1 in 10).

Dulcamara occurs usually in commerce in short, nearly cylindrical pieces of a light greenish or brownish-yellow colour, and about 6 mm. or less in diameter. They bear occasional alternate scars where the leaves have fallen off, are quite free from hairs, and more or less longitudinally furrowed and wrinkled. The outer, glossy, yellow corky layer is easily removed by scraping, disclosing the green primary cortex, while the yellowish wood exhibits distinct annual rings in older pieces of stem. The pieces are usually hollow, the remains of the pith being attached to the inner surface of the woody layer. The drug has a slight but not marked odour, and the taste is bitter at first, but afterwards sweet.

The alternate leaf-scars on the pieces of stem, the smooth glossy surface, hollow centre, and bitter-sweet taste are distinctive characters of dulcamara. The bitterness of the plant is said to be more pronounced in the spring than in the autumn. The chief constituent of the drug is the amorphous glucoside dulcamarin, to which the characteristic bitter-sweet taste of dulcamara is due; other constituents of the drug are the alkaloid solanine, resin, gum, starch, etc. Dulcamarin yields dulcamaretin and sugar on hydrolysis, while solanine can be converted into another base named solanidine, a sugar being formed at the same time.

ELATERIUM.

Elaterium.

The dried sediment from the juice of the fruit of the squirting cucumber, *Ecballium Elaterium*, A. Richard (N.O. Cucurbitaceæ), a prostrate trailing plant which is common throughout the Mediterranean region, extending eastward as far as Southern Russia and Persia, and westward to Portugal. It is cultivated for the production of elaterium in England, at Hitchin and Ampthill, but most of the elaterium of commerce is imported from Malta. The fruit of the plant, which resembles a small hairy gherkin, is about 37·5 to 50 mm. long, and separates suddenly from its stalk when ripe, the seeds and juice being ejected forcibly from the aperture left at the point where the fruit has parted from the peduncle. The fruit is therefore collected before it is quite ripe, sliced, pressed, and the slightly turbid juice, which becomes more turbid on standing, allowed to deposit. A glucoside named elaterinid occurs in the freshly expressed juice, and is decomposed on exposure, by a ferment also present in the juice, into glucose and elaterin, the latter being nearly insoluble and therefore precipitated, together with the mechanically suspended débris. The sediment, after being collected on a calico filter, is drained and dried on porous tiles. The drug is a powerful hydragogue cathartic, and is used in the preparation of Elaterin and Pulvis Elaterini Compositus (1 in 40).

Elaterium occurs in light, friable, flat or slightly curved, opaque pieces, about 2·5 mm. thick. It is pale green, greyish-green, or yellowish-grey in colour, has a finely granular fracture, a faint tea-like odour, and a bitter, acrid taste, due to the presence of elaterin. As prepared in England, elaterium is bright green in colour, owing to the presence of chlorophyll, but with age it becomes greyish-green and, finally, yellowish-grey, besides exhibiting minute crystals of elaterin on the surface. The Maltese drug contains less elaterin, and is usually yellowish-grey when imported. Elaterium is sometimes adulterated with chalk or starch, but should not effervesce with dilute acids or give a blue colour when iodine is added to a cooled decoction of the drug, thus indicating freedom from these impurities. It should yield half its weight to boiling 90 per cent. alcohol, and not less than 20 to 25 per cent., consisting of elaterin, to chloroform.

The chief constituent of elaterium is elaterin, of which it may yield as much as 33·6 per cent., although the commercial drug usually yields much less. Other constituents of elaterium are chlorophyll, amorphous bitter substances, and prophetin — a crystalline bitter glucoside, which is soluble in ether and gives a brownish-red colour with sulphuric acid. Elaterin may be extracted by treating the drug with chloroform, evaporating the solution to dryness, then washing the dry residue with ether, and crystallising from chloroform. As thus obtained, elaterin occurs in minute, colourless, odourless, hexagonal scales or prismatic crystals, with a slightly acrid, bitter taste. It is neutral to litmus and almost entirely insoluble in water, though sparingly soluble in ether or in 90 per cent. alcohol, and readily soluble in boiling alcohol, carbon bisulphide, amylic alcohol, or chloroform. When heated with access of air it melts (m.p. 209° C.), and then burns without leaving any residue. It is dissolved by solutions of alkalies and re-precipitated on supersaturating with an acid. When added to melted phenol, elaterin yields a solution which becomes crimson on adding sulphuric acid, though the colour changes rapidly to scarlet. The constitution of elaterin is unknown, but the substance can be converted into an acid body devoid of cathartic power by dissolving it in boiling alcohol and adding solid potassium hydroxide to the solution.

ELEMI.

Elemi; Manila Elemi.

An oleo-resin which is supposed to be obtained from *Canarium commune*, Linné (N.O. Burseraceæ), and other species of *Canarium*, indigenous to the Philippine Islands. It has been stated, however, that elemi cannot be the product of the *C. commune*, Linné, as the resin from that plant forms a dry mass, nor from *C. Muelleri*, Bailey, the product of which contains no crystalline constituents. The oleo-resin exudes naturally from the bark of the trees, but the flow is promoted by making incisions and applying heat. After exudation the oleo-resin solidifies upon the bark in a crystalline condition, and is then collected, the more or less solid masses being packed in lead-lined cases and exported chiefly from Manila. The oleo-resin possesses stimulant and irritant properties, and is sometimes used as an ingredient of ointments and plasters, though now rarely employed in medicine.

Elemi occurs in whitish or pale yellow, soft and granular masses, somewhat resembling crystalline honey when fresh and of good quality; on keeping, however, it tends to become firmer and of a more decided yellow colour, and at last becomes quite hard. When recent and quite pure it is colourless, but the presence of carbonaceous matter frequently gives it a greyish tint, and exposure to the air causes it to become yellow, as well as harder, externally. The masses may contain small chips or fragments of bark, and are friable when cooled. The oleo-resin is entirely soluble in ether, and nearly so in 90 per cent. alcohol, but it is only partially soluble in petroleum spirit. It has a bitter, pungent taste and a fragrant, somewhat terebinthinate odour, recalling the odours of fennel and lemon. Examined under the microscope, after being moistened with alcohol to cause disintegration, the oleo-resin is seen to contain an abundance of acicular crystals. It softens at 100° C., and fuses into a clear mass at a somewhat higher temperature.

Several other oleo-resins, which more or less closely resemble Manila elemi in appearance, are the products of different plants. Brazilian elemi, from *Icica* (*Protium*) *icicariba*, De Candolle, and allied species, occurs in fragrant yellowish-white, or greenish-white, translucent or opaque masses; Mexican elemi, from *Amyris elemifera*, Royle, occurs in yellow or greenish, more or less translucent masses of waxy lustre; Mauritius elemi, from *Colophonia* (*Canarium*) *Mauritiana*, De Candolle, is also said to resemble Manila elemi closely; West Indian elemi is the product of *Bursera gummifera*, or *Dacryodes hexandra*. The chief constituents of Manila elemi are from 10 to 30 per cent. of volatile oil, 60 to 70 per cent. of an amorphous resin named breïn, and about 25 per cent. of two isomeric, crystalline, resinous substances named α-amyrin and β-amyrin; other constituents of the drug are a bitter principle and three crystalline substances, named elemic acid, bryoïdin, and breïdin. The volatile oil (s.g. 0·87 to 0·91) consists of d-phellandrene, dipentene, and certain oxygenised products. Breïn is readily soluble in cold alcohol, amyrin crystallises from hot alcohol in acicular crystals, and bryoïdin is an acrid, bitter substance, readily soluble in alcohol, and crystallising from hot water. Breïdin is a similar substance to bryoïdin, but less soluble in water. Elemic acid is soluble in alcohol, and forms larger crystals than any other constituent of elemi.

EMBELIA.

Embelia.

THE dried fruit of *Embelia Ribes*, Burmann (N.O. Myrsinaceæ), and of *E. robusta*, Roxburgh, straggling shrubs indigenous to India and the islands of the Indian Archipelago, and those to the east of Africa. The fruits are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, where the drug is use as an equivalent of kousso and male fern, being administered usually in the form of powder as a remedy fo tapeworm.

Embelia consists of globular, superior fruits, abou 4 mm. in diameter, varying in colour from dull re with dark spots to nearly black. The fruit is wart or striated longitudinally, is often attached to a 5-partit calyx with a slender pedicel, and is surmounted by minute beak. It contains a reddish, horny seed, whic is surrounded by a delicate membrane and covere with a fine efflorescence. The seed has a depression the base and is marked with light-coloured spots, whic disappear when it is soaked in water for some time; it contains a slightly ruminated endosperm which encloses a linear embryo. The drug has a slightly astringent and aromatic taste.

The fruits of *Embelia Ribes* and *E. robusta* possess the same properties and contain similar principles. The chief constituent of the drug is embelic acid, the ammonium salt of which has been found effective as an anthelmintic. Being tasteless, it is particularly suitable for administration to children. Other constituents of embelia are tannin, volatile oil, fixed oil, colouring matters, and a resinous body. The presence of an alkaloid named christembine has been recorded, but the existence of the base requires confirmation.

ERGOTA.

Ergot.

The sclerotium or dormant mycelium of a fungus, *Claviceps purpurea*, Tulasne (N.O. Pyrenomycetes), the ascospores of which develop in the flowers of the rye plant, *Secale cereale*, Linné (N.O. Graminaceæ), to which they are conveyed by the wind. The spores germinate and penetrate into the ovaries at the base, the germ-tube feeding on the substance within the ovaries and developing into a white, closely woven, felt-like mycelium, on the outside of which are produced a number of short, thread-like, branched hyphæ, bearing single, small, oval, reproductive cells. These conidia or gonidia float in a sweet, slightly milky juice known as "honey-dew," which is secreted by the fungus at this particular stage of its development. Insects attracted by the sweet liquid convey the conidia to other inflorescences, where they germinate and give rise to new mycelia similar to those produced by the ascospores, the fungus being propagated in this manner throughout the summer. Meanwhile, the mycelium originally produced by the ascospores continues to grow and forms a compact elongated mass of hyphæ, which pushes aside the withered ovary of the host-plant, or carries it on its apex. When the formation of conidia ceases, in the late summer, the fully grown mycelium becomes transformed gradually into the firm, dark-coloured sclerotium, which, when mature, stands out conspicuously from the glumes of the ears of rye, and constitutes the drug known as ergot. It has attained its full development when the ears of rye have ripened, and is then collected by hand, or separated from the grain after it has been threshed by specially designed machinery. After collection it is carefully dried, and is then ready for use. The chief commercial varieties of the drug are the Russian, Spanish, and German; but Austrian, Swiss, Norwegian, and Swedish ergots also come into the market occasionally. The Spanish drug is generally largest and of the finest appearance, but it contains much starch and is less active than Russian ergot. The drug is a powerful ecbolic, and is used in the form of Extractum Ergotæ (Ergotin), Extractum Ergotæ Liquidum (1 in 1), Infusum Ergotæ (1 in 20), and Tinctura Ergotæ Ammoniata (1 in 4); the extract is used in the preparation of Injectio Ergotæ Hypodermica (1 in 3).

Ergot occurs in very dark violet-black grains, which are about 1 to 4 cm. long, subcylindrical or somewhat triangular in cross-section, tapering towards the ends, generally curved, and sometimes have a small whitish appendage at one end. They are furrowed longitudinally, especially on the concave side, and often bear numerous small, irregular, transverse fissures. The grains break easily, with a very short fracture, are whitish or pinkish-white inside, and do not exhibit any definite structure when examined with a lens. The drug has a disagreeable oily taste, and a peculiar disagreeable odour, which is more marked if the powdered drug be triturated with potassium hydroxide solution, and is probably due to the formation of methylamine, trimethylamine, or some similar decomposition product of albuminoid matters present. If exposed to damp, ergot will deteriorate and acquire a musty or putrid odour, especially if it be kept in the powdered state. Deterioration of the drug may also be caused by the attacks of mites (*Trombidium* sp.), or by oxidation of the fixed oil it contains.

The ergot of rye, which alone should be used for medicinal purposes, differs from the ergot of wheat and many other grasses in being much larger than the grains or fruits which it displaces. The fungus yielding the drug produces two kinds of gametophyte in the course of its development, and affords an interesting example of the alternation of generations. The sclerotium germinates in the soil on being moistened, under suitable conditions as to temperature, and sends up several fleshy pink stalks with rounded heads (stromata) in which are imbedded a large number of flask-shaped cavities (perithecia), the position of the minute opening at the narrow end of each cavity or perithecium being indicated by a slight depression in the outer surface of the rounded head. Long club-shaped cells (asci), each containing eight ascospores, proceed from the base of the interior of the perithecia, and about the time grasses are in flower the ripe ascospores are shot out of the asci and through the openings of the perithecia, being then conveyed by the wind to the flowers of the rye plant and other grasses, as already described. The chief constituent of ergot is the crystalline alkaloid ergotinine, of which it may contain 0·1 to 0·26 per cent. The alkaloid cornutine is a decomposition product of ergotinine, found in alcoholic extracts of certain varieties of ergot. Other active constituents of the drug are sclerotic or ergotinic acid, and sphacelinic acid or sphacelotoxin. Ergotinine and sphacelinic acid are insoluble in water but soluble in alcohol, while sclerotic acid is soluble in water but insoluble in alcohol. Ergot also contains about 33 per cent. of fixed oil, together with proteids, choline, lecithin, and various other bodies of minor importance.

ERYTHROPHLEI CORTEX.

Sassy Bark ; Mancona or Red Water Bark.

THE bark of *Erythrophlœum guineense*, Don (N.O. Leguminosæ), a large tree with spreading branches, which is indigenous to Upper Guinea and Senegambia. The bark of the tree, which is used as an ordeal poison by the West African negroes, is collected from the trunk, large and small branches, and sometimes from the root. It varies considerably, therefore, in size and thickness, whilst the colour and appearance of the outer surface also vary considerably. It appears probable, also, that some of the sassy bark of commerce is obtained from other species than *E. guineense*, as differences have been observed in the alkaloid extracted from bark imported at different times. The drug is poisonous, but possesses emetic and purgative properties, and has been recommended as a substitute for digitalis in certain forms of heart disease. It has been used in the form of tincture (1 in 10).

Sassy bark occurs usually in hard, heavy, flat or curved pieces about 7·5 to 10 cm. long, 5 to 7·5 cm. wide, and 5 to 9 mm. thick, but it may occur in quilled pieces, the smallest of which are less than 12 mm. in diameter. Very young bark is comparatively smooth and dark in colour externally, with occasional small reddish warts and longitudinal reddish bands. The inner surface of the bark is dark reddish-brown or nearly black, and exhibits shallow longitudinal striations. Bark of medium thickness is dull grey or nearly black externally, and shows a fissured surface interrupted by circular reddish spots which tend to run into one another and so form longitudinal bands; older and thicker bark is of a more uniform reddish-brown colour, with a rugged outer surface, and frequently exhibits conchoidal depressions from 12 to 25 mm. long, the result of exfoliation of the primary cortex by the formation of cork. The bark breaks with a very short granular fracture. The drug is odourless, but possesses a slightly bitter and astringent taste.

The distinctive characters of sassy bark are the reddish-brown warts on the outer surface, the nearly black inner surface, the hard, granular fracture, and the groups of sclerenchymatous cells in the bast. A transverse section of a typical piece exhibits a narrow brownish line of cork, within which is the thin dark cortex, separated from the bast by a pale, sometimes interrupted, line of sclerenchymatous cells; in the bast occur numerous larger and closely approximated groups of sclerenchymatous cells, imbedded in the reddish-brown parenchyma. The larger and thicker pieces of bark consist chiefly of bast. The chief constituent of the bark is a poisonous alkaloid erythrophleine, which yields methylamine and erythrophleic acid on hydrolysis with hydrochloric acid, and resembles digitalin in its properties. The bark also contains tannin and colouring matter.

EUCALYPTI GUMMI.

Eucalyptus Gum; Red Gum.

A RUBY-COLOURED exudation from the bark of *Eucalyptus rostrata*, Schlechtendal (N.O. Myrtaceæ), and other Australian species of *Eucalyptus*. They are large trees, yielding large quantities of "gum," the variety preferred mostly being the product of *E. rostrata*, a species which is very common on the banks of the Murray River, New South Wales. The gum is a kino-like substance, which is secreted as a liquid of treacle-like consistence in cavities in the wood, or between the bark and the wood. It may exude naturally and be found in the dry state in cavities of the trunk, but it is usually collected by making incisions in the trees, inserting trough-shaped pieces of tin, and allowing the viscid liquid to drain into buckets or tins. The average yield is rather more than a litre from each tree. The liquid dries into a solid mass in a few days, but the process of evaporation is sometimes hastened by the application of artificial heat. The drug is an effective astringent, and is used in the form of fluid extract, syrup, tincture, and Trochiscus Eucalypti Gummi (1 grain).

Eucalyptus gum occurs in grains or small masses, thin fragments being transparent and of a ruby-red or garnet-red colour; the powdered gum is pale red. Fragments of the gum are somewhat tough and have a very astringent taste, owing to the presence of much tannin; when chewed, the gum adheres to the teeth, and the kino-red it contains imparts a reddish tinge to the saliva. The drug should be almost entirely soluble in 90 per cent. alcohol, and dissolve to the extent of 80 to 90 per cent. in cold water, forming a neutral solution. Good qualities of red gum may yield more than 90 per cent. to cold water. The drug is distinguished from other substances by its reddish colour and the more or less dusty appearance of the grains.

Though the average yield of eucalyptus gum from each tree is rather more than a litre, some trees produce very little, while others have been known to yield as much as 18 litres. The gum is yielded by several species of *Eucalyptus*, including *E. marginata*, *E. amygdalina*, *E. sideroxylon*, *E. fissilis*, etc., but the product of *E. rostrata* is preferred for medicinal purposes. The chief constituent of the drug is 40 to 47 per cent. of kino-tannic acid; other constituents are catechin, pyro-catechin, kino-red, gum, and sometimes volatile oil. Many red gums are only imperfectly soluble in alcohol or water, and the solubility of all eucalyptus gums is affected on keeping, owing to the action of an oxydising enzyme present in the crude drug. The enzyme converts the kino-tannic acid gradually into an insoluble phlobaphene (kino-red), by a process of oxidation similar to that which occurs in the case of kino.

EUCALYPTI OLEUM.

Oil of Eucalyptus.

THE oil distilled from the fresh leaves of *Eucalyptus Globulus*, Labillardière (N.O. Myrtaceæ), and other species of *Eucalyptus*, which yield oils containing a large proportion of cineol (eucalyptol), and but little phellandrene. The trees are natives of Australia and Tasmania, and bear long coriaceous leaves, which have a strong camphoraceous odour, especially when crushed, and an aromatic, pungent, and slightly bitter taste. The leaves of *E. Globulus*, the blue gum tree of Victoria and Tasmania, may attain a length of 30 cm., and the older leaves have a narrow ensiform outline. They taper gradually towards the apex, but narrow rather abruptly at the base into a short petiole which is twisted in such a way that the leaves are vertical instead of horizontal. The two surfaces of the leaves are alike, and are frequently marked with minute, warty, brown spots formed by groups of cork-cells, while the mesophyll contains numerous oil-glands. The oil of eucalyptus is a powerful antiseptic and deodoriser, with antipyretic properties. It is used as an inhalation, and is an ingredient of Unguentum Eucalypti (1 in 10).

Oil of eucalyptus (s.g. 0·910 to 0·930) is a colourless or pale yellow liquid, with an aromatic, camphoraceous odour, and a pungent taste which leaves a sensation of coldness in the mouth. The oil is soluble in all proportions of absolute alcohol, and is also soluble in 90 per cent. alcohol (3 in 1 or less), or in 60 per cent. alcohol (1 in 38). The peculiar taste and odour of the oil are due chiefly to cineol, but the odour varies according to the esters present. The presence of a due proportion of cineol is insured by the limitation of the specific gravity of the oil, by its optical activity not exceeding 10° in either direction, and by the oil becoming semi-solid on being stirred, when cold, with one-third or one-half its volume of phosphoric acid (s.g. 1·750), with which the cineol combines to form a crystalline compound, from which it can be liberated in a pure state by adding hot water.

The fresh leaves of *E. Globulus* yield from 0·8 to 1·5 per cent. of oil, but those of other species may yield as much as 4 per cent. The leaves also contain tannin and a bitter principle. The chief constituent of oil of eucalyptus is from 50 to 65 per cent. of cineol or eucalyptol, a body which also occurs in the oils of cajuput, wormseed, spike lavender, etc., and can be produced by treating terpin hydrate with dilute acids. It is an optically inactive, nearly colourless liquid (s.g. 0·930), with a strong aromatic, camphoraceous odour, a pungent, spicy, and cooling taste, and a refractive index of 1·4559 ; it solidifies at low temperatures, melts at –1° C., boils at 176° C., and forms a crystalline phosphate when treated with phosphoric acid. Other constituents of oil of eucalyptus are d-pinene (eucalyptene) and other terpenes, as well as various aldehydes, alcohols, and esters. The presence of more than small quantities of phellandrene, a terpene which constitutes the chief constituent of the oils of *E. amygdalina* and other species, is indicated by the formation of a crystalline mass, consisting of phellandrene nitrite or nitrosite, on adding to the oil twice its volume of glacial acetic acid, and the same quantity of a saturated aqueous solution of sodium nitrite. The oil of *E. amygdalina* is less soluble (1 in 175) than the oil of *E. Globulus* in 60 per cent. alcohol.

EUONYMI CORTEX.

Euonymus Bark ; Wahoo Bark.

THE dried root-bark of the wahoo or spindle tree, *Euonymus atropurpureus*, Jacquin (N.O. Celastraceæ), a tall erect shrub common in shady woods in the eastern United States, southward to Florida and westward to Wisconsin. The plant produces smooth and deeply lobed pods, and bears petiolate leaves. The bark of *E. americanus* is sometimes supplied in the United States as wahoo bark; the plant is distinguished from *E. atropurpureus* by its rough, warty, depressed pods, and thick, almost sessile leaves. The bark of both root and stem is collected and is obtainable in commerce, but that of the root is preferred in this country. It possesses tonic, cathartic, and diuretic properties, and is used chiefly in the form of Extractum Euonymi Siccum, a powerful cholagogue and purgative.

Euonymus bark occurs in small, more or less irregular, quilled or curved pieces, varying in thickness from 2 to 4 mm., and not usually exceeding 7·5 cm. in length or 12·5 mm. in width. The outer layer of the bark is a soft, finely fissured cork of a light ash-grey colour ; it is friable and easily removed with the finger-nail. There are occasional small transverse scars and darker lines or patches on the bark. The inner surface of the bark is of a pale tawny-white or buff colour, and smooth except when some of the whitish or pale yellow dense wood adheres to it, as is sometimes the case owing to the difficulty experienced in separating the bark from the root. The bark breaks with a very short fracture, the fractured surfaces being yellowish and, when separated very gently, connected by delicate silky threads, formed by the mucilaginous contents of some of the cells of the bast. A transverse section exhibits, when moistened, a narrow whitish cork, a pale cortex and darker bast. The drug has a faint but characteristic odour, and a somewhat mucilaginous taste, with a bitter and slightly acrid after-taste.

The root-bark of euonymus is distinguished by the friable grey cork, the silky threads connecting fractured surfaces, and the bitter taste. Euonymus stem-bark occurs in long, thin, narrow strips, with a dark greenish-grey cork, green cortical portion, and fibrous bast. The chief constituent of the root-bark is euonymin, a nearly colourless, amorphous, and intensely bitter principle, which is soluble in alcohol or water. The drug also contains atropurpurin, asparagin, a bitter extractive, and a pungent principle to which the characteristic odour of the bark is due, together with citric, tartaric, and malic acids, various resins, fixed oil, wax, starch, pectin, etc. Commercial euonymin is usually a powdered extract of euonymus bark, but the name " euonymin " has also been applied to the mixture of substances precipitated from a concentrated alcoholic extract or tincture of the bark on adding water.

EUPHORBIÆ HERBA.

Euphorbia Herb.

THE entire ærial portion of *Euphorbia pilulifera*, Linné (N.O. Euphorbiaceæ), an annual herb growing in the hotter parts of India, also in Queensland, Central America, and most other tropical countries. The plant has a slender, obliquely-erect or ascending stem, which attains a height of 30 to 60 cm., is furnished with opposite, shortly stalked leaves, and bears numerous minute flower-heads crowded in dense axillary or terminal cymes.

The herb is collected when in flower, or after the fruit has begun to form, and then carefully dried. The drug is imported chiefly from India. It possesses anti-asthmatic properties, and is used in the form of tincture (1 in 5) or extract, the extract being prepared by evaporation of the tincture.

Euphorbia herb consists usually of the stem, leaves, flowers, and fruits of the plant. The stem is cylindrical, covered with coarse, bristly hairs, and bears opposite, dark green leaves, from 18 to 36 mm. long, which are frequently blotched with red. The leaves are ovate or obliquely-lanceolate and acute, with a dentate or serrulate margin; they are hairy on both upper and lower surfaces, and are often much broken. The involucral glands of the perianth are without appendages, and the minute flowers are arranged in shortly peduncled globular cymes, about 12 mm. or less in diameter. The fruits are small yellow three-celled capsules, and can usually be seen on examining the inflorescence with a lens; they are about 1 mm. in diameter, have three distinctly keeled carpels, and contain reddish ovoid seeds which are minutely wrinkled when mature. The drug is without any marked odour, but has a bitter taste.

The coarse hairs on the slender cylindrical stems of *E. pilulifera*, the acute leaves, and the tetragonal wrinkled seeds distinguish the plant from allied species of *Euphorbia*. In the case of *E. parviflora*, there are but few flowers in the inflorescence, the glands of the involucre have obovate-orbicular appendages, and the seeds are minutely papillose. The drug is also readily distinguished from various other herbs. Thus, in Indian pink (*Spigelia marilandica*, Linné) the leaves are about 75 cm. long, with prominent lateral veins and entire margins; grindelia (*Grindelia robusta*, Nuttall, and *G. squarrosa*, Dunal) has stouter stems, which are yellowish or light brown, and bear alternate leaf-scars; chiretta (*Swertia Chirata*, Hamilton) usually has a much thicker, smooth, branching stem of a brown or purplish-brown colour, and bears larger, one-celled, ovoid fruits which contain numerous reticulated seeds. The chief constituent of *E. pilulifera* appears to be an unstable poisonous glucoside, which has not been isolated, but is soluble in water and diluted alcohol, and insoluble in strong alcohol, ether, or chloroform. Other constituents of the drug are resin, tannin, wax, caoutchouc, and various inorganic salts.

EUPHORBIUM.

Euphorbium.

A GUM-RESIN obtained from *Euphorbia resinifera*, Berg (N.O. Euphorbiaceæ), a cactus-like plant about 1 to 2 m. high, which is common in the mountainous districts of Morocco. The plant produces green, fleshy, quadrangular, and branching stems, which bear an inflorescence at the summit, while small scaly leaves appear as depressions above pairs of persistent spiny stipules, which occur at intervals at the angles of the stems. The flowers are small, mostly with short stalks, and each fruit consists of three carpels. The cortex and pith contain long, branching, laticiferous cells, the contents of which are exuded when incisions are made in the stems, the latex being then discharged in the form of milky drops, which harden on exposure to the air and form a resinous mass, encrusting the stems. The drug is collected in the early autumn and exported chiefly from Mogador. It possesses very acrid properties, and has been employed as a drastic purgative, but is now used chiefly as a vesicant in veterinary practice.

Euphorbium occurs in dull yellow or brown waxy-looking and dusty pieces of irregular shape, which rarely exceed 25 mm. in diameter, and are often mixed with fragments of the quadrangular thorny stems of the plant, and other débris. Many of the pieces are hollow, and others enclose a pair of spiny stipules or a flower-stalk or fruit, round which the exuding gum-resin has evidently solidified after exudation. The gum-resin is translucent, very brittle, and of a dull yellowish-brown colour internally. It is only partially soluble in alcohol or in ether, and yields a turbid mixture rather than an emulsion when triturated with water. It has a slightly aromatic odour, and the powder, when inhaled, causes violent sneezing. The taste of the drug is extremely acrid.

The colour and sternutatory action of euphorbium distinguish it readily from other gum-resins. The chief constituent of the drug is about 40 per cent. of an amorphous acrid resin, but it also contains 35 per cent. of a crystalline body named euphorbone, and 20 per cent. of gum, together with caoutchouc and various salts. The resin, which is the only active constituent of the drug, is readily soluble in 70 per cent. alcohol, but the sternutatory property and acrid taste are limited to that portion of the resin—about two-thirds of the whole—which is soluble in ether. Euphorbone (m.p. 67° to 68° C.) is also soluble in ether, but is tasteless and inactive; it appears to be analogous to, if not isomeric with, lactucerin or lactucone, an inert, waxy substance which exists in lactucarium.

FEL BOVINUM PURIFICATUM.

Purified Ox Bile; Ox Gall.

The purified contents of the gall-bladder of the domestic ox, *Bos Taurus*, Linné (Order Ruminantia). The fresh, viscid, greenish or brownish-green liquid obtained from the gall-bladder is evaporated to one-fourth its bulk, freed from mucin, etc., by precipitation with 90 per cent. alcohol, and then evaporated to the consistence of a thick extract. The product possesses antiseptic, cholagogue, and purgative properties; it assists the emulsification of fats in the intestine, and is usually given in pills coated with keratin solution, the keratin being insoluble in the gastric juice, and thus preventing the ox bile from coming in contact with the stomach.

Purified ox bile is a yellowish-green hygroscopic substance, with a bitter-sweet nauseous taste. It is soluble in water or in 90 per cent. alcohol, but is insoluble in ether. It should contain no mucin or other substance insoluble in alcohol. The absence of unpurified ox bile is shown by an aqueous solution giving no precipitate on adding 90 per cent. alcohol. A positive reaction for ox bile is obtained on applying Pettenkofer's gall test, an aqueous solution (1 in 20 or 30) gradually acquiring a cherry-red colour, which changes in succession to carmine, purple, and violet, on adding a drop of freshly made syrup (refined sugar, 1; water, 4), followed by strong sulphuric acid, the acid being added cautiously until the precipitate at first formed is redissolved.

The chief constituents of ox bile are the sodium salts of glycocholic and taurocholic acids. Glycocholic acid is decomposed by dilute acids or alkalies into cholalic acid and glycine (amido-acetic acid); taurocholic acid, under similar conditions, yields cholalic acid and taurine (amido-ethyl-sulphonic acid). Pettenkofer's reaction is due to the presence of cholalic acid, produced by hydrolysis from the glycocholic and taurocholic acids liberated from the salts present in the bile. Other constituents of ox bile are lecithin, cholesterin, fats, soaps, urea, mineral salts, and the bile pigments, of which the most important are bilirubin and biliverdin. Lecithin is a very complex fat, and is a characteristic constituent of nerve substance, brain, yolk of egg, etc.; it breaks up on saponification into choline, glycerin, phosphoric acid, and a fatty acid. Cholesterin is a crystallisable monatomic alcohol, which also occurs in wool fat.

FICUS.

Figs.

THE dried fleshy receptacles of *Ficus Carica*, Linné (N.O. Urticaceæ), a native of Persia and neighbouring countries. The tree is cultivated in most warm and temperate climates. By the abnormal growth of lateral shoots it produces green, hollow, pear-shaped receptacles, each of which has a small aperture closed by bracts, and bears numerous small flowers on its inner fleshy walls. The latex or milky juice disappears from the laticiferous vessels contained in the walls, as ripening proceeds, sugar being formed and the receptacles becoming pulpy, sweet, and agreeable to the taste. When ripe, they are collected, dried in the sun, pressed and kneaded to make them supple, and packed in small boxes for exportation. The dried figs are nutritious, laxative, and demulcent; they are chiefly used medicinally in constipation, and are contained in Confectio Sennæ (4 in 25).

Figs are not fruits, properly so-called, each one being a syconus or collective fruit, consisting of the enlarged, hollow, succulent receptacle, which bears very numerous minute one-seeded fruits (achenes) on its inner surface. The ripe fig is more or less pear-shaped, and has a soft, yellowish, greenish, or purplish skin marked with shallow longitudinal furrows. As met with in commerce, and used in medicine, figs are compressed, irregular in form, soft, tough, brownish or yellowish, with a sweet taste and pleasant fruity odour.

There are two chief varieties of pressed or "pulled" figs, the most esteemed being Smyrna figs, which are thin-skinned, soft, and luscious, while Greek figs are thicker-skinned, tougher, and less pulpy. Those which are packed loose and retain their original shape are known as "natural figs," and are not used in medicine. The chief constituent of figs is from 60 to 70 per cent. of grape sugar; they also contain a small quantity of calcium oxalate in stellate crystals, together with gum, fat, and various salts.

FILIX MAS.

Male Fern.

THE rhizome of *Aspidium Filix-mas,* Swartz (N.O. Filicineæ), one of the commonest indigenous British ferns. The plant produces a circular tuft of fronds, which attain a height of 30 to 90 cm., and have a pinnately divided lamina, while the petiole or rachis bears numerous brown scarious scales, especially on the lower part. Peculiar secreting cells occur in intercellular spaces in the parenchymatous tissue of the rhizome and petioles, and in those cells are formed the various substances to which the activity of the drug is due. The rhizome is collected late in the autumn, at which time it is most active, and divested of rootlets, fronds, and dead portions, before being dried. It should not be kept more than twelve months before use, as its activity tends to diminish with age. The drug possesses anthelmintic properties, and is also slightly tonic and astringent; it is sometimes given in powder, but is used chiefly in the form of Extractum Filicis Liquidum as a remedy for tapeworm.

Male fern occurs usually in pieces from 7·5 to 15 cm. in length and from 2 to 2·5 cm. in diameter. The rhizome constitutes only about half the thickness of each piece, the rest being made up by the dark brown bases of the hard, persistent, curved and angular attached petioles, which are usually about 25 mm. in length and from 6 to 12 mm. in thickness. The bases of the petioles are more or less densely covered with numerous dry, brown, membranous scales, the marginal cells of which are seen under the microscope to be prolonged at intervals into simple hair-like processes, each consisting of two parallel and contiguous cells; glandular hairs are usually absent, though sometimes there are two at the base of the scale. The bases of the petioles should be green internally, and exhibit in smoothed transverse sections from seven to nine fibro-vascular bundles (steles), arranged in a diffuse circle. The brown rhizome should also be green internally, and exhibit in transverse section about as many principal steles as the petioles. The drug possesses a faint disagreeable odour, and a taste which is sweetish and astringent at first, but subsequently bitter and nauseous.

The presence of secreting cells in the parenchymatous tissue, the number of bundles or steles at the base of the petiole, and the absence of glandular hairs from the margins of the scales, readily distinguish the male fern from other species. Of those which resemble it, the lady fern, *Athyrium Filix-fœmina*, has no secreting cells, and only two large bundles in the base of the petiole, while the shield fern, *Aspidium spinulosum*, possesses glandular secreting cells on the margins of the scales. By extraction with ether, male fern yields an oily liquid extract containing the most important constituents of the drug. The chief constituents are about 5 per cent. of filmaron—an amorphous acid, and from 5 to 8 per cent. of filicic acid, which is also amorphous and tends to degenerate into its inactive crystalline anhydride filicin. Filmaron can be obtained as a bright yellowish-brown powder, which is insoluble in water and soluble with difficulty in alcohol or petroleum spirit, but very soluble in carbon bisulphide and other general solvents. It decomposes slowly into filicic acid and filix-nigrin, when dissolved in acetone, and is also decomposed by boiling alkalies. Other constituents of the drug are about 6 per cent. of fixed oil, together with volatile oil, tannin (filitannic acid), glucose, resin, filix-red, chlorophyll, and various crystalline substances, including aspidin (polystichin), albaspidin, aspidinol, flavaspidinin, flavaspidic acid, and phloraspin.

FŒNICULI FRUCTUS.

Fennel Fruit.

The dried ripe fruit of *Fœniculum capillaceum*, Gilibert (N.O. Umbelliferæ), a plant indigenous to the countries bordering on the Mediterranean. It is cultivated in France, Germany (Saxony and Thüringia), Russia, Galicia, Roumania, India, Japan, and Persia, the fruit collected from cultivated plants grown in Saxony being the largest and best, though the Russian, Galician, and Roumanian varieties are also suitable for pharmaceutical purposes. The different kinds imported vary considerably in size and colour. Thus, Saxon fennel is 8 to 10 mm.

long, about 3 mm. wide, and greenish-brown or yellowish-brown in colour; Russian fennel is 4 to 5 mm. long, from 1·5 to 2 mm. wide, and usually brownish-green in colour; Galician fennel is 5 to 6 mm. long, from 1 to 1·5 mm. wide, and similar in colour to the Russian; Japanese fennel is 3 to 4 mm. long, from 2 to 3 mm. wide, and pale greenish-brown in colour; French sweet fennel is 7 to 8 mm. long, 2 to 3 mm. wide, and pale yellowish-green in colour; French bitter fennel is 4 to 5 mm. long, about 2 mm. wide, and darker in colour than the sweet variety; Persian fennel is 6 to 7 mm. long, less than 2 mm. wide, and very green in colour; Indian fennel is 6 to 7 mm. long, and browner in colour than other varieties. The drug possesses stimulant, aromatic, antispasmodic, and carminative properties, and is similar in its action to anise fruit; it is used in the preparation of Aqua Fœniculi (1 in 10) and Pulvis Glycyrrhizæ Compositus (1 in 12).

Fennel fruit varies considerably in size, but the finest is from 5 to 10 mm. in length and about 3 mm. in diameter. It is oblong in shape, more or less curved, and capped by a conspicuous stylopod and two styles. The fruit is glabrous, greenish-brown or pale yellowish-brown in colour, and consists of two mericarps united and attached to a pedicel about the same length as the fruit. The mericarps are easily separated, and each one bears five paler primary ridges, which are so prominent as to give the fruit a winged appearance. In transverse section a mericarp exhibits six large vittæ—four on the dorsal and two on the commissural surface. The fruit has an aromatic odour, and a sweet, agreeable, aromatic taste.

The very prominent ridges, large vittæ, and agreeable odour and taste are distinctive characters of fennel fruit. The chief constituent of the fruit is the volatile oil (s.g. 0·965 to 0·975), which is soluble in an equal volume of 90 per cent. alcohol, and consists chiefly of fenchone, anethol, and pinene, while d-pinene, dipentene, phellandrene, and limonene have been found in some specimens of the oil. Fenchone is a ketone and an isomer of camphor, possessing a pungent camphoraceous odour and a bitter taste; anethol is also the chief constituent of anise oils, and is present in greatest proportion in those fennel oils which contain least fenchone. Saxon, Russian, and Galician fennel yield from 4 to 5 per cent. of volatile oil, containing about 18 to 20 per cent. of fenchone and from 50 to 60 per cent. of anethol. Other varieties of fennel fruit do not yield more than 2 to 3 per cent. of oil, and Indian fennel yields less than 1 per cent.

FŒNI-GRÆCI SEMINA.

Fenugreek Seeds.

THE seeds of *Trigonella Fœnum-græcum,* Linné (N.O. Leguminosæ), an annual herb indigenous to countries bordering on the eastern shores of the Mediterranean, where it is largely cultivated. It is also cultivated in India, Egypt, and Morocco. The seeds are contained in long, narrow, sickle-shaped pods, from 7·5 to 10 cm. long, and are separated by threshing the fruits when ripe. The seeds possess demulcent properties, and are used chiefly in veterinary practice, in the form of powder.

Fenugreek seeds are about 3 mm. long and 2 mm. broad, compressed or flattened, and rhomboidal in outline, but often shrivelled and distorted. They are hard, brownish-yellow in colour, and are marked on one edge with a small depression, in which the hilum and micropyle are situated, the former appearing as a whitish point. The seed is divided into two unequal lobes by diagonal furrows on both sides, which meet in the depression on the edge, and a section cut transversely, so as to pass through both lobes, exhibits two accumbent cotyledons in the larger lobe and the radicle in the smaller one. The yellowish cotyledons and radicle are surrounded by a darker, horny, translucent endosperm, which swells when soaked in water, owing to the liberation of mucilage. If an entire seed be soaked in warm water, the seed-coats burst and disclose the structure of the seed. The peculiar odour of fenugreek is very distinctive and more pronounced in the powdered seeds; the taste is mucilaginous and bitter.

The shape, internal structure, and peculiar odour of fenugreek seeds distinguish them from other seeds. The chief constituent of the seeds is about 28 per cent. of mucilage, which occurs in the endosperm and not in the seed-coats, as in the case of linseed or mustard seeds. Fenugreek also contains about 22 per cent. of proteids, 6 per cent. of fixed oil, a trace of volatile oil, a bitter principle, and two alkaloids—trigonelline (methyl-nicotinic acid) and choline, the latter being probably a decomposition product of lecithin. Trigonelline resembles arecaine, one of the alkaloids of areca nuts, in its properties.

FRANGULÆ CORTEX.

Frangula Bark ; Alder Buckthorn Bark.

THE bark of the alder buckthorn, *Rhamnus Frangula*, Linné (N.O. Rhamnaceæ), which is indigenous to Britain, and distributed widely throughout Europe and Northern Asia. It is distinguished from the common buckthorn, *R. cathartica*, Linné, by its less bushy and more tree-like habit, larger and entire feather-veined leaves, hermaphrodite flowers with five stamens, and the absence of thorns. After removal of the bark from the stem and branches, the wood is used for making charcoal. Older bark is distinguished by being much rougher than young bark, of a dull, dark purple colour, and marked with shallow longitudinal fissures, as well as transversely elongated lenticels; the cork is also less easily removed from older bark, and fine medullary rays can be distinguished in the thicker bast. The fresh bark possesses a disagreeable odour and taste, and acts as an emetic, but its objectionable properties disappear on keeping the bark; it should therefore be kept for at least twelve months after drying, in order to render it fit for medicinal use. The drug is a tonic, purgative, and diuretic, and is used in the form of decoction (1 in 20), or liquid extract (1 in 1).

Frangula bark is about 1 to 1·5 mm. thick, and occurs in single or double quills of variable length, from 6 to 36 mm. in diameter. The outer surface is greyish-brown, blackish-brown, or of a dark purplish colour, smooth, glossy, and marked with numerous small circular or transversely elongated, whitish lenticels. The cork appears of a dark crimson colour when scraped so as to remove the outer layers of cells, and is separated easily from the yellowish-brown cortex. The inner surface of the bark is nearly smooth and of a pale brownish-yellow or dark cinnamon-brown colour; when examined with a lens it exhibits fine longitudinal striations. The bark breaks with a short and purplish fracture in the outer portion, but the fracture is rather fibrous and pale yellow in the inner portion, and groups of bast fibres project a short distance beyond the fractured surface. A transverse section, examined under a lens, exhibits a narrow purplish cork and a yellowish-brown cortex and bast, the bast bundles being in tangential groups, accompanied by axial rows of cells containing crystals. The bark is nearly inodorous, but has a sweetish yet slightly bitter taste, and colours the saliva yellow when masticated. The inner surface of the bark is coloured red by dilute alkaline solutions, owing to the presence of frangulin, while the reddish infusion of the bark is coloured dark brown by ferric chloride, owing to the presence of tannin.

The purplish cork of frangula bark, the whitish lenticels, and the somewhat fibrous fracture of the bast or inner portion, are distinctive characters. The bark of *Rhamnus Frangula* can be distinguished from that of *R. purshianus* by the absence of the irregular, angular sclerenchymatous cells which, in the latter, are wedged together in large compact groups, increasing in size and number towards the surface, and causing the short fracture of the outer bark. The emetic action of fresh frangula bark is attributed to a ferment which is said to be destroyed by heat, or on drying and keeping the bark. The chief constituents of dried frangula bark are frangulin, emodin and iso-emodin; other constituents of the drug are pseudo-frangulin (frangulic acid), resin, and tannin. Frangulin is a tasteless glucoside which yields emodin and rhamnose or isodulcite on hydrolysis, and appears to be the most important constituent of the drug. It can be obtained in fine yellow crystals (m.p. about 226° C.), and is coloured purple by alkalies. Emodin and iso-emodin are bitter laxative substances. The emodin of frangula bark melts at 250°-255° C., and appears to be identical with that found in rhubarb root.

FUCUS.

Bladder-wrack.

A SEAWEED, *Fucus vesiculosus* (N.O. Fucaceæ), which is distributed widely on the shores of the Atlantic Ocean, and very common on the coast of Britain. The plant covers extended areas of the littoral region of the sea-coast, and is fastened to the substratum by branched, root-like, discoid hold-fasts, which are developed from the base of the stalk. It has a band-shaped, dichotomously branching thallus with air-bladders, whence it derives its common name.

The entire living plant is gathered from the rocks and dried, the dark olive-brown thallus becoming nearly black in the process. The seaweed thrown up on the shore by the sea is not suitable for medicinal purposes, as prolonged contact of the detached plants with sea water causes the loss of important constituents by diffusion from cells containing protoplasm which has lost its vitality. The drug possesses alterative properties, and extracts prepared from it are used as remedies for obesity.

Bladder-wrack consists of the dried, nearly black, thin, flattened thallus, which is about 18 mm. wide, and may attain a length of 1 m., though it is usually shorter. When quite dry it is hard and brittle, but it acquires a cartilaginous consistency when slightly moistened. The thallus has an entire margin, and branches in a dichotomous manner, some of the branches terminating in club-like enlargements in which the reproductive organs of the plant are situated. At intervals the thallus bears bladder-like swellings or air-vesicles, imbedded near the midrib. The drug has a peculiar seaweed odour, and a disagreeable mucilaginous and saline taste. The entire margin of the thallus, and the occurrence of the air-vesicles in pairs, as is usually the case, are important distinctive characters of bladder-wrack.

Other species of *Fucus* grow in similar situations to *F. vesiculosus*, the chief being *F. serratus*, which is distinguished by its serrated margin and the absence of air-vesicles, and *F. nodosus*, which has no midrib, while the air-vesicles are not usually in pairs. Both species contain the same constituents as bladder-wrack, and all three plants belong to the Phæophyceæ or Brown Algæ, of which class the Fucaceæ and the Laminariaceæ are the most highly-developed forms. Asexual reproduction does not occur in the Fucaceæ, and sexual reproduction is distinctly oogamous, the oogonia and antheridia being found in flask-shaped depressions or conceptacles, which are crowded together below the surface in the swollen tips or receptacles of the dichotomously branched thallus. The conceptacles may in some species contain both oogonia and antheridia, but in *F. vesiculosus* the plant is diœcious. The chief constituent of bladder-wrack is a gummy or gelatin-like substance named algin, while mannite and fat are also present, and the ash of the plant contains chlorides, bromides, and iodides.

GALANGÆ RHIZOMA.

Galangal; Lesser Galangal.

THE dried rhizome of *Alpinia officinarum*, Hance (N.O. Scitaminaceæ), a native of China, which is cultivated in the island of Hainan and on the south-east coast of China opposite the island, also in Siam. It is a flag-like plant, about 1 m. or more in height, and produces a pale-coloured, branched, cylindrical rhizome, which is dug up in the autumn, washed, trimmed, cut into pieces, and dried, becoming darker-coloured in the process of drying. The drug is exported chiefly from Kiung-chow (Hainan) and Canton. It is an aromatic stimulant, resembling ginger in its properties, but is more frequently used as a spice than as a medicine.

Galangal occurs in dull reddish-brown cylindrical pieces, from 5 to 8 cm. long and about 12 mm. thick, to which portions of rootlets are sometimes attached. The pieces are sometimes tapering or enlarged, and often branched. They are shrivelled or striated longitudinally, and are encircled at intervals of about 6 mm. by narrow, raised, sinuous, or frilled rings, being the remains of cataphyllary leaves. The rhizome is hard, tough, and difficult to break, and a smooth transverse section exhibits a dark central column (stele), surrounded by a paler reddish-brown bark, with still paler fibro-vascular bundles and numerous deep red resin-cells in both portions. The drug has an agreeable spicy odour, especially when powdered, and a strongly pungent, spicy taste.

Greater galangal consists of the rhizome of *Alpinia Galangal*, Willdenow, a native of Java; it is much larger than the Chinese drug, orange-brown externally, and of a pale buff colour internally. The rhizome of *Alpinia officinarum* is distinguished by its colour, the remains of cataphyllary leaves, its pungent taste, and the appearance of a transverse section. The chief constituents of the drug are from 0·5 to 1 per cent. of a greenish-yellow volatile oil, and a very pungent oily body named galangol. Other constituents are resin, fat or fixed oil, starch, tannin, mucilage, and three tasteless, yellow, crystalline substances —galangin (dioxyflavanol), alpinin, and kæmpferid. The volatile oil (s.g. 0·915 to 0·925) contains cineol, and has a camphor-like odour.

GALBANUM.

Galbanum.

A GUM-RESIN obtained from *Ferula galbaniflua*, Boissier and Buhse (N.O. Umbelliferæ), and other species. They are large plants indigenous to, and widely distributed throughout, Persia. The cortical portion of the stem and root of the plants contains numerous schizogenous ducts, which secrete a milky juice, some of which exudes naturally in the form of tears. But the gum-resin is obtained chiefly by cutting through the stem near the crown and collecting the juice as it exudes and hardens on the surface, successive slices of the root being removed at intervals of a few days. Commercial galbanum is imported from Persia by way of the Levant, Bombay, and Russia, the two chief varieties in commerce being known as Levant and Persian galbanum respectively. Levant galbanum has a decided musky odour, and occurs (1) in opaque or translucent tears, (2) in small lumps mixed with pieces of stalk and, sometimes, fruits, or (3) in sticky masses containing slices of root, and consisting of small, translucent, yellowish fragments, mixed with larger, soft, bluish or greenish portions, this being the kind usually met with in commerce. It is exported from Persia to India, and thence sent to Europe by way of Bombay, Egypt, or Turkey. Persian galbanum has a distinct turpentine-like odour, in addition to that characteristic of Levant galbanum, and occurs (1) as a brownish or reddish-brown liquid of the consistence of Venice turpentine, or (2) in masses of small sticky tears with a varnished appearance, mixed with fragments of stem, fruit-stalks, etc. It is exported from Persia to India, or to Russia, by way of Astrachan and Orenburg. The drug possesses antispasmodic and stimulating expectorant properties, and resembles asafetida in its action, though less energetic; it is used in the preparation of Pilula Galbani Composita (1 in $3\frac{1}{2}$).

Galbanum for medicinal purposes should be in distinct tears or in irregular masses of agglutinated tears. The tears are rounded or irregular in form, sometimes rough and dirty on the surface, and, on the average, about the size of a pea, though sometimes much larger. They vary in colour from translucent bluish-green to opaque yellowish or orange-brown, the gum-resin tending to become opaque and darker-coloured with age. In cold weather the tears are hard and brittle, breaking easily with an irregular granular fracture, and then usually appearing opaque, yellowish, and soft internally, though sometimes translucent and of a bluish-green colour. They soften as the temperature rises, the heat of the hand sufficing to render them ductile and sticky. When agglutinated, the tears are imbedded in a brownish mass and mixed with various foreign substances, including transverse slices of root. Similar slices, about an inch or more in diameter, may be found mixed with galbanum in tears; they frequently bear on one side some of the gum-resin which has dried there on exuding from the freshly cut surface of the root. The gum-resin has a bitter and unpleasant taste, and a characteristic aromatic odour.

Good qualities of galbanum contain not more than 10 per cent. of moisture, and yield at least 50 per cent. to alcohol, while leaving not more than 10 per cent. of ash on incineration. The chief constituent of galbanum is from 60 to 66 per cent. of resin which consists of an alcohol—galba-resinotannol—combined with umbelliferone as an ester; it yields resorcin when fused with potassium hydroxide. Other constituents of galbanum are 15 to 20 per cent. of gum, and 5 to 10 per cent. or more of a colourless or yellowish volatile oil (s.p. 0·910 to 0·940) containing pinene and cadinene. The gum-resin differs from ammoniacum in containing umbelliferone, an anhydride of umbellic acid, which is present both free and in combination, the purified resin being stated to contain about 0·25 per cent. of free umbelliferone and 20 per cent. of combined umbelliferone. The presence of umbelliferone is proved by heating a small fragment of the gum-resin to redness in a dry test-tube, so as to liberate the umbelliferone from its combination with the resin, and treating the contents of the tube, after cooling, with boiling water; the resulting solution, when diluted largely and rendered alkaline by adding solution of ammonia, should exhibit the same peculiar blue fluorescence as is produced in the case of asafetida.

GALLA.

Galls.

Excrescences on *Quercus infectoria*, Olivier (N.O. Cupuliferæ), resulting from the puncture of the bark of young twigs and subsequent deposition therein of eggs by the female of the gall-wasp, *Cynips Gallæ tinctoriæ*, Olivier (Order Hymenoptera). The insect pierces the young twigs with its ovipositor nearly to the cambium, and deposits one or more eggs. As they increase in size, the eggs secrete a peculiar liquid which promotes abnormal development of the vegetable tissues and the formation of a gall. The eggs, or larvæ hatched therefrom, thus become completely enclosed in a nearly spherical mass, which projects from the twig and furnishes the larvæ with a supply of starch and other nutritive material. The growth of the gall continues only so long as the egg or larva lives, or until the latter reaches maturity and passes into a chrysalis, from which the fully developed gall-wasp emerges and escapes into the air through a hole bored with its mandibles in the side of the gall. The best Aleppo galls, however, are collected before the insects escape. They are collected in Asiatic Turkey, particularly in the province of Aleppo, but galls are also exported from Persia and Greece. They are astringent, and are used in the preparation of gallic and tannic acids, Unguentum Gallæ (1 in 5), and Unguentum Gallæ cum Opio.

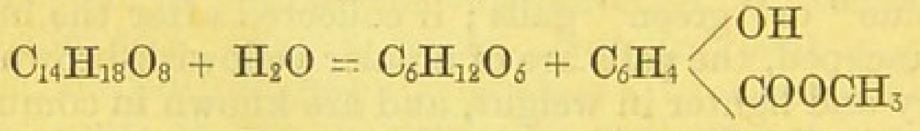
Galls of good quality are hard and heavy, without perforations, dark bluish-green or olive-green in colour, nearly spherical (sub-globular) in shape, and from 12 to 18 mm. or more in diameter. They are known in commerce as "blue" or "green" galls; if collected after the insects have escaped, the galls are of a paler yellowish-brown hue, spongy and lighter in weight, and are known in commerce as "white" galls. Aleppo galls are tuberculated on the surface, the short, bluntly pointed projections being most numerous on the upper portions; both projections and intervening spaces are smooth. On breaking a gall, it appears yellowish or brownish-white within, and there is usually a small cavity containing the remains of a larva or gall-wasp. Galls have no marked odour, but are characterised by their intensely astringent taste and slightly sweet after-taste.

The chief constituents of Aleppo galls are 50 to 70 per cent. of gallotannic acid, which can be converted into gallic acid by hydrolysis; they also contain 2 to 4 per cent. of gallic acid, together with mucilage, sugar, and resin. "White" galls are supposed to contain less gallotannic acid than "blue" or "green" galls. English oak-galls or "oak apples" are smooth, globular, brown, usually perforated, and much less astringent than Aleppo galls; they contain only 15 to 20 per cent. of gallotannic acid. Chinese galls—produced by a species of *Aphis* on *Rhus semialata*, Murray (N.O. Anacardiaceæ)—are employed chiefly for the manufacture of tannic and gallic acids, pyrogallol, ink, etc. They are not spherical, but of extremely diverse and irregular form, with a thick, grey, velvety down masking their reddish-brown colour; they contain about 70 per cent. of gallotannic acid.

GAULTHERIÆ OLEUM.

Oil of Gaultheria; Oil of Wintergreen or Sweet Birch.

An oil obtained by distillation from the leaves of the wintergreen, *Gaultheria procumbens*, Linné (N.O. Ericaceæ), or from the bark of the sweet birch, *Betula lenta*, Linné (N.O. Betulaceæ). The wintergreen is a small creeping plant indigenous to the northern United States and Canada, while the sweet birch is a large tree which is also a native of North America. The oil does not exist ready formed in the leaves or bark, but is formed in a similar manner to the oils of bitter almonds and mustard, from the glucoside gaultherin, which becomes hydrolysed by a ferment named betulase. The products of the reaction are dextrose and methyl salicylate, thus:—



$$\underset{\text{Gaultherin}}{C_{14}H_{18}O_8} + \underset{\text{Water}}{H_2O} = \underset{\text{Dextrose}}{C_6H_{12}O_6} + \underset{\text{Methyl Salicylate}}{C_6H_4\left\langle\begin{matrix}OH\\ COOCH_3\end{matrix}\right.}$$

The oil consists almost entirely of methyl salicylate. It possesses antiseptic, stimulant, diuretic, and emmenagogue properties. In addition to its medicinal uses, it is employed largely as a flavouring agent.

Oil of gaultheria (s.g. 1·176 to 1·187) is colourless or slightly yellowish in tint, with a strong, characteristic odour, a warm, sweetish, aromatic taste, and a slightly acid reaction. It is readily soluble in 90 per cent. alcohol, ether, chloroform, or glacial acetic acid. If not optically inactive, the oil should not rotate the plane of a ray of polarised light more than 1·0° to the left in a tube 100 mm. long. The oils obtained from wintergreen and sweet birch are almost, if not quite, identical, both consisting chiefly of methyl salicylate; but the oil of wintergreen proper, from *G. procumbens,* possesses a slight lævo-rotation, while the oil of sweet birch is optically inactive.

The chief constituent of the oil obtained from wintergreen leaves is nearly 99 per cent. of methyl salicylate; the oil also contains small quantities of a paraffin named triacontane, an aldehyde or ketone with an odour like that of œnanthic aldehyde, an alcohol corresponding to the aldehyde or ketone present, and an ester which yields the same alcohol and an acid on saponification. The oil of sweet birch contains 99·8 per cent. of methyl salicylate, together with small quantities of triacontane, and the same ester that occurs in the oil obtained from wintergreen leaves; but the alcohol found in the latter, and yielded by the ester on saponification, does not occur in the free state in the oil of sweet birch. The alcohol and ester possess very penetrating characteristic odours, which serve to distinguish the natural oils from artificial methyl salicylate produced synthetically.

GELATINUM.

Gelatin.

The air-dried product of the action of boiling water on such animal tissues as skin, tendons, ligaments, and bones. It is an albuminoid substance formed as the result of the prolonged action of the boiling water upon collagen, the substance of which the white fibres of connective tissue are composed, and does not exist ready formed in the animal tissues. On cooling, the aqueous solution sets into a jelly, but if the water be driven off, a thick syrupy liquid remains, and forms horny sheets on cooling and drying by exposure to the air. The crude product so obtained is known as glue, but by purification the odour and colour are removed, and commercial gelatin is obtained. It is a powerful hæmostatic and styptic, and has been used for increasing the congulability of the blood. It is also used in preparing Suppositoria Glycerini and various medicated lamellæ.

Gelatin occurs in translucent and almost colourless sheets or shreds. When dissolved in 50 parts of hot water it forms an inodorous solution which solidifies to a jelly on cooling. It is insoluble in 90 per cent. alcohol, ether, or chloroform, but dissolves in acetic acid, being thus distinguished from chondrin—a mixture of gelatin with mucinoid materials obtained from hyaline cartilage by boiling — which does not produce a good jelly and is precipitated from aqueous solutions by acetic acid. Aqueous solutions of gelatin are distinguished from solutions of proteids, to which gelatin is closely allied, by yielding no precipitate with solutions of any acid except tannic acid, the reaction in the latter case being the same as that which occurs during the conversion of hides into leather. Gelatin solutions are also unaffected by alum, lead acetate, ferric chloride, or the majority of metallic salts which precipitate proteids.

The gelatinising power of commercial gelatin varies considerably, and it is therefore advisable to use only the best French gelatin for medicinal purposes, gelatin of the same brand being used on all occasions so as to avoid variation in the products. Like the true proteids, gelatin contains carbon, hydrogen, oxygen, nitrogen, and sulphur, but it is somewhat poorer in carbon and richer in oxygen than those bodies, and contains very little sulphur. It gives most of the proteid colour-tests, and, like proteid, is converted on digestion into peptone-like substances and is readily absorbed. Gelatin is not dissolved by cold water, but when immersed in that liquid it absorbs several times its weight, and is then readily reduced to the liquid form on the application of gentle heat. Chondrin resembles gelatin in being precipitated from its solutions by tannic acid, but it also gives the reactions of mucin, being precipitated by acetic acid, lead acetate, and other reagents which do not affect gelatin.

GELSEMII RADIX.

Gelsemium Root; Yellow Jasmine Root.

THE dried rhizome and roots of the Carolina or yellow jasmine, *Gelsemium nitidum*, Michaux (N.O. Loganiaceæ), a climbing plant indigenous to the southern states of North America, which grows in rich, moist soils along the sea coast, from Virginia to the south of Florida. The drug is collected in the autumn, and consists usually of the dried rhizome of the plant with the larger roots attached, but sometimes smaller roots and portions of slender aerial stems are also present. Gelsemium possesses antispasmodic and analgesic properties, and must be used with care; it is usually given in the form of Tinctura Gelsemii (1 in 10), or the powdered resinoid known as "gelsemin," which is a mixture of substances obtained by evaporating an alcoholic extract of gelsemium to dryness.

Gelsemium rhizome occurs usually in nearly straight and cylindrical pieces, about 15 cm. or more in length, and from 6 to 18 mm. in thickness. It is brown or dark brownish-violet in colour, or marked with a network of purplish lines with yellowish-brown intervening spaces, the difference in colour being due to the outer cork-cells containing a dark reddish-brown substance, whilst the inner ones contain a yellowish deposit which is partly disclosed as growth proceeds and as the outer dark layer of the rhizome becomes fissured. The roots are fibrous and somewhat smaller, on the average, than the rhizome; they are of a uniform yellowish-brown colour, finely wrinkled on the surface, and somewhat tortuous or sinuous in shape. The drug is hard and woody, breaking with an irregular splintery fracture, and the rhizome frequently exhibits silky fibres in the bast, similar to the more conspicuous ones found in the aerial stems. The drug has a bitter taste and a slightly aromatic odour.

Transverse sections of the rhizome or root of *Gelsemium nitidum* exhibit a distinctly radiate appearance, the thin cortex or bark enclosing a large, pale yellowish-white wood, which consists of narrow bundles with small pores, alternating with straight, whitish medullary rays. In the case of the rhizome, a small pith—frequently divided into four nearly equal parts—is also present, particularly in smaller and younger pieces; the silky fibres in the bast are isolated, or occur in groups of two or three, and form an interrupted ring, whereas in the aerial stem they are grouped in bundles. The active principles of gelsemium are present only in small quantities, if at all, in the stem. The chief constituents of the drug are gelseminine, gelsemine, and gelsemic acid. Other constituents of the drug are volatile oil, resin, and starch. Gelseminine is an intensely bitter and poisonous amorphous alkaloid, and forms amorphous salts, while gelsemine is a crystalline, non-toxic alkaloid, and forms crystalline salts. Gelsemic or gelseminic acid is a crystalline substance which exhibits an intense bluish-green fluorescence in alkaline solutions; it is probably identical with the β-methyl-æsculetin or chrysatropic acid found in belladonna root.

GENTIANÆ RADIX.

Gentian Root.

THE dried rhizome and roots of the yellow gentian, *Gentiana lutea*, Linné (N.O. Gentianaceæ), a perennial herb indigenous to Central Europe. The drug consists of the erect rhizome or rootstock and the large fleshy roots of the plant, collected in the autumn and dried, the pieces being occasionally sliced longitudinally. It is collected in the mountainous districts of Germany, Switzerland, France, and Spain, that imported from France being preferred. When fresh the drug is whitish internally and almost odourless, but the colour darkens and a distinctive odour develops during the drying process, the fresh root being sometimes made into heaps and allowed to heat and ferment in order to facilitate those changes. It is a bitter tonic, and is used in the form of Extractum Gentianæ, Infusum Gentianæ Compositum (1 in 80), and Tinctura Gentianæ Composita (1 in 10); the extract is largely used as a pill excipient.

Gentian root occurs usually in nearly cylindrical yellowish-brown pieces about 15 to 20 cm. long, and seldom exceeding 2·5 cm. in thickness. Occasionally the pieces are split longitudinally, and they may also be obtained in thin transverse slices. The roots are much shrivelled and longitudinally wrinkled; the rhizome is often longer and thicker, without conspicuous longitudinal wrinkles, but marked by close transverse annulations caused by leaf-scars, and frequently terminated by a large bud protected by dry scaly leaves. Pieces of the drug are tough and flexible when slightly moist, but brittle when dried, the fractured surface being of a nearly uniform reddish-yellow colour. A transverse section shows a dark cambium ring separating the rather thick bark from the soft wood, the latter consisting almost entirely of parenchymatous tissue and exhibiting no radiate structure. Roots which have been sliced longitudinally before drying frequently exhibit transverse instead of longitudinal wrinkles, and are paler than usual internally. Gentian root has a characteristic aromatic odour and a pleasant bitter taste.

The odour, taste, and uniform yellowish-brown colour of gentian root are distinctive. The root lacks any characteristic structure in transverse sections, and contains no starch. The roots of other species of *Gentiana*—*G. purpurea*, *G. pannonica*, *G. punctata*, etc.—are collected and dried in Switzerland and Austria; they are smaller, as a rule, than the roots of *G. lutea*, but all of them appear to possess similar properties. The chief constituent of gentian root is gentiopicrin, a bitter crystalline glucoside of which it contains about 0·1 per cent. Other constituents of the drug are a pale yellow crystalline substance named gentianin or gentisin, pectin, fixed oil, quercitrin, and gentianose, a crystallisable, fermentable sugar which is converted into an uncrystallisable modification during the process of drying the root. Gentiopicrin forms pale yellow needles which are soluble in water or in diluted alcohol, but insoluble in ether. It yields dextrose and an amorphous, yellowish-brown, neutral, bitter substance named gentiogenin, when decomposed with a dilute mineral acid.

GLUCOSUM LIQUIDUM.

Liquid Glucose.

A SYRUPY liquid obtained by the hydrolytic decomposition of polysaccharides (cane sugar, starch, cellulose, etc.) and glucosides. It is produced on a large scale in the United States, from maize starch. The maize or "corn" is soaked thoroughly in warm water and then ground on specially prepared stones, after which the starch is removed from the meal by washing, allowed to settle in large tanks, and separated from the gluten by treatment with caustic soda. The starch is next washed from all adhering alkali, beaten into a cream with water, and treated with diluted sulphuric acid while steam is allowed to pass through the mixture, or the starch and diluted acid are enclosed in stout copper cylinders and subjected to the action of superheated steam. When the conversion of the starch is complete, marble dust and animal charcoal are added, and the neutralised liquid is filtered, after which it is evaporated in a vacuum pan. The product is the liquid glucose (saccharum) of commerce, which is used in the preparation of Syrupus Glucosi (1 in 3), and forms an excellent excipient for pills when diluted with one-third its volume of syrup or treacle.

Liquid glucose is a clear, sweet, odourless and almost colourless, viscid liquid. It may contain traces of calcium sulphate, but should be free from arsenic. Solid glucose can be obtained in crystalline masses, or in anhydrous hard crusts (s.g. 1·54 to 1·57). It is not so sweet as cane sugar, and it is also less soluble in water, but it is much more soluble in alcohol. Strong mineral acids have but little effect on glucose, and it undergoes very little alteration when dissolved in water and subjected to prolonged ebullition. It is decomposed by alkalies, becoming brown and being partially changed to mannose and fructose, while it differs from cane sugar in being capable of undergoing the vinous fermentation directly, without passing through any intermediate state. It is also distinguished from cane sugar by producing a red or yellowish precipitate when heated with solution of potassio-cupric tartrate (Fehling's solution), or with solution of copper sulphate and excess of solution of potassium hydroxide.

Commercial glucose may be a mixture of dextrose (d-glucose or grape sugar) and other glucoses, but consists chiefly of dextrose when prepared by the action of dilute acids on starch, dextrin, or cellulose, as is usually the case. In preparing liquid glucose, the process of conversion is stopped when the starch has disappeared, and, as a result, the liquid glucose of commerce contains both dextrose and dextrin, in addition to traces of calcium sulphate, formed after the process of conversion by neutralisation of the sulphuric acid with calcium carbonate. The process of conversion is carried further when solid glucose is required, and the product contains about 60 per cent. of dextrose, together with a dextrin-like substance named gallesine, which is not fermentable. Glucose crystallises from water or dilute alcohol with one molecule of water, in nodular masses (m.p. 86° C.), but it loses its water of crystallisation at 110° C.; at 30° to 35° C. it crystallises in anhydrous hard crusts from concentrated aqueous solutions, or from solutions in alcohol.

GLYCYRRHIZÆ RADIX.

Liquorice Root.

THE peeled root and peeled subterranean stem of *Glycyrrhiza glabra*, Linné (N.O. Leguminosæ), and other species. The plants are widely distributed over Southern Europe and eastward to Central Asia, being cultivated largely for the preparation of extract. They produce tall, erect, herbaceous stems and stout perennial roots, which divide, a few inches below the surface of the ground, into several long, straight, descending branches, beset with slender wiry rootlets. Long, horizontal, subterranean stems (runners or stolons) are also given off by the principal roots near the surface, and are provided with buds which develop into aerial stems if the runners be allowed to remain undisturbed until the following year. The whole of the underground part of the plant is collected in the autumn, dried carefully, and peeled. The chief source of the drug is *G. glabra*, which is cultivated to a limited extent in England, near Mitcham and in Yorkshire, but it is imported chiefly from Spain and the south of France. There are several other varieties in commerce, such as Russian and Persian liquorice, but they are not suitable for medicinal purposes. The drug possesses demulcent and expectorant properties, and is employed largely in the form of powder or extract to disguise the taste of nauseous medicines. It is used in the preparation of Extractum Glycyrrhizæ, Extractum Glycyrrhizæ Liquidum (s.g. 1·2), Liquor Sarsæ Compositus Concentratus (1 in 10), Pilula Hydrargyri (1 in 6), and Pulvis Glycyrrhizæ Compositus (1 in 6); the extract is used in the preparation of Extractum Glycyrrhizæ Spirituosum (1 in 2), Confectio Sennæ (1 in 75), and Decoctum Aloes Compositum (1 in 25); the liquid extract is an ingredient of Mistura Sennæ Composita (1 in 20) and Tinctura Aloes (3 in 20).

Liquorice root is imported in bundles of long, nearly cylindrical, dark reddish-brown pieces, which are usually wrinkled longitudinally and not scaly, but bear on the surface small transverse root-scars and, in the case of runners, minute dark buds. When peeled, the pieces are shorter, yellowish in colour, and have a smooth fibrous surface. The pieces break with a coarsely fibrous fracture, and a transverse section exhibits a yellow wood—consisting of narrow porous wedges of vascular tissue, alternating with numerous medullary rays—encircled by a thick cortex with groups of bast fibres arranged in radial lines, the groups appearing as rows of dark points opposite to the wedges of vascular tissue. In addition, the pieces of subterranean stem, which constitute the greater portion of the drug, are distinguished by the presence of a small dark pith. The drug has a peculiar earthy odour and a characteristic sweet taste, due to the presence of glycyrrhizin. Spanish liquorice root should be preferred for medicinal purposes. It is distinguished by its taste, which is sweet without bitterness, by the yellow colour of a transverse section, the fibrous bark, and the presence of minute buds and pith in most of the pieces.

Russian liquorice root is the product of *G. glandulifera.* It is slightly bitter, and larger than the Spanish drug as a rule. It consists chiefly of purplish roots with scaly cork, the pieces being destitute of pith, and exhibiting no traces of buds. Other varieties of liquorice root, derived from *G. echinata,* are also bitter and equally unsuitable for medicinal purposes. The chief constituent of liquorice, to which its sweet taste is due, is 7 per cent. or more of glycyrrhizin, an ammonium compound of glycyrrhizic acid. Other constituents of the drug are sugar, asparagin, starch, albumin, resin, and various salts, whilst a small quantity of tannin occurs in the outer bark of the root. The roots of *G. glandulifera* and *G. echinata* contain an amorphous bitter substance named glycyramarin. Glycyrrhizin can be obtained as a transparent yellow substance, soluble in boiling water or cold alcohol. Glycyrrhizic acid occurs as a crystalline, comparatively tasteless substance of glucosidal character, which, on boiling with dilute acids, breaks up into a resinous, amorphous, bitter substance named glycyrretin and parasaccharic acid. It is soluble in boiling acetic acid, but only very slightly soluble in water, alcohol, or ether, and combines with alkalies to form crystallisable soluble salts which are intensely sweet. Glycyrrhizin or a similar substance has been obtained from the rhizome of *Polypodium vulgare,* the leaves of *Myrrhis odorata,* and the bark of *Lucuma glycyphlœa.*

GOSSYPII RADICIS CORTEX.

Cotton Root Bark.

The dried root-bark of *Gossypium herbaceum,* Linné (N.O. Malvaceæ), an herbaceous or shrubby perennial plant indigenous to India, and cultivated in most tropical countries as a source of cotton. It is also grown in Persia, the south of Europe, and other countries bordering on the Mediterranean. The root-bark is official in the Indian and Colonial Addendum, for use in India, and the Eastern, North American, and West Indian Colonies, as an equivalent of ergot. It possesses emmenagogue properties, and is used in the form of a liquid extract (1 in 1), tincture (1 in 4), Decoctum Gossypii Radicis Corticis (1 in 5), and Extractum Gossypii Radicis Corticis Liquidum (1 in 1).

Cotton root bark occurs in thin flexible bands or quilled pieces, covered with a thin brownish-yellow periderm, which forms fine longitudinal ridges and meshes, and is marked with small black dots or short transverse lines. The tissues immediately beneath the periderm are orange-brown, but the inner surface of the bark is whitish, silky, and finely striate, the striations being due to the medullary rays. The liber portion can be separated readily into thin fibrous laminæ. The bark breaks with a tough fibrous fracture ; it is inodorous, but has a slightly acid, astringent taste, owing to the presence of resin and tannin.

The chief constituent of cotton root bark is a pale yellow or colourless chromogen, an acid resin which is present to the extent of about 8 per cent., and becomes bright brownish-red on keeping the drug or a tincture prepared from it. It is soluble in alcohol, chloroform, ether, and benzene. Other constituents of the bark are starch, fixed oil, and traces of tannin and sugar. The herbaceous part of *G. herbaceum* contains much mucilage and has been used as a demulcent, the hairs of the seeds are employed in the manufacture of cotton (see Gossypium), and the seeds themselves yield a fixed oil (cotton-seed oil), which is used for making soap and for other purposes, and is sometimes employed as an adulterant of lard and olive oil.

GOSSYPIUM.

Cotton ; Cotton Wool.

The hairs of the seed of *Gossypium barbadense*, Linné (N.O. Malvaceæ), and of other species of *Gossypium*, freed from fatty matter. The plants are herbs, shrubs, or small trees, cultivated in tropical and sub-tropical countries, and producing three- to five-celled capsular fruits containing numerous seeds covered with a wool-like mass of long white or yellowish hairs. The hairs are removed from the seeds, separated from impurities by means of special machinery, and freed from adhering fatty matter, so as to render them more absorbent, by boiling the crude " wool," under pressure, with a dilute caustic alkali. It is then washed, bleached by the action of chlorinated lime and hydrochloric acid, again washed, dried, and the fibres mechanically loosened and separated, so as to make a fleecy, wool-like mass. The resulting absorbent cotton wool is used in the preparation of pyroxylin and of various surgical dressings, being frequently medicated with boric acid, carbolic acid, salicylic acid, and other antiseptic substances.

Cotton wool occurs, when purified, in long, white, soft filaments, about 2 to 4 or 5 cm. long, and 0·02 mm. broad, each consisting of an elongated cell which appears, when magnified, as a flattened twisted band, with slightly thickened, rounded edges. Cotton is inodorous, tasteless, and should absorb water readily, the absence of fatty matter being thus indicated. It should impart to water in which it is immersed neither an alkaline nor an acid reaction, thus showing that it has been thoroughly washed after being freed from fatty matter and bleached. On incineration in air it burns, leaving less than 1 per cent. of ash. An ammoniacal solution of cupric oxide dissolves cotton almost completely, the dissolved cellulose being thrown out of solution on adding an acid.

The chief constituent of cotton wool is cellulose; other constituents of crude cotton are a wax which is soluble in alcohol or ether, stearic and palmitic acids, pectic acid, colouring and albuminoid matters. The fatty matter present forms a thin coating on the crude cotton, and is removed in the preparation of absorbent cotton wool. Cotton is insoluble in hot solution (8 per cent.) of potassium hydroxide, is not permanently stained yellow by picric acid solution, and contains only traces of nitrogenous substances, being thus distinguished from animal fibres. Iodine solution colours it yellow, the colour changing to blue on treatment with sulphuric acid, this cellulose reaction distinguishing cotton from many other vegetable fibres.

GRAMINIS CITRATI OLEUM.

Oil of Lemon Grass; Indian Oil of Verbena.

An oil obtained by distillation from the sweet-scented lemon grass, *Andropogon citratus*, De Candolle (N.O. Graminaceæ), also known as *A. Schœnanthus*, Wallich, a native of Malabar, which is cultivated largely in India. An infusion of the fresh grass is used as a diaphoretic and stimulant, while the oil is used as a carminative and as an application in acute rheumatism. It is official in the Indian and Colonial Addendum, for use in India, and the Eastern and West Indian Colonies.

Oil of lemon grass (s.g. 0·895 to 0·905) is a dark yellow liquid, with an odour resembling that of verbena. Its optical rotation should not exceed +3° or −3°. The oil is soluble in 70 per cent. alcohol (1 in 3), and should contain not less than 65 per cent. of citral and other aldehydes, as determined by shaking the oil with a boiling 30 per cent. solution of sodium hydrogen sulphite and measuring the oily layer which separates.

The chief constituent of lemon-grass oil is the aldehyde citral, an optically inactive body which boils between 228° and 229° C., and of which it may contain from 75 to 85 per cent. The oil also contains traces of citronellal, and possibly of an isomer of citral. Other constituents are methyl heptenone, geraniol, linalool, limonene, dipentene, and traces of other bodies.

GRANATI CORTEX.

Pomegranate Bark.

The dried bark of the stem and root of *Punica Granatum*, Linné (N.O. Lythrariaceæ), a shrub or small tree which is indigenous to North-Western India. It is cultivated in countries bordering on the Mediterranean and in subtropical regions generally. It may attain a height of 6 m. or more, and has a very unequal trunk, with numerous branches which sometimes produce thorns. The pomegranate bark of commerce is obtained chiefly from the stem. The bark possesses astringent and anthelmintic properties, and is used as a remedy for tapeworm, following a dose of castor oil. The chief preparation of the drug is Decoctum Granati Corticis (1 in 5).

Pomegranate bark occurs sometimes in quills, but more frequently in irregular curved or channeled pieces, varying from 5 to 10 cm. in length, and from 12 to 25 mm. in width. The root-bark has a rough, yellowish-grey outer surface, marked with irregular conchoidal depressions due to exfoliation of the outer portion of the bark; the inner surface is smooth and yellow, with irregular brownish blotches. The bark breaks with a short fracture, and the fractured surface is nearly white; a transverse section exhibits fine tangential lines and finer radial lines when examined with a lens. The stem-bark is in straighter channeled pieces than the root-bark, and may also occur in quills. It frequently bears the minute apothecia of lichens, is smoother than the root-bark, and exhibits no conchoidal depressions, though it presents occasional shallow longitudinal furrows and bands of pale cork. Neither root- nor stem-bark has any distinctive odour, but both possess an astringent, slightly bitter taste.

The root-bark of *P. granatum* is distinguished by its rough surface with conchoidal depressions, and the stem-bark by its comparatively smooth outer surface bearing lichens. The bark of *Buxus sempervirens* has been found mixed with pomegranate bark, but is bitter without being astringent, as it contains no tannin. The chief constituents of pomegranate bark are the four alkaloids pelletierine (punicine), isopelletierine (isopunicine), methylpelletierine (methyl-punicine), and pseudo-pelletierine (pseudo-punicine). The first three are liquids, but pseudo-pelletierine occurs in crystals. Other constituents of the bark are mannite, sugar, gum, pectin, and more than 22 per cent of tannic acid. The pelletierine of commerce consists of pelletierine, properly so-called, and isopelletierine, the two constituents of the bark to which its anthelmintic power is due; the other two bases are inactive. Though pelletierine is a volatile liquid, it forms stable salts. The root-bark may contain more than 3 per cent. of aklaloids, but the stem-bark does not often contain more than 0·5 per cent. The proportion diminishes when the bark is kept, and the average amount in commercial bark is said to be only about 0·35 per cent.

GRANATI FRUCTUS.

Pomegranate Fruit.

The fruit of *Punica Granatum*, Linné (N.O. Lythrariaceæ), a shrub or small tree which is indigenous to North-Western India and cultivated in the warmer parts of temperate regions, especially in the countries bordering on the Mediterranean. It bears smooth, shining, bright green, opposite leaves, and rich scarlet or crimson flowers which have been used in medicine. The reddish-yellow fruit is a balausta or polycarpellary berry, about the size of an orange, of sub-globular shape, and of a brownish-yellow to dull crimson-red colour. It contains a juicy edible pulp of a reddish colour, with a sweetish but pleasantly acid taste. The seeds are demulcent, and have been employed in medicine, as well as the rind or pericarp of the fruit, which possesses astringent and anthelmintic properties, and is sometimes used for tanning purposes. The powdered rind has been given in cases of intermittent fever, and a decoction (1 in 20) has been taken internally as an astringent, or used as an injection or gargle.

Pomegranate fruit is crowned with a large, deeply five-toothed, tubular, leathery calyx, which encloses the remains of the stamens and style. The hard, leathery pericarp has a granular appearance externally, and is about 1·5 mm. thick. It encloses a large cavity which is divided by thin membranous dissepiments into a number of cells, closely packed with numerous sub-pyramidal seeds about 12 mm. long. A longitudinal section of the fruit shows its division into two portions by a membrane, and a transverse section shows how the upper portion is divided by radiating dissepiments into six cavities, while the lower portion contains from three to five irregularly arranged cavities. The placentation of the seeds is parietal in the cavities of the upper portion of the fruit.

Dried pomegranate fruit rind occurs in commerce in thin curved fragments of irregular shape, which are granular and brownish-yellow or reddish externally, and uniformly yellowish-brown within, shallow angular depressions indicating where the seeds have been. The rind breaks with a short, granular fracture, and is practically without odour, but has a powerfully astringent taste. It is distinguished by its granular outer surface, the impressions of the seeds on the inner surface, the absence of pulp, the occasional presence of fragments of the leathery calyx, and the strongly astringent taste of the drug. In the case of bael fruit (*Ægle Marmelos*), the rind is smooth externally and has more or less of the reddish pulp adhering to it; the fruit also consists of numerous carpels containing hairy seeds imbedded in mucilage. The chief constituents of pomegranate fruit rind are gum, sugar, and about 28 per cent. of tannic acid. It contains no alkaloidal matter, and yields about 6 per cent. of ash.

GRINDELIA.

Grindelia.

THE dried leaves and flowering tops of *Grindelia squarrosa*, Dunal (N.O. Compositæ), and *G. robusta*, Nuttall, both of which are perennial herbs indigenous to North America. The first grows in salt marshes west of the Rocky Mountains, and attains a height of 30 to 90 cm., while *G. squarrosa* is a less leafy and bushy plant, found on the western plains extending to the Sierra Nevada, and as far south as Texas. The two plants sometimes resemble each other so closely that it has been doubted whether they are distinct species. In the case of both plants, the flower-heads secrete a white sticky resin before they expand, and, in May and June, when the leaves and flowering tops are collected and dried, the whole plant is resinous. The drug possesses antispasmodic, expectorant, and slightly diuretic properties, and has also been applied locally in the form of a poultice. It is official in the Indian and Colonial Addendum, for use in the Australian and North American Colonies, the chief preparation of the drug being Extractum Grindeliæ Liquidum (1 in 1).

Grindelia consists usually of the upper part of the flowering stem, together with the flower-heads and a few leaves. The smooth, rounded, yellow or light brownish stems are about 45 cm. long, and bear the somewhat thick, pale green, coriaceous leaves alternately; but, as the leaves are easily broken off, they are frequently found detached. They are from 4 to 5 cm. long, vary in shape from broadly spathulate or oblong to lanceolate, and are sessile or clasping (amplexicaul), rather acute, more or less sharply serrate, often spinosely toothed, smooth, rigid, finely dotted, and brittle. The flower-heads are yellowish, hard, resinous, and either depressed globular in shape or nearly conical. The bracts are lanceolate-acuminate in shape, imbricated, and often covered with resin. The tubular disk florets and ligulate ray florets are of a yellow colour, but the ray florets are sometimes absent. The fruit is brown and compressed, tapers towards the base, and is crowned with a pappus consisting of two or three awn-like bristles. The drug has a slight persistent balsamic odour, and a pungent, aromatic, and bitter taste.

The distinctive characters of grindelia are the stalky appearance of the drug, the resinous exudation, especially on the flower-heads, and the pale green, rigid, brittle leaves. The drug appears to be collected indiscriminately from the two species, but that obtained from *G. robusta* is distinguished by the slightly serrate leaves and depressed globular flower-heads, that obtained from *G. squarrosa* having more deeply serrate leaves and nearly conical flower-heads; the bracts are more or less squarrosely tipped in both instances, but are closely appressed in the case of *G. robusta*. Though the dried stems are frequently stripped of their leaves, some of the flower-heads usually remain attached, but broken leaves and detached flower-heads are common in parcels of the drug. The chief constituents of grindelia are resin, volatile oil, and saponin. Other constituents of the drug are fat, wax, sugar, gum, tannin, and traces of an alkaloid named grindeline. The saponin is said to consist of two glucosides, resembling those of quillaia bark and senega root.

GUAIACI LIGNUM.

Guaiacum Wood; Lignum Vitæ.

THE heartwood of *Guaiacum officinale*, Linné (N.O. Zygophyllaceæ), a native of Hayti, Jamaica, and other parts of the West Indies, or of *G. sanctum*, Linné, a tree found in Cuba, the Bahamas, etc. The trunks of the trees consist chiefly of a dark heartwood, in which brown zones alternate with darker olive-green or nearly black zones. The heartwood is surrounded by a narrow ring of yellowish sapwood and a grey or ash-coloured bark. The wood of *G. sanctum* occurs in smaller pieces than that of *G. officinale*, and is also paler and less dense. After the trees are felled, the bark is removed and the heartwood cut into logs or billets for export, being used for medicinal purposes in the forms of chips, turnings, or raspings. It possesses stimulant, diaphoretic, and alterative properties, and is used in the preparation of guaiacum resin and Liquor Sarsæ Compositus Concentratus (1 in 10).

Guaiacum wood is dark greenish-brown in colour, dense, hard, and so heavy that it sinks in water. Any lighter, pale yellow chips or turnings consist of the sapwood, and should be rejected. The taste of the heartwood when chewed is acrid, owing to the presence of resin, which also causes it to give off a somewhat aromatic odour, recalling that of benzoin, when heated. On examination with a lens the medullary rays of guaiacum wood are seen to be straight, narrow, and closely approximated; the vessels are distinct, usually single, and arranged in concentric zones. An alcoholic tincture of the heartwood assumes a blue colour, as the result of oxidation of the resin it contains, on the addition of a diluted solution of ferric chloride.

The dark greenish-brown colour of the heartwood, and the distribution of the vessels it contains, are characteristic features of guaiacum wood. The chief constituent of the drug is the resin, which consists of guaiaconic, guaiaretic, and guaiacic acids, and is present to the extent of 20 to 25 per cent. in the heartwood, though only about 3 per cent. occurs in the sapwood. Other constituents of the drug are an innocuous saponin (guaiaco-saponin), 0·8 per cent. of a bitter, pungent substance, and 3 to 4 per cent. of extractive soluble in water. The resin assumes a deep blue colour when treated with oxidising agents.

GUAIACI RESINA.

Guaiacum Resin.

The resin obtained from the stem of *Guaiacum officinale*, Linné (N.O. Zygophyllaceæ), or *G. sanctum*, Linné. It exudes in tears spontaneously, or after deep cuts have been made in the stem or branches, but is extracted chiefly by the aid of heat. A billet about three feet long is bored longitudinally with an auger, and one end of it placed on a fire, the heat of which causes the resin to flow out of the boring at the other end; or, the wood is reduced to chips or sawdust and boiled in a solution of common salt, the resin being skimmed off as it rises to the surface. The resin which occurs in tears is the best, containing less insoluble matter than the masses; that extracted by boiling the wood is the most inferior in quality. The drug is stimulant, diaphoretic, and alterative, but is generally prescribed in combination with other medicines. It is used in the preparation of Mistura Guaiaci (1 in 40), Pilula Hydrargyri Subchloridi Composita (1 in 2¼), Tinctura Guaiaci Ammoniata (1 in 5), and Trochiscus Guaiaci Resina (3 grains).

Guaiacum resin occurs usually in large dark-coloured masses, often more or less covered with a greenish powder, but may occur in rounded tears about 25 mm. in diameter. It is brittle, breaking with a clean, glassy fracture, and thin splinters are transparent, their colour varying from yellowish - green to reddish - brown. The latter is the natural colour of the resin prior to oxidation taking place. The powdered resin is greyish, but becomes green on exposure to light and air, as the result of oxidation. The taste of the resin is slightly acrid, and its odour when warmed is somewhat balsamic, recalling that of benzoin. A solution of the resin in 90 per cent. alcohol assumes a deep blue colour on the addition of a diluted solution of ferric chloride. The colour is destroyed by reducing agents, but restored by oxidising agents.

The varying colour of guaiacum resin when viewed by transmitted light, the greenish powder covering it, and its peculiar odour and taste, are distinctive characters. The resin is also identified readily by the deep blue colour produced when an oxidising agent is added to an alcoholic solution. The chief constituents of guaiacum resin are guaiaconic, guaiaretic (guaiacinic), and guaiacic acids. Guaiaconic acid, which constitutes about 70 per cent. of the resin, is amorphous, and produces the blue colour with oxidising agents. Guaiaretic and guaiacic acids are crystalline. Other constituents of the resin are guaiac yellow, gum, and various impurities. Tears of guaiacum resin leave about 1·5 per cent. of gum, vegetable débris, etc., when dissolved in strong alcohol; the masses of resin may leave from 7·5 to 25 per cent. of residue.

GUARANA.

Guarana.

The prepared seeds of *Paullinia Cupana*, Kunth (N.O. Sapindaceæ), a climbing plant indigenous to, and cultivated in, Brazil and Uruguay. The seeds of the plant, which resemble small horse-chestnuts, are sub-globular, 8 to 10 mm. in diameter, and of a glossy blackish-brown colour, with a broad, light brown hilum and a whitish embryo. They are contained in a three-celled, three-valved, coriaceous capsule, and invested with a flesh-coloured arillus which is easily separated when dry. The seeds are collected when ripe, washed thoroughly, and freed from their papery shells by beating. The broken kernels are then coarsely powdered and water is added to form a paste, which is shaped into cylindrical or globular masses and dried in the sun, or by the heat of a slow fire so arranged as to avoid smoke. The dried masses constitute the guarana of commerce. The drug possesses mild astringent, tonic, stimulant, and nervine properties. It is used in the form of elixir (1 in 5), liquid extract (1 in 1), and tincture (1 in 4).

Guarana occurs in hard, heavy, sub-globular, elliptical, or cylindrical masses, from 10 to 30 cm. long and from 25 to 38 mm. thick. They are dark reddish-brown externally, but of a lighter reddish colour internally, breaking with an uneven fracture and having small pale angular fragments of seeds projecting slightly or imbedded in the darker-coloured mass. The powder is of a light reddish-brown colour, and contains thick-walled cells, thin-walled parenchyma, starch, crystals, oil-drops, etc. It has a scarcely perceptible odour and a slightly astringent, bitter taste.

The distinctive characters of guarana are its occurrence in extremely hard heavy masses, and the presence of small fragments of seeds imbedded in the masses. The chief constituent of the drug is from 2·5 to 5 per cent. of caffeine (guaranine); other constituents are tannin (catechu-tannic acid), catechin, starch, mucilage, fixed oil, resin, and volatile oil. Guarana is used in Brazil to make a beverage, just as tea and coffee are used elsewhere. It forms a refreshing drink and acts as a nervine stimulant when the fresh powder is suspended in sweetened water.

GUMMI INDICUM.

Indian Gum; Ghatti Gum.

An exudation from the wood of *Anogeissus latifolia*, Wallich (N.O. Combretaceæ), a large and very common tree indigenous to India and Ceylon. The tree is remarkable for the large amount of gum which flows from it, and contains 15·5 per cent. of tannic acid in its leaves, which are employed largely in India for tanning. The exudation, which forms the bulk of the "Ghâti" or "Ghatti" gum of the Bombay gum merchants, is used largely in India in conjunction with turmeric and other dye-stuffs. It possesses demulcent properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, in making official preparations for which gum acacia is directed to be used, one part of it replacing two parts of gum acacia.

Indian gum occurs in pale amber or yellowish-white, vermiform or rounded tears of varying size, the tears being transparent, with a somewhat dull surface, and breaking with a bright glossy fracture. The dull white, roughened surface and glassy fracture, free from cracks, distinguish Indian gum from all other gums. It has a faint odour and an insipid, mucilaginous taste. The gum should be entirely soluble in water, forming a viscid adhesive mucilage, but is insoluble in 90 per cent. alcohol. The aqueous solution is gelatinised by the addition of alcohol, borax, or lead subacetate, but is unaffected by ferric chloride or lead acetate. The solution should give no blue colour with iodine, and the gum should not yield more than 4 per cent. of ash.

The reactions of Indian gum closely resemble those of gum acacia, but the former yields only a slight precipitate with lead subacetate, while gum acacia forms an opaque white jelly with that reagent. The ferric chloride and lead acetate tests serve to show the absence of inferior gums, some of which contain tannin and give a bluish-black coloration with ferric chloride, while others are precipitated by lead acetate; the iodine test serves to prove the absence of starch. Indian gum possesses about twice the viscosity of gum acacia, forms a colourless or nearly colourless mucilage with water, and is a better emulsifier than any other gum. The chief constituents of Indian gum, like those of gum acacia, are arabic acid and salts of that acid, including the acid calcium salt, arabin.

GUTTAPERCHA.

Guttapercha.

THE dried purified latex obtained from *Palaquium oblongifolium*, Burck (N.O. Sapotaceæ), *P. Borneense*, Burck, *P. Treubii*, Burck, *Payena Leerii*, Kurz, and various other members of the same natural order, all of which are indigenous to the Malay Archipelago. They are large trees, containing in the bast and cortical parenchyma of the stem numerous superposed, elongated, laticiferous cells which are filled with a granular latex. The laticiferous cells extend into the mesophyll or interior parenchyma of the leaves, and the latter have been found to yield more guttapercha than the stem-bark. The bulk of the guttapercha of commerce is exported from Sumatra, where it has been customary to collect it by a somewhat wasteful process, trees about 30 cm. in diameter being felled, their branches removed, and transverse or oblique channels cut in the bark. The latex is discharged into the channels from the severed laticiferous vessels and, as in the case of caoutchouc, the albumin present coagulates and thus collects the suspended particles of guttapercha into a curdy mass. The coagulated latex is removed from the channels by scraping, then kneaded under hot water to free it from vegetable and earthy impurities, beaten with mallets to produce a homogeneous mass, and, finally, made into cakes. A less wasteful method of production is to use the leaves of cultivated trees, or of shoots sent up from the truncated stocks of trees which have been felled, as a source of guttapercha; they are dried, crushed, and treated with hot petroleum spirit or other suitable solvent, the pure guttapercha being deposited on cooling or on evaporation. The purification of crude guttapercha may be effected partially by slicing it and kneading it under hot water, or it may be heated with oil of turpentine and the solution evaporated after straining. Other methods of purification involve solution of the crude material in chloroform, benzene, or toluol, decolorisation of the solution with animal charcoal, and precipitation of the guttapercha as a white mass by the addition of alcohol to the filtered liquid. Guttapercha is used in medical and surgical practice for the same purposes as caoutchouc, solutions in chloroform being employed largely as vehicles for medicaments which are to be applied to the skin.

Guttapercha occurs in lumps of variable size, which are brown or greyish-brown externally, reddish-yellow or reddish-grey internally, and of laminated or fibrous nature. It is flexible and slightly elastic at ordinary temperatures, becomes softer and more flexible at about 50° C., and is very plastic and capable of being moulded into any form at temperatures above 65° C. On cooling it reassumes its former state and retains any form which may have been given to it. If exposed to a temperature of 166° C., it loses water and becomes translucent and grey on hardening, but immersion in water restores its original characters. When subjected to dry distillation, guttapercha yields volatile products resembling those given off by caoutchouc under the same conditions; heated in an open vessel, it melts and takes fire, the melted portion retaining the state of a viscid fluid on cooling. Purified guttapercha is white, firm, tough, and flexible, with but little elasticity. It is a bad conductor of heat and electricity, is easily cut with a knife, softens at 45° to 60° C., and can then be rolled into flat cakes or drawn into pipes. Oil of turpentine, carbon bisulphide, and benzene dissolve it entirely, and it is also very soluble in chloroform or petroleum spirit; alcohol, ether, and volatile oils dissolve it partially, but it is insoluble in water, alkaline solutions, or diluted acids.

The flexibility of guttapercha, and its property of retaining any form given to it when soft, are characteristic, as is also its behaviour with solvents. It is stated that *Palaquium oblongifolium* yields the finest guttapercha, the masses being homogeneous, compact, elastic, and capable of assuming any form after softening in hot water, while they stiffen again upon cooling. The product of *Payena Leerii* is lighter-coloured, less elastic, and less compact. The chief constituent of guttapercha is about 80 per cent. of a hydrocarbon named gutta, which is very similar in composition to the chief constituent of caoutchouc; other constituents of guttapercha are a yellow resinous substance named fluavil, and a white crystalline resin named alban, also colouring matter and mineral substances which leave 3 to 4 per cent. of ash. The hydrocarbon can be separated by treating guttapercha with dilute hydrochloric acid, and boiling the residue with ether; the gutta is deposited from the ethereal solution on boiling, and can be obtained pure by repeated treatment with ether. The resinous constituents of guttapercha are produced by the oxidation of the hydrocarbon; fluavil is soluble in cold alcohol, and alban in hot alcohol, also in chloroform, ether, or carbon bisulphide.

GYNOCARDIÆ OLEUM.

Gynocardia Oil; Chaulmoogra Oil.

THE fatty oil obtained by expression from the seeds of *Taraktogenous Kurzii*, King (N.O. Bixaceæ), a native of Burmah. It has been incorrectly stated that the source of the oil is *Gynocardia odorata*, R. Browne, or *G. Prainii*, Desprez, but neither of those plants produces the seeds from which the oil is obtained. The oil possesses alterative and emetic properties, and is administered in the form of an emulsion, or in capsules, or mixed with other oils. It is also used externally in the treatment of skin diseases. It is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. The chief preparation of the oil is Unguentum Gynocardiæ (1 in 10).

Gynocardia oil is a brownish-yellow oil or fat of varying consistence, having a characteristic odour and a somewhat acrid taste. It has an acid reaction, and may liquefy fully only at 42° C., re-solidifying in different periods at temperatures from 15·5° C. upwards. The specific gravity of the oil is not constant, but varies usually from 0·930 to 0·954 at 30° to 40° C. The oil is soluble in purified ether, chloroform, or carbon bisulphide, and the greater part of it is dissolved by cold 90 per cent. alcohol, the remainder being dissolved by repeated treatment with warm alcohol. A little insoluble, non-fatty matter is sometimes present in the oil, and causes turbidity of solutions in the liquids mentioned.

The chief constituent of chaulmoogra oil is about 12 per cent. of gynocardic acid, which produces a reddish-brown coloration, changing to olive-green, on mixing the oil with 5 per cent. of strong sulphuric acid. The acid can be obtained in crystalline plates, and has an acrid, burning taste. Other constituents of chaulmoogra oil are palmitic acid, the glycerides of gynocardic and palmitic acids, and the glycerides of hypogæic and cocinic acids.

HÆMATOXYLI LIGNUM.

Logwood.

THE heartwood of *Hæmatoxylon campechianum,* Linné, (N.O. Leguminosæ), a tree of medium size, indigenous to Campeachy, Honduras, and other parts of Central America, and naturalised in Jamaica and other West Indian islands. The wood is exported in logs or billets, from which the bark and sapwood have been removed, as the heartwood alone contains the colouring and astringent principles. It is seen usually in chips, turnings, or coarse powder, and is used chiefly as a dye-stuff, being prepared for that purpose by exposure to the air in a moist state until fermentation takes place. For medicinal purposes, however, unfermented logwood is preferred. It is a valuable astringent, and is used in the form of Decoctum Hæmatoxyli (1 in 20), or as an extract or liquid extract (1 in 1).

Logwood is hard, compact, and heavy, dull orange to purplish-red externally, and reddish-brown internally, the colour varying with the proportion of colouring matter present. A transverse section exhibits narrow and closely approximated medullary rays, also narrow concentric dark zones alternating with paler ones in which the presence of colouring matter is less evident. The chips or coarse powder should be unfermented, and have then a slight and somewhat agreeable odour recalling that of violets, and a sweetish, astringent taste. When chewed, the wood colours the saliva dark pink or violet, and a similar colour is imparted by logwood to dilute aqueous solutions of caustic alkalies.

The chief constituent of logwood is a colourless crystalline body named hæmatoxylin or hæmatin, of which the unfermented wood contains about 10 per cent.; other constituents are tannin, fat, resin, and a trace of volatile oil. Hæmatoxylin has a sweet taste resembling that of liquorice, without bitterness or astringency. It yields pyrogallol when fused with alkalies, and tends to become oxidised into hæmatein on keeping, the colourless crystals of hæmatoxylin gradually acquiring a yellowish or yellowish - rose colour, and also becoming bitter, acrid, and slightly astringent; the change may be brought about more rapidly by the action of alkalies upon hæmatoxylin, the resulting hæmatein then forming blue, red, or purple solutions. Hæmatein occurs in dark reddish-brown or violet plates and scales, with a fine green lustre, and can be re-converted into hæmatoxylin by the reducing action of hydrogen or sulphurous acid. It is formed from hæmatoxylin when logwood is fermented, the wood becoming darker in colour, while dark green lustrous patches of hæmatein form on the surface.

HAMAMELIDIS CORTEX.

Hamamelis Bark; Witch Hazel Bark.

The dried bark of *Hamamelis virginiana*, Linné (N.O. Hamamelidaceæ), a shrub indigenous to the United States and Canada. The bark is collected in the spring and dried. It is a local astringent and hæmostatic, and is used chiefly in the form of Tinctura Hamamelidis (1 in 10), which is diluted largely with water for local application. The name "hamamelin" is given to a brown powder prepared by extracting the bark with diluted alcohol and evaporating the resulting solution to dryness; it is richer in tannin than the green hamamelin obtained from hamamelis leaves, but does not keep so well, owing to the presence of hygroscopic substances extracted from the bark.

Hamamelis bark occurs usually in thin channeled or curved pieces about 1·5 mm. thick, and varying from 0·5 to 2 dcm. long. It is sometimes covered with a smooth silvery-grey or ash-grey cork marked with transverse lenticels, but is frequently free from cork, the smooth reddish-brown cortex being then exposed and exhibiting under the lens slight transverse striations. In older pieces of bark, the cork is darker in colour, fissured and scaly. The inner surface of the bark is pale reddish-pink in colour and finely striated longitudinally, small portions of dense white wood with numerous fine medullary rays being frequently found adhering to it. The cork and cortex break with a short fracture, but that of the inner portion of the bark is coarsely fibrous, the bast tending to separate into laminæ, owing to the presence of numerous tangentially elongated groups of bast fibres. A smoothed transverse section of the bark exhibits the groups of bast fibres and a dark narrow cortex, the latter separated from the bast by a pale tangential line of sclerenchymatous cells; in some pieces of bark the sclerenchymatous cells may form the outer layer, owing to the removal of much of the cortex, in addition to the cork. The bark has an astringent taste, but no marked odour.

The pinkish colour, the pale grey cork with lenticels, and the line or ring of sclerenchymatous cells, are distinctive characters of hamamelis bark. It somewhat resembles oak and willow barks, but oak bark has a glossy cork, and is usually of a brownish colour, while willow bark has a dull greenish-brown cork, is usually striated on the outer surface, and does not exhibit the line of sclerenchymatous cells. The chief constituent of hamamelis bark is about 6 per cent. of tannin, which consists partly of crystalline hamamelo-tannic acid and partly of amorphous glucosidal tannin; other constituents of the drug are gallic acid, resin, fat, phytosterin, volatile oil, and traces of bitter and pungent principles.

HAMAMELIDIS FOLIA.

Hamamelis Leaves; Witch Hazel Leaves.

The fresh or dried leaves of *Hamamelis virginiana*, Linné (N.O. Hamamelidaceæ), a shrub indigenous to the United States and Canada. The leaves are collected usually in the autumn. When dried, they occur in commerce in a somewhat indifferent state of preservation, being frequently discoloured, broken, and pressed together into more or less compact masses. The drug is a local astringent and hæmostatic. The fresh leaves are used in the preparation of Liquor Hamamelidis (1 in 1), and the dried leaves in the preparation of Extractum Hamamelidis Liquidum (1 in 1), while Unguentum Hamamelidis (1 in 10) is prepared from the liquid extract. Hamamelin, obtained from the leaves by extraction with strong alcohol, is a green powder containing less tannin than the brown extract prepared from hamamelis bark, but it keeps better than the bark extract.

Hamamelis leaves are from 7 to 15 cm. in length, dark green or brownish-green on the upper surface, and paler on the under surface. They are broadly oval in outline, obtuse at the apex, and have a sinuate margin. Towards the base, the lamina becomes narrowed and oblique; it is also slightly heart-shaped and shortly stalked. The leaves are pinnately veined, the veins being more prominent on the under surface. The lateral veins, which run direct from the midrib to the margin, are practically the only ones that can be seen on the upper surface. In the angles formed by the lateral veins, branching or stellate hairs may usually be found, being more frequent on young leaves. Very young leaves are brown in colour and densely hairy. The leaves have an astringent, slightly bitter taste, but no marked odour.

The distinctive characters of hamamelis leaves are the sinuate margin, the lateral veins running direct to the margin, and the branching or stellate hairs. The chief constituent of the leaves is tannin, similar to that which exists in hamamelis bark; other constituents of the leaves are gallic acid, a trace of volatile oil, and a bitter principle, while the liquid extract of hamamelis contains a trace of protocatechuic acid. When the leaves are distilled with water or diluted alcohol, as in preparing Liquor Hamamelidis, some decomposition appears to take place, as the odour of the distillate differs from that of the leaves, owing, apparently, to the formation of some aromatic body.

HELLEBORI NIGRI RHIZOMA.

Black Hellebore Rhizome or Root.

THE rhizome and rootlets of the Christmas rose, *Helleborus niger*, Linné (N.O. Ranunculaceæ), a native of the mountainous regions of Central and Southern Europe, which is largely cultivated in this country as a garden plant. It is a low perennial herb with a knotted, fleshy, creeping rhizome, the direction of which may be horizontal, oblique, or even erect. The rhizome gives off numerous long, simple, depending fibrous rootlets which are brownish-yellow when fresh, but become darker on drying. It is collected in the autumn—chiefly in Germany—and dried. The drug possesses drastic purgative and emmenagogue properties, and is used in the form of tincture (1 in 8).

Black hellebore rhizome occurs in irregular, tortuous, branched pieces, about 2·5 to 5 cm. long, and 5 to 7·5 mm. thick, or, when older, in knotty masses. The short erect branches are marked with encircling leaf-scars, and usually bear the scar of an aerial stem or the remains of a stem or bud at the free extremity. The rhizome and straight, unbranched, brittle roots are black or brownish-black externally. Internally, the rhizome is yellowish or greyish; it breaks with a short fracture, and a transverse section exhibits a thick bark, enclosing a ring of about eight small, usually narrow and radially elongated wood-bundles, which enclose a large pith. A similar section of a root exhibits a thick bark encircling a hexagonal wood, which tends to assume a stellate form in older roots, though never to such a degree as in the roots of *Cimicifuga racemosa*. When cut or broken, the drug has a slight odour which somewhat resembles that of senega root. It also has a somewhat bitter-sweet and acrid taste. The dark colour, tortuous appearance, short erect branches, and peculiar structure of the rhizome distinguish it from most other drugs.

The rhizome of *H. viridis*, Linné, closely resembles that of black hellebore, but is much more bitter and acrid than the latter, while the wood-bundles appear broader and shorter in a transverse section. In the rhizome of *Cimicifuga racemosa* the branches curve upwards, and a transverse section exhibits a thin bark, surrounding a ring of numerous narrow wedges of wood; the structure of the roots also differs from that of black hellebore roots, a transverse section exhibiting from four to six wedges of whitish wood and broad dark medullary rays. The chief constituents of black hellebore rhizome are the poisonous crystalline glucosides helleborin and helleborein, the first of which has a burning, acrid taste, while the second is sweetish. When decomposed by acids, helleborin yields helleboresin, and helleborein yields helleboretin. Other constituents of the drug are resin, fat, and starch. No tannin or quercitrin-like body is present, and an infusion of the drug does not, therefore, assume a black or dark green colour on the addition of ferric chloride, as is the case with an infusion of black snake-root.

HEMIDESMI RADIX.

Hemidesmus Root; Indian Sarsaparilla.

THE dried root of *Hemidesmus indicus*, R. Brown (N.O. Asclepiadaceæ), a climbing plant indigenous to India and Ceylon. The dried root has long been employed as a substitute for sarsaparilla in India, whence the drug is exported to this country. It is reputed to possess alterative, diaphoretic, diuretic, and tonic properties, but is used chiefly as a flavouring agent, being employed in the form of Syrupus Hemidesmi (1 in 8).

Hemidesmus root occurs in long, rigid, nearly cylindrical pieces, which are tortuous, longitudinally furrowed, and transversely fissured at intervals. They are hard, woody, and often more than 30 cm. long, but seldom exceed 6 mm. in thickness. They vary in colour from reddish-brown to dark brown or nearly black. The pieces branch occasionally, bear a few fibrous rootlets, and may have portions of the slender aerial stems — marked with opposite leaf-scars—attached to one extremity. At one side of the root the thin cork is frequently separated from, and raised above, the cortex. A transverse section exhibits a thin greyish bark or cortex, containing numerous laticiferous cells, and surrounding a larger, porous, yellowish wood, which is not distinctly radiate. The root has a fragrant odour recalling that of tonka beans, and a somewhat sweet taste.

The tortuous character, transverse cracks, easily separable cork, and large yellowish wood are distinguishing characters of hemidesmus root. Though somewhat resembling it in appearance, sarsaparilla root differs in being destitute of transverse cracks, while it has a firmly adherent cork and a small wood. The chief constituent of hemidesmus root is coumarin, to which the fragrant odour of the drug is due; other constituents are starch and traces of tannin.

HIRUDO.

Leeches.

The speckled leech, *Sanguisuga medicinalis,* Savigny (Order Hirudinea), and the green leech, *S. officinalis,* Savigny, two fresh-water members of the Class Annelida, which are collected in various parts of Europe, the speckled (Swedish or German) leech being found in Central and Northern Europe, while the habitat of the green (Hungarian) leech is Southern Europe. They occur in fresh-water ponds, swimming with an undulating motion, or crawling by the aid of their suckers, attaching themselves first by one extremity and then by the other, and progressing by alternately stretching out and contracting their bodies. Leeches are imported chiefly from Hamburg, and are used to extract blood from congested parts. Inside the anterior sucker, by means of which the leech attaches itself, are three curved chitinoid plates, placed radially, and having finely serrated edges. The leeches bite through the skin with these jaws or "teeth," and continue to draw blood until they are gorged, when they drop off. The skin should be well cleaned before applying them, and the leeches should be confined in tubes known as leech glasses, when they are to be applied to on of the orifices of the body.

Leeches have a soft, smooth body, 5 cm. or more i length, tapering to each extremity. A section of th body appears plano-convex, the convexity being on th dorsal surface, which is olive-green in colour, with si rusty-red longitudinal stripes. The body is also divide into twenty-six segments, each of which, except those at the extremities, is marked by five fine rings, the total number of the annulations being from ninety to a hundred. The anterior end of the body is terminated by a small sucker surrounding the tri-radiate jaws, and the posterior end is similarly terminated by a large adhesive sucker. In *S. medicinalis* the ventral surface is greenish-yellow, with black spots; in *S. officinalis* the ventral surface is olive-green, without spots. The absence of bristles and "foot-tubercles" distinguishes leeches from the higher Annelida.

When leeches have become gorged with blood, a period of several months is required for digestion in the ordinary course, but they can be made to get rid of the blood readily by placing them in a 16 per cent. aqueous solution of common salt, then taking them by the tail, one by one, dipping them into warm water, and passing them lightly between the fingers. After being replaced in fresh water, they should again be fit for application at the end of eight or ten days. The blood absorbed by leeches is coagulated by hirudine, a peptone allied to the albumoses, which can be extracted from the leeches and used as an anti-hæmorrhagic.

HIRUDO AUSTRALIS.

Australian Leeches.

Five-striped leeches, *Hirudo quinquestriata*, Schmarda (Order Hirudinea), also known as *H. australis*, Bosisto, or *Timnobdella quinquestriata*, R. Blanch. This variety is official in the Indian and Colonial Addendum, for use in the Australasian Colonies instead of European leeches.

Australian leeches are of a greenish yellow-brown colour on the dorsal surface, where they are marked with five longitudinal stripes. They are greenish-yellow on the ventral surface, and have large jaws, with forty-eight to fifty teeth, the inner ones being the larger.

The number of longitudinal stripes on the dorsal surface distinguishes Australian leeches from the European species used in medicine, the absence of spots on the ventral surface being also to some extent characteristic. Both *Sanguisuga medicinalis* and *S. officinalis* have six longitudinal stripes, and the former has black spots on the ventral surface.

HORDEI FRUCTUS.

Barley.

The fruit of *Hordeum distichon*, Linné (N.O. Graminaceæ), a native of Western Asia, which is now cultivated in different parts of the world for the sake of its grain. The inflorescence of the grass is a bilateral spike, composed of an aggregation of spikelets, arranged in threes on opposite sides of the rachis, the central floret in each spikelet being fertile, while the other two are abortive. The lower bracts borne by the spikelets are known as glumes, and those subtending the florets are the paleæ. The inferior or outer paleæ are prolonged into bristle-like appendages named awns, and the inner paleæ so closely envelop the grains formed after fertilisation has taken place that they are adherent to the pericarp. The dried grains of plants cultivated in Britain, divested of their integuments, are known as pearl barley (Hordeum Decorticatum). A decoction of pearl barley (1 in 10) is used for its nutritive and demulcent properties, also as a drink in febrile diseases, or as a diluent of cow's milk, a more easily digested curd being thus formed when the milk is taken as a food by very young children. Barley is also used for preparing malt, from which, when freshly crushed, extract of malt is prepared.

Barley consists of elliptic grains about 9 mm. long, tapering towards both ends and somewhat truncate, with a longitudinal furrow traversing the pericarp. On removing the adherent, smooth, greyish-yellow paleæ, the pericarp appears of a brownish colour. A transverse section of a grain, examined under a lens, exhibits the pericarp closely combined with the testa, forming an outer coating of dead cells, inside which is the white endosperm, consisting of an aleurone layer enclosing a mass of parenchyma filled with starch. The crushed grains have a faint odour in the mass, and a mild, sweetish, farinaceous taste. Pearl barley is globular, white, and mealy, with a groove on one side, containing traces of the brownish integuments; it has usually been almost completely deprived of the pericarp and testa, but a portion of the aleurone layer remains. The starch of barley resembles that of wheat, but the granules are rather smaller.

The grains of barley are distinguished chiefly by their elliptic shape, by the longitudinal groove traversing the pericarp, and by the mealy appearance of the decorticated grains. The chief constituents of barley are about 60 to 70 per cent. of starch, and 12 to 16 per cent. of albuminoids; other constituents are sugar, dextrin, fat, and various salts, which yield nearly 3 per cent. of ash. Malt is prepared by subjecting barley to the action of heat and moisture so as to induce incipient germination, after which the grains are dried. The object of this operation is to develop the maximum amount of diastase — a ferment formed during germination, which is able to convert starch into dextrin and maltose. The soluble portion of malt—consisting chiefly of dextrin and maltose, with some albumin and phosphates—can be extracted by infusing or macerating the ground malt with water at a temperature of 60° to 70° C. Extract of malt is obtained by filtering the resulting solution and evaporating it in a vacuum apparatus to the consistence of syrup or thick honey, as may be desired, diluted alcohol being sometimes added to syrupy extracts as a preservative.

HYDRASTIS RHIZOMA.

Hydrastis Rhizome; Golden Seal Rhizome.

The dried rhizome and roots of the golden seal, *Hydrastis canadensis*, Linné (N.O. Ranunculaceæ), a small herbaceous perennial plant which is widely distributed in the United States and Canada, being found in moist, rich woodlands. It has a thick, fleshy, yellow rhizome, from which proceed numerous long roots and an erect, simple, pubescent stem from 15 to 30 cm. in height. The remains of stems are frequently found attached to the rhizome, which is collected in the autumn after the leaves have withered. The drug possesses tonic, nervine stimulant, hæmostatic, astringent, and stomachic properties, and is useful in chronic catarrhal conditions of the mucous membranes. It is used chiefly in the form of Extractum Hydrastis Liquidum (1 in 1) and Tinctura Hydrastis (1 in 10), both preparations being largely diluted with water when required for local application. The name "hydrastin" has been given to powdered extracts of hydrastis, prepared by exhausting the drug with diluted alcohol, or by precipitating an infusion of hydrastis with hydrochloric acid; these preparations contain the alkaloidal and resinous matters of the drug in variable proportions, and must not be confounded with the alkaloid hydrastine.

Hydrastis rhizome is yellowish-brown, becoming darker with age, and occurs in rough, knotty, and tortuous pieces from 12 to 38 mm. long and from 3 to 12 mm. in thickness. Branched pieces are uncommon, though the rhizome frequently gives off short ascending branches which terminate in cup-shaped scars, indicating the position of the aerial stems of previous years. The branches are found on the upper surface of the rhizome, and bear encircling scars of cataphyllary leaves, which are much more distinct than the scars found on the rhizome itself. From the sides and under surface of the rhizome proceed numerous thin, shrivelled, wiry, brittle yellow roots, but they break off readily, leaving small protuberances. The rhizome is hard, and breaks with a clean, short, resinous fracture, the surface thus exposed being smooth and of a dark brownish-yellow or greenish-yellow colour. A transverse section exhibits a comparatively thick bark and a ring of bright yellow, somewhat distant, narrow wood-bundles, surrounding a large pith. The root exhibits a dark-coloured bark and a small bright yellow wood. The drug has a slight but characteristic odour, and a bitter taste.

The yellow colour of hydrastis rhizome, the appearance of a transverse section, and the characteristic odour of the drug distinguish it readily from blood-root, obtained from *Sanguinaria canadensis*, which is usually of a dark reddish-brown colour, while a transverse section exhibits a more or less pronounced red colour and no evident wood-bundles. The chief constituents of hydrastis rhizome are the alkaloids berberine, hydrastine, and canadine (tetrahydroberberine). Other constituents of the drug are a fluorescent compound, resin, albumin, starch, fatty matter, sugar, and a small quantity of volatile oil, to which its odour is due. Berberine is present to the extent of 3·5 to 4 per cent., and constitutes the yellow colouring matter of the drug. Hydrastine, of which the rhizome contains 2 to 4 per cent., can be converted into hydrastinine by oxidation, and canadine yields berberine by reduction. Berberine forms yellow acicular crystals, while hydrastine occurs in colourless prisms, and canadine in small white nodules.

HYGROPHILA.

Hygrophila.

THE dried herb, including the root, of *Hygrophila spinosa*, T. Anderson (N.O. Acanthaceæ), a native of India, which is also known as *Asteracantha longifolia*, Nees. The plant attains a height of 60 to 120 cm., and bears white or bright purplish-blue flowers. The drug possesses demulcent and diuretic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, the chief preparation of the herb being Decoctum Hygrophilæ (1 in 10).

Hygrophila has tapering roots, with numerous rootlets, and quadrangular, sparingly branched stems, with opposite branches and leaves, and swollen nodes. There are six entire leaves at each node, the two outer ones being from 10 to 13 cm. long and 12 mm. broad, while the four inner leaves are 4 cm. long, linear-lanceolate, and tapering to each end. A yellowish subulate spine, about 2·5 cm. long, occurs in the axil of each leaf. Both stem and leaves bear scattered, hispid, spreading, three- to five-celled white hairs, which are more numerous near the nodes and on the bracts and young leaves. The flowers occur at the nodes, four pairs occurring at each node, and the bracts resemble leaves in shape. The calyx has four sepals, one of which is broader than the others; the corolla is glabrous and two-lipped, with didynamous stamens and an oblong staminode on the lower lip. The fruit contains four to eight brownish flattened seeds, from 2 to 3 mm. long and 1 to 1·5 mm. broad; they are unequal at the base, rounded at the apex, and have a projecting angle from base to apex on one surface. They exude a tenacious mucilage when moistened, but have scarcely any flavour and are without odour.

The distinctive characters of hygrophila are the tapering roots, quadrangular stem with swollen nodes, the hairs on the stem and leaves, and the manner in which the seeds adhere to the tongue when placed in the mouth. The chief constituent of the drug is mucilage, but, in addition, all parts of the plant contain alkaloidal matter, phytosterin, fixed oil, etc. The seeds are glutinous as well as mucilaginous; they contain the equivalent of more than 31 per cent. of albuminoids, and about 23 per cent. of a yellow fixed oil.

HYOSCYAMI FOLIA.

Hyoscyamus Leaves; Henbane Leaves.

THE fresh leaves and flowers of henbane, *Hyoscyamus niger*, Linné (N.O. Solanaceæ), with the branches to which they are attached; also the leaves and the flowering tops, separated from the branches and dried carefully. The plant is an erect herb which is distributed over the whole of Europe and extends to Persia and India. It is cultivated for medicinal purposes in England and Germany, much of the henbane of commerce being imported from the latter country. There are both annual and biennial varieties of henbane, but the product of flowering biennial plants is preferred for medicinal use. During the first year of its growth, the biennial variety produces no flowers, but simply a rosette of large-stalked leaves, about 30 cm. long, which are frequently collected and sold as "first biennial henbane." A large branching stem is produced during the second year, and attains a height of 1 metre or more. The leaves and flowering tops which constitute the "second biennial henbane" are collected soon after the plant has flowered, either with or without the smaller branches to which they are attached, and carefully dried, unless they are required for the preparation of the juice or green extract. The drug possesses hypnotic, mild diuretic, and antispasmodic properties, and is similar in its action to belladonna and stramonium, though milder in its effects. It is used in the preparation of hyoscine hydrobromide, hyoscyamine sulphate, Extractum Hyoscyami Viride, Succus Hyoscyami, and Tinctura Hyoscyami (1 in 10): the extract of hyoscyamus is an ingredient of Pilula Colocynthidis et Hyoscyami (1 in 3).

Hyoscyamus leaves vary considerably in size, but seldom exceed 25 cm. in length, the lower or root leaves being the larger and stalked, while the upper leaves are sessile. The leaves are arranged alternately on the stem or branches, triangular-ovate or ovate-oblong in outline acutely pointed, and without stipules. The margin i undulated, irregularly toothed, and sinuate or pinnatifid The leaves are pale green in colour, with a broad, com spicuous midrib, and are furnished on both surfaces, bu particularly near the veins on the under surface, with sof glandular hairs which secrete a resinous substance tha causes the fresh leaves to feel unpleasantly clammy c sticky. Similar hairs occur on the sub-cylindrical branches. The mesophyll of the leaf contains small prismatic crystals of calcium oxalate. The flowers proceed from the axils of large, hairy, and coarsely dentate leafy bracts, and are usually crowded together; they have a hairy pitcher-shaped calyx and a yellowish gamopetalous corolla, with a network of purplish veins. The capsular fruit (pyxis) is two-celled, and contains numerous seeds. The strong, characteristic, tobacco-like odour of the fresh herb disappears to a large extent on drying, but the bitter and slightly acrid taste then becomes more pronounced.

The leaves of hyoscyamus are distinguished from those of belladonna, digitalis, stramonium, and various other plants, by the shape of the crystals of calcium oxalate found in the mesophyll. Biennial hyoscyamus is characterised by the sessile hairy leaves with sinuate-dentate outline and broad midrib, the purple veins of the corolla, and the shape of the ovary or fruit. It occurs in commerce in dried, irregularly rounded or flattened masses, about 25 to 50 mm. in diameter, in which can easily be identified the coarsely dentate hairy bracts, the yellowish corolla with purple veins, and the two-celled ovary with numerous ovules. The first year's leaves of biennial henbane are stalked, free from stem or flowers, and longer and narrower than those of the second year; annual henbane has smaller leaves, a slender simple stem, a paler corolla than biennial henbane, and less distinct purple veins. The chief constituent of hyoscyamus is the crystalline alkaloid hyoscyamine, which is accompanied, on extraction, by small quantities of its isomer atropine, and of hyoscine or scopolamine, an amorphous base which occurs as a varnish-like or oily liquid, though it forms crystalline salts. Other constituents of hyoscyamus are a glucosidal bitter principle named hyoscypicrin, choline, mucilage, albumin, calcium oxalate, and potassium nitrate. The dried leaves, whether from wild or cultivated plants, may yield 0·25 per cent. or more of total alkaloid, three-fourths of which consists of hyoscyamine, a base which also occurs in the roots of *Scopola carniolica*, Jacquin, the flowers of *Datura alba*, Nees, and in other solanaceous plants.

Hyoscyamine separates in crystalline form from the solution of mixed alkaloids obtained by extraction with ether of drugs containing the base. It is difficult to obtain the base free from its isomer atropine, which does not pre-exist in the drug, but is formed from hyoscyamine during the process of extraction, by the action of heat or the alkali employed. Atropine differs from hyoscyamine and hyoscine in being optically inactive. Hyoscine occurs in all the plants which yield hyoscyamine, the chief source of the base being *Datura alba*, the flowers of which yield 0·51 per cent. of hyoscine, together with 0·03 per cent. of hyoscyamine and 0·01 per cent. of atropine.

The mixed alkaloids can be extracted with ether in a reflux condenser, the hyoscyamus or other drug being previously moistened with solution of potassium or sodium carbonate; the ethereal solution is subsequently shaken out with diluted sulphuric or hydrochloric acid, and the acid solution in turn shaken out with chloroform and ammonia. The chloroform solution, washed with water and then evaporated, leaves the alkaloids in the form of a brownish syrup, from which most of the hyoscyamine and atropine can be removed by treatment with ether, those two bases separating from the ethereal solution in the form of crystals. Any hyoscyamine or atropine that may remain can be removed by subsequent re-crystallisation, and if atroscine be present, as is the case when the mixed alkaloid is extracted from *Scopola carniolica*, it can be removed by crystallisation at a very low temperature, the pure hyoscine being left in the mother liquor, from which it can be obtained as a varnish-like or oily liquid. Hyoscyamine sulphate is prepared from hyoscyamine by neutralisation of the base with diluted sulphuric acid and subsequent crystallisation. Hyoscine hydrobromide is prepared by neutralising hyoscine with hydrobromic acid, evaporating the clear, filtered solution to a small bulk, adding strong alcohol to separate the crystals which form, and subsequently recrystallising from hot, strong alcohol.

HYOSCYAMI SEMINA.

Hyoscyamus Seeds; Henbane Seeds.

THE seeds of *Hyoscyamus niger*, Linné (N.O. Solanaceæ), an erect herb which is distributed over the whole of Europe, and extends to Persia and India. It is cultivated for medicinal purposes in England and Germany. The fruit of the plant is a small two-celled capsule (pyxis), which dehisces transversely, the upper part separating from the lower like the lid of a box. The fruit encloses a large number of minute seeds which are collected when ripe and dried. They possess anodyne, hypnotic, and narcotic properties, and have been given in the form of powder, but they are not often used in medicine. As a domestic remedy, they are sometimes used for toothache, the seeds being thrown upon hot coals, and the vapour inhaled.

Hyoscyamus seeds are of a dark grey or greyish-brown colour, from 1 to 1·5 mm. in length, flattened and roundish-reniform in shape, and slightly pointed at one extremity, where the hilum and micropyle occur on the concave edge. Examined under a powerful lens, the surface of the seed is seen to be minutely, but regularly and deeply, reticulate, the reticulations being smaller near the hilum. A longitudinal section, cut parallel with the flat surface, exhibits a coiled embryo imbedded in a whitish oily endosperm, with the tip of the cotyledons incurved. The seeds have no odour, but they taste oily, slightly bitter, and somewhat acid.

The small size, sub-reniform shape, and deeply reticulated surface of henbane seeds distinguish them readily from other seeds which resemble them, black poppy seeds being distinctly reniform and having larger and shallower reticulations on the surface, while stramonium seeds are much larger and darker in colour. The chief constituent of henbane seeds is the alkaloid hyoscyamine, which is accompanied by a small quantity of hyoscine or scopolamine; other constituents are a bitter glucoside named hyoscypicrin, 20 to 25 per cent. of fixed oil, resin, mucilage, proteids, and various salts. The total alkaloid present is about 0·058 per cent., and the seeds yield from 3 to 4 per cent. of ash.

ICHTHYOCOLLA.

Isinglass.

A GELATINOUS substance prepared from the sound or swimming-bladder of the sturgeon, *Acipenser Huso*, Linné (Order Sturiones), and of other species of *Acipenser*, found in the Caspian and Black Seas, and their tributary rivers. Inferior isinglass may be prepared from the sounds of other kinds of fish, including the cod, ling, and hake.

Russian isinglass is imported from Astrakhan, St Petersburg, and Taganrog; Brazilian isinglass, which is obtained from various unknown species of fish, is imported from Para and Maranham. The so-called swimming-bladder is a membranous air-bag found in the anterior part of the abdomen of most fishes, and consists of two thin and delicate inner coats, with an outer tough coat of silvery whiteness. After removal from the sturgeon, the bag is split open and washed in water so as to remove blood, fat, and adhering extraneous membranes, after which it is spread out to dry. When sufficiently stiffened, the membranes are dried flat, or, after being folded, they may be formed into cylindrical rolls, the ends of which are secured together so that the rolls may dry in the form of a lyre or a staple. Thus prepared, the product is known as staple isinglass, two varieties of that form being distinguished as long and short staple respectively. More frequently, however, the membranes are dried flat, or simply folded, being then known as leaf or book isinglass. The prepared membrane is commonly sold in the form of fine shreds.

Isinglass occurs in fine white or yellowish shreds, or in separate sheets of a horny or pearly appearance, which are sometimes rolled. It is semi-transparent, iridescent, inodorous, and insipid. It softens, swells up and becomes opalescent in cold water, but is insoluble in that liquid, though almost entirely soluble in boiling water or in boiling diluted alcohol. A solution of isinglass in twenty-four parts of boiling water forms, on cooling, a transparent jelly. Cake isinglass, which is sometimes seen in globular masses, is prepared by boiling pieces of membrane in water, thus dissolving the gelatin, which is subsequently left in the solid state upon evaporation of the solvent. Purse or pipe isinglass consists of fish sounds dried without being cut open.

The finest Russian isinglass is the product of *Acipenser Huso*, and is imported from Astrakhan and St Petersburg. Inferior kinds are often yellowish and more opaque. Brazilian isinglass is inferior to Russian, and American isinglass consists of thin sheets or long ribbons prepared from the sounds of the hake and other fish. Japanese or Chinese "isinglass," also known as "agar-agar," is prepared from various Algæ. The best isinglass consists almost entirely of gelatin, with about 2 per cent. of insoluble membrane, and leaves only about 0·5 to 0·9 per cent. of ash. Specimens adulterated with glue or commercial gelatin may yield from 2 to 4 per cent. of ash. An aqueous solution of isinglass (1 in 50), recently prepared, is precipitated by tannic acid, and the solution is therefore used as a test for the latter substance, with which the gelatin in the isinglass forms an insoluble compound.

IGNATII SEMINA.

Ignatius Beans; Ignatia Amara.

The seeds of *Strychnos Ignatii*, Bergius (N.O. Loganiaceæ), a stout climbing plant with a woody stem, indigenous to the Southern Philippine Islands. The plant produces a large ovoid fruit, about the size of a pear, containing a number of seeds imbedded in a pulp from which they are separated and dried. They are covered with whitish hairs when fresh, but the hairs are very easily rubbed off and are very rarely seen on commercial specimens. The seeds are poisonous and possess tonic properties like those of nux vomica. The drug is used in the form of extract, liquid extract, and tincture (1 in 10).

Ignatius beans are of a dull brownish or blackish colour, oblong or ovate and irregularly angular in shape, about 25 mm. to 30 mm. long, and rather less in breadth and thickness. The seeds frequently have one large curved side and three or four smaller flattish surfaces with rounded angles, but some are irregularly bluntly angular. Patches of the dull ash-grey seed-coat are occasionally present and, when examined under a lens, are seen to be covered with appressed whitish hairs, which are less regularly arranged than those on nux vomica seeds. The seeds are very hard, and break with an irregular, granular fracture. If a seed be soaked in warm water until it is thoroughly softened, the endosperm can be divided into two portions, thus disclosing an oblong embryo with a small radicle and leafy cotyledons. The seeds are inodorous, but have an extremely bitter taste.

The dark colour, irregular shape, and bitter taste of Ignatius beans are distinctive characters. Usually, the thin seed-coat has been entirely removed by friction of the seeds against one another, and the exposed endosperm appears dark, translucent, and horny, the hilum being visible at one extremity of the seed. The chief constituents of the seeds are from 2·5 to 3 per cent. of strychnine and brucine, rather more than half the total alkaloid being strychnine; other constituents of the seeds are proteids, fat, gum, various salts, and igasuric (caffeotannic) acid, with which the alkaloids are combined in the drug.

INDIGO.

Indigo; Indigo Blue or Indigotin.

A BLUE pigment obtained from *Indigofera tinctoria*, Linné (N.O. Leguminosæ), a native of India, and *I. Anil*, Linné, a native of the West Indies, both being shrubby plants. Other sources of indigo are the dyer's woad, *Isatis tinctoria*, Linné (N.O. Cruciferæ), a native of South-eastern Europe, and probably other plants, including *Wrightia tinctoria*, R. Browne (N.O. Apocynaceæ), and *Polygonum tinctorium*, Ait. (N.O. Polygonaceæ). The colouring matter does not exist ready formed in the plants, but is produced from the juice by a process of fermentation, being formed from a glucoside named indican. The glucoside is a yellow amorphous body, with a nauseous bitter taste and acid reaction. It is readily soluble in water, alcohol, or ether, but can be converted into sugar and insoluble indigo by dilute acids, or by the action of air in the presence of water, the latter being the method by which the pigment is produced during the fermentation which takes place when the indigo plant is macerated in water. The product of fermentation forms coppery-blue lumps, which contain about 50 per cent. of pure indigo or indigotin. The pigment is produced largely from plants in Bengal, Java, and Central America. It can also be prepared synthetically from indoxyl, isatin chloride, ortho-nitro-phenyl-propiolic acid, ortho-nitro-benzaldehyde, and various other compounds. Indigo possesses emetic and purgative properties; it was formerly used largely in medicine, but is now rarely employed except as a dyestuff. A solution of indigo in sulphuric acid (1 in 1000) is employed as a test for chlorinated lime, being decolorised by that compound owing to the formation of a colourless indigo derivative by the oxidising action of the chlorine which is set free by the acid present.

Indigo is of an intensely blue colour, and assumes a bronze hue when rubbed with a smooth hard body. It is insoluble in water, alcohol, ether, alkalies, or dilute acids, but is very slightly soluble in hot alcohol, and more soluble in glacial acetic acid, hot aniline, concentrated sulphuric acid, etc. The sulphuric acid solution is yellowish-green, but becomes blue on keeping or when heated, owing to the conversion of the indigo into indigo mono- and di-sulphonic acids, the latter of which is readily soluble in water, while the mono-sulphonic acid is much less soluble. When heated to 288° C., indigo gives off a reddish-violet vapour which condenses in minute, copper-red, prismatic crystals. Reducing agents convert indigo into indigo-white, a crystalline powder soluble in alcohol, ether, or alkalies, the alkaline solution becoming oxidised quickly when exposed to the air, and a blue film of indigo then separating. Chlorine destroys the blue colour of indigo, and a pale yellow solution is yielded on warming the pigment with a 10 per cent. acidified solution of stannous chloride.

Nitric acid oxidises indigo to isatin, while aniline is produced on distilling the pigment with potassium hydroxide, and anthranilic acid on heating it with manganese dioxide and potassium hydroxide solution. Other compounds which can be prepared from indigo are indole, the mother substance of the indigo group, oxindole, indoxyl, dioxindole, indole-carboxylic acid, skatole and its isomers. The chief constituent of the indigo of commerce is indigotin or indigo-blue, but the pigment also contains indigo-gluten, indigo-brown, and indigo-red, an isomer of indigotin; other isomerides are indirubin (indigo-purpurin), and indin, both of which have been prepared synthetically. Java indigo contains a yellow crystalline colouring matter which is identical with kampherol. Indigo-carmine is indigo-sodium disulphonate. Prussian blue may closely resemble indigo in appearance. The commercial substance is a mixture of ferric ferro-cyanide, $Fe_4(FeCy_6)_3$, with ferrous ferrocyanide, Fe_2FeCy_6, ferrous ferricyanide, $Fe_3(FeCy_6)$, and probably one or more of the K-Fe ferro- or ferricyanides. It occurs as a dark blue amorphous solid with a coppery lustre, which does not require the masses to be rubbed for its production. When heated strongly, Prussian blue glows and is burnt to ferric oxide, but it remains unchanged when heated with an acidified solution of stannous chloride. It is insoluble in water, alcohol, ether, or dilute acids, but is soluble in strong hydrochloric acid, oxalic acid, or ammonium tartrate solution, being precipitated from the hydrochloric acid solution on adding water, or from the oxalic acid solution when exposed to sunlight.

INULÆ RADIX.

Elecampane Root.

The root of *Inula Helenium*, Linné (N.O. Compositæ), a tall, herbaceous, perennial plant indigenous to Europe and Asia, and cultivated for medicinal use in Holland, Switzerland, and Thüringia. It produces a short, thick, fleshy rootstock or crown, from which branch several large fleshy roots. When the plant is from two to three years old the entire subterranean portion is dug up in the autumn, before it becomes too stringy or woody, and dried, the thick crown being usually divided longitudinally or transversely before drying. The drug possesses stimulant, diaphoretic, diuretic, and expectorant properties, and has been used in the form of powder or decoction (1 in 40).

Elecampane root occurs in thin concave slices—transverse or longitudinal sections of the rootstock—with overlapping, wrinkled bark and from 4 to 5 cm. in diameter, or in cylindrical pieces from 15 to 30 cm. long and 2 to 2·5 cm. thick, to which portions of the rootstock may be attached. The root is of a dark brownish-grey colour externally, and greyish or pale brownish internally. It is hard and horny, tough and flexible when moist, but breaks with a short fracture when dry. A transverse section exhibits a thickish brown bark, divided by a somewhat indistinct cambium line from a greyish wood in which occur radially elongated groups of vessels; the wood exhibits an indistinct radiate structure, and numerous shining brown oil-glands can be seen in both bark and wood. The drug has a peculiar aromatic odour, and a slightly bitter, camphoraceous taste.

Most roots of similar appearance to elecampane root—such as belladonna, dandelion, and marshmallow—are devoid of oil-glands; that of belladonna has also a short mealy fracture, dandelion root has a small yellow wood and a thick whitish bark with concentric rings, marshmallow root exhibits a distinctly radiate structure and has a fibrous bark which is easily separated. In the case of pellitory root, which contains oil-glands, the odour and taste are distinctive, and there is a yellow radiate wood. The chief constituents of elecampane root are an acrid resin and from 1 to 2 per cent. of a more or less solid volatile oil; other constituents are a bitter extractive, helenin, wax, and—when the root is collected in the autumn—about 45 per cent.

of inulin. The volatile oil consists chiefly of alanto-lactone, together with small quantities of alantic or alantolic (inulic) acid, alantol (inulol), and helenin. Alanto-lactone (m.p. 76°) was formerly known as helenin; it can be obtained in colourless prismatic needles, with faint odour and taste, and forms salts of alantic acid when heated with solutions of the alkalies. Alantic acid can be partially converted into alanto-lactone by heating with water. Alantol—an isomer of common camphor—is a yellowish oily liquid (b.p. 200° C.) which occurs in small quantities in the fresh root only; it yields cymene upon distillation with phosphorus pentasulphide. Helenin, properly so-called, crystallises in four-sided prisms and melts at 110° C.

IPECACUANHÆ RADIX.

Ipecacuanha Root.

THE dried root of *Psychotria Ipecacuanha*, Stokes (N.O. Rubiaceæ), a small shrubby plant, about 30 cm. high, which is found in most parts of Brazil, though the drug is chiefly collected in the interior, in the province of Matto Grosso. The product of cultivated plants has also been imported from Johore, near Singapore. The plant has a slender stem which grows partly underground and is often procumbent at the base, the lower portion being knotted. Fibrous rootlets are given off from the knots, and some of them develop an abnormally thick bark, in which much starch is deposited. The thickened rootlets alone are collected and dried for medicinal use, since the active constituents of the drug are found chiefly in the bark. The drug is known in commerce as Brazilian or Rio ipecacuanha. It possesses expectorant, diaphoretic, cholagogue, and emetic properties, and is used as a gastro-intestinal stimulant. The most important preparations of the drug are Extractum Ipecacuanhæ Liquidum (2 to $2\frac{1}{4}$ p.c. of alkaloid), Pulvis Ipecacuanhæ Compositus (1 in 10), Trochiscus Ipecacuanhæ ($\frac{1}{4}$ grain), and Trochiscus Morphinæ et Ipecacuanhæ ($\frac{1}{12}$ grain); the liquid extract is used in the preparation of Acetum Ipecacuanhæ (1 in 20) and Vinum Ipecacuanhæ (1 in 20), while the compound powder is an ingredient of Pilula Ipecacuanhæ cum Scilla (3 in $5\frac{1}{2}$).

Ipecacuanha root occurs in slender and somewhat tortuous, closely annulated pieces, which seldom exceed 15 cm. in length and 6 mm. in thickness. It varies in colour from very dark brown to dark brick-red, the latter colour being partly due to adhering particles of earth. The bark is constricted at short intervals, so as to give the root the appearance of a number of discs somewhat irregularly strung together. The constrictions are sometimes quite shallow in Brazilian or Rio ipecacuanha, though they may penetrate nearly to the wood; they never assume the form of narrow merging ridges, as in the case of Cartagena (Colombian) ipecacuanha. The root is hard, and breaks with a very short fracture, the fractured surface exhibiting a thick, dark grey bark or cortex with a horny, resinous, or starchy appearance, and a small dense wood, in which no distinct pores or pith can be discerned when examined with a lens. A transverse section of the cortex exhibits small compound starch grains and acicular crystals (raphides) of calcium oxalate when examined under the microscope, but the wood contains no vessels. The drug has a bitter taste, but only a slight odour. Brazilian or Rio ipecacuanha root is distinguished by the closely approximated disc-like annulations, the thick starchy bark, and the small dense wood. Pieces of the stem are more slender, longitudinally striated, and exhibit no annulations, while transverse sections of the stem exhibit a thin bark, surrounding a ring of wood which encloses a distinct pith. Cartagena or Colombian ipecacuanha, the product of *Psychotria acuminata*, is usually thicker than Brazilian, occurs in shorter and more brittle pieces, and has distinct, somewhat distant, narrow, raised ridges, instead of annulations; the starch grains are also rather larger than those of Brazilian ipecacuanha.

In addition to Cartagena ipecacuanha, various other roots have been offered as substitutes, but they all differ considerably from Brazilian ipecacuanha. Thus, East Indian ipecacuanha, from *Cryptocoryne spiralis*, exhibits a typically monocotyledonous structure in transverse sections, scattered bundles running through a parenchymatous stele, which is surrounded by a white starchy bark. Undulated ipecacuanha, from *Richardsonia scabra*, is only slightly annulated, the wood is porous, and the starchy bark often has a violet colour. Lesser striated ipecacuanha, from *Richardsonia* sp., is dark purplish-brown in colour, longitudinally wrinkled, not annulated, and has porous wood. Greater striated ipecacuanha, from *Psychotria emetica*, closely resembles the preceding, but contains no starch, and has dense wood. White ipecacuanha, from *Ionidium Ipecacuanha*, is greyish-white or yellowish in colour, and is also free from starch. The chief constituents of ipecacuanha root are the alkaloids emetine, cephaeline, and psychotrine, of which the bark may contain from 1·5 to 2 per cent., about 72 per cent. consisting of emetine, and 26 per cent. of cephaeline, while only 2 per cent. consists of psychotrine. Emetine (m.p. 68° C.) occurs as an amorphous white powder, but it forms crystalline salts ; cephaeline (m.p. 96°–98° C.) can be obtained in white silky needles, and psychotrine (m.p. 138° C.) also occurs in crystalline form. Other constituents of ipecacuanha root are a crystalline saponin-like glucoside, an amorphous bitter glucoside named ipecacuanhic acid, choline, resin, pectin, starch, sugar, calcium oxalate, odorous fatty matter, and a disagreeable-smelling volatile oil. Cartagena ipecacuanha contains more alkaloidal matter (2 to 2·3 per cent.) than the Brazilian drug, but a smaller proportion of emetine, cephaeline being the alkaloid present in largest quantity. East Indian ipecacuanha and white ipecacuanha contain minute quantities of emetic principles which differ from the alkaloids of true ipecacuanha, but the undulated and striated ipecacuanhas contain emetine.

IRIDIS RHIZOMA.

Orris Rhizome or Root.

The rhizome of *Iris germanica*, Linné (N.O. Iridaceæ), *I. pallida*, Lamarck, and *I. florentina*, Linné. The three species have dark blue, pale blue, and white flowers respectively, and are cultivated in Italy for the sake of their rhizomes ; *Iris germanica* is also cultivated in Morocco, and is a common garden plant in England. The plants are perennial and produce horizontal, fleshy rhizomes, which resemble one another so closely that they cannot easily be distinguished. Contractions occur at intervals of about 2·5 cm. or more, indicating the limit of a year's growth in each case, and short lateral branches are sometimes developed from buds at the apex of the rhizome, after the plant has flowered. The rhizome is collected in the late summer or autumn, immersed in water to facilitate peeling, and, after the fibrous roots and brown epidermis have been removed, the trimmed pieces of rhizome are allowed to dry slowly in the sun, losing much of their naturally acrid taste and acquiring a more agreeable fragrance during the process of drying. The loss of acridity appears to be due to the disappearance of a volatile acrid principle on drying the rhizome. The drug possesses cathartic, emetic, and diuretic properties, but it is used chiefly in preparing perfumes, dentifrices, violet powder, etc. Pieces of orris rhizome, trimmed smoothly or turned, and sometimes whitened with chalk or magnesia, are used for teething purposes or for rosaries.

Orris rhizome occurs usually in somewhat flattened, peeled, dull white pieces, from 5 to 10 cm. long and about 2·5 cm. thick, contracted at intervals and bearing one or two short lateral branches at the broadest part or apex, which is terminated by a circular scar. The upper surface of the rhizome bears traces of leaves or of small fibro-vascular leaf-bundles, arranged in transverse lines; the under surface is marked with numerous small, circular, brownish root-scars. The hard, heavy, compact rhizome breaks with a short fracture, revealing a yellowish horny interior. A transverse section exhibits a large stele or central column, containing scattered wood-bundles of a darker colour and surrounded by a comparatively thin bark. The rhizome possesses an agreeable violet-like odour, and a slightly bitter taste. There are several varieties of orris rhizome in commerce, differing chiefly in colour and the care with which they have been peeled. The finest is Florentine orris, from *I. florentina*, which is carefully peeled, nearly white, plump, and very fragrant. German or Veronese orris, from *I. germanica*, is less carefully peeled, yellowish, and somewhat wrinkled. Morocco or Mogadore orris, also obtained from *I. germanica*, bears patches of reddish-brown cork, is darker in colour generally, and less fragrant; the pieces are also smaller, flatter, more shrunken, and often bear the shrivelled remains of leaves at the apex. This variety is sometimes bleached with sulphur dioxide. Bombay orris is also of small size, dark-coloured, and of inferior fragrance.

The chief constituent of orris rhizome is the oil of orris (0·1 to 0·2 p.c.), a yellowish-white to yellow mass (m.p. 44° to 50° C.) containing about 85 per cent. of odourless myristic acid, which appears to be liberated from a fat present in the rhizome, during the process of steam distillation. Other constituents of the rhizome are fat, resin, starch, mucilage, bitter extractive, and a glucoside named iridin, which can be obtained in colourless needles and yields a phenol named irigenin when decomposed by dilute acids, whilst alkalies convert it into formic acid, iridic acid, and iretol. The glucoside iridin must not be confused with the powdered extract—iridin or irisin—prepared from the rhizome of *Iris versicolor*, Linné, by precipitating a tincture of the drug with water and mixing the precipitate with an equal weight of powdered liquorice root, or other absorbent powder. The odorous constituent of oil of orris is a liquid ketone named irone, to which the violet-like odour is due, but the oil also contains small quantities of the methyl ester of myristic acid, oleic acid and its esters, and oleic aldehyde. Pure irone has a pungent odour, and its violet-like fragrance is only revealed when the ketone is dissolved in a large amount of alcohol and the solvent allowed to evaporate. Otto of orris is a golden-yellow oily liquid, which contains the odorous principles of the concrete oil, without the solid, fatty, inodorous constituents.

ISPAGHULA.

Ispaghula.

The dried seeds of *Plantago ovata*, Forskohl (N.O. Plantaginaceæ), an herbaceous plant indigenous to India and Persia, and also known as *P. Ispaghula*, Roxburgh. The seeds are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of linseed and barley. They are demulcent and mildly astringent, and are administered whole in cases of protracted diarrhœa, or used in the form of Decoctum Ispaghulæ (1 in 73).

Ispaghula seeds are boat-shaped, somewhat acute at one end, from 2 to 3 mm. long and from 1 to 1·5 mm. wide. They are pale pinkish-grey in colour, with a darker, elongated spot on the convex side. The hilum, covered with the remains of a thin white membrane, occurs on the concave side of the seed. The testa swells when it is placed in water, a viscid mucilaginous liquid being produced. The seeds are devoid of odour or taste.

The distinctive characters of ispaghula seeds are their colour and shape. The chief constituent of the seeds is the mucilage contained in the testa; other constituents are proteids, fixed oil, etc. The mucilage can be extracted by soaking the seeds in water, a thick viscid liquid being obtained, as in the case of linseed when similarly treated. When administered whole, the seeds absorb moisture during their passage through the alimentary canal, and yield the mucilage, which is bland and soothing. The crushed seeds have also been made into poultices with vinegar and oil, for rheumatic and gouty swellings.

JABORANDI FOLIA.

Jaborandi Leaves.

The dried leaflets of *Pilocarpus Jaborandi*, Holmes (N.O. Rutaceæ), a shrub indigenous to Brazil. The plant has large, imparipinnate, compound leaves which consist of three or four pairs of leaflets. They are exported chiefly from Pernambuco and Ceara, and are usually mixed with the petioles and occasional small fruits, while they are also liable to be mixed with the leaves of other varieties of jaborandi. Numerous varieties of jaborandi occur in commerce, but all differ in important respects from the Pernambuco variety, the distinctive characters of which are the presence of oil-glands in the leaflets, the entire margin, emarginate apex, inequality at the base, the prominence of the veinlets on the brownish-green upper surface, and the practically glabrous under surface. The drug is a powerful diaphoretic, sialagogue, and galactagogue, and is antagonistic in its action to belladonna. It is used in the preparation of pilocarpine nitrate, Extractum Jaborandi Liquidum (1 in 1), and Tinctura Jaborandi (1 in 5).

Jaborandi leaflets are dull brownish-green in colour, leathery in texture, oval-oblong or oblong-lanceolate in outline, and usually from 6 to 10 cm. in length. They have short stalks, entire and revolute margins, are blunt and emarginate at the apex, and for the most part are unequal at the base. When mature the leaflets are glabrous, though a few scattered hairs may occur on the under surface. The lateral veinlets are distinctly prominent on the upper surface, and the mesophyll contains numerous large oil-glands which are readily visible when the leaflets are examined by transmitted light. The volatile oil present causes the drug to give off a slight aromatic odour when bruised, and imparts a slight pungency to the taste, which is also somewhat bitter owing to the presence of alkaloids, one of which—pilocarpine—induces an increased flow of saliva when the leaflets are chewed.

Maranham jaborandi, from *P. microphyllus*, Stapf, consists of ovate leaflets which are deeply emarginate at the apex, have a slightly winged rachis, and do not exceed 2·5 to 4 cm. in length. In the case of Paraguay jaborandi, from *P. pennatifolius*, Lemaire, the leaflets are paler than those of *P. Jaborandi*, more of a greyish-green colour, and less leathery in texture; the veinlets are not prominent on the upper surface, and the base is usually equal and tapering. Ceara jaborandi, from *P. trachylophus*, Holmes, consists of dark olive-green leaflets, which are smaller than the Pernambuco variety, though larger than those of *P. microphyllus*; they have a few scattered hairs on the upper surface, and are yellowish-green and clothed with short curved hairs on the under surface. Aracati jaborandi, from *P. spicatus*, resembles bay leaves in size and shape; the veins are scarcely visible, the outline is lanceolate and the petiole short and twisted. Rio Janeiro jaborandi, from *P. selloanus*, Engler, consists of leaflets which are more obovate in outline than those of other varieties, and the veinlets are not prominent on the upper surface like those of *P. Jaborandi*. The large, thin, grey papery leaves of *Piper Jaborandi*, Vellozo, taper towards both base and apex, and are usually mixed with the stems, which are swollen at the nodes. Cherry-laurel leaves differ from jaborandi leaflets in having a serrated margin, pointed apex, and no oil-glands; bay leaves are pointed at the apex and equal at the base, with wavy margins.

The chief constituents of jaborandi leaves are from 0·5 to 1 per cent. of amorphous alkaloids, consisting chiefly of pilocarpine, together with small quantities of the isomeric base isopilocarpine and pilocarpidine, all three alkaloids occurring as syrupy liquids. The name jaborine has been applied to a mixture of alkaloidal and colouring matters obtained from jaborandi leaves. Other constituents of jaborandi leaves are tannin, resin, and volatile oil. Pilocarpine is optically active and forms crystalline salts, the chief of which is pilocarpine nitrate (m.p. 173° to 178° C.), a white crystalline powder soluble in water (1 in 8), and slightly soluble in 90 per cent. alcohol (1 in 50). The commercial salt sometimes contains isopilocarpine nitrate (m.p. 158° C.), the presence of which lowers the melting-point. Isopilocarpine, though present in jaborandi leaves in small quantity, is formed chiefly from pilocarpine during the process of extraction, in a similar manner to that by which hyoscyamine is converted into atropine. It can be formed from pilocarpine by the action of heat or alkalies, and is very similar to that base in its physical and chemical properties, though it is optically inactive, except in neutral solutions. Pilocarpidine also forms crystalline salts, but it differs in many respects from pilocarpine and isopilocarpine.

JALAPA.

Jalap.

THE dried tubercules of *Ipomœa Purga*, Hayne (N.O. Convolvulaceæ), a climbing plant which is indigenous to the eastern slopes of the Mexican Andes, and cultivated in India and Jamaica. The plant gives off slender runners with fibrous roots, some of which thicken and become tuberous. The tubercules are collected and dried over fires, the larger ones being cut longitudinally to allow moisture to escape. They are white and fleshy internally when fresh, but darken in colour on drying. The drug is imported chiefly from Vera Cruz. It is a brisk hydragogue cathartic, and is used in the form of Extractum Jalapæ, Pulvis Jalapæ Compositus (1 in 3), Jalapæ Resina, and Tinctura Jalapæ (1·5 p.c. of resin); the resin possesses purgative properties, and is an ingredient of Pilula Scammonii Composita (1 in 3).

Jalap root occurs in irregularly oblong, ovoid, napiform, or fusiform pieces, varying in length from 2·5 to 7·5 cm. or more, the larger pieces being frequently incised. The pieces are hard, compact, and heavy, and taper towards the lower extremity, where the slender part of the root has been broken off. The dark brown outer surface of the roots is furrowed, wrinkled, and marked with numerous small, paler, transverse scars, which appear to correspond with lenticels; internally, the roots are of a yellowish-grey to dingy brown colour. Owing to the formation of secondary cambiums, a transverse section usually exhibits irregular dark lines which are often arranged concentrically. Numerous compound starch grains and clustered crystals of calcium oxalate are seen when a section is examined with a lens or microscope; dark resin cells are also visible, especially in the cortical portion, but woody tissue is not easily distinguished. The starch is frequently gelatinised by the heat employed in drying the drug, to which a horny appearance is thus given, but roots dried with greater care have a mealy appearance internally. The drug has a characteristic odour, partly caused by the smoke from the fire over which the roots have been dried, but chiefly due to the resin they contain. The taste is at first sweet, but afterwards acrid and disagreeable.

The presence of lenticels in jalap root, its freedom from convolutions and radiate structure, and the comparative insolubility of its resin in ether, distinguish it from other roots. Tampico jalap, from *Ipomœa simulans,* is irregular in shape, has a remarkably convoluted surface, does not exhibit lenticels, and yields about 10 per cent. of ether-soluble resin (tampicin), which is identical with scammony resin and the ether-soluble resin (scammonin) of true jalap. Orizaba or male jalap, from *I. orizabensis,* occurs in irregular, rectangular, or block-like pieces which have formed part of very large roots, or in small, spindle-shaped, entire roots, transverse sections of which exhibit a radiate structure, whilst numerous thick bundles of vessels project as woody fibres from the fractured surface; it contains about 12 per cent. of orizabin, a resin identical with scammonin. The chief constituent of true jalap is about 10 per cent. or more of resin; other constituents of the drug are starch, gum, sugar, colouring matter, calcium oxalate, etc. The purified resin consists of two homologous glucosides —about 90 per cent. of jalapin (convolvulin) and 10 per cent. of scammonin, to which the name jalapin is sometimes incorrectly applied. Both are white powders, soluble in alcohol, but only scammonin is soluble in ether.

Jalap resin is extracted by exhausting the powdered drug with 90 per cent. alcohol, and subsequently removing the solvent by distillation, distilled water being added to the tincture before distillation in order to facilitate recovery of the whole of the alcohol. The resin is freed from soluble impurities by washing it thoroughly with hot distilled water, but when prepared as described it contains colouring matter and other constituents of jalap which are soluble in alcohol but insoluble in water. The product occurs in dark brown, opaque, brittle fragments, which are translucent at the edges and break with a resinous fracture. It is reduced readily to a pale brown powder, which has a peculiar sweetish odour and somewhat acrid taste. The powder should dissolve easily in 90 per cent. alcohol, but not in oil of turpentine, and it should yield little or nothing to warm water, thus showing that it has been properly freed from soluble impurities. By further treatment of an alcoholic solution of the resin with animal charcoal, a perfectly white product can be obtained.

JUNIPERI OLEUM.

Oil of Juniper.

THE oil distilled from the full-grown, unripe, green fruit or "berries" of *Juniperus communis*, Linné (N.O. Coniferæ), a small, diœcious, evergreen shrub indigenous to Great Britain and distributed widely over Europe. The plant bears linear, spreading, prickly leaves, and produces in the axils of some of the upper leaves small rudimentary branches bearing a number of minute bracts. Ovules are produced in the axils of the uppermost whorl of bracts, and, after fertilisation, the three bracts increase in size, becoming fleshy and gradually enclosing the ripened ovules or seeds, thus forming a berry-like fruit known as a galbulus, about 8 mm. in diameter, which ripens during the second year. The ripe fruit is distinguished by its dark purplish colour, the presence of six minute pointed bracts in two whorls at the base, and the distinct tri-radiate scar at the apex, indicating the sutures of the three bracts by which the seeds are enclosed. The thin outer skin of the fruit encloses a yellowish-brown, loose, soft tissue, in which are imbedded three hard, triangular seeds, which contain the oil in glands partly sunk in the hard tissue, while smaller and less conspicuous oil-glands are present in the pulp of the fruit. The oil possesses stimulant, carminative, antispasmodic, and diuretic properties. It is given alone or in combination with other diuretics, and is used in the preparation of Spiritus Juniperi (1 in 20).

Oil of juniper (s.g. 0·865 to 0·890) is colourless or pale greenish-yellow, with the characteristic odour of the fruit and a warm, aromatic, somewhat bitter taste. It dissolves with slight turbidity, in four times its volume of a mixture of equal parts of absolute and 90 per cent. alcohols ; it also mixes with an equal bulk of absolute alcohol, and dissolves in twenty parts of 90 per cent. alcohol, though the solution does not become quite clear. The solubility is less in the case of oil which has been kept for some time.

Commercial oil of juniper is obtained chiefly from the ripe fruit, and normal oil of ripe fruit is stated to be in all essential qualities superior. The ripe fruit yields from 0·5 to 1·5 per cent. of volatile oil, according to the district in which the plants are grown, Italian fruit yielding most and Swedish least. The age of the fruit from which oil of juniper has been distilled affects the specific gravity of the oil markedly, while exposure of the oil to the air causes gradual resinification, and thus affects the specific gravity. The oil is always lævo-rotatory, but the rotation never exceeds -10°. The chief constituents of the oil are the terpene pinene, and a sesquiterpene named cadinene; other constituents of the oil are juniper camphor—a stearoptene or crystalline sesquiterpene alcohol, and the acetic ester of that alcohol, to which the peculiar odour and taste of the oil are due.

KALADANA.

Kaladana; Pharbitis Nil.

THE dried seeds of *Ipomœa hederacea*, Jacquin (N.O. Convolvulaceæ), a twining herbaceous plant indigenous to India. The seeds possess cathartic properties, and are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies as an equivalent of jalap. The drug is used in the preparation of Pulvis Kaladanæ Compositus (1 in 3), Tinctura Kaladanæ (1 in 5), and Kaladana Resin (pharbitisin), which possesses similar purgative properties to jalap resin.

Kaladana seeds have the form of the segment of an orange, being triangular with one convex side. They are generally about 5 mm. in length and breadth, but are sometimes much smaller, while their weight varies from 3 to 6 cgm. The testa is black except at the hilum, where it is brown and somewhat hairy. On soaking a seed in water, the testa bursts and discloses the delicate albumen enveloping the folded cotyledons and radicle. The seeds have an acrid taste and an earthy odour, due to the presence of fixed oil and resin.

The chief constituent of kaladana is about 8 per cent. of a resin which consists entirely of pharbitisin, a glucoside identical with jalapin (convolvulin), the chief constituent of jalap resin. The seeds also contain about 14 per cent. of an acrid fixed oil, together with mucilage, albuminoids, and tannin. Kaladana resin is extracted in the same way as jalap resin. It occurs in brownish, opaque, brittle fragments, which are translucent at the edges, and break with a resinous fracture. The resin is easily reduced to powder, and is then of a greyish colour, whereas powdered jalap resin is pale brown. Kaladana resin resembles jalap resin in having a sweetish taste and producing a feeling of acridity in the throat, but its odour is somewhat disagreeable, especially on warming. It is readily soluble in 90 per cent. alcohol, but practically insoluble in benzol, ether, chloroform, or carbon bisulphide. The resin melts at about 106° C., and yields little or nothing to warm water when powdered.

KAMALA.

Kamala.

The glands and hairs that cover the fruits of *Mallotus Philippinensis*, Müller Arg. (N.O. Euphorbiaceæ), a tree from 4 m. to 6 m. high, which is widely distributed throughout India, China, Ceylon, the Malay Archipelago, Australia, Abyssinia, and Southern Arabia. The fruit of the tree is a roundish, three-valved, three-celled capsule about the size of a large pea, which is marked externally with three furrows and covered thickly with a reddish powder. After the fruits are collected, they are placed in large baskets, in which they are rolled about and rubbed with the hands, the powder thus detached falling through the open wicker-work of the basket and on a cloth placed beneath. The sifted powder, consisting chiefly of the glands and hairs, constitutes the kamala of commerce. It possesses tænifuge and purgative properties, and has been used externally for scabies and other affections of the skin. The drug is given in the form of powder or tincture (1 in 5).

Kamala is a light, finely granular, very mobile powder, which floats when thrown on the surface of water. It is of a dull brownish-red or madder colour, without odour and nearly tasteless, though it produces a slight sense of acrimony in the mouth, while feeling gritty between the teeth. It is inflammable, and produces a brilliant flash, like lycopodium, when blown into a flame. Though insoluble in cold water and only very slightly soluble in boiling water, it is very soluble in alcohol, ether, chloroform, or alkalies, forming deep red solutions from which water precipitates resinous matter. Examined under the microscope, it is seen to consist of semi-transparent, depressed, globular glands, much smaller than those of lupulin, filled with a deep red resin, and containing a number of club-shaped secreting cells, radiating from a common centre. The hairs are greyish, thick-walled, curved, and arranged usually in a stellate manner. The pale yellow solution obtained on treating the drug with boiling water becomes brown on adding ferric chloride solution. On heating commercial kamala to redness in a crucible, the ash left should not exceed 8 per cent., and, if the drug be quite pure, the ash will not exceed 1·5 per cent.

The colour and mobility of kamala, its behaviour with solvents, and its appearance when examined under the microscope, distinguish it from other powders. It is often grossly adulterated with ferric oxide or ferruginous sand, and will then yield a very high percentage of ash. Ground safflower (the florets of *Carthamus tinctorius*), dyed starch, and other sophistications have been recorded, but all such additions are easily detected on microscopical examination. The chief constituent of kamala is a dark brownish substance soluble in ether and containing two crystalline substances—rottlerin (mallotoxin) and isorottlerin, also red and pale yellow resins, wax, and traces of a yellow, crystalline, colouring principle. Other constituents of the drug are a trace of volatile oil, albuminoid matter, and a small quantity of sugar, probably existing originally in combination as a glucoside. A drug analogous to kamala, known as "vars," "wars," "waras," or "wurrus," consists of the glands and hairs that cover the fruits of *Flemingia Grahamiana* (N.O. Leguminosæ). It is a coarser powder than kamala, of a deep purple colour, slightly odorous, and consists of solitary hairs and cylindrical or subconical glands composed of several tiers of elongated cells which do not radiate from a common centre. It is used in Southern Arabia and Africa for the same purposes that kamala is employed for elsewhere, and appears to have very similar properties and composition, yielding red and yellow resins, volatile oil, albuminoid matter, sugar, and a crystalline substance resembling rottlerin, to which the name flemingin has been applied.

KAVÆ RHIZOMA.

Kava Rhizome; Kava-kava.

The decorticated, dried, and divided rhizome, without roots, of *Piper methysticum*, Forster (N.O. Piperaceæ), a native of the Sandwich Islands. The rhizome, as it occurs naturally, is large, somewhat woody and starchy, with a grey periderm and roots attached, but it is prepared for medicinal use by removing the periderm and roots, and then cutting it longitudinally or transversely into pieces of irregular shape. The drug possesses stimulant, diaphoretic, diuretic, and tonic properties. It is official in the Indian and Colonial Addendum, for use in the Australasian Colonies, in the form of Extractum Kavæ Liquidum (1 in 1).

Kava rhizome occurs in whitish or light brownish-grey, irregularly cuboid or roughly wedge-shaped fragments, from which the grey periderm has been removed by slicing. The pieces are usually from 1·25 cm. to 5 cm. thick, but may be larger. When cut transversely they exhibit a central portion of close, even texture, surrounded by a distinct ring of narrow, radiating, vascular bundles, which are separated by paler, relatively broad medullary rays. The rhizome is more or less porous, but pieces of a coarsely porous or very woody character should not be used for medicinal purposes, as they are less active. The drug breaks with a starchy fracture, has a slight, somewhat pleasant odour, and a peppery, faintly bitter, and slightly saponaceous taste when chewed.

The distinctive characters of kava rhizome, as it occurs in commerce, are its irregular shape, freedom from roots, and peculiar odour and taste. The chief constituent of the drug is an acrid resin; other constituents are a volatile oil, gum, starch, and two neutral crystalline bodies named kavahin and methysticin, which appear to be analogous to piperine. An alcoholic extract of the drug acts as a local anæsthetic, and an intoxicating drink can be prepared from the fresh root.

KINO.

Kino; East Indian Kino.

The juice obtained from incisions in the trunk of *Pterocarpus Marsupium*, Roxburgh (N.O. Leguminosæ), evaporated to dryness. The tree grows upon the mountains of the Malabar coast of Hindostan, and contains in the bast numerous cells filled with a red astringent liquid which exudes when incisions are made in the bark. After collection, the juice is evaporated by the heat of the sun, the resulting dark mass breaking up into angular pieces of variable size as it dries. Though imported in fairly large pieces, it is seen usually in small grains, owing to its extremely brittle nature, which causes the pieces to disintegrate. The drug is known in commerce as East Indian, Malabar, or Madras kino. It is a powerful astringent, and is used in the preparation of Pulvis Catechu Compositus (1 in 5), Pulvis Kino Compositus (3 in 4), and Tinctura Kino (1 in 10).

Kino occurs in small, angular, glistening, opaque fragments, which are remarkably free from dust. They are of a black or reddish-black colour, and thin laminæ appear transparent and ruby-red at the edges. The fragments are hard and brittle, break with a vitreous fracture, and yield a brownish-red powder. They are without odour, but have an astringent taste owing to the presence of a peculiar tannic acid, and contain a colouring matter which tinges the saliva red when the drug is chewed. Kino should be only partially soluble in cold water, more soluble in hot water (from 80 to 90 per cent.), and almost entirely soluble in 90 per cent. alcohol, but it should yield little or nothing to ether.

The blackish colour and freedom from dust of East Indian kino distinguish it from other kinds of kino, which are imported chiefly from Africa and Australia, though also occasionally from the West Indies, South America, and elsewhere. It is also readily distinguished from eucalyptus gum, which is of a ruby or garnet-red colour and has a dusty appearance. The chief constituent of kino is from 70 to 80 per cent. of kinotannic acid; other constituents are kino-red and small quantities of pyrocatechin (catechol), gallic acid, pectin, gum, and resin. Kinotannic acid gives a greenish-black precipitate with ferric salts, and is converted into kino-red when boiled with a dilute mineral acid. Kino-red is a phlobaphene, and is deposited when kino is boiled in water and the decoction allowed to cool, owing to oxidation of the kinotannic acid, while a similar deposition takes place when the surface of a cold, filtered, aqueous solution is long exposed to air. Tincture of kino tends to gelatinise and gradually lose its astringency on keeping, owing to the conversion of the tannic acid into a body which is insoluble in alcohol, by the action of an oxydase or oxidising enzyme which is present in the crude drug. The oxydase can be destroyed by the application of heat, and the kino then remains in a soluble condition.

KINO EUCALYPTI.

Eucalyptus Kino; Botany Bay Kino.

An exudation from the stem of various species of *Eucalyptus* (N.O. Myrtaceæ), which grow in different parts of Australasia. It exudes naturally, and is either scraped from the bark or removed from crevices between the concentric layers of wood, in which it collects. The drug possesses astringent properties, and is official in the Indian and Colonial Addendum, for use in the Australasian Colonies, in making preparations for which East Indian kino is used in this country.

Eucalyptus kino has similar characters, and responds to the same tests as East Indian kino, obtained from *Pterocarpus Marsupium*. It occurs in dark-coloured fragments with an astringent taste, is partially soluble in water, and, when freed from mechanical impurities, almost entirely soluble in alcohol.

Though closely resembling ordinary kino in physical characters, eucalyptus kino usually contains much foreign matter, such as fragments of bark removed in collecting the drug by scraping the trees. The composition and behaviour of eucalyptus kino with solvents may also vary considerably, owing to the different sources from which it is obtained. The chief constituent of the drug is kino-tannic acid; other constituents are kino-red, catechin, pyrocatechin, gum, and resin, while volatile oil is found in some varieties.

KOLÆ SEMINA.

Kola Seeds; Cola Nuts.

The seeds of *Cola vera*, Schumann (N.O. Sterculiaceæ), *C. acuminata*, Schott and Endlicher, and probably other species. The trees are natives of tropical Western Africa, but they are cultivated in the West Indies, Brazil, Java, and other tropical countries. They bear woody capsular fruits, containing a number of large seeds known as Gooroo or Bissy nuts, the kernels of which possess tonic, stimulant, and nervine properties, and are sometimes roasted and used like coffee. The seeds are white or crimson when fresh, but become reddish-brown on drying. A tincture (1 in 5) and a liquid extract (1 in 1) of the drug are used in medicine.

Kola seeds, as they occur in commerce, consist of the entire kernels or separated cotyledons, freed from the seed-coats. They are hard and solid, about 25 to 50 mm. long, brittle, and of a brown or reddish-brown colour, with blackish spots. The kernels are somewhat paler internally than externally, and vary considerably in shape; they are usually oblong-ovate, somewhat flattened on one side and curved on the other, but may be wedge-shaped, or irregularly six-sided. A shallow furrow encircles the kernel where the cotyledons join, and a transverse cleft occurs at one end, where the small radicle is situated. The fresh kernels have a faintly nutmeg-like odour and a bitterish astringent taste, but the dried kernels are almost odourless and tasteless.

The fleshy cotyledons, small radicle, and absence of seed-coats are distinctive characters of kola seeds. The seeds of *C. vera* have two cotyledons, those of *C. acuminata* have four, and those of *C. Ballayi* have six, while those of other species differ in various ways. The chief constituent of true kola seeds is from 2 to 2·5 per cent. of caffeine; other constituents are starch, sugar, fat, volatile oil, a little theobromine, and a variety of tannin which yields a phlobaphene named kola-red on oxidation. The change in the colour of the seeds on drying is due to the conversion of tannin into insoluble kola-red.

KRAMERIÆ RADIX.

Krameria Root; Rhatany Root.

The dried root of Para rhatany, *Krameria argentea*, Martius (N.O. Polygalaceæ), a native of Brazil, or of Peruvian or Payta rhatany, *Krameria triandra*, Ruiz and Pavon (N.O. Polygalaceæ), which grows on the mountain slopes of Peru and Bolivia. Both plants are shrubs and produce branched, spreading roots, which are dug up after the rains and dried. The drug is a tonic and powerful astringent. It is used in the preparation of Extractum Krameriæ, Infusum Krameriæ (1 in 20), Liquor Krameriæ Concentratus (1 in 2), Tinctura Krameriæ (1 in 5), and Pulvis Catechu Compositus (1 in 5); the extract is contained in Trochiscus Krameriæ (1 grain) and Trochiscus Krameriæ et Cocainæ (1 grain).

Para rhatany occurs in long, nearly straight, cylindrical pieces, not often exceeding 12 mm. in thickness, and is characterised by its dark purplish-brown colour and smooth thick bark, which adheres firmly to the pale reddish-brown wood and is marked at intervals by deep transverse cracks and longitudinal wrinkles. A transverse section of the root exhibits a dark purplish-brown bark occupying about one-half the radius of a root of medium size, and a reddish-brown wood, which has a short fracture. Peruvian rhatany root is large and knotty at its upper extremity, but divides near the crown into several long stout branches which subdivide into smaller branches. The larger pieces are of a dark reddish-brown colour; smaller pieces are usually brighter and smoother, and do not exhibit any conspicuous transverse fissures. A transverse section of the root exhibits a comparatively narrow reddish-brown bark, occupying about one-fourth the radius of a root of medium size, and a pale reddish or yellowish wood. The rough and scaly bark is rather fibrous, thinner than that of Para rhatany, and bright reddish-brown internally; it separates readily from the yellowish woody axis. The dense wood breaks with a splintery fracture, contains minute vessels, and is marked with numerous narrow medullary rays. Neither Para nor Peruvian rhatany possesses any odour, but the bark of both kinds has a strongly astringent taste, and tinges the saliva red when chewed.

The proportion of bark to wood, as exhibited in transverse sections, is twice as great in Para rhatany as in the Peruvian variety. Para rhatany is also distinguished by the bark being dark purplish-brown and exhibiting deep transverse cracks, while Peruvian rhatany has a reddish-brown bark, which is free from deep transverse cracks and is scaly or smooth according as the pieces of root are large or small. Para rhatany has been offered as Savanilla rhatany, but true Savanilla or New Granada rhatany, the product of *K. tomentosa*, does not often come into the market. It resembles Para rather than Peruvian rhatany in its characters, but thin sections of it become violet when moistened with a solution of ferrous sulphate, while sections of Para rhatany turn bluish-black, and those of Peruvian rhatany greyish. The root of *K. lanceolata*, Torrey, a North American plant, becomes deep purple when treated with ferrous sulphate. Antilles rhatany, which is not often imported, appears to be identical with the Para variety. Guayaquil rhatany is of unknown origin and but rarely seen on the market; it occurs in large reddish-brown pieces with blackish streaks, is somewhat striated on the surface and dotted over with small warts. The chief constituent of rhatany root is about 8·4 per cent. of krameria-tannic or ratanhia-tannic acid, which occurs in the bark; other constituents of the root are gum, starch, etc. The colouring matter of the drug is krameria-red or ratanhia-red, a dark red phlobaphene which is produced by oxidation of the tannic acid present.

LACCA.

Shellac.

A RESINOUS exudation found encrusting the bodies of the female insects of *Coccus Lacca*, Kerr (Order Hemiptera), on the twigs or extreme branches of various trees indigenous to the East Indies and Ceylon, including *Croton aromaticus*, Willdenow (N.O. Euphorbiaceæ), *Ficus religiosa*, Linné, and *F. indica*, Linné (N.O. Urticaceæ), *Butea frondosa*, Roxburgh (N.O. Leguminosæ), *Schleichera trijuga*, Willdenow (N.O. Sapindaceæ), *Zizyphus jujuba*, Lamarck (N.O. Rhamnaceæ), and others. After impregnation, the insects resort in large numbers to the trees and there increase in size, becoming filled with red colouring matter resembling that produced by the cochineal insect. At the same time, they become encrusted with resin, which appears to be formed by the insects from the plant juices. The death of the mature insects follows, but the young to which they give birth eat their way out through the resin and escape. The twigs covered with the granular brownish or reddish resin, which is frequently 6 mm. thick and encloses the dead insects, are broken off, and constitute the stick-lac of commerce. After removal of most of the colouring matter from stick-lac, the resin is left in minute, irregular, glossy fragments, and is then known as seed-lac. It still contains the débris of insects, etc., which are removed by melting and straining the resin, after washing thoroughly with water until no more colouring matter can be removed. The strained and melted resin is spread out in thin uniform layers upon wooden cylinders covered with sheet brass, the sheets of resin being subsequently removed from the cylinders, waved about in the air until they become quite crisp, then placed in packing-cases and broken into fragments by pressure. The product is the shellac of commerce, which is used chiefly for making varnishes and sealing-wax.

Shellac occurs usually in thin, pale brownish-yellow to dark brown, leafy flakes, which are more or less translucent, brittle, and readily crushed. It is tasteless and odourless, but evolves a characteristic odour when heated until it melts. It is completely soluble in hot 90 per cent. alcohol, fixed alkalies, or solution of borax, and almost completely soluble in cold alcohol, the insoluble portion consisting chiefly of wax. Cold ether dissolves only the waxy portion of shellac, adulteration with resins soluble in ether being thus detected. The distinctive characters of shellac are its occurrence in thin translucent flakes, its solubility in alcohol, and the odour evolved on heating it until it melts.

The chief constituent of stick-lac is 74·5 per cent. of resin, about two-thirds of which is insoluble in ether—the soluble portion containing erythrolaccin and the substance which produces the characteristic aromatic odour of stick-lac or shellac when heated. Other constituents are 6 per cent. of wax, 6·5 per cent. of colouring matter (laccaic acid), 3·5 per cent. of moisture, and 9·5 per cent. of sand and vegetable and insect débris. The red colouring matter in the bodies of the insects—lac dye or laccaic acid—can be extracted by removing the resinous coating from the twigs, crushing it, and exhausting it with water or dilute soda solution. The laccaic acid can be precipitated from the alkaline solution by adding alum, and the precipitate, when dried, forms the lac dye of commerce. Laccaic or laccainic acid resembles carminic acid in some respects, but dyes fabrics a different colour. Seed-lac differs in composition from stick-lac, in containing but little of the colouring matter (laccaic acid) found in the latter. Shellac contains about 90 per cent. of resin and 10 per cent. of wax and other substances; it is free from laccaic acid, and the finer qualities are known as orange shellac.

Garnet lac is dark reddish in colour, as its name implies. Cake or lump lac is obtained by boiling stick-lac with water and running the melted resin into brown, translucent cakes, which are free from the natural colouring matter. Button lac and sheet lac are varieties which occur in button-like masses or sheets, as the case may be. White shellac occurs in long, somewhat twisted sticks, and is produced by bleaching the melted resin by artificial means ; it tends to become insoluble in alcohol on keeping, and must therefore be preserved under water.

LACTUCA.

Lettuce.

THE prickly lettuce, *Lactuca virosa*, Linné (N.O. Compositæ), a tall herb indigenous to Britain, and cultivated in England, France, Germany, Austria, and Russia, for the production of lactucarium or lettuce opium. It is a biennial plant, producing depressed, obovate, undivided leaves the first year, and a solitary upright stem, 60 to 150 cm. high, the second year. A system of laticiferous vessels forms an anastomosing network in all parts of the plant, the vessels being especially numerous in the bast of the stem. When the plant is wounded, the latex exudes from the vessels in the form of a bitter milky liquid, and lactucarium is formed by the hardening of the fluid into yellowish-brown masses. The drug is used as a sedative in cases of irritable cough, either in the form of extract of the fresh herb, or as a tincture (1 in 10) or syrup (1 in 20) of lactucarium.

Prickly lettuce has a cylindrical stem which is somewhat prickly near the base, smooth and branched above, and bears a panicled cyme of numerous small, pale yellow flowers, resembling those of the garden lettuce, *L. sativa*, Linné. The lower leaves are large, glaucous-green, oblong-ovate, undivided, toothed, usually prickly on the under side of the white midrib, sessile, and horizontal ; the upper leaves are smaller, clasping, and often lobed. The bracts are cordate and pointed. The whole plant has a bitter, acrid taste, and abounds in a bitter milky juice (latex), with a strong, unpleasant, opium-like smell. On exposure the juice hardens into irregular masses of lactucarium, which resembles opium somewhat in odour and taste. It occurs in hard, opaque pieces of varying size and shape, greyish-brown or dull reddish-brown externally, and creamy-white or yellowish internally, changing to dull brown on exposure.

The chief constituent of *Lactuca virosa* is lactucarium, in collecting which it is usual to cut off the stem of the plant about 30 cm. below the summit and to remove the exuded latex when it has become partially hardened, after which a slice is cut off the stem, so as to cause further exudation, the cutting process being repeated until the plant is exhausted. The collected latex is frequently dried in small earthen dishes, and is then broken into pieces of irregular shape. The drug is prepared in Great Britain, France, Germany, and elsewhere, from *L. virosa* and other species. British lactucarium occurs usually in small irregular lumps about the size of a pea or larger, while the French drug occurs in circular cakes about 40 mm. in diameter, and the German in four-sided angular pieces about 40 mm. long by 25 mm. thick, with one side convex and the others flat or slightly concave, owing to shrinkage, as if a saucer-shaped cake had been divided into four before it was quite dry. The convex side is usually darker than the cut surfaces, which are of a light yellowish-brown colour. Lactucarium is tough and difficult to powder, but softens to a plastic mass on boiling in water, and the cooled and filtered aqueous solution should not be coloured blue by iodine, thus indicating the absence of starch, which is sometimes added as an adulterant. It is partly soluble in alcohol or ether, but only very slightly soluble in water. The chief constituents of lactucarium are three bitter principles—lactucin, lactucic acid, and lactucopicrin; other constituents are caoutchouc, wax, albumin, lignin, mannite, various salts, and nearly 50 per cent. of lactucerin (lactucone), an inert crystalline substance.

LARICIS CORTEX.

Larch Bark.

THE bark of *Larix europæa*, De Candolle (N.O. Coniferæ), a tree which is indigenous to Southern and Central Europe, and is grown extensively in England. Large forests of larch trees occur in the Austrian Alps, and the oleo-resin known as Venice turpentine is collected from larch trees both in the Southern Tyrol and in France. The stem is bored into in the spring, and the oleo-resin exudes from the heartwood as a yellowish, slightly turbid, viscid liquid, with a bitter, aromatic taste. The bark of the tree possesses stimulant, astringent, and expectorant properties, and is used in the form of tincture (1 in 8).

Larch bark is sometimes seen in large quills, but occurs usually in flat, curved, or channeled pieces deprived of the rough, dark brownish-red outer layer, which is largely developed except in the case of young bark, and sometimes attains a considerable thickness. This outer layer tends to exfoliate in large flakes, as a result of the formation of patches of cork, which have a bright rosy tint when freshly exposed, owing to the deposition of a rose-coloured substance in certain layers of cork-cells. The inner surface of the bark is smooth and of a pinkish-brown or pale yellowish-white colour. The bark breaks with a short fracture which is slightly fibrous in the bast or inner portion. A transverse section, when examined with a lens, exhibits a whitish bast and a dark brownish-red outer bark which generally shows distinct curved lines formed by successive bands of cork. The odour of the bark is distinctly terebinthinate, and the taste is astringent.

The distinctive characters of larch bark are the rosy patches of cork disclosed when the outer bark is split off, the whitish bast, the terebinthinate odour, and astringent taste. The chief constituent of the bark is tannic acid; other constituents of the bark are gum, starch, resin, and a crystalline substance named laraxin (laraxinic acid), which possesses a bitter astringent taste and is most abundant in young bark.

LAURI FRUCTUS.

Laurel Fruit; Bay Berries.

The ripe fruits of the bay laurel, *Laurus nobilis*, Linné (N.O. Lauraceæ), a small evergreen tree common in the Western Caucasus and Syria, which has been spread by cultivation over all the temperate and warmer regions of Europe, and may frequently be seen in gardens in Great Britain. In the countries bordering on the Mediterranean the tree attains a height of 6 to 9 m. It bears alternate, glabrous, coriaceous, lanceolate, and acuminate leaves with an entire wavy margin, the apex being often acute, though sometimes blunt; they are about 5 to 10 cm. long, shortly stalked, shining and deep green on the upper surface, but paler and reticulated beneath. In the mesophyll of laurel leaves are situated oil-cells which contain a volatile oil. The leaves also contain tannin and a bitter principle. The flowers are diœcious, of a yellowish-white colour, and arranged in small clusters of three or four upon a common peduncle in the axil of a leaf. The drupaceous, one-celled, one-seeded fruits contain both volatile oil and fat, the latter being extracted from the ripe fruits by boiling and expression. It has been used as a stimulant in veterinary practice.

Laurel fruits are one-celled, one-seeded, and ovoid in shape, about 12 to 13 mm. long, slightly pointed at the apex, and bearing the scar of the peduncle at the base. When ripe they are dark purple or nearly black in colour, with a glabrous, shining, and coarsely wrinkled surface when dried. A thin brittle pericarp encloses the single seed, and the seed-coats adhere to the inner surface of the pericarp, the yellowish or brownish kernel lying loosely in the cavity. The two large firm cotyledons of which the kernel consists are easily separated; they have an aromatic odour and a bitter taste, the pericarp being less aromatic and much more bitter. Laurel or bay leaves yield from 1 to 3 per cent. of volatile oil (s.g. 0·920 to 0·930) which contains pinene, cineol, eugenol, and methyl chavicol—the isomer of anethol. The oil should not be compounded with the oil of bay (Oleum Myrciæ) obtained from *Pimenta acris,* Wight (N.O. Myrtaceæ).

The ovoid shape, loose kernels, aromatic odour, and bitter taste of laurel fruits distinguish them from cocculus indicus, the fruit of *Anamirta paniculata,* Colebrooke (N.O. Menispermaceæ), which is sub-reniform in shape, without odour, and has a tasteless pericarp, though the seed is very bitter. The chief constituents of laurel fruits are a bitter principle, the nature of which is unknown, and about 25 to 30 per cent. of a greenish mixture of fatty and volatile oils, which can be extracted by boiling and expression; it is of granular consistence, melts near 40° C., and consists mainly of laurostearin—the ester of lauric acid—together with chlorophyll and about 1 per cent. of volatile oil (s.g. 0·915 to 0·935) which contains the same substances as the oil of bay leaves, but is more viscid and of a less agreeable odour, owing to the presence of lauric acid.

LAUROCERASI FOLIA.

Cherry-Laurel Leaves.

THE fresh leaves of *Prunus Laurocerasus*, Linné (N.O. Rosaceæ), an evergreen shrub or small tree which is indigenous to Persia and Asia Minor, but cultivated in Europe and most temperate regions. Almost all parts of the plant yield hydrocyanic acid, in a greater or less degree, but the fresh leaves alone are official. The leaves are almost inodorous when fresh, but when bruised they emit an odour recalling that of bitter almonds; the odour of the dried leaves, when crushed and moistened with water, is similar, but less perceptible. The leaves act as a nervine sedative, and are used when fresh to prepare Aqua Laurocerasi, which should contain about one-tenth per cent. of hydrocyanic acid.

Cherry-laurel leaves are smooth, dark green, and shining on the upper surface, much paler beneath, thick, coriaceous, from 12·5 to 17 cm. long, and, on an average, about 5 cm. in breadth. They have short strong petioles, and are oblong or somewhat obovate in outline, tapering towards each end and recurved at the apex. The margins are slightly revolute or recurved, and distantly but sharply serrate, the serrations being felt distinctly when the finger is passed along the margin of a dried leaf from apex to base. The midrib is prominent on the under surface, and gives off lateral veins at angles of 45° to 60°, whilst on each side of it, near the base, are one or two brown depressed spots, the depressions being the remains of glands from which the young leaves exude a saccharine substance in the spring.

The chief constituent of cherry-laurel leaves is laurocerasin, a glucoside which closely resembles amygdalin, and, like that substance, is decomposed in the presence of water by emulsin—an enzyme also contained in the leaves—into benzaldehyde, hydrocyanic acid, and dextrose. The decomposition is less rapid than in the case of bitter almonds, and does not take place whilst the leaves remain intact, the emulsin being stored in the endodermis of the veins, and so kept apart from the laurocerasin, which is distributed through the parenchyma of the leaf. The yield of hydrocyanic acid from the leaves varies with the season, age of the plant, etc., but fresh leaves from healthy plants yield on an average about 0·1 per cent., the yield being less in the autumn than in the spring or early summer, when the leaves are young and especially rich in laurocerasin. Other constituents of the leaves are a bitter principle, tannin, sugar, and gum.

LAVANDULÆ OLEUM.

Oil of Lavender.

THE oil distilled from the flowers of *Lavandula vera*, De Candolle (N.O. Labiatæ), a shrubby plant indigenous to the mountainous regions of the countries bordering the western half of the Mediterranean basin, including Eastern Spain, Southern France, Upper Italy, Corsica, Calabria, and Northern Africa. It is also cultivated in England, France, and other countries, the finest oil being obtained from cultivated plants grown in Surrey. The inflorescence of the plant is a terminal spike, on which the bluish-violet flowers are arranged in small verticillasters. Most of the oil yielded by the flowers is contained in glands on the calyx, from 1·5 to 3 per cent. being obtained when the flowers are distilled with water over an open fire, as soon as possible after being cut.

Oil of lavender (s.g. 0·885 to 0·890 or 0·900) is pale yellow or nearly colourless, with the fragrant odour of the flowers and a pungent, bitter taste. It should dissolve in all proportions of absolute or 90 per cent. alcohol, and in three times its volume of 70 per cent. alcohol, the absence of oil of turpentine being thus indicated; the oil is also sparingly soluble in 60 per cent. alcohol. It is lævo-rotatory, its optical rotation being from −5° to −10°. The usual adulterants of oil of lavender are the oils of spike and turpentine. The oil of spike (s.g. 0·905 to 0·910), distilled from *Lavandula spica*, is much less fragrant than oil of lavender, its odour resembling that of a mixture of the oils of lavender and rosemary. Oil of turpentine (s.g. 0·855 to 0·880) does not dissolve freely in 70 per cent. alcohol.

The chief constituents of oil of lavender are linalool and its acetic ester—linalyl acetate, which is also the characteristic ingredient of oil of bergamot, and is present in English oil of lavender to the extent of 7 to 10 per cent., whilst foreign oils contain as much as 28 to 40 per cent. Other constituents of the oil are pinene, limonene, geraniol esters, a sesquiterpene, borneol and its esters, dextro-camphene, and a stearoptene. Cineol is found in some quantity in English oil of lavender, but only traces of it exist in French oil. Oil of spike is dextrorotatory (+1° to +4°), and contains from 30 to 40 per cent. of alcohols—linalool, cineol, borneol, etc.—but only traces of esters, while camphor and other odorous substances are also present.

LIMONIS CORTEX.

Lemon Peel.

The fresh outer part of the pericarp of the fruit of *Citrus Medica*, Linné, var. *β-Limonum*, Hooker filius (N.O. Rutaceæ), a small tree which is probably a native of Northern India. It is cultivated in all countries bordering on the Mediterranean, especially in Sicily, Southern Italy, Spain, Portugal, and the Riviera. The fruit resembles the orange in development and structure, but is easily distinguished by its more elongated ovoid shape and pale yellow colour. It is also crowned at the apex by a distinct pointed nipple, and the pulp has a strongly but agreeably acid taste. The peel is aromatic and bitter. Lemons are gathered and exported whilst green, the fresh peel being cut and most readily obtainable in December. In India and the Colonies, where fresh lemon peel cannot be obtained, the use of dried lemon peel is authorised for making the official preparations. The peel is a bitter stomachic and tonic, and is frequently added to stomachic medicines, or employed as a flavouring agent. It is used in the preparation of the oil or essence of lemon, Infusum Aurantii Compositum (1 in 80), Infusum Gentianæ Compositum (1 in 40), Syrupus Limonis (1 in 65), and Tinctura Limonis (1 in 4); the oil is an ingredient of Linimentum Potassii Iodidi cum Sapone, Spiritus Ammoniæ Aromaticus, Tinctura Guaiaci Ammoniata, and Tinctura Valerianæ Ammoniata. The oil of lemon is stimulant, carminative, and externally rubefacient. The greater part of the oil of commerce is produced in Sicily, chiefly in Messina and the adjacent districts, and in the province of Palermo. But a large quantity is produced in Calabria and exported from Reggio, whilst the north of Italy and south of France also supply the market with oil. It is obtained during the winter months, from November to March or April, that collected in November and December being usually of the finest quality.

Lemon peel is pale yellow in colour, and more or less rough externally, the roughness of the outer surface being due to the presence of numerous large oil-glands imbedded in the tissue of the epicarp. The inner surface is whitish, owing to the presence of a small amount of the white spongy mesocarp of the fruit. The strong fragrant odour and warm aromatic taste are due to the volatile oil contained in numerous large glands imbedded in the tissue of the epicarp: the bitter taste appears to be due to the presence of hesperidin. When moistened with strong hydrochloric acid, lemon peel retains its colour or assumes a dingy yellowish-brown tint. Oil of lemon (s.g. 0·857 to 0·860) is pale yellow, with the fragrant odour of the lemon, and a warm, somewhat bitter, aromatic taste. It is soluble in 12 parts of 90 per cent. alcohol, and in all proportions of glacial acetic acid or absolute alcohol. The optical rotation of the oil at 20° C. should not be less than $+59°$, and the rotation may be as much as $+66°$.

The fruit of the citron (*C. Medica*, Risso) is much larger than that of the lemon, and has a rougher and thicker yellow rind; the lime (*C. acris*, Miller) is smaller than the lemon, with a smoother and thinner, pale yellow or greenish-yellow rind, and rounded at the extremities. Orange peel is distinguished from lemon peel by its colour changing from yellow to a rich dark green, when moistened with strong hydrochloric acid. The chief constituent of lemon peel is the volatile oil, which consists mainly of the terpenes dextro- and lævo-limonene, with traces of phellandrene and a sesquiterpene. The characteristic odour of the oil is due to its oxygenated constituents, of which the aldehyde citral (geranial) is the most important. It occurs to the extent of 5 to 7 per cent. in pure oil of lemon, together with small quantities of citronellal, geraniol, geranyl acetate, pinene, lævo-pinene, octyl aldehyde, monyl aldehyde, methyl anthranilate, a resin, and—in the case of Palermo oil—linalyl acetate. In addition to the oil, lemon peel contains a bitter glucoside, hesperidin, which occurs in yellow crystals, and appears to exist most largely in the spongy mesocarp, of which as little as possible should be retained on the narrow thin bands of peel. The darkening of thin slices of lemon peel by alcoholic solution of ferric chloride is due to the hesperidin present being acted upon and turning dingy black.

Oil of lemon is collected in Sicily and Calabria by cutting the peel off the lemons in strips and then pressing it against a sponge in such a way that the oil-glands are broken and the oil is forcibly ejected, the sponge being squeezed as it becomes saturated in order to remove the oil which has accumulated. In the north of Italy and the south of France the oil is collected by rotating the fruit rapidly in a tinned-copper saucer (*écuelle*), 20 to 25 cm. in diameter, which is covered inside with short spikes from 6 to 8 mm. long; the oil-glands are broken by the spikes, and the oil flows through a hole in the bottom of the saucer into a collecting tube beneath, which is emptied periodically. Machine processes are employed in some districts for extracting the oil, and simple distillation or expression in bags in ordinary presses may also be resorted to on occasion. In both the sponge and *écuelle* processes the residual traces of oil in the exhausted peel are extracted by placing the latter in hot water and skimming off the oil as it rises to the surface, or the peel may be subjected to distillation; in either case the oil obtained is of inferior quality, its value being impaired by the heat employed in the process of extraction. Pure oil of lemon should evaporate from paper without leaving a stain, thus indicating the absence of fixed oil. The most common adulterant of oil of lemon is oil of turpentine, which differs in its optical rotation, and boils at a much lower temperature than the terpenes of oil of lemon. Waste terpenes, produced in the manufacture of terpeneless oil of lemon, have also been used as adulterants, such additions reducing the proportion of the oxygenated constituents of the oil. The addition of alcohol can be detected by shaking the suspected oil with water, as it then diminishes in volume.

LINUM.

Linseed.

THE dried ripe seeds of the flax plant, *Linum usitatissimum*, Linné (N.O. Linaceæ), a tall erect annual which is cultivated almost universally in temperate and tropical regions. The fruit is a globular capsule, about the size of a small pea, and contains in separate cells ten seeds, the envelope or testa of which abounds in a peculiar gummy matter or mucilage. The seeds also contain much fixed oil in the cotyledons and endosperm. They are collected when ripe, and dried. The seeds possess demulcent properties, and are used to prepare infusions or poultices, being reduced to a coarse powder (Linum Contusum) for the latter purpose, without removing any of the oil or other constituents. The powder should be recently prepared and have a bland odour, free from pungency or rancidity, when mixed with warm water. Certain Cruciferous seeds which often occur as impurities in linseed produce a pungent odour, while the oil in crushed linseed which has been kept for some time becomes rancid and affects the odour accordingly. The cake left after extracting the oil from linseed is sometimes termed oil-cake. Linseed meal or ground oil-cake contains not more than one-fourth of the oil originally present in the seeds, and is a much finer powder than crushed linseed, without the oily feeling of the latter. The oil is a laxative, and is also used largely as an application for burns, mixed with an equal quantity of lime water to form the preparation known as Carron oil.

Linseed consists of small, brown, glossy, nearly flat seeds, which vary in length from about 4 to 6 mm. They are ovate in outline, rounded at one end, and somewhat obliquely pointed at the other, a slight depression—in which the hilum and micropyle are situated—occurring at one side, just below the apex of the seed, which is anatropous. The glossy surface of the seed is seen to be minutely pitted when examined under a lens. Internally the seed is yellowish-white, and a transverse section reveals the presence of two large oily cotyledons, surrounded by a narrow oily endosperm. Linseed is practically inodorous, but has a mucilaginous and oily taste. It contains no starch. Crushed linseed adulterated with ground linseed cake leaves more than 5 per cent. of ash when incinerated with free access of air. The presence of added starch or meal from seeds containing starch is indicated on testing for that substance in the usual manner.

The chief constituents of linseed are about 15 per cent. of mucilage, and from 30 to 40 per cent. of fixed oil, about three-fourths of which can be extracted by pressure. Other constituents of the seeds are about 25 per cent. of proteids, wax, resin, sugar, phosphates, and a minute quantity of the glucoside linamarin, which differs from amygdalin in not being decomposed by emulsin, though it is hydrolysed by dilute acids, yielding hydrocyanic acid, dextrose, and a volatile body which possesses some of the characters of a ketone. Starch is present in unripe seeds, but it disappears as ripening proceeds, being replaced by the mucilage, which appears to be a product of the transformation of starch. The mucilage can be extracted by soaking the seeds in either cold or hot water, and the thick viscid liquid which results when it is extracted with hot water gives a dense precipitate with lead subacetate, while the addition of alcohol to the liquid causes the formation of white flakes. On boiling with diluted mineral acids, the mucilage is decomposed into glucose, gum, and a substance having the same composition as cellulose; with nitric acid it yields crystals of mucic acid.

Linseed oil (s.g. 0·930 to 0·940) is obtained by expression, at ordinary temperatures, from dried ripe linseed. When thus prepared, by cold expression, the oil tends to become rancid on exposure, owing to the presence of much mucilage extracted from the seed. When freshly prepared, it is a viscid yellow liquid, with a faint but distinct odour and bland taste, the marked odour and sometimes acrid taste of the linseed oil of commerce being due to exposure to air, or to the seeds having been roasted before expression, in order to obtain the oil free from mucilage. The oil is practically insoluble in 90 per cent. alcohol, though slightly soluble in absolute alcohol (1 in 40). It is miscible in all proportions with oil of turpentine, forming clear solutions, and is also soluble in ether, chloroform, or carbon bisulphide, its solubility in the last-mentioned liquid affording a means of extracting the oil in a purer condition than usual, as well as in larger proportion. Freedom from non-drying oils, which may be present as adulterants, is indicated by the oil thickening gradually on exposure to air, a thin layer spread on glass forming a hard transparent varnish. Linseed oil should not congeal above –20° C. The chief constituent of the oil is linolein, a mixture of the glycerides or glyceryl esters of linolic, linolenic, and isolinolenic acids, three isomeric bodies possessing similar physical properties, and sometimes described generally as linoleic acid. Other constituents of linseed oil are small quantities of olein, stearin, palmitin, and myristin—the glycerides or glyceryl esters of oleic, stearic, palmitic, and myristic acids.

LITMUS.

Litmus; Lacmus.

A BLUE pigment obtained from the lichen, *Roccella tinctoria*, De Candolle (N.O. Discomycetes or Discolichenes), and other species found upon the coasts of Europe, Africa, and the neighbouring islands in the Atlantic Ocean. It is prepared chiefly in Holland by a process of fermentation. The coarsely powdered lichens are macerated for several weeks, with occasional agitation, in a mixture of urine, lime, and potassium or sodium carbonate, becoming first red and afterwards blue during the process. The coloured mass is subsequently mixed with chalk and gypsum to give it consistence, and introduced into small moulds in which it is allowed to harden. The chief use of the resulting pigment is as an indicator or test for acids and alkalies. For that purpose, it is employed in the form of an aqueous solution, to which alcohol is added as a preservative, or a test paper is prepared by applying an aqueous solution of the pigment to white unsized paper, which is afterwards carefully dried and preserved in well-stoppered bottles, from which light should be excluded.

Litmus occurs in small, rectangular, indigo-blue or deep violet cakes, from 6 to 25 mm. long. They are light, friable, finely granular, and marked with scattered white points. The odour of litmus is reminiscent of indigo and violets. The taste is somewhat pungent and saline, and the pigment imparts a deep blue colour to the saliva. An aqueous solution of litmus is reddened by acids, the original blue colour being restored by alkalies. Litmus paper for testing acids should have a uniform medium blue or slightly purple colour; paper for testing alkalies is coloured with an infusion of litmus just reddened by an acid, care being taken to avoid excess. Neutral litmus paper is of an intermediate tint; it becomes deep blue when moistened with water and treated with acid, or red in the presence of alkalies.

The plants from which litmus is prepared contain colourless acids or anhydrides, which yield the blue pigment when exposed to the influence of water, air, and ammonia. The chief constituent of *Roccella* sp. and various other lichens is lecanoric or di-orsellinic acid, which yields orsellinic acid when boiled with water or alkaline solutions, while the orsellinic acid is decomposed into orcin and carbon dioxide on heating. Orcin combines with ammonia to form a compound which becomes reddish when exposed to the air, owing to the formation of orcein, the chief constituent of commercial orchil (archil) dye. A blue colouring matter, resembling that of litmus, has been produced by heating orcein with solution of ammonia and sodium carbonate. Litmus contains several colouring principles, including a deep red crystalline substance named erythrolitmin, and a brownish-red substance named azolitmin, which is related to orcein and is regarded as the distinctive colouring matter of commercial litmus. It is nearly insoluble in water, but forms a red solution with alcohol. Azolitmin possesses the characters of a weak acid, and forms blue salts, the potassium or sodium salt of the acid being present in litmus.

Orchil (archil) is a deep reddish-purple ammoniacal liquid, prepared by macerating *Lecanora tartarea* and other lichens with lime and stale urine or a solution of an impure ammonium salt. Cudbear is a purplish-red powder, prepared in a similar manner, but, after fermentation has taken place and the colour has been developed, the mixture is evaporated to dryness and powdered. The chief difference between the process by which litmus is prepared and that resulting in the production of orchil or cudbear is that an alkaline carbonate is added to the ammoniacal liquor in which the powdered lichens are fermented, the distinctive blue colour of the litmus being due to that addition, though indigo is sometimes added to intensify the colour.

LOBELIA.

Lobelia.

THE dried flowering herb of *Lobelia inflata*, Linné (N.O. Lobeliaceæ), an annual or biennial plant which is indigenous to North America and cultivated for medicinal use in the states of New York and Massachusetts. The plant is collected in August or September, when the fruits are most numerous, and carefully dried. All parts of the plant are of medicinal value, but the roots and inflated capsules are most powerful. The drug is known as "Indian tobacco," and occurs in commerce either loose or in oblong compressed cakes or packets. It is depressant, antispasmodic, diaphoretic, diuretic, and expectorant; in larger doses it is cathartic and emetic. It is used chiefly in the form of Tinctura Lobeliæ Ætherea (1 in 5), but a simple alcoholic tincture (1 in 8) is also employed in medicine.

Lobelia has angular, channeled stems, which are furnished with narrow wings; they vary from green to yellowish or purplish in colour, and bear one-celled hairs and the scars of alternate leaves. The irregularly toothed leaves are usually in a fragmentary condition, but they can be recognised by their hairy under surface. Flowers are seldom present in the drug, but the inflated two-celled capsules are usually present and, when mature, contain minute brown, oblong, reticulated seeds. A transverse section of the stem exhibits laticiferous vessels in the bast, when examined under the microscope. The drug has a somewhat irritating odour, and a burning, acrid taste is perceived after chewing it.

The hairy winged stem, inflated fruits, and minute, oblong, reticulated seeds are distinctive characters of lobelia. The mature seeds are sometimes removed from the plants by threshing and sold separately, in which case the compressed herb will contain numerous empty capsules, with but few seeds. The chief constituent of the drug is the non-volatile poisonous alkaloid lobeline, a yellow viscid liquid which forms crystalline salts and is a powerful emetic. Other constituents of lobelia are a neutral crystalline substance named inflatin, lobelic acid, resin, wax, volatile and fixed oils, gum, and various salts.

LUPULUS.

Hops; Humulus.

THE dried strobiles of *Humulus Lupulus*, Linné (N.O. Urticaceæ), a scabrous, climbing, diœcious plant which grows wild throughout the whole of Europe, and is largely cultivated in England, Germany, Russia, California, etc. The pistillate plant alone is cultivated, and bears cone-like collective fruits, consisting of leafy stipules, and bracts which enfold minute fruits at their base. The stipules do not enfold fruits at their base, and are sprinkled with glands to a less degree than the bracts and fruits. When fully developed, the hops are picked, dried in kilns, and frequently exposed to the fumes of burning sulphur, the sulphur dioxide preserving the colour and probably the odour of the hops, which are afterwards pressed into compact bales or "pockets." They are tonic, stomachic, sedative, and somewhat narcotic, and are used in the form of Infusum Lupuli (1 in 20) and Tinctura Lupuli (1 in 5).

Hop strobiles are about 3 cm. long, oblong-ovoid or rounded in shape, and consist of numerous yellowish-green, overlapping (imbricated), membranous stipules and bracts, attached to a hairy axis which has a zigzag course and bears rudimentary branches on alternate sides. Each bract enfolds at its base a small fruit (achene) which is partially surrounded by a perianth. The fruits and the bases of the bracts are sprinkled over with yellowish, shining, translucent glands (lupulin) which contain the volatile oil to which the aromatic odour and flavour of the drug are due, as well as a bitter principle and tannin, which impart to the drug its bitter, somewhat astringent taste. The glands of hops can be separated more or less completely by shaking and heating the dried strobiles; they also become detached during the collection and drying of hops, commercial lupulin consisting frequently of the sifted sweepings of the floors of the hop-kilns, sometimes mixed with débris of the strobiles, sand, and other impurities.

Lupulin occurs usually as a granular brownish-yellow powder, with a strong hop-like odour, and bitter, aromatic taste, due to the presence of volatile oil, resin, and lupamaric acid. On examination under the microscope the powder is seen to consist of minute glands, each of which consists of a single hemispherical layer of cells, the cuticle of which appears somewhat dome-like, having been raised slightly by the oily liquid secreted by the gland. The oily contents are discharged when the glands are subjected to pressure. Pure lupulin yields about 70 per cent. of its weight to ether, and leaves less than 3 per cent. of ash when incinerated. The commercial article, however, does not often yield more than 39 to 54 per cent. of its weight to ether, and may leave more than 30 per cent. of ash. The chief constituent of lupulin is about 3 per cent. of volatile oil, which consists chiefly of a sesquiterpene named humulene, together with various oxygenated bodies to which the oil owes its peculiar odour. Other constituents are a crystalline bitter principle named lupamaric acid, choline, resin, and wax (myricin). The bracts and stipules of hops contain about 5 per cent. of tannin (lupulotannic acid), also a dark red phlobaphene formed from the tannin by oxidation, and various salts.

LYCOPODIUM.

Lycopodium.

THE spores of the common club-moss, *Lycopodium clavatum*, Linné (N.O. Lycopodiaceæ), and of other species of *Lycopodium*, indigenous to Europe, Asia, and North America. The common club-moss occurs in Great Britain, but the spores are collected chiefly in Russia, Germany, and Switzerland. The plant has long, trailing, branching stems and ascending branches, thickly covered with deep green, moss-like, linear-lanceolate leaves, which are partly serrate and terminate in a capillary point. The fructification is borne on terminal spikes, which occur singly or in pairs, and are covered with small, crowded, ovate, pointed, scaly leaves (sporophylls), in the axils of which occur small receptacles (sporangia) filled with minute spores. As the spikes approach maturity, in July and August, the tops of the plant are cut and shaken over a cloth, on which the spores collect as a fine yellow powder, from which extraneous matter is subsequently separated by means of a sieve. The powder is used sometimes for dusting excoriated surfaces and for enveloping hygroscopic pills, while a tincture (1 in 10) of the drug is given for irritability of the bladder.

Lycopodium occurs as a fine, pale yellowish powder, which is very mobile, inodorous, tasteless, and floats on water without being wetted, though it sinks when boiled. It burns with a brilliant flash when blown into a flame, but burns slowly when incinerated in a crucible, leaving only about 4 to 5 per cent. of ash. Examined with a lens, the spores have a speckled appearance, and, under a microscope, the powder is seen to consist entirely of minute sphæro-tetrahedral granules, each one consisting of a three-sided pyramid resting upon a somewhat convex base. The surfaces of the granules are marked by a delicate network of projecting ridges which, by their intersection, form regular five- or six-sided meshes and produce slight elevations that give the speckled appearance already referred to. Below the network occurs a yellowish cellular membrane, which is not ruptured by the action of boiling water or potash solution, nor coloured blue by iodine; but strong sulphuric acid renders the spores transparent, and causes drops of oil to exude. Lycopodium is not coloured by chlor-zinc-iodine nor by methyl-green, being thus distinguished from pollen.

The mobility of lycopodium, the manner in which it floats on water, and the brilliant flash produced when it is blown into a flame, are characteristic of the powder. It is frequently adulterated with the pollen of coniferous trees, also with starch, dextrin, sulphur, sand, and other inorganic substances. Pine pollen and starch-grains are easily recognised under the microscope when a specimen of lycopodium containing them is mounted in a mixture of spirit and water, since pine pollen consists of elliptic cells, with globular cells attached at each end, while starch grains are distinguished by their characteristic shapes and markings. Pollen, if present, will be coloured yellow by chlor-zinc-iodine and green by methyl-green. The absence of starch and commercial dextrin is indicated by the absence of a blue or brown coloration on adding a little solution of iodine to a small quantity of water with which some lycopodium has been boiled. Sulphur is soluble in carbon bisulphide, and other inorganic substances present sink in that liquid, while lycopodium floats; the presence of mineral substances also increases the percentage of ash yielded by lycopodium. The chief constituent of lycopodium is about 47 to 50 per cent. of a bright yellow fixed oil (s.g. 0·925), which can be extracted by triturating the spores with sand, so as to break the cellular membrane with which they are enveloped; the oil consists chiefly of the glycerides of oleic, arachic, stearic, and palmitic acids. Other constituents of lycopodium are phytosterin, sugar, and traces of methylamine; the ash is not alkaline, but contains aluminium phosphate.

MANNA.

Manna.

A CONCRETE saccharine exudation from the stem of the manna ash, *Fraxinus Ornus*, Linné (N.O. Oleaceæ), a tree from 6 to 8 m. high, which is a native of Southern Europe and cultivated in Calabria and Sicily. It begins to yield manna when about eight to ten years old, the juice exuding spontaneously from the bark during the hot months, and solidifying upon the surface. The process of exudation is facilitated, however, by making deep transverse or oblique incisions through the bark on one side of the tree. The saccharine juice that exudes solidifies in stalactitic masses (flake manna), or it drops from the trunk and is then collected in fragments which are of inferior quality. Incisions are made in the bark three years in succession, on different sides of the tree. At the end of the third season the exhausted tree is cut down and the truncated stock is allowed to give off shoots which, in turn, can be tapped for manna. The drug possesses demulcent and gently laxative properties, and is sometimes given in the form of syrup.

Manna of the best quality (flake manna) occurs in flattish, three-edged, yellowish-white, brittle pieces, about 10 to 15 cm. long and 2·5 to 5 cm. wide. They are concave and smooth on one side, where the pieces have been in contact with the stem of the tree yielding the drug. The pieces are friable, white and porous internally, and exhibit an indistinctly crystalline structure when broken. Inferior qualities of the drug consist of darker brownish-yellow, broken flakes, united into a somewhat sticky mass. The drug has a slight honey-like odour, and a sweet, slightly bitter and faintly acrid taste. It dissolves in water (1 in 5) and 90 per cent. alcohol (1 in 150), fragments of bark and similar impurities being usually left behind. When heated with twenty times its weight of alcohol and filtered, separate crystals of mannite should be deposited rapidly.

When of good quality, manna occurs in three-sided stalactitic pieces, which are characterised by their peculiar sweet taste, and indistinctly crystalline structure when broken. The chief constituent of the drug is from 80 to 90 per cent. of mannite or mannitol, a crystalline hexatomic alcohol; other constituents are dextrose, mucilage, resin, and a fluorescent glucosidal substance named fraxin, which closely resembles æsculin and yields dextrose and fraxetin on hydrolysis. The presence of fraxin is shown, even in very dilute alcoholic solutions of inferior manna, by a faint fluorescence. Manna is also obtained from *Fraxinus rotundifolia* and other species of *Fraxinus*, while saccharine exudations from the larch and various other trees are known as manna in France, Syria, Persia, and Kurdistan, but they are not articles of commerce in this country.

MARRUBII HERBA.

Horehound ; White Horehound.

THE leaves and flowering tops of *Marrubium vulgare*, Linné (N.O. Labiatæ), an erect herbaceous plant with a perennial fibrous root. It is distributed widely over Europe, and is cultivated in England and the south of France. The plant produces numerous annual stems, from 30 to 45 cm. high, on which the flowers are borne in crowded, axillary, woolly whorls. It is cut down when in flower and dried. The fresh plant has a strong, rather disagreeable odour, which is diminished by drying, and lost on keeping. The dried herb possesses mild stimulant and tonic properties, and is used in the form of infusion (1 in 20) as a remedy for pulmonary complaints attended with cough and copious expectoration.

Horehound consists usually of the dried flowering stems with leaves. The stems are quadrangular, branching, and densely covered with white woolly hairs. The leaves are much wrinkled, opposite, petiolate, about 25 mm. long, and covered with white felted hairs, which are more numerous on the lower surface ; the lower leaves are rounded-ovate, and the upper ones ovate-acuminate, the margins being dentate or dentate-crenate. The flowers are arranged in dense verticillasters in the axils of the upper leaves, and have a hairy calyx provided with ten recurved, hooked teeth, a whitish bilabiate corolla with a small, erect, cleft upper lip, and four included stamens. The drug has an agreeably aromatic odour, and a very bitter taste.

White horehound is distinguished from other species by its woolly stem, the densely felted hairs on the leaves, and the ten hooked teeth of the calyx. Other species of *Marrubium* differ in the last-mentioned respect, and black horehound (*Ballota nigra*, Linné) is distinguished by its disagreeable odour and the absence of white felted hairs. The chief constituent of white horehound is a crystalline bitter substance named marrubiin ; other constituents of the drug are a little volatile oil, tannin, resin, wax, fat, sugar, etc. Marrubiin crystallises in prisms which melt at 154° to 155° C., and are soluble in alcohol, ether, hot water, and other solvents, the solutions not being precipitated by tannin or metallic salts.

MASTICHE.

Mastic ; Mastich.

A CONCRETE resinous exudation from the male plants of *Pistacia Lentiscus*, Linné (N.O. Anacardiaceæ), a shrub or small tree, seldom exceeding 4 m. in height, which is indigenous to the countries bordering on the Mediterranean. The resin is collected in Scio, Cyprus, and probably other islands of the Grecian Archipelago. A certain amount of mastic of very fine quality exudes spontaneously from the small branches of the tree, but the bulk is obtained from vertical incisions which are made in the bark of the tree about the middle of June. The bark contains a ring of oleo-resin ducts in the bast, and after incision the oleo-resin exudes and hardens in the form of small tears, that which hardens upon the tree being of superior quality to that which drops upon the ground. The tears which fall to the ground unite frequently to form irregular masses. The collection lasts for about two months, and a single tree may yield as much as 4 to 5 kilos. of mastic. The resin possesses stimulant properties, but it is rarely employed in medicine, being chiefly used in the manufacture of varnishes.

Mastic occurs usually in small, pale yellow, brittle, pear-shaped, ovoid, or nearly globular tears about the size of pepper-corns, but is seen occasionally in small pieces of an elongated stalactitic form, or in masses of agglutinated tears. The tears have a dull, dusty surface, but break with a clear, glassy, conchoidal fracture, and are then seen to be quite transparent internally. When chewed, the tears break up into a sandy powder which subsequently becomes agglomerated into a plastic mass, mastic being thus distinguished from sandarac. The specific gravity of mastic is 1·074, and its melting-point is about 106° C. The resin is soluble in alcohol to the extent of 90 per cent., the residue being soluble in ether ; mastic is also entirely soluble in chloroform (2 in 1) or ether (2 in 1), and partly soluble in benzene or oil of turpentine. It has an agreeable, somewhat aromatic odour, and a slightly terebinthinate taste, which becomes acrid after prolonged chewing.

In mastic of good quality there is a preponderance of rounded or pear-shaped tears. The peculiar odour is intensified on rubbing or heating, and a plastic mass is formed when the resin is chewed. Sandarac differs from mastic in consisting chiefly of stalactitic tears with a terebinthinate odour, which do not form a plastic mass when chewed. Inferior mastic occurs in less translucent tears of darker colour, or in masses of light and dark tears, intermingled with fragments of wood, bark, or earthy matter. East Indian or Bombay mastic, from *Pistacia Terebinthus*, Linné (*P. Cabulica*, Stocks), the tree which yields Chian turpentine, is usually less clean and more opaque than true mastic; it is also more soluble in alcohol and less soluble in oil of turpentine. The chief constituent of mastic is resin; other constituents are a bitter principle, and 1 to 2 per cent. of a colourless volatile oil (s.g. 0·858 to 0·868), which possesses the characteristic odour of mastic, and appears to consist chiefly of d-pinene. The 90 per cent. of the resin soluble in alcohol consists of masticic acid, while the ether-soluble residue is named masticin.

MATÉ FOLIA.

Maté; Paraguay Tea.

The dried leaves of *Ilex paraguayensis*, Hooker (N.O. Ilicaceæ), a native of Brazil and the Argentine Republic. It is a small tree or shrub, cultivated for the sake of its leaves, which are collected from the plant every two or three years. After collection they are dried by the aid of heat, then reduced to fragments or coarse powder, and packed in sacks ready for the market. The drug possesses astringent, tonic, stimulant, and nervine properties, similar to those of ordinary tea, and, like the latter, is used chiefly in the form of infusion.

Maté consists of shortly petiolate, oblong-lanceolate leaves, about 5 cm. long. They are smooth, nearly obtuse, and have a few teeth in the margin. As met with in commerce, the drug occurs in the form of fragments or coarse powder, possessing a slight odour, and an astringent, bitterish, and somewhat empyreumatic taste.

The maté of commerce is distinguished by its fragmentary condition, faint balsamic odour, and peculiar bitter taste. The leaves are rarely seen entire, as they are used only in the form of coarse powder, which is kept for several months, protected from moisture, before being packed for the market. The chief constituent of the drug is from 0·2 to 1·6 per cent. of caffeine; other constituents are from 10 to 16 per cent. of tannin, and a little volatile oil, together with gum, resin, and other plant principles.

MATICÆ FOLIA.

Matico Leaves.

THE leaves of *Piper angustifolium*, Ruiz and Pavon (N.O. Piperaceæ), a native of Peru, which is also found wild in moist woods in Bolivia, Brazil, Colombia, and Venezuela, and is cultivated in some parts of tropical America. It is a shrub with a jointed stem about 4 m. high, bearing sessile or very shortly petiolate leaves, opposite which the hermaphrodite flowers are arranged in slender, cylindrical, solitary spikes, on which, after fertilisation, the cubeb-like fruits are densely packed. After collection, the leaves are dried, packed in bales or serons, and exported from Panama. They possess stimulant, tonic, and astringent properties, and contain a volatile oil which is a powerful styptic. The drug is used in the form of infusion (1 in 20), liquid extract (1 in 1), and tincture (1 in 5).

Matico leaves occur usually in brittle, more or less compressed masses of a dull, dark greyish-green or yellowish-green colour, in which portions of stem and fruits may occasionally be found. By soaking the masses in water, the leaves can be separated, and are then seen to be from 10 to 15 cm. long, sessile or shortly petiolate and oblong-lanceolate, with a pointed apex, unequally heart-shaped base, and an entire or minutely crenulate margin. They are tesselated above, the veins being depressed on the upper surface, which they divide into squares; the under surface is reticulate, the veins being prominent, and densely covered with short shaggy hairs. The mesophyll contains very minute oil-glands, the contents of which impart to the drug a slight aromatic odour and somewhat bitter camphoraceous taste.

The leaves of other species of *Piper* are not tesselated or covered with hairs like true matico, while the leaves of *Digitalis purpurea*, Linné, have not depressed veins or an aromatic taste. The chief constituents of matico leaves are volatile oil and tannin; other constituents are a bitter principle, artanthic acid, resin, etc. The volatile oil imported formerly deposited crystals of matico camphor when cooled, while a heavier oil yielded by the leaves of a variety of *P. angustifolium* contained asarone in place of matico camphor. Another variety of matico oil has been found to contain dill-apiol, parsley-apiol, a hydrocarbon congealing at –18° C., and an unidentified phenol ether.

MEL DEPURATUM.

Clarified Honey.

A SACCHARINE secretion deposited in the honeycomb of the bee, *Apis mellifica*, Linné (Order Hymenoptera), purified after collection by melting in a water-bath and then straining, while hot, through flannel previously moistened with warm water. The saccharine matter is extracted from the nectaries of plants by the bee, the intestine of which contains invertin, which converts cane sugar into invert sugar. The finest " virgin " honey is obtained from hives which have never swarmed, and is allowed to drain from the honeycomb; honey obtained by submitting the honeycomb to pressure is of inferior quality, and the product is still more inferior if heat be applied before expression. The honey of commerce varies in consistence from a viscid liquid to a soft semi-solid; it is usually white or yellowish, but may have a brownish or reddish tinge. It varies somewhat in odour, according to the flowers from which the nectar has been collected by the bees, and its sweet, feebly aromatic taste is followed by a slight prickling or sense of acridity in the fauces. Honey is demulcent, laxative, and nutritive; it is used in the preparation of Confectio Piperis, Mel Boracis, Oxymel, and Oxymel Scillæ.

Clarified honey, when freshly prepared, is a viscid translucent liquid of a light yellowish or brownish-yellow colour, with a faintly acid reaction towards litmus paper, due to the presence of a minute quantity of formic acid, which acts as a preservative. It gradually becomes opaque on keeping owing to partial crystallisation of the sugar it contains, and is converted ultimately into a soft granular mass. Its very sweet taste, characteristic but somewhat variable odour, and peculiar flavour, resemble those of crude honey. If the clarified liquid yields more than 0·25 per cent. of ash when incinerated, the presence of foreign inorganic substances, or possible adulteration with molasses, commercial glucose, etc., is indicated. The presence of sulphates in any appreciable quantity indicates adulteration of the honey with commercial glucose, prepared by the hydrolysis of starch with sulphuric acid, since the acid is usually neutralised with chalk, and the product may then contain calcium sulphate. Starch is occasionally added to inferior kinds of honey in order to give them a white appearance ; any traces left in clarified honey can be detected by the iodine test.

The clarification of honey renders it less liable to ferment, or to produce griping pains when swallowed. The chief constituents of crude honey are dextrose and levulose, of which it contains about 70 to 80 per cent. Other constituents of honey are dextrin, wax, proteids, volatile oil, formic acid, colouring matter, mucilage, and water; pollen, spores, and other flocculent matters are also present usually, in suspension, and tend to cause fermentation. When diluted with water, honey may undergo the vinous fermentation, and, if not very pure, it may ferment in warm weather without being diluted, thus acquiring a pungent taste and a deeper colour. Inferior honey contains a large proportion of uncrystallisable sugar and vegetable acid.

MENTHÆ PIPERITÆ OLEUM.

Oil of Peppermint.

THE oil distilled from fresh flowering peppermint, *Mentha piperita*, Smith (N.O. Labiatæ), a plant found growing wild throughout Europe, and cultivated in England, France, Germany, and America. There are two varieties of the plant, known as black and white peppermint respectively, the former being more hardy and yielding considerably more oil than the white variety, though the product is said to possess a less delicate aroma than that of white peppermint. The largest yield of oil is obtained from plants cut in September. In England the whole herb is distilled while fresh, the yield varying from about 0·5 to 1 per cent., but in America the plants are partially dried before distillation, since experience has proved that a larger yield of oil can thus be obtained. The oil is a grateful aromatic, stimulant, and carminative. It is given on sugar or in pills, and is used in the preparation of Aqua Menthæ Piperitæ (1 in 1000), Pilula Rhei Composita, Spiritus Menthæ Piperitæ (1 in 10), and Tinctura Chloroformi et Morphinæ Composita.

Oil of peppermint (s.g. 0·900 to 0·920) is colourless, pale yellow, or greenish-yellow when recently distilled, but it becomes darker gradually on keeping. It has the characteristic odour of the herb, and a strong, penetrating, aromatic taste, which is followed by a sensation of coldness in the mouth, caused by the menthol it contains. The oil mixes in all proportions with absolute alcohol, and is soluble in half its volume of 90 per cent. alcohol, the solution becoming turbid on adding more of the solvent. On cooling the oil to a low temperature, separation of menthol takes place, especially if a few crystals of that substance be first added to start crystallisation. Menthol occurs usually in colourless acicular crystals (m.p. 42°–43° C.), which are more or less moist from adhering oil, but is sometimes, though more rarely, seen in crystalline masses. Its odour and flavour recall those of peppermint, and it imparts to the tongue a sensation of warmth, which is succeeded by a sensation of coolness on drawing air into the mouth. It is almost insoluble in water or glycerin, but readily soluble (5 in 1) in 90 per cent. alcohol, the solution having a neutral reaction; it is also soluble in chloroform (about 4 in 1), ether (8 in 3), petroleum spirit (10 in 7), and olive oil (1 in 4).

The chief constituent of oil of peppermint is menthol, but it also contains menthyl acetate and isovalerate, together with menthone, cineol, inactive pinene, lævo-limonene, cadinene, phellandrene, acetic aldehyde and acid, isovaleric aldehyde and acid, amyl alcohol, and dimethyl sulphide. English oil of peppermint contains from 58 to 66 per cent. of menthol. American oil contains less menthol than the English, but the Japanese and Chinese oils (s.g. 0·895 to 0·905), obtained from *Mentha arvensis*, De Candolle, vars. *piperascens et glabrata*, Holmes, are the richest of all in menthol, sometimes containing 85 per cent. Menthol is imported chiefly from Japan, as is also the "dementholised" oil of commerce. The menthol is separated by submitting the oil to fractional distillation, or by cooling it to a very low temperature, when the menthol crystallises out, often in a dense mass from which the adhering oil can be separated by pressure. Menthol acquires an indigo-blue or ultramarine colour when boiled with sulphuric acid diluted with half its volume of water, the liquid at the same time becoming brown; but if thymol be present as an impurity, a deep rose colour is developed on heating with the sulphuric acid. Menthol also volatilises entirely when heated on a water-bath, the presence of any non-volatile adulterant, such as wax, paraffin, spermaceti, or magnesium sulphate, being thus indicated.

MENTHÆ VIRIDIS OLEUM.

Oil of Spearmint.

The oil distilled from fresh flowering spearmint, *Mentha viridis*, Linné (N.O. Labiatæ), a native of Europe and Asia. The plant is cultivated largely for domestic use, as well as for the sake of its oil, of which it yields less than 0·5 per cent. of oil. Most of the oil in commerce is imported from America, but English, German, and Russian oils are also known, the German and Russian products being obtained from other species than *M. viridis*. The oil has similar aromatic, stimulant, and carminative properties to those of oil of peppermint, but it is much less used in medicine. It is given on sugar or in pills, and is used in the preparation of Aqua Menthæ Viridis (1 in 1000).

Oil of spearmint (s.g. 0·920 to 0·940) is colourless, pale yellow or greenish-yellow when recently distilled, but becomes darker on keeping. It has the characteristic odour and warm, slightly bitter taste of the spearmint, the taste being less pungent than that of peppermint. The oil forms a clear solution with its own volume of a mixture of equal parts of absolute alcohol, and 90 per cent. alcohol. It is also soluble in all proportions of absolute alcohol, and dissolves in its own volume of 90 per cent. alcohol, the solution becoming milky on adding more of the solvent.

The spearmint emits a most fragrant odour from all parts when rubbed, and has a pungent, aromatic taste. It is not cultivated so extensively for the production of oil as peppermint, the fresh and dried herb being used chiefly for domestic purposes in this country. The chief constituent of oil of spearmint is carvone, of which it may contain as much as 56 per cent.; other constituents are an alcohol and terpenes, including l-limonene and l-pinene. German oil of spearmint, from *M. crispa*, L., resembles the American oil closely in appearance. Russian oil of spearmint, from *M. aquatica*, differs from other varieties in odour; it contains less carvone than the American and German oils, and also contains linalool and cineol, in addition to l-limonene.

MEZEREI CORTEX.

Mezereon Bark.

THE dried bark of *Daphne Mezereum*, Linné (N.O. Thymeaceæ), *D. Laureola*, Linné, and *D. Gnidium*, Linné, obtained from both stem and root. The mezereon, *D. Mezereum*, is distributed widely throughout Europe, including the southern counties of England, but the bark is collected chiefly from plants grown in Thüringia. The spurge laurel, *D. Laureola*, is a small evergreen shrub indigenous to Britain; its bark is inferior in medicinal activity, and seldom collected. The bark of *D. Gnidium* is collected largely in Algeria and the south of France. Mezereon bark is collected in the winter or early spring, when it separates readily in long flexible strips, which are dried in the form of quills of varying length, or, more usually, made into small bundles or flat disc-like rolls. The drug is a stimulant and vesicant, and is used in the preparation of Liquor Sarsæ Compositus Concentratus (1 in 20).

Mezereon bark occurs in long, thin, more or less flattened, fibrous strips, or in quills of varying length. It is flexible, very tough, and separates readily into two layers. The outer corky layer of the bark varies in colour from olive-brown or reddish-brown to deep purplish-brown. The bark has a pale yellowish, or nearly white, silky inner surface; it is also extremely tough and fibrous, owing to the presence of numerous strands of tough bast fibres, as can be seen in a transverse section. The bark of *D. Mezereum* has a very thin, yellowish or olive-brown, transversely wrinkled cork, which is marked, in the case of the stem-bark, with scattered rounded scars of leaves and buds, and often bears the minute black apothecia of small lichens; the cork easily separates from the cortex, which is green in the stem-bark and yellowish in the root-bark. The bark of *D. Laureola* is very similar to that of *D. Mezereum*, but the cork is of a paler brownish colour, and bears elongated, pointed-oval scars of leaves and buds, which are crowded together at intervals. The bark of *D. Gnidium* has a dark purplish-brown cork, with leaf-scars resembling those of *D. Mezereum*. The drug has no marked odour, but it has a persistent acrid, burning taste.

The distinguishing characteristics of mezereon bark are its thin, easily separable cork, silky inner surface, and extreme toughness and flexibility. The chief constituent of the bark is a greenish-brown amorphous resin, named mezerein, which possesses extremely acrid and sternutatory properties. Other constituents of the bark are a crystalline bitter glucoside named daphnin, fixed oil, and a substance resembling euphorbone, an inactive constituent of euphorbium, or the inert waxy substance, lactucone or lactucerin, of which lactucarium consists largely.

MORRHUÆ OLEUM.

Cod-Liver Oil.

THE oil extracted from the fresh liver of the cod, *Gadus Morrhua*, Linné (Order Teleostei), by the application of a temperature not exceeding 82° C., and from which solid fat has been separated by filtration at about –5° C. The cod inhabits the Northern Atlantic Ocean, and the oil is prepared in Norway, Newfoundland, etc., from fish caught on the coasts. Unhealthy livers are rejected and the gall-bladders removed, after which the oil is caused to separate from the livers by the application of low-pressure steam. It is then cooled to a low temperature, and the frozen mass submitted to great pressure in canvas bags, the liquid forced through the canvas being thus separated from the so-called " stearine " and liver débris, which are left in the bags in the form of a whitish, tallow-like mass. The purified oil is known as " non-freezing " oil, because it does not become turbid readily when subjected to low temperatures. Another method of extraction is to heat the livers with water and strain the oil which separates, or to heat the livers in a clean iron pot over a slow fire, stirring them until they are in a pulpy condition, and subsequently straining the pulpy mass through canvas, after which the oil is allowed to separate from any water present, and filtered through paper. Brownish oil of inferior quality, and not suitable for medicinal purposes, is obtained by allowing the livers to undergo decomposition gradually in barrels, and collecting the liquid which rises to the surface of the mass as it escapes from the disintegrating tissue. Cod-liver oil of good quality is nutritive, and acts as a nervine and hæmatinic tonic. It is usually given alone or in the form of emulsion.

Cod-liver oil (s.g. 0·920 to 0·930) should be of a pale yellow colour, with a slight fishy but not rancid odour, and a bland, slightly fishy taste. Inferior or old samples are liable to be dark-coloured, acrid or bitter, unduly acid, and more or less rancid. Fresh oil is readily soluble in ether (1 in 2) or chloroform, and slightly soluble in strong alcohol. It is distinguished from seal oil or vegetable oils by the violet coloration produced on adding a drop of sulphuric acid (s.g. 1·843) to a few drops of cod-liver oil on a porcelain slab, the presence of cholesterin being thus indicated. Cod-liver oil should be only slightly acid, and fine oils containing but little acid show a ring of coagulated albumin when floated upon nitric acid. There may be no trace of acidity in fine colourless oil, though as much as 9 per cent. of free acid has been found in dark-coloured samples, altered by heat and long keeping. If cod-liver oil be adulterated with other fish oils, or vegetable oils, solid fat will separate on cooling the mixture to 0° C. for two hours.

The chief constituents of cod-liver oil are jecolein and therapin, the glycerides or glyceryl esters of jecoleic acid and therapic acid; other constituents of the oil are the glycerides of one or more unknown acids, and traces of cholesterin (cholesterol), alkaloidal bodies (aselline, morrhuine, etc.), bile acids and iodine, while the glycerides of acetic, butyric, valeric, and capric acids sometimes occur as secondary products in oil of inferior quality, owing to putrefaction of the livers from which it is extracted. Jecoleic acid is a very unstable compound, belonging to the same series as oleic acid, and is probably isomeric with doeglic acid. On distillation with ammonia, cod-liver oil yields trimethylamine, being thus distinguished from other fixed oils used in medicine. Oils from the livers of other species of *Gadus* have analogous properties to cod-liver oil, and are difficult to detect when mixed with it, being distinguishable only by their odour and taste.

MOSCHUS.

Musk.

The dried secretion from the preputial follicles of the musk deer, *Moschus moschiferus*, Linné (Order Ungulata), an animal which inhabits the vast mountainous regions of Central Asia, extending from India to Siberia, and from China to the Caspian Sea. The male animal alone produces musk, the secretion being found in a small hairy sac which is situated between the umbilicus and the prepuce, and is provided with a small opening through which the contents can be discharged. The sac is produced by an infolding of the skin, and is lined internally by a smooth membrane, the numerous irregular folds of which form incomplete partitions, and thus constitute the preputial follicles. The musk is secreted by the lining membrane as a liquid, but it becomes converted gradually into a soft brownish mass which is marked with the folds of the membrane, and increases in size with the age of the animal. The sacs or "musk pods" are dried after being removed from the dead musk deer by cutting, and, in the case of the best musk, the pods are wrapped separately in paper, about twenty-five being packed in a box or "caddy." Most of the musk of European commerce is obtained from China and Thibet, the best being exported from Shanghai and known as Tonquin or Tonkin musk. Russian musk, procured from Southern Siberia, has a weaker and more fetid odour than the Tonquin variety. A small quantity comes from Yunnan, in Southern China, and is known by the name of that province. Nepaul and Assam musk, which occurs usually in grains, is imported from India, being collected in Southern China, Thibet, and the Himalaya district, whence it is sent by way of Nepaul or Assam to Calcutta. Cabardine musk is an inferior kind collected in Thibet and sent thence to China and Japan. The drug is a stimulant and antispasmodic, and is given usually in mixtures or pills, but it is not now much used in medicine, being employed chiefly in the manufacture of perfumes.

Musk forms a soft, moist, unctuous, granular mass when contained in the sac, but after removal it appears in the form of somewhat unctuous, dark reddish-brown or reddish-black grains, which have a characteristic, penetrating, persistent odour, and a somewhat bitter taste. The pods in which the musk is imported are flattened oval or roundish sacs about 3·5 to 5 cm. in diameter and from 2 to 2·5 cm. thick. They are smooth and flattened on one side, indicating where they have been attached to the animal, but the rest of the outer surface is covered with brownish-yellow or greyish, appressed, bristle-like hairs, which are arranged concentrically around a nearly central orifice. The thin, soft, supple membrane or "blue skin" which is disclosed where the outer skin has been removed, appears dark brown in colour, but often exhibits a fine steel-blue iridescence when the contents of the sac have not been removed. Musk should be free from earthy impurities, and, on incineration, should yield not more than 8 per cent. of whitish or greyish ash.

The chief constituent of musk is its odorous principle, which has not yet been identified, but an artificial musk (trinitro-butyl-toluene) has been prepared by treating tertiary butyl-toluene with a mixture of concentrated nitric and sulphuric acids. The bitter taste of the drug is due to the presence of a peculiar bitter resin, whilst fatty matter, cholesterin, ammonia, various inorganic substances, gelatinous and albuminous principles, and moisture are also present. From 50 to 75 per cent. of musk should be soluble in water, the solution being deep brown, faintly acid, and strongly odorous. Alcohol (90 per cent.) dissolves only 10 to 12 per cent. of the drug, and the resulting light brownish-yellow tincture becomes slightly turbid on the addition of water. Artificial musk is insoluble in water, but soluble in alcohol. Musk is capable of communicating its odour to three thousand times its weight of inodorous powder. The odour is diminished greatly when musk is mixed with preparations of bitter almonds or with cherry-laurel water, and is said to be destroyed by rubbing the musk with golden sulphide of antimony or with camphor. The addition of ammonia solution sometimes restores the odour. Among the substances which have been found as adulterants of musk are dried blood, which leaves a reddish ash; resin and other substances soluble in spirit, which increase the amount of alcoholic extractive; small stones, shot, scraps of leather or horn, sand, iron filings, hair, animal membrane, and other impurities, which increase the percentage of ash left on incineration.

MUCUNA.

Cowhage; Cowitch.

THE hairs attached to the fruit of *Mucuna pruriens*, De Candolle (N.O. Leguminosæ), a perennial climbing plant common throughout the tropical regions of Africa, India, and America. The fruit of the plant is a slightly compressed, dark blackish-brown legume or pod, from 5 cm. to 10 cm. long, about 10 mm. wide, and containing four to six seeds. Each valve of the fruit is furnished with a prominent ridge, running from the apex nearly to the base, and is covered densely with rigid, pointed, brown hairs, which enter the skin when touched and cause an intolerable itching. The hairs possess anthelmintic properties, and have been administered in the form of an electuary, mixed with syrup or honey, but they are now rarely used in medicine.

Cowhage consists of the hairs detached from the legumes. They are one-celled, stiff, brownish-red, and about 2 mm. to 3 mm. long. When examined under the microscope the hairs appear sharp-pointed, retrorsely serrate, rather thick-walled, and partly filled with a brown granular matter. They penetrate the skin easily, causing violent itching. The hairs assume a darker brown colour when treated with sulphuric acid and iodine, and they are completely decolorised by concentrated nitric acid.

The distinctive characters of cowhage are the size and colour of the hairs and the violent irritation induced when they enter the skin. The hairs of *Mucuna urens* are shorter and darker, but equally irritating. The irritant effect of cowhage appears to be purely mechanical, as neither a tincture nor a decoction produces a similar effect. The chief constituents of the hairs are a little tannin and resin.

MYLABRIS.

Mylabris.

THE dried beetle, *Mylabris phalerata*, Pallus (Order Coleoptera), also known as *M. Sidæ*, Fabricius, that species and *M. Cichorii*, Fabricius, being known as Chinese blistering flies or beetles. The two species are found in China, India, etc. They are richer in cantharidin than cantharides, and, together with other species containing an equivalent proportion of that substance, are official in the Indian and Colonial Addendum, for use in India and the African and Eastern Colonies as an equivalent of cantharides. Like cantharides, mylabris is an irritant poison, possessing diuretic, aphrodisiac, rubefacient, and vesicant properties. The chief preparations of the drug are Acetum Mylabridis (1 in 10), Emplastrum Calefaciens Mylabridis (1 in 25), Emplastrum Mylabridis (1 in 3), Liquor Epispasticus Mylabridis (1 in 2), and Unguentum Mylabridis (1 in 10).

Mylabris has two long black and orange elytra or wing-sheaths, under which are two brown membranous wings. In the case of *M. phalerata,* the beetle measures usually 25 mm. or more in length and 9 mm. broad, the elytra being black with two broad, wavy, transverse, orange-coloured bands, and a large orange-coloured spot at the base of each. When examined under a lens the bands are seen to bear black bristly hairs. *M. Cichorii* is usually smaller than *M. phalerata* and bears brighter-coloured bands covered with a yellow downy pubescence, the hairs on the black portions of the elytra being black. The odour of the beetles is somewhat disagreeable.

The distinctive characters of mylabris are the orange-coloured bands on a black ground, *M. Cichorii* being distinguished from *M. phalerata* by the difference in the hairs on the bands. Other species—*M. bifasciata* and *M. lunata*—have been imported from South Africa. The chief constituent of the beetles is from 1 to 1·2 per cent. of cantharidin; other constituents are fat, an odorous principle, and other extractive matter.

MYRISTICA.

Nutmeg; Nux Moschata.

THE dried seed, divested of its testa, of *Myristica fragrans,* Houttuyn (N.O. Myristicaceæ), a lofty tree which is indigenous to the Moluccas and the Banda Islands, and has been introduced into Penang, Sumatra, Malacca, Java, Singapore, Ceylon, and other parts of the East Indies, as well as Mauritius and Bourbon, Cayenne, and several of the West Indian Islands. The tree yields three crops annually, the fruit being a fleshy, peach-like drupe, which turns yellow as ripening proceeds, the fleshy pericarp becoming dry and leathery, then splitting longitudinally and disclosing a scarlet or crimson, lobed and reticulated arillus (mace), surrounding a brown shining seed. The arillus originates in a thickening of the funiculus, which extends to the outer integument of the seed near the exostome, and divides into branching lobes as it develops, the lobes approaching one another near the apex of the seed, so that the latter is enveloped by the arillus or mace. After the fruit has been collected, the pericarps are removed, and the mace is stripped off and dried, its colour changing to reddish-yellow as a result of the drying process. The seeds are also carefully dried, and the thin brown shell or testa is removed from each, the kernels or nutmegs being afterwards sorted for the market, and the broken and imperfect ones reserved for the production of the volatile and expressed oils. The nutmegs of commerce are exported chiefly from the Malay Archipelago to Amsterdam and London. They are sometimes dusted or rubbed with slaked lime, or washed with milk of lime, to protect them against the attacks of insects, but Penang nutmegs are not limed. Nutmegs are aromatic, stimulant, and carminative, but act as a narcotic poison when given in large doses. They are employed chiefly as an agreeable flavouring agent, but are also used in the preparation of oil of nutmeg, Pulvis Catechu Compositus (1 in 10), Pulvis Cretæ Aromaticus (1 in 15), Spiritus Armoraciæ Compositus, and Tinctura Lavandulæ Composita; the oil is used in the preparation of Spiritus Ammoniæ Aromaticus, Spiritus Myristicæ (1 in 10), Tinctura Guaiaci Ammoniata, Tinctura Valerianæ Ammoniata, and Pilula Aloes Socotrinæ; the spirit of nutmeg is an ingredient of Mistura Ferri Composita.

Nutmegs are oval, rounded, or broadly and bluntly ovoid in shape. They vary in size, but rarely exceed 25 mm. in length, and are rather less in thickness. The seeds are greyish-brown externally and marked with shallow reticulated furrows, the surface being finely pitted and marked with minute reddish points, larger dark reddish-brown lines, and irregularly elongated spots, as can be seen on examination with a powerful lens. Internally the seeds are of a waxy consistence and greyish-red in colour, with darker brownish-red veins or lines, so that a transverse section has a marbled appearance. The greater portion of the nutmeg consists of the ruminated albumen, the ruminations being produced by the infolding of part of the perisperm, in the cells of which deposition of dark colouring matter occurs. The infoldings occur near the fibro-vascular bundles, and produce depressed lines on the surface of the nutmeg, which correspond to the branching bundles. The waxy consistence of the seed enables it to be cut easily, and the cut surface emits oil readily when indented with the finger-nail. The hilum lies in a little circular depression surrounded by a raised ring, and the course of the raphé can usually be traced in a furrow which extends to the chalaza at the apex of the nutmeg. The embryo is small, and occupies a cavity at the base of the seed. Nutmegs have a strong and pleasantly aromatic odour, and an agreeably aromatic, warm, and somewhat bitter taste, both odour and taste being due to the volatile and fixed oils the seeds contain.

The only seeds resembling nutmegs are those of *M. argentea*, Warburg, *M. malabarica*, and other species of *Myristica*, all of which are longer and narrower than nutmegs, and also more or less destitute of aroma, the only one which produces an aromatic seed being the Papua nutmeg (*M. argentea*). Mace is sometimes adulterated with Bombay or wild mace (*M. malabarica*), which occurs in longer, narrower, and less fragrant pieces of a dark red colour. True mace has an agreeable aromatic smell, closely resembling that of nutmeg, and a pungent, spicy, somewhat acrid taste. It is horny, brittle, and translucent, reddish-yellow or orange-brown in colour, has a dull fatty lustre, and exudes oil when pressed with the finger-nail. The chief constituents of nutmegs are volatile and fixed oils; other constituents of the seeds are starch, albuminoids, mucilage, etc. The volatile oil, of which the seeds contain from 8 to 15 per cent., consists chiefly of dextro- and lævo-pinene, together with dipentene, myristicol, and a phenol-like substance, its composition being somewhat variable. Dried mace contains about 4 to 15 per cent. of volatile oil of similar composition, but it also contains myristicin, a crystalline compound which must be distinguished from myristin. The expressed oil of nutmeg, of which the seeds contain from 25 to 30 per cent., is a solid fat. It consists chiefly of myristin or glyceryl myristate, with some free myristic acid, palmitin, olein, resin, and about 5 per cent. of the volatile oil. A similar fixed oil can be obtained from mace, and the expressed oil of nutmeg, which occurs as yellowish-brown mottled masses, with a very aromatic odour and taste, is commonly known as oil of mace. It separates from alcoholic solutions, on evaporation and cooling, in light crystalline scales. The volatile oil of nutmeg (s.g. 0·865 to 0·920) is obtained by distilling the powdered seeds with water, or it may be extracted from the powder by means of carbon bisulphide or ether. It is a colourless or pale yellow oil, possessing the characteristic odour and taste of nutmeg, and mixes in all proportions with absolute alcohol. It is also soluble in 90 per cent. alcohol (1 in 4·5), but only sparingly soluble in 60 per cent. alcohol.

MYROBALANUM.

Myrobalans.

THE dried immature fruits of *Terminalia Chebula*, Retzius (N.O. Combretaceæ), a tree which is indigenous to India. The immature fruits are commonly known as black myrobalans. They possess astringent and purgative properties, and are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of galls, the chief preparations of the drug being Unguentum Myrobalani (1 in 5) and Unguentum Myrobalani cum Opio.

Myrobalans are black, ovoid or fusiform in shape, from 8 mm. to 13 mm. or more in length, and about 9 mm. in width. They are much shrivelled longitudinally, solid and brittle, breaking with a somewhat shining fracture, and appearing blackish-brown internally. The fruits are without odour, but have a very astringent taste, due to the tannin present.

The distinctive characters of myrobalans are their shape, size, colour, and astringency. The matured fruits, which are brownish in colour and larger than the immature fruits, are known in commerce as Chebulic myrobalans. The chief constituent of the immature fruits is from 20 to 30 per cent. of tannic acid; other constituents are gallic acid, free fatty acid, resins, glucose, a bitter principle, and colouring matter.

MYRRHA.

Myrrh.

A GUM-RESIN obtained from the stem of *Balsamodendro* *Myrrha*, Nees (N.O. Burseraceæ), and probably othe species, the plants yielding it being indigenous to North eastern Africa and Southern Arabia. The plants are shrub or small trees, the bark of which contains numerou schizogenous ducts in which an oily granular secretion i formed, while the tissue intervening between the duct breaks down frequently, and the large lysigenous cavitie thus produced also become filled with the secretion. I the early autumn, after the rains, fissures form in the bar and the ducts and cavities then discharge the secretion a creamy, yellowish-white liquid, which soon hardens to firm reddish mass and constitutes the myrrh of commerc

There are three chief varieties of myrrh in European commerce, the finest being Somali or African myrrh, collected in Somaliland on the mountains between Zeila and Cape Gardafui. Fadhli or Arabian myrrh is collected in the Fadhli district, to the east of Aden, while Yemen myrrh is collected in the Arabian province of that name. Fadhli and Yemen myrrh are seldom found in commerce. The drug possesses stomachic, carminative, and emmenagogue properties. It is an ingredient of Decoctum Aloes Compositum (1 in 200), Mistura Ferri Composita (1 in 73), Pilula Aloes et Myrrhæ (1 in 4½), Pilula Galbani Composita (1 in 3½), and Pilula Rhei Composita (1 in 7½); the gum-resin is also used in the preparation of Tinctura Myrrhæ (1 in 5), which is employed largely as an ingredient of mouth-washes and gargles.

Myrrh occurs in small rounded or irregular fragments or tears, or in masses of agglutinated tears, the pieces varying in size from small grains the size of a pea to masses as large as the fist. They have a somewhat rough, dull, dusty surface, being more or less covered by a fine powder, and vary in colour from reddish-brown to reddish-yellow. The pieces are also dry and brittle, breaking fairly easily, with an irregular fracture. The fractured surface is somewhat translucent, and of a rich brown or reddish-brown colour; it frequently exhibits opaque, whitish or yellowish spots or veins, and has an unctuous or oily granular appearance. Thin splinters of the gum-resin are translucent or almost transparent. The drug has an agreeable aromatic odour, and an aromatic, somewhat bitter and acrid taste. It may be distinguished from bdellium and other gum-resins which resemble it to some extent, by the purplish or violet colour it assumes when moistened with strong nitric acid; a similar coloration is produced when nitric acid is added to the tincture. Myrrh is partially soluble (40 to 65 per cent.) in water, and the remainder is almost entirely soluble in 90 per cent. alcohol. When powdered and triturated with water, myrrh forms a yellowish emulsion, and since the gum-resin, as a whole, is soluble in solutions of the alkalies, the addition of potassium carbonate facilitates its suspension in water. When digested for a few hours with ether, myrrh yields a solution which assumes a violet colour when the vapour of bromine is allowed to come in contact with it, the reaction being due to the volatile oil in the drug.

The peculiar taste of myrrh is its most characteristic feature, but it can also be distinguished by its unctuous granular fracture, and the translucency of thin fragments. Somali myrrh occurs in irregularly rounded, brownish pieces, which are from 25 to 75 mm. or more in diameter, and covered more or less with fine powder; it is obtained from *Balsamodendron Myrrha*, Nees, and is imported into Europe or Bombay by way of Berbera and Aden. Fadhli (Arabian) myrrh, which is also exported from Aden, occurs in smaller and more gummy-looking pieces, which are rarely more than 40 mm. in diameter, and are not so strongly aromatic as Somali myrrh. Yemen (Arabian) myrrh is more like Somali myrrh, but is of a dark reddish-brown colour, and has a somewhat disagreeable odour; it is probably identical with the Arabian myrrh which is exported to India (Bombay) from Makalla and Aden. The different varieties of bdellium are either opaque, or their odour and taste distinguish them from myrrh. African bdellium is hard, appears translucent in thin layers, has a dull slaty fracture, and appears red when viewed by transmitted light; Indian bdellium occurs in large, irregular, dark reddish-brown masses, with a feeble cedar-like odour; opaque bdellium is yellow, opaque, and has only a slight odour. East Indian myrrh (Bissa Bol) is of African origin and resembles genuine myrrh closely, but differs markedly in odour. The chief constituents of myrrh are from 25 to 40 per cent. of resin, 57 to 59 per cent. of gum, and 2·5 to 8 per cent. of volatile oil. The resin is a mixture of a neutral resin, an indifferent soft resin, and two dibasic acid resins. The gum resembles arabin, and makes a good mucilage. The volatile oil (s.g. 0·988 to 1·007) is a thick yellow or greenish liquid of unknown composition, and is said to acquire an acid reaction by oxidation.

NUX VOMICA.

Nux Vomica.

THE dried ripe seeds of *Strychnos Nux-vomica*, Linné (N.O. Loganiaceæ), a small tree which is indigenous to India. It is distributed widely throughout Bengal and Madras, and also occurs in Ceylon, Siam, and Northern Australia. The ripe fruit is one-celled, about the size and colour of an orange, with a smooth, hard, fragile rind, enclosing a whitish, juicy, bitter pulp containing from three to five seeds. After the pulp has been removed by washing, the seeds are dried in the sun and are then ready for exportation. The Indian drug is collected chiefly in the Coromandel and Malabar Coast districts, and is sent to Cocanada, Calcutta, Madras, Bombay, Cochin, and other ports for shipment. The drug is extremely poisonous, but acts as a general tonic in small doses. It is used in the preparation of strychnine and Extractum Nucis Vomicæ Liquidum (1·5 p.c. of strychnine), while Extractum Nucis Vomicæ (5 p.c. of strychnine) and Tinctura Nucis Vomicæ (1 in 6) are prepared from the liquid extract.

Nux vomica seeds are nearly circular in shape, the discs being flat or slightly convex on one side, concave on the other, and sometimes irregularly bent. They are ash-grey or greenish-grey in colour, from 2 to 2·5 cm. in diameter and about 6 mm. in thickness. The edge of each seed is either rounded or somewhat acute, according to the variety, and at one point of the margin there is a small but distinct prominence—the micropyle—from which a ridge or raised line passes to the hilum in the centre of the seed. The ridge does not exist in the fresh seed, and must not be mistaken for the raphé. The hilum may be recognised by the scar left by the funicle. The surface of the seeds has a silky sheen, owing to the presence of numerous short, closely appressed, satiny hairs, which radiate from the centre to the circumference. If one of the dry, hard, and horny seeds be soaked in water, it softens and can easily be split into two thinner discs; a small embryo, consisting of a radicle and two leafy cotyledons, can then be seen imbedded in the large, grey, translucent, horny endosperm. The seeds have an extremely bitter taste, and are without odour while unbroken, though a faint sweetish odour distinguishes the powdered drug.

The seeds of *S. Nux-vomica* are distinguished readily by their characteristic shape and silky appressed hairs. The chief constituents of the seeds are the poisonous crystalline alkaloids strychnine and brucine, the total alkaloid varying from 1·5 to 5 per cent., and the strychnine being usually present in larger proportion, though the ratio of strychnine to brucine may vary as much as 3 to 1 and 1 to 2. Other constituents of the seeds are the glucoside loganin, igasuric or caffeo-tannic acid, and 2·6 to 4·7 per cent. of a fixed oil or fat consisting of various glycerides, also gum, starch, proteids, sugar, and colouring matter. The fat, of which the hairs contain the greater proportion, is soluble in alcohol, but it is deposited from the solution when cooled to a low temperature. Strychnine occurs in the seeds of *Ignatia Amara* and various species of *Strychnos*, and may be extracted by exhausting the seeds with alcohol. The resulting tincture is submitted to distillation to recover the alcohol, the residue dissolved in water, and lead acetate added to the solution to precipitate colouring matter and other inert substances. Finally, after removal of lead by precipitation with hydrogen sulphide, the alkaloidal solution is evaporated to a small bulk and mixed with lime or magnesia to liberate the alkaloids, which can then again be extracted with alcohol and separated by fractional crystallisation, strychnine being much less soluble in alcohol than brucine.

Strychnine occurs in colourless, inodorous, intensely bitter rhombic prisms, or as a white crystalline powder. It is soluble in 6000 to 8000 parts of water, in 170 parts of 90 per cent. alcohol, and in 6 parts of chloroform, but is nearly insoluble in ether. It is not coloured by strong nitric acid, this test serving to distinguish it from brucine, or to detect the latter if present as an impurity, since it gives an intense red coloration with the acid. Strychnine dissolves in strong sulphuric acid to form a colourless solution, being thus distinguished from many organic substances which are easily charred, and from others, like salicin, which give colour reactions with the acid. A characteristic violet colour reaction results when strychnine is treated with sulphuric acid and potassium bichromate or some other oxidising agent. Strychnine hydrochloride is obtained by neutralising strychnine with hydrochloric acid and crystallising the resulting salt. It occurs in small trimetric prisms or white silky needles, which are efflorescent in dry air. They are soluble in 35 parts of water or in 73 parts of 90 per cent. alcohol, the solutions being neutral to litmus and intensely bitter.

OLIBANUM.

Olibanum; Frankincense.

A GUM-RESIN obtained from *Boswellia Carterii*, Birdwood (N.O. Burseraceæ), and other species of *Boswellia*, natives of Southern Arabia and Somaliland (N.E. Africa). They are small trees, the bark of which contains schizogenous ducts in which an oily secretion is formed as in the case of myrrh. When incisions are made in the bark, the milky liquid exudes and hardens into yellowish tears on exposure. After collection, the gum-resin is exported to Europe by way of Aden and Bombay. It possesses stimulant and expectorant properties, but is used chiefly in the preparation of incense and fumigating pastilles.

Olibanum occurs in small, brittle, ovoid, pear-shaped, club-shaped, or stalactitic tears, varying in length from 6 to 25 mm.; occasionally they are combined in reddish masses of irregular shape. The tears are of a pale yellowish colour, tinged with green, blue, or red, and they are usually covered with a dull whitish dust produced by friction. When broken, the tears appear opalescent and translucent internally, and the fractured surface is waxy. The drug has a fragrant terebinthinate odour, due to the volatile oil present, and an aromatic, bitterish taste, due to the volatile oil and resin. When chewed, the tears soften to a plastic mass. The gum-resin is partially soluble in alcohol, and yields a whitish emulsion on trituration with water, the gum forming a mucilage in which the volatile oil and resin are suspended as in the analogous case of myrrh.

The yellowish tears of olibanum are distinguished by their fragrant odour, opalescent waxy appearance internally, and the formation of a whitish emulsion when the gum-resin is triturated with water. American frankincense, or "gum thus," is a somewhat soft and opaque solidified oleo-resin, which becomes brittle and translucent on keeping, and has then only a faint terebinthinate odour. The American drug contains no gum, and it is thus distinguished from olibanum, since it does not form an emulsion when triturated with water. The chief constituent of olibanum is from 60 to 70 per cent. of resin, consisting of about equal parts of an indifferent substance named olibanoresin and a resin acid (boswellic acid), of which only a small proportion (1·5 per cent.) is in combination. Other constituents of olibanum are a bitter principle soluble in alcohol, from 3 to 8 per cent. of a volatile oil (s.g. 0·875 to 0·885) which consists chiefly of a terpene (olibene), dipentene, and phellandrene, and from 27 to 35 per cent. of gum, about one-fourth of which is bassorin and the rest arabin.

OLIVÆ OLEUM.

Olive Oil.

The oil expressed from the ripe fruit of *Olea europæa*, Linné (N.O. Oleaceæ), a small tree cultivated in Spain, France, Italy, and other countries bordering on the Mediterranean, also in California and South Australia. The small, ovoid, drupaceous fruit, about 12 to 25 mm. long, is collected while green and pickled for use as a table relish. It contains mannite in the cells of the pericarp, but, as the fruit ripens, the mannite disappears and the cells become filled with oil, of which ripe olives may yield as much as 50 per cent. The fruit ripens from November to March, and is then collected, bruised in a mill, and submitted to pressure. The finest or " virgin " oil is sold as " Provence oil " and " Elix oil," and used largely as salad oil. It is obtained from fruit picked before perfect maturity, and immediately subjected to moderate pressure. The residual pulp yields more oil on being thrown into boiling water, the oil separating and rising to the surface. The finest ordinary oil is obtained by crushing and pressing the fruit when it is quite ripe, removing colouring matter and other impurities from the oil by allowing it to flow into water, and subsequently separating the oil from the water by skimming. By mixing the marc with hot water and again pressing, a further yield of oil may be obtained, but it is of inferior quality, while oil of a very inferior kind is obtained by allowing the residue to ferment, and pressing it a third or even a fourth time ; sometimes the entire fruit is thrown into heaps and allowed to ferment for several days before pressure. Olive oil is nutritious, mildly laxative, and demulcent, and is given internally in capsules or emulsified with gum acacia. It is used in the preparation of Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Emplastrum Picis, Emplastrum Plumbi, Linimentum Ammoniæ (1 in 2), Linimentum Calcis (1 in 2), Linimentum Camphoræ (4 in 5), Sapo Durus, Sapo Mollis, Unguentum Capsici, Unguentum Hydrargyri Compositum, Unguentum Hydrargyri Nitratis, and Unguentum Resinæ.

Olive oil (s.g. 0·914 to 0·919) should be pale yellow o greenish-yellow, with a faint odour and a bland taste. I is soluble in chloroform, carbon bisulphide, or ethe (1 in 2), but is only partially soluble in 90 per cent. alcoho

It is liable to deposit solid fats and assume a pasty consistence when cooled to 10° C., and forms a nearly solid, granular mass at 0° C., the actual point at which congelation takes place depending largely upon the length of time the oil is exposed to cold. Thus, oil cooled to a very low temperature for a brief time sometimes remains liquid, though it will become partially solidified if kept at a somewhat higher temperature for several hours. When cooled to very low temperatures, about 72 per cent. of the oil remains liquid. Olive oil which does not congeal is the product of over-ripe fruit. The presence of cotton-seed oil, which is a common adulterant of olive oil, can be detected, except when the cotton-seed oil has been previously heated or highly purified, by the blackening which occurs when the oil is heated with silver nitrate, the blackening being due to the reduction of the silver salt by some constituent of the cotton-seed oil.

The chief constituent of olive oil is olein, the glyceride or glyceryl ester of oleic acid, which constitutes about 93 per cent. of the portion which remains liquid when cooled to very low temperatures, while the remaining 7 per cent. consists of the glyceride of linolic acid. The part of the oil which congeals on cooling contains no stearin, but consists of palmitin and arachin, the glycerides of palmitic and arachidic acids, the arachin being present in very small proportion. Phytosterin (phytosterol) and free fatty acid are also usually present in small quantity in olive oil, the proportion of free acid being very great in the case of inferior, old, or rancid oil. The greenish colour of inferior olive oil is due to dissolved chlorophyll. When exposed to the air, olive oil loses colour and becomes rancid, acquiring a disagreeable smell, a sharp taste, and a thicker consistence, the changes being promoted by heat and accompanied by a large increase in the quantity of fatty acid present in the oil. On heating with nitrous acid or with an acid solution of mercuric nitrate, as in making Unguentum Hydrargyri Nitratis, the olein of olive oil is converted into the solid isomeric substance eläidin. In addition to cotton-seed oil, olive oil may be adulterated with earth-nut, sesame, poppy, and other oils, all of which are less readily congealed than olive oil. Further tests of purity are afforded by the specific gravity of olive oil, which is very constant, and the quantity of iodine—from 78 to 88 per cent.—which the oil is capable of absorbing.

OLIVERI CORTEX.

Oliver Bark; Black Sassafras Bark.

THE dried bark of *Cinnamomum Oliveri*, Bailey (N.O. Lauraceæ), a tree which is indigenous to New South Wales and Queensland, and was formerly incorrectly named *Beilschmiedia obtusifolia*. The bark of the tree possesses aromatic, stimulant, diaphoretic, and alterative properties, and is official in the Indian and Colonial Addendum, for use in the Australasian Colonies, as an equivalent of sassafras root, being employed in the form of Tinctura Oliveri Corticis (1 in 10).

Oliver bark occurs in flat pieces, which are usually about 20 cm. long and 37 mm. wide. It is covered with a deep orange-brown, coarsely granular periderm, which is marbled with yellowish-brown patches, and sometimes bears patches of moss. The tissues beneath the periderm are of a deep umber-brown colour, and the inside of the bark is also umber-brown, with a close satin-like surface marked with very fine striæ. The bark breaks with a close fracture, which is slightly fibrous in the liber portion. The drug has an aromatic and spicy odour, recalling that of sassafras and camphor, and an agreeably spicy and camphoraceous taste.

The distinctive characters of oliver bark are its dark brown colour, peculiar aromatic odour, and coarsely granular, orange-brown periderm. The drug closely resembles sassafras root in its properties. The chief constituent of the drug is about 1 per cent. of a golden-yellow volatile oil (s.g. 1·001) which contains safrol, cineol, eugenol, and cinnamic aldehyde; other constituents of the bark are a peculiar tannin and other plant principles. The leaves of *C. Oliveri* also yield a volatile oil which has a decided odour of sassafras.

OPIUM.

Opium.

THE juice obtained by incision from the unripe capsules of *Papaver somniferum*, Linné (N.O. Papaveraceæ), inspissated by spontaneous evaporation. The plant from which the drug is obtained chiefly is *P. somniferum*, var. *album*, De Candolle, which is indigenous to Asia Minor and cultivated largely in European Turkey, Asia Minor, Persia, India, and China, for the production of opium. All parts of the plant yield a white, opaque, narcotic juice or latex on incision, but opium is obtained from the unripe capsule only, which is especially rich in latex, the wall containing an elaborate branching and anastomosing system of laticiferous vessels, which accompany the fibro-vascular bundles. After the petals have fallen from the flowers, transverse, oblique, or vertical incisions are made in the wall of the unripe fruit, and the latex then begins to exude, great care being taken to avoid penetrating to the interior of the fruit when making the incisions, lest part of the escaping juice should be lost inside. The exuded juice dries partially in the form of tears near the edges of the incisions, and it is then scraped off by means of blunt knives, the scrapings being afterwards combined so as to form cakes, which are wrapped in poppy leaves (Turkey opium) or paper (Persian and Indian opium), and dried further by the heat of the sun. The knives used are moistened frequently with saliva to prevent the juice adhering to the blades, and portions of the epidermis of the capsule may be removed along with the exuded juice, sometimes constituting about one-twelfth of the whole product. In India the adhesive and granular paste formed by the partially dried juice is placed, after collection, in small vessels, in which it is beaten into a homogeneous mass before being made into cakes. An inferior quality of opium is obtained by bruising capsules which have ceased to yield their juice by exudation, and beating them up with a little water, the liquid thus obtained being afterwards inspissated by artificial heat.

Opium possesses hypnotic, sedative, hæmostatic, astringent, expectorant, diaphoretic, and antispasmodic properties. It is used in the preparation of morpheine, codeine, Emplastrum Opii (1 in 10), Extractum Opii (20 p.c. of morphine), Pilula Plumbi cum Opio (1 in 8), Pilula Saponis Composita (1 in 5), Pulvis Cretæ Aromaticus cum Opio (1 in 40), Pulvis Ipecacuanhæ Compositus (1 in 10), Pulvis Kino Compositus (1 in 20), Pulvis Opii Compositus (1 in 10), Suppositoria Plumbi Composita (1 grain), and Tinctura Opii (0·75 p.c. of morphine). The compound powder of opium is an ingredient of Pilula Ipecacuanhæ cum Scilla (1 in 20); the extract is used in the preparation of Extractum Opii Liquidum (0·75 p.c. of morphine); and the tincture is an ingredient of Linimentum Opii (1 in 2), Tinctura Camphoræ Composita (1 in 16⅔), and Tinctura Opii Ammoniata (3 in 20).

Opium should be plastic and somewhat moist internally when fresh, coarsely granular or of a nearly smooth consistence, and reddish-brown or chestnut-brown in colour. It becomes harder and darkens to blackish-brown on keeping. Turkey opium, which is the best kind for medicinal purposes, occurs in two varieties, which are exported from Smyrna and Constantinople respectively. It is of a rich light-brown to reddish-brown colour internally and coarsely granular, that exported from Smyrna occurring in rounded masses weighing from 250 to 1000 grammes or more. The masses are flattened or of irregular shape, covered with poppy leaves, and sprinkled on the surface with the reddish-brown, triangular, winged fruits of a species of *Rumex*, which are used in order to prevent the masses adhering when packed together in cases. Constantinople opium occurs in flattened cakes or masses of more regular shape, though also variable in size, and the poppy leaves covering them are entire, the broad midrib being usually very conspicuous and so placed as to divide the surface into two equal parts. Smyrna opium is distinguished by the presence of portions of epidermis, the masses being formed from drops of juice, which are allowed to concrete with adhering fragments of epidermis before removal from the capsules, whereas in the case of Constantinople opium the juice is removed from the capsules before concretion takes place, so that there is no attachment of the juice to the epidermis. Opium possesses a strong, characteristic, narcotic odour, and a bitter taste.

Persian opium may occur in masses, sticks, or cakes. It is usually dark brown and nearly smooth internally, being kneaded into a homogeneous mass before being divided into short and bluntly conical pieces, weighing about 200 to 400 grammes each; it is wrapped usually in paper instead of leaves, but may also occur in short sticks or flat cakes, and is sometimes oily owing to the addition of oil after the collection of the juice. Indian opium, which is only rarely exported to Europe, occurs in flat cakes or in round balls wrapped in oiled paper. Chinese opium is almost entirely consumed in China. Though opium from any source may be used for medicinal purposes, Turkey and Persian opuim are the only kinds of which there is a regular supply, and Turkey opium alone is suitable for making galenical preparations, both the Persian and Indian products being unsuitable for that purpose, on account of the large percentage of narcotine they contain.

The chief constituent of opium is the alkaloid morphine, which occurs in combination with meconic acid, to the extent of 4 to 20 per cent. or more. Good Turkey opium easily yields from 12 to 18 per cent., and Persian contains from 8 to 12 or even 16 per cent. Indian opium does not usually contain more than 4 to 8·5 per cent. of morphine. The drug also contains from 0·3 to 2 per cent. of codeine, 2 to 10 per cent. of narcotine, and about 1 per cent. of other alkaloids, including thebaine, narceine, papaverine, meconidine, codamine, laudanine, laudanosine, lanthopine, protopine, cryptopine, rhœadine, oxynarcotine, pseudo-morphine, gnoscopine, xanthaline, tritopine, hydrocotarnine, etc., the whole, including morphine, constituting about one-fifth of the weight of good dry opium. The artificial alkaloid apomorphine is prepared by heating morphine or codeine in a closed tube with excess of hydrochloric acid. Other constituents of opium are about 5 per cent. of meconic acid and small quantities of meconin, meconoiosin, and opionin—three indifferent substances, together with mucilage, sugar, wax, caoutchouc, and salts of calcium, potassium, and magnesium. Sulphuric acid is found in the ash, of which good opium should not yield more than 4 to 8 per cent. The presence of starch, tannin, fat, and oxalic acid in opium indicates adulteration, as those substances do not occur normally in the drug. Powdered poppy capsules, stones, small shot, pieces of lead, gum, grape must, sugary fruits, and other mechanical impurities have also been used as adulterants of opium. The drug should contain not more than 12·5 per cent. of moisture, and should yield about 64 per cent. of its weight to water.

Morphine is distinguished from most other alkaloids by its sparing solubility in ether, chloroform, benzene, and petroleum ether, the only solvent, immiscible with water, in which it is fairly soluble being amylic alcohol. The alkaloid is used chiefly in the form of morphine acetate, hydrochloride, and tartrate, prepared by combining morphine with acetic, hydrochloric, and tartaric acids respectively. Morphine acetate occurs as a white crystalline or amorphous powder which—when freshly prepared—is almost entirely soluble in 2·5 parts of water, though the addition of acid is required usually in order to effect complete solution, owing to the fact that the salt loses acetic acid and becomes basic when exposed to the air. The salt is also soluble in 100 parts of 90 per cent. alcohol and in 5 parts of glycerin. Old samples of morphine acetate have a brownish colour, and the odour of acetic acid is distinctly perceptible, particularly when the containing vessel is freshly opened. Morphine hydrochloride occurs in acicular prisms with a silky lustre, or as a white powder consisting of minute cubical crystals. It remains unchanged on exposure to air, and does not affect litmus paper. The salt is soluble in 24 parts of cold water, 8 parts of glycerin, and about 50 parts of 90 per cent. alcohol, but is insoluble in ether. Morphine tartrate is a white powder, consisting of fine nodular tufts of minute acicular crystals, which are efflorescent at 20° C., and soluble in 10 parts of cold water, but only sparingly soluble in 90 per cent. alcohol. It is a very useful salt, because it is more soluble in water than the hydrochloride, and does not become basic and insoluble like the acetate.

Codeine, like morphine, occurs in combination with meconic acid. It is extracted along with the morphine, in the preparation of morphine hydrochloride, and can be separated by crystallisation after the morphine has been precipitated from the solution of the mixed hydrochlorides, the codeine thus obtained being afterwards purified by recrystallisation from ether. It is a methyl derivative of morphine, from which it can be prepared artificially by treatment with methyl iodide. Codeine occurs in colourless, or nearly colourless, rhombic crystals, which are soluble in 80 parts of water, 85 parts of solution of ammonia, 2 parts of 90 per cent. alcohol or chloroform, 30 parts of ether, and 12 parts of benzol. It also dissolves in dilute acids, forming salts, the chief of which is codeine phosphate, a salt occurring in colourless crystals, which are soluble in 4 parts of water, or in 200 parts of 90 per cent. alcohol.

OS SEPIÆ.

Cuttlefish Bone.

A CALCAREOUS substance obtained from the cuttlefish, *Sepia officinalis*, Linné (Order Decapoda), a native of the

Mediterranean and of the Atlantic Ocean. The substance is situated beneath the skin of the dorsal surface of the cuttlefish, and possesses antacid properties. When finely powdered it is used for polishing purposes and as an ingredient of tooth-powders.

Cuttlefish "bone," so-called, occurs in white, oblong-oval, flattened masses, 10 to 25 cm. long and 4 to 7·5 cm. broad. They are composed of numerous loosely connected layers, which give them a porous consistence and cause them to be very friable, but the upper surface is somewhat smooth and hard. The masses have thin edges, are slightly convex on both sides, and are lighter than water. They are practically inodorous, but have an earthy, somewhat saline taste.

The distinctive characters of cuttlefish "bone" are its shape, lightness, and the effervescence produced on adding dilute acids. The chief constituent of the substance is from 80 to 85 per cent. of calcium carbonate; other constituents are a little sodium chloride, traces of calcium phosphate and magnesia, and from 10 to 15 per cent. of animal matter.

OVUM.

Egg.

THE egg of the domestic fowl, *Gallus Bankiva*, var. *domesticus*, Temminck (Order Gallinæ), a native of Java and Cochin-China, domesticated almost everywhere. The egg consists of the shell and lining membrane, enclosing the liquid white or "albumen" and the yolk. The shell, powdered and levigated, has been used as an antacid in diarrhœa; the white is employed as an antidote for metallic poisons, as a clarifying agent, and, when coagulated, as a test for pepsin; the yolk of egg is used in the preparation of Mistura Spiritus Vini Gallici, and also as an emulsifying agent.

Egg shell is a thin, whitish or pale brownish, calcareous substance, which is lined with a white, semi-opaque, albuminous membrane, and encloses a glairy, viscid, usually colourless liquid, surrounding a yellow sac — the yolk. The white of egg is coagulated by heat, and is then rendered white, opaque, and insoluble. It may be obtained in thin, transparent flakes by evaporating it carefully at a temperature below 50° C. Egg-albumin, the most important proteid in the white of egg, differs from serum albumin in not being precipitable by ether. The yolk of egg is a natural emulsion of a yellow oil, which is suspended in water by the aid of albuminous matter, and enclosed in a delicate sac called the vitelline membrane.

The shell of the egg (Testa Ovi) consists of a highly resistant, keratinous material, infiltrated with calcium carbonate, and traces of magnesium carbonate and calcium phosphate. The white of egg (Albumen Ovi) consists of a semi-fluid material which is pervaded by a meshwork of firmer and more fibrous material, closely resembling the membrane enclosing the vitreous humour of the eye. The semi-fluid is alkaline and contains from 82 to 88 per cent. of water, about 12 per cent. of proteids (globulins and albumins), 0·5 per cent. of sugar, traces of fats, alkaline soaps, lecithin, and cholesterin, and less than 1 per cent. of inorganic residue. The yolk of egg (Vitellus Ovi) contains about 47 per cent. of water, 16 per cent. of proteids (vitellin, albumin, and nuclein), 23 per cent. of fats (olein, palmitin, stearin, and a yellow lipochrome or lutein), 11 per cent. of lecithin, 1·75 per cent. of cholesterin, and traces of cerebrin (?), grape sugar, iron and inorganic salts, the iron being combined with the nuclein.

PANCREATINUM.

Pancreatin.

A MIXTURE of enzymes obtained from the fresh and healthy pancreas of the hog, *Sus scrofa*, Linné (Order Ungulata), freed from fat. The pancreas or sweet-bread must not be confounded with the thymus, which is commonly known as the "sweet-bread." It is a long flattened gland which lies across the vertebral column behind the stomach. The gland is alkaline during life, and the solids of which it is composed consist of proteids, extractives (guanine, xanthine, hypoxanthine, leucine, tyrosine, uric acid, lactic acid, inosite), and a small proportion of inorganic salts. The secreting cells of the gland produce a zymogen called trypsinogen, the precursor of trypsin—the most important constituent of the pancreatic juice, which contains several enzymes or soluble ferments. Pancreatin is a mixture of those ferments, extracted by means of water or very dilute hydrochloric acid, the mixed enzymes being precipitated from the resulting solution by the addition of strong alcohol, then freed from excess of liquid by pressure, and dried at a temperature not exceeding 40° C. If necessary, the product must be treated with benzene or petroleum spirit, to remove traces of fat. The pancreatin can be obtained in scales by spreading a clear syrupy solution in thin layers upon glass plates, and allowing evaporation to proceed in an atmosphere free from dust. Pancreatin digests albuminoids, converts starch into sugar, and emulsifies fats. It is used in intestinal disorders, for predigesting milk, fat, and other foods, being employed in the form of powders, tablets, or Liquor Pancreatis.

Pancreatin occurs as a yellowish, yellowish-white, or greyish amorphous powder, or in transparent, brittle, yellowish scales. It should be odourless, or have only a faint, peculiar odour, and a somewhat meat-like taste. It is slowly and almost entirely soluble in water, but is insoluble in alcohol. Prolonged contact with mineral acids renders it inert. It may be obtained in the form of a stable extract by exhausting the finely divided fresh pancreas with glycerin, but the official pancreatic solution is prepared by disintegrating the pancreas by trituration with sand, and macerating the resulting mixture in 20 per cent. alcohol for seven days. The solution thus obtained keeps well when filtered, owing to the antiseptic action of the alcohol, the proportion of which is insufficient to precipitate the pancreatin or to interfere with its activity. It should be noted that the distinguishing feature of pancreatic as compared with peptic digestion is that pancreatin requires an alkaline medium, while pepsin only exercises its proteolytic power in an acid medium. Pancreatin is thus especially valuable as a digestive agent for milk, the proteids of which it converts chiefly into peptones, so that coagulation no longer occurs on adding nitric acid.

The action of an extract of pancreas, or solution of pancreatin, is the same as that of the pancreatic juice, which is a clear, colourless, viscid liquid, with a saltish taste and a strong alkaline reaction, due to the presence of sodium and other phosphates and carbonates. The liquid also contains four ferments—trypsin, amylopsin, steapsin, and a milk-curdling ferment, together with a small amount of coagulable proteid, a mucin-like substance, and traces of leucine, tyrosine, xanthine, and soaps. Trypsin is a proteolytic ferment, which dissolves coagulated white of egg slowly, but acts with great rapidity on soluble proteids, such as the casein of milk. It differs from pepsin by acting best in an alkaline medium, though it also acts in a neutral medium. Amylopsin converts starch into maltose, and acts best in a neutral or slightly alkaline medium. It differs thus from malt diastase, the action of which is almost stopped by a very small quantity of alkali. Amylopsin is absent from the pancreatic juice of infants, and much starchy food is therefore bad for very young children. Steapsin decomposes fats into glycerol (glycerin) and fatty acids, which unite with alkaline bases to form soaps. The milk-curdling ferment of the pancreas causes milk to clot, but the effect differs somewhat from that produced by the rennin of the stomach. Pancreatic juice possesses all the necessary qualifications for forming an emulsion, since it is alkaline, viscous from the presence of proteid matter, and capable of liberating free acids.

PAPAVERIS CAPSULÆ.

Poppy Capsules.

THE nearly ripe dried fruits of the opium poppy, *Papaver somniferum*, Linné (N.O. Papaveraceæ), a plant which is indigenous to Asia Minor and of which there are several varieties, the best known being the white and black poppies, so named because of the colour of their respective seeds. The white poppy, *P. somniferum*, var. *album*, De Candolle, is the plant chiefly cultivated for medicinal use, and from which the poppy capsules of commerce are obtained usually in England. It bears flowers of a white or silver-grey colour, while the fruit is a smooth, rounded, glaucous-green capsule, which becomes yellowish-brown as it ripens. The capsule is from 5 to 10 cm. in diameter, more or less flattened at the top and bottom, and crowned with a persistent stigma, the diverging segments of which are arranged in a circle upon the summit. The fruit contains numerous minute, whitish seeds, which escape when the fruit is perfectly ripe, through small openings beneath the stigma. The capsules are cut from the stems when nearly ripe, before the seeds have escaped, being then richest in latex. The unripe fruit has a narcotic odour which is destroyed by drying, while its bitter taste is retained only partially. The dried capsules possess similar properties to opium, but they are much weaker and of uncertain strength. They are used in the preparation of a syrup (1 in $2\frac{1}{4}$), a liquid extract (1 in $2\frac{1}{4}$), and a decoction (1 in 10) which is employed as a soothing anodyne fomentation.

Poppy capsules are often nearly globular or ovoid in shape, but are sometimes much depressed at the summit and base. They vary in diameter from 5 to 7·5 cm. or more, and are crowned by the stellately arranged stigmas. They are contracted suddenly below into a neck which is swollen just above the point of attachment to the peduncle, and marked there with the scars of the petals and sepals. The thin, dry, brittle pericarp is of a pale yellowish-brown colour and marked frequently with dark spots; from its inner surface a number of thin, brittle, membranous, parietal placentas, corresponding in number to the carpels, project into the cavity of the fruit, a transverse section of which shows it to be unilocular, but formed by the union of as many carpels as there are stigmas. The numerous minute, whitish seeds, which lie loose in the dried fruit, are reniform in shape and covered with distinct delicate reticulations. The capsules are inodorous, but the pericarp is distinctly bitter and the seeds have an oily taste.

The capsules of the black poppy, *P. somniferum*, var. *nigrum*, De Candolle, are sometimes found mixed with those of the white poppy, but usually they are somewhat smaller and more globular, and contain greyish or slate-coloured seeds which are known in commerce as maw seeds. The chief constituent of poppy capsules is morphine, which occurs in combination with meconic acid. Other constituents are small quantities of codeine, narcotine, and other alkaloids which occur in opium, together with citric and tartaric acids, mucilage, wax, and various salts. The amount of morphine present is very variable, from 0·12 to 0·28 per cent. having been yielded by capsules deprived of seeds, whilst both lower and higher amounts may be present at times. The seeds contain no morphine, but the oily endosperm yields about 50 per cent. of fixed oil (s.g. 0·924 to 0·937) which is used largely for culinary purposes and also, on account of its excellent drying properties, for mixing artists' colours. Poppy oil is used sometimes to adulterate olive oil, but has a higher iodine absorption (from 137 to 143 per cent.), and is also distinguished by its comparatively high specific gravity.

Paracoto Bark.

A BARK of unknown botanical origin, imported from Bolivia, and used largely as a substitute for true coto bark, which it resembles closely in appearance, constituents, and therapeutic action. True coto bark is thinner and usually free from cork. The only satisfactory means of distinguishing coto and paracoto barks by chemical means is afforded by the colour reactions of their chief constituents —cotoin and paracotoin—with nitric acid. Paracoto bark possesses aromatic, stimulant, and astringent properties, and has been used in chronic diarrhœa, being given in the form of powder, tincture (1 in 10), or liquid extract (1 in 1).

Paracoto bark occurs in hard, heavy, flat or curved pieces, about 70 cm. or less in length, 4 to 7·5 cm. broad, and 12 to 18 mm. thick. The outer surface is of a cinnamon-brown colour, and bears patches of thin, brownish, or sometimes whitish cork ; it may be nearly smooth, though marked frequently with deep whitish furrows formed by transverse wrinkles, while longitudinal fissures and transverse cracks may give it an irregularly chequered appearance. The inner surface is brown and coarsely striated, owing to projecting strands of sclerenchymatous tissue. The bark breaks with a fibrous splintery fracture, similar to that of true coto bark, coarse stiff strands of sclerenchymatous tissue projecting from the fractured surface. The inner part of the bark can be separated easily in the form of coarse longitudinal strips on which glistening prismatic crystals can be observed, especially after the strips have been exposed to the air for some time. The odour of paracoto bark, like that of true coto bark, is very faint in specimens which have been kept for a long time. The taste of the drug is slightly pungent and resembles that of nutmeg.

In transverse sections paracoto bark resembles sassy bark, a thin brownish cork enclosing a narrow brown cortex, which is separated by a paler line of sclerenchymatous cells from the thick bast that constitutes nine-tenths of older bark ; in the bast occur numerous rounded or tangentially elongated groups of sclerenchymatous cells, which differ from those of sassy bark in being smaller, fewer in number, and of a reddish-brown colour.

The brownish cork, the coarsely striated inner surface, the appearance of a transverse section, and the nutmeg-like taste, are distinctive characters of paracoto bark. Coto bark is free from cork and has a cinnamon-like taste, while sassy, bebeeru, and flat red cinchona bark differ from paracoto bark in various respects, as explained in the notes on coto bark. The chief constituent of paracoto bark is paracotoin, a crystalline bitter principle which can be obtained in pale yellow scales, and differs from cotoin by giving a yellowish-brown coloration when heated with nitric acid; other constituents are hydrocotoin, methyl-hydrocotoin (benzoyl-hydrocotoin), protocotoin, methyl-protocotoin (oxyleucotin), phenyl-coumalin, piperonylic (methylene-protocatechuic) acid, volatile oil, resin, tannin, and starch. Hydrocotoin is the dimethyl ether of benzoyl-phloro-glucinol, just as cotoin is the monomethyl ether; paracotoin is dioxy-methylene-phenyl-coumalin, and protocotoin is dioxy-methylene-phloro-glucinol.

PARADISI GRANA.

Grains of Paradise; Guinea Grains.

THE seeds of *Amomum Melegueta*, Roscoe (N.O. Scitamineæ), an herbaceous plant indigenous to the West Coast of Africa. It attains a height of 1 to 1·5 m., and produces an ovoid pointed fruit, 7·5 to 10 cm. long, containing a large number of small seeds, imbedded in a colourless acid pulp of pleasant taste. The seeds are imported from Guinea and other parts of Western Africa. They possess stimulant properties, and were formerly employed as a condiment, but they are now used chiefly in veterinary practice.

Grains of paradise are small, hard, shining seeds of a rich reddish-brown colour, about 2 to 3 mm. long. They vary considerably in shape, but are frequently sub-pyramidal with rounded or obtuse angles, and have the paler fibrous remains of the funiculus projecting from one extremity in the form of a beak. Examined under a lens the surface is seen to be minutely but distinctly papillose. The hilum occurs near the slightly conical end of the seed, and a transverse section cut near that point exhibits a copious white starchy perisperm, surrounding a yellowish horny endosperm in which is imbedded the minute pale-coloured embryo. A longitudinal section of the seed also exhibits the perisperm, endosperm, and embryo, with the radicle directed towards the funiculus. The seeds have an intensely pungent taste, and a faintly aromatic odour, which is more pronounced when they are crushed.

The rich reddish-brown colour, papillose surface, large projecting funiculus, and pungent taste of grains of paradise are characteristic. Cardamom seeds, for which they are sometimes substituted, have a dark reddish-brown colour, transverse wrinkles, and a more powerful aromatic odour than grains of paradise, but a less pungent taste. The chief constituent of grains of paradise is from 0·3 to 0·75 per cent. of volatile oil (s.g. 0·894), which has not so fine an odour as oil of cardamoms, but is probably of similar composition; other constituents of the seeds are tannin, fat, resin, starch, gum, and a yellowish, viscid, oily body named paradol, to which the pungent taste of the drug is due.

PAREIRÆ RADIX.

Pareira Root; Pareira Brava.

THE dried root of *Chondrodendron tomentosum*, Ruiz and Pavon (N.O. Menispermaceæ), a native of Brazil and Peru. The plant is a lofty climbing shrub with stout woody stems, leaves which may attain a length of 30 cm., and a long, branching, woody root. The drug is known as "Pareira Brava," and is imported from Rio de Janeiro, in South Brazil, the parcels sometimes containing pieces of stem, which differ from the root by enclosing a small but well-defined pith. The drug possesses tonic, diuretic, sedative, and astringent properties. It is used in the preparation of Extractum Pareiræ Liquidum.

Pareira root occurs in long, hard, heavy, and nearly cylindrical pieces, which are knotty, more or less twisted, and from 2 to 5 cm. in diameter. It is covered with a thin blackish-brown bark, and marked externally with longitudinal furrows and transverse ridges and fissures. Internally, the root is yellowish-grey or brownish-grey, and the fractured surface when cut with a knife has a glossy, waxy appearance. A transverse section shows four or five well-marked, concentric or more or less eccentric, crenated zones, separated from each other by lighter lines of parenchymatous tissue. The innermost zone is usually from 6 to 12 mm. in diameter, and each zone consists of a varying number of wedge-shaped wood-bundles with large pores, the bundles being separated by wide medullary rays. The root is without odour, but has a decidedly bitter taste.

On account of the scarcity of pareira root, various substitutes for the genuine drug have been offered at different times, but it can be distinguished from all other roots by its nearly black outer surface, the crenate outline of the woody, usually concentric zones, the waxy surface when cut, and the bitter taste of the root. The stem of *C. tomentosum* is paler in colour than the root, has a more or less warty surface, and exhibits a small pith. A root of unknown botanical origin (? *Menispermum* sp.), which is frequently substituted for pareira root, is not so heavy or bitter, and does not appear waxy when cut; it may also be distinguished by its decided brownish colour, the presence of larger vessels in the wood, and the greater number of woody zones, which are narrower than those of pareira root and not distinctly crenate. Other roots have also been confused with true pareira, including that of *Cissampelos Pareira*, Linné (N.O. Menispermaceæ), and bitter roots which exhibit incomplete eccentric zones in transverse sections. The chief constituent of pareira root is from 0·5 to 3 per cent. of the bitter alkaloid pelosine (cissampeline), which is identical with the beberine or bebeerine found in bebeeru bark (*Nectandra Rodiæi*) and is very prone to decomposition, when exposed to light, air, and moisture. The drug also contains about 9 per cent. of free fatty acids (chiefly stearic acid) and neutral fatty matter, together with starch, tannin, mucilage, etc.; it yields 4 per cent. of ash, and more than 10 per cent. of aqueous extractive.

PEPSINUM.

Pepsin.

An enzyme or soluble ferment obtained from the mucous lining of the fresh and healthy stomach of the pig, *Sus scrofa* (Ungulata), sheep, *Ovis aries* (Ungulata), or calf, *Bos taurus* (Ungulata). Commercial pepsin is obtained chiefly from the stomach of the pig, as the digestive secretions of the sheep and calf are less active. Pepsin is a proteid-like body formed from the zymogen pepsinogen, which is secreted by glands imbedded in the tissue of the inner coating of the stomach. The pepsin may be obtained by scraping the mucous membrane of the stomach, and drying and powdering the viscid pulp so obtained, but it is preferable to remove the mucous membrane from the underlying muscular coats of the stomach, mince it finely, and allow it to macerate for several days in water slightly acidulated with hydrochloric acid, or mixed with glycerin. Most of the membrane undergoes digestion during maceration, as the liquid is strongly proteolytic, and therefore capable of digesting proteid matter. The pepsin is precipitated from the acid liquid after filtering the latter from the undigested débris, by saturating the solution with sodium chloride, ammonium sulphate, or some other neutral salt. If the mucous membrane be extracted with glycerin, the proteids are not dissolved to the same extent as when hydrochloric acid is used, but in neither case is the pepsin obtained pure. It may be freed from excess of salt by suspending it in water in a dialyser, the adhering salt then diffusing away, while the pepsin remains in solution in the dialyser, being soluble in water when prepared as described, though not in the strong saline solution. The pepsin is re-precipitated from the aqueous solution on the addition of excess of alcohol, after which it is collected and dried at a low temperature, or the aqueous solution may be evaporated *in vacuo* and the residue powdered, in which case the product will contain peptones, as well as the proteoses of digestion found in pepsin separated from aqueous solutions by saturation with neutral salts. Pepsin exercises a digestive or solvent action on proteid substances when in slightly acid solution, and is used in the form of powder, or Glycerinum Pepsini (1 in 11).

Pepsin occurs as a light yellowish-brown or white powder, or as pale yellow scales or grains. It should be free from any trace of putrescence, and have only a faint odour and a slightly saline taste. It is liable to absorb moisture from the air, and is moderately soluble in water (1 in 100), but is almost insoluble in 90 per cent. alcohol. No commercial pepsin is absolutely pure; that prepared by scraping the stomachs contains a large proportion of the tissue elements of the mucous membrane, while precipitated pepsin usually contains salt and the products of the decomposition of primary proteid matter, and scale and granular pepsins contain both the proteoses of digestion and peptones. Three distinct types of pepsin are found in commerce—those which are insoluble in water without the addition of traces of acid, those which dissolve in water, forming clear solutions, and pepsins which are not entirely soluble in water or in dilute hydrochloric acid. The insoluble pepsins are less liable to deteriorate on keeping, while soluble pepsins are more hygroscopic, but better suited for making liquid preparations. The proteolytic or proteid-digesting power of pepsin should enable it to dissolve at least 2500 times its weight of hard-boiled white of eggs, prepared by boiling fresh eggs in water for fifteen minutes, then immersing them in cold water until sufficiently cool to handle, after which the albumin must be separated, washed with water to remove any traces of yolk or membrane, dried with a clean towel, rubbed through a sieve having twelve meshes to a centimetre, and used before it has lost moisture.

Scale pepsin is prepared by allowing the finely divided inner coatings of the stomachs to digest in a mixture of hydrochloric acid and water, straining the liquid when solution is complete, and evaporating it to a syrupy consistence at a temperature not exceeding 45° C., after which dextrin is added, and the strained syrupy fluid spread in thin layers upon glass plates, and allowed to evaporate to dryness in an atmosphere free from dust. Granular pepsin is prepared in the same way, except that no dextrin is added and the syrupy fluid is evaporated so as to produce thicker sheets, like fine glue, which are broken up into small pieces when dry. The chief constituent of commercial pepsin is a soluble enzyme which renders insoluble proteids soluble, converting them into proteoses and peptones. It can be prepared in a relatively pure condition by extracting the finely divided mucous membrane with water containing 5 per cent. of phosphoric acid, straining off the débris, filtering the extract, and adding lime water almost to the point of neutralisation, the calcium phosphate thus precipitated carrying down with it most of the enzyme, mixed with a certain amount of proteid matter. The precipitate is dissolved in dilute hydrochloric acid, and lime water again added to cause precipitation, the enzyme clinging to the precipitate being thus obtained much purer than before, after which the precipitate is again dissolved in dilute hydrochloric acid and subjected to dialysis until the solution is free from chlorides and phosphates, or a solution of cholesterin in alcohol and ether is passed through a thistle funnel reaching to the bottom of the vessel containing the acid solution of pepsin. The cholesterin, being insoluble and lighter than water, rises to the surface, carrying with it the enzyme, and, after the separated matter has been washed with very dilute acetic acid and subsequently suspended in a little water, the cholesterin can be removed by repeated agitation with ether, leaving the purified enzyme dissolved in the water, from which it can be separated by evaporating the liquid.

PHYSOSTIGMATIS SEMINA.

Calabar Beans; Ordeal Beans.

THE ripe seeds of *Physostigma venenosum*, Balfour (N.O. Leguminosæ), a woody climbing plant indigenous to Western Africa, and growing especially near the mouths of the Old Calabar and Niger Rivers. The fruits of the plant are legumes about 15 to 18 cm. long, and contain two or three large poisonous seeds, known as "ordeal beans," because they have been used by the natives of Africa as a test of the guilt or innocence of suspected criminals or witches, the suspected person's guilt being considered proved if he died after swallowing the crushed seeds mixed with water. The seeds are extremely poisonous, but possess myotic, antispasmodic, and expectorant properties, and increase the flow of saliva and other secretions. The drug is used chiefly in ophthalmic work, being employed in the form of physostigmine sulphate and Extractum Physostigmatis; a tincture (1 in 5) is also prepared from the seeds.

Calabar beans are large, reddish-brown or chocolate-brown, oblong-reniform seeds, usually about 25 mm. long, 18 mm. broad, and 12 mm. thick. They are nearly flat or only slightly convex on one side, but boldly curved on the other; a broad deep groove (the hilum) extends nearly the entire length of the curved margin and passes completely round one end of the seed. The lips of the groove are thickened and paler in colour than the bottom, which is black, with a distinct fine brown furrow in the middle. Portions of a white papery funiculus are found occasionally on the hilum, and at one end the micropyle appears as a minute depression. The hard thick testa or outer seed-coat is somewhat rough, and encloses two firm white starchy cotyledons, which are curved so as to enclose between them a large lenticular cavity filled with air, the presence of which enables the seed to float in water. The small white radicle will be found attached to one of the separated cotyledons, near the micropyle. The seed contains no endosperm. On moistening the embryo with potassium hydroxide solution it becomes pale yellow. The seeds have no characteristic taste or odour.

The seeds of *Physostigma venenosum* are distinguished by their reniform shape and long hilum. Those of *P. cylindrospermum* are nearly cylindrical and have a shorter hilum than Calabar beans. Other substitutes which have been offered as Calabar beans are the seeds of *Mucuna urens* and *Entada scandens*, both of which differ markedly in appearance from the beans, and cannot well be mistaken for them. The chief constituent of Calabar beans is about 0·25 per cent. of a poisonous crystalline alkaloid named physostigmine or eserine, which exists in the cotyledons only; calabarine or eseridine is a derivative of eserine. Other constituents of the drug are starch, proteids, mucilage, and a neutral principle—phytosterin—which is closely allied to cholesterin. Physostigmine can be obtained by dissolving an alcoholic extract of Calabar beans in water, adding sodium bicarbonate, shaking the mixture with ether, and evaporating the ethereal liquid after separation. The most important salt of the alkaloid is physostigmine sulphate, which occurs in minute yellowish-white crystals. They have a bitter taste, are highly deliquescent, and become red by exposure to air and light, owing to absorption of oxygen. The crystals are very soluble in water (4 in 1), and are also soluble in 90 per cent. alcohol (2½ in 1). A dilute aqueous solution of physostigmine sulphate causes contraction of the pupil when applied to the eye. The salt does not keep so well as physostigmine salicylate, since it assumes the consistence of an extract when exposed to air, and is then difficult to dispense.

PICRORHIZA.

Picrorhiza.

The dried rhizome of *Picrorhiza Kurroa*, Royle (N.O. Scrophulariaceæ), a small, perennial, herbaceous plant indigenous to the Alpine Himalaya. The rhizome is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. It is a bitter tonic, aperient, and antiperiodic, and is best administered in combination with aromatics. It has been given in the form of powder and decoction, and is also used in the form of Extractum Picrorhizæ Liquidum (1 in 1) and Tinctura Picrorhizæ (1 in 8).

Picrorhiza occurs usually in pieces about 2·5 cm. to 5 cm. long and from 4 mm. to 8 mm. in diameter. The lower portion of the rhizome is covered by a shrivelled, greyish-brown, corky bark, and marked by the remains of rootlets, which form prominent scars. At the thicker end the rhizome terminates in a scaly leaf bud or stem, and is thickly set with dark greyish-brown scales, which are disposed so as to form partial annulations. The rhizome breaks with a short fracture, and is black internally, with an imperfect ring of pale-coloured xylem. The drug is without odour, but has a very bitter taste, due to the presence of picrorhizin.

The small pieces in which picrorhiza occurs distinguish it from most other dried rhizomes, but the drug is also characterised by the presence of scales and its bitter taste. The chief constituent of the rhizome is a bitter crystalline glucoside, named picrorhizin, which yields picrorhizetin and dextrose on hydrolysis; other constituents are cathartic acid and another organic acid, together with wax and gum. Picrorhizin is acid in reaction and freely soluble in water or alcohol, but almost insoluble in pure ether. Picrorhizetin is a tasteless, reddish-brown, brittle, resinous body; it is soluble in aqueous alkalies, and evolves an odour of benzoin when heated with strong sulphuric acid, or burnt.

PIMENTA.

Pimento; Allspice or Jamaica Pepper.

The dried, full-grown, unripe fruit of *Pimenta officinalis*, Lindley (N.O. Myrtaceæ), a tree which is indigenous to the West Indies, Mexico, and South America, and cultivated largely in Central America and Jamaica. The fruit is a small, green, spherical berry, which turns black or dark purple on ripening, and is then filled with a sweet pulp. It loses its aroma on ripening, owing to loss of volatile oil, and is therefore collected as soon as it has attained its full size, but whilst yet green. The berries are dried in the sun, after which the stalks are separated, and the dried reddish-brown fruit is packed for exportation in bags and casks. It is imported chiefly from the West Indies. The fruit is a warm aromatic stimulant and carminative, resembling cloves in its properties, and is used as an adjuvant to tonics and purgatives, in the form of oil of pimento and Aqua Pimentæ (1 in 20).

Pimento is a dull reddish-brown, two-celled fruit, nearly globular in shape, and varying usually from 5 to 8 mm. in diameter. The woody pericarp is thin, rough, and brittle, and a small scar at the base of the fruit indicates the point of attachment of the stalk or pedicel. Each berry is crowned with the remains of a four-toothed calyx, which forms a raised ring, in the centre of which can be seen the remains of the style. A transverse section of the fruit shows that each cell contains a single brownish-black reniform seed, within which is a dark coiled embryo, but no endosperm. The fruit has a warm aromatic odour and taste, somewhat resembling those of cloves. The name "allspice" is given to pimento because it is supposed to possess the combined flavour of cloves, cinnamon, nutmeg, and pepper; it is also known as Jamaica pepper, in allusion to the place where it is most largely produced.

The remains of the calyx crowning the fruit, and the presence of two single-seeded cells, are distinctive characters of pimento. Cubebs are one-celled, one-seeded, dark grey in colour, and reticulated on the surface; black pepper is also one-celled and one-seeded. The chief constituent of pimento fruit is from 3 to 4·5 per cent. of volatile oil, which is contained in glands in the pericarp and seeds; other constituents of the fruit are tannin, fixed oil, gum, resin, and sugar. Oil of pimento (s.g. 1·040 to 1·055) is prepared by distillation from the dried, full-grown, unripe fruit. It is yellow or yellowish-red when recently distilled, but gradually becomes darker on keeping. It has the odour and taste of pimento fruit, is soluble in all proportions of 90 per cent. alcohol and in 50 parts of 60 per cent. alcohol. It contains 65 per cent. or more of eugenol, which is also the chief constituent of oil of cloves, but the odour of oil of pimento is modified by the presence of a sesquiterpene, resin, and other constituents. On shaking the oil with an equal volume of strong solution of ammonia, it should be converted into a semi-solid mass of eugenol-ammonium. If the specific gravity of the oil be lower than 1·040, it may be assumed that some of the eugenol has been removed, or that the oil has been adulterated with substances having a lower specific gravity than that of eugenol.

PINI OLEUM.

Oil of Pine.

THE oil distilled from the fresh leaves of the Mountain Pine, *Pinus Pumilio*, Haenke (N.O. Coniferæ), a small tree found in the sub-alpine regions of Central Europe and also in the Carpathian Mountains. It furnishes an oil of fairly constant character, and superior to fir-wool oil obtained from *P. sylvestris*. The oil is taken on sugar, or in the form of jujubes or pastilles, or is applied externally in rheumatism; the vapour of the oil acts as a mild stimulant and disinfectant in chronic catarrhal affections of the respiratory passages.

Oil of pine (s.g. 0·865 to 0·870) is colourless, or nearly so, with a pleasant aromatic odour and a pungent taste. About four-fifths of the oil is soluble in 90 per cent. alcohol (1 in 5), the remaining one-fifth being much less soluble. The oil should rotate the plane of a ray of polarised light from 5 to 10 degrees to the left, and not more than 10 per cent. of the oil should distil below 165° C., the absence of oil of turpentine being thus indicated, since pinene, the chief constituent of oil of turpentine, boils at 156° C. Oil of pine resinifies on exposure to the air.

The oil of pine is distinguished from other oils by its specific gravity and optical rotation. The oil of *Pinus sylvestris* has a specific gravity of not less than 0·880, and it may rotate the plane of polarisation about 20 degrees to the right or left. Other pine-needle oils are of still higher specific gravity, and their optical rotation differs widely from that of the official oil of pine. The chief constituent of oil of pine is from 4 to 7 per cent. of bornyl acetate, to which the odour of the oil is chiefly due; other constituents are l-pinene, l-phellandrene, sylvestrene, cadinene, and dipentene. Bornyl acetate is the only fatty acid ester of borneol or Borneo camphor that will crystallise. Borneol is closely related to ordinary camphor, which is a ketone, probably belonging to the hexamethylene group, while borneol is the corresponding alcohol. Hence, for the same reason as in the case of menthol, borneol easily forms esters, and does not behave like a phenol.

PIPER LONGUM.

Long Pepper.

The dried unripe fruit-spike of *Piper officinarum*, De Candolle (N.O. Piperaceæ), a native of the Malay Archipelago, or of *P. longum*, Linné, a native of Bengal and the Philippine Islands, the produce of *P. officinarum*, exported from Java, being the kind usually seen in English commerce. Both plants are diœcious shrubs, *P. officinarum* bearing ovate-oblong acuminate leaves, attenuated at the base and having pinnate nerves, while the leaves of *P. longum* differ in being five-nerved and cordate at the base. The flowers of both plants are arranged in dense, short, terminal, and nearly cylindrical spikes, while the fruit consists of very small one-seeded berries imbedded in pulpy matter. The fruit-spikes are gathered and dried in the sun when green and immature, being then more pungent than if allowed to remain on the plant until ripe. They possess warm, carminative, stimulant, and stomachic properties, resembling those of black pepper, but less pronounced. Long pepper may be used for similar purposes to black pepper, but is employed chiefly as a spice.

Long pepper consists of nearly cylindrical reddish-brown spikes about 35 mm. long and 5 mm. thick, tapering to a rounded apex and covered with a greyish-white earthy powder. Each spike consists of a large number of minute, sessile, ovoid fruits, about 2·5 mm. long, with their supporting peltate bracts densely crowded together on, and partially imbedded in, an elongated axis. On removing the greyish-white powder from one of the spikes, the minute fruits appear arranged in a close spiral, each with the remains of the stigma at its apex. A transverse section of a spike shows eight or ten fruits arranged around a central axis, the thin brown testa beneath the pericarp of each fruit enclosing a starchy perisperm, near the more obtuse end of which occurs a small embryo. The taste and odour of long pepper resemble those of black pepper, but are not so strong.

The distinctive characters of long pepper are its shape, colour, and the white and starchy appearance of the minute fruits in a transverse section of a spike. Bengal long pepper, from *P. longum*, is darker in colour, more slender, and shorter than the Java (Singapore) variety, the spikes being frequently only from 20 to 25 mm. long;

it is also said to be less pungent. Swaheli long pepper, exported from Zanzibar to India, occurs in almost filiform spikes from 25 to 65 mm. long ; it has a peculiarly fragrant odour and does not possess the acridity of other varieties. The chief constituent of long pepper is a volatile oil; other constituents are piperine, a pungent resin named chavicin, and starch. The oil and resin are found only in the pericarp of the fruit.

PIPER NIGRUM.

Black Pepper.

THE dried unripe fruit of *Piper nigrum*, Linné (N.O. Piperaceæ), a climbing plant which is indigenous to Southern India and cultivated in the Malay Archipelago, the West Indies, and South America, the chief supplies of the fruit being obtained from the East Indies, Sumatra, Singapore, Johore, Penang, Siam, etc. The plant bears a cylindrical spadix or rachis of small whitish flowers which are succeeded by globular berries. The fruit turns red when ripe, and as soon as the lower berries on the rachis begin to change from green to red, the whole spike is picked and dried in the sun, the fruits becoming dark brown or black as they dry, owing to decomposition of the tannin they contain. The dried fruits are afterwards separated from each other and sorted, before being packed for exportation. Black pepper is a warm carminative stimulant and tonic; it is used in the preparation of Confectio Piperis (1 in 10) and Pulvis Opii Compositus (1 in 7½).

Black pepper consists of dark brown or nearly black globular fruits, which are without stalks, and usually about 5 mm. in diameter. At the apex of the fruit the remains of the sessile stigma can occasionally be traced, and a scar at the base indicates the point of attachment to the rachis. The thin dark pericarp is deeply and reticulately wrinkled, and encloses a single globular seed which completely fills the cavity. The seed is covered with a brown seed-coat, and contains a small endosperm near the apex of the fruit, in which is situated a minute embryo, but it consists chiefly of perisperm, which is yellowish and horny near the periphery, and whitish, mealy, and frequently hollow towards the centre. Both pericarp and seed contain oil-cells, the contents of which impart an aromatic odour and a pungent taste.

The absence of a stalk and the presence of a single seed, which completely fills and adheres to the pericarp, distinguish black pepper from fruits which resemble it in other respects. White pepper (Piper Album) is about the same size and shape as black pepper, but is greyish-white and nearly smooth. It is produced by allowing the fruit of *P. nigrum* to become nearly ripe, and then removing the outer portion of the pericarp by maceration in water and subsequent friction, the nearly smooth greyish-white surface consisting of the adherent inner portion of the pericarp, which is traversed from base to apex by about sixteen fibro-vascular bundles. The chief constituent of black pepper is from 1 to 2·5 per cent. of volatile oil, consisting of phellandrene and sesquiterpenes. Other constituents of the fruit are from 5 to 8·25 per cent. of the alkaloid piperine, piperidine, a pungent resin named chavicin, and starch. Piperine yields piperidine and piperic acid when decomposed by alkalies.

PIX BURGUNDICA.

Burgundy Pitch.

The resinous exudation obtained from the stem of the Norway spruce fir, *Picea excelsa*, Link (N.O. Coniferæ), melted and strained. The tree is a native of Europe and Northern Asia, and is probably not the only source of commercial Burgundy pitch. The resin is collected chiefly in Finland, but smaller quantities are obtained in the Black Forest and in the Jura Mountains. It was formerly imported from Burgundy, but is now imported chiefly from Germany. The resin is contained in schizogenous secretion ducts of the wood, and exudes when the stem is wounded, portions of the bark being removed so as to lay bare the wood; or perpendicular channels, about 40 mm. in width and depth, are cut in the stem. After solidification, the resin is scraped from the stem, purified by being melted in hot water, and then strained. The opaque product so obtained may be further freed from the water it contains by re-melting and stirring freely in an open vessel. The resin is used in the preparation of Emplastrum Picis (1 in 2), which is employed as a counter-irritant.

Burgundy pitch is hard and brittle, but it flows and assumes gradually the form of the vessel in which it is kept. It is somewhat opaque, strongly adhesive, of a dull reddish-brown or yellowish-brown colour, and breaks with a clean, conchoidal fracture. Its agreeably aromatic terebinthinate odour is especially marked when the drug is heated. The taste of the resin is sweet and aromatic, without bitterness. The resin is soluble in 90 per cent. alcohol (1 in 20), and almost entirely soluble in glacial acetic acid (1 in 1½). The heat of the body suffices to soften Burgundy pitch, and it then becomes very adhesive.

The reddish-brown tint of Burgundy pitch is the result of exposure and loss of water from the surface. Mixtures of colophony, turpentine, water, and palm oil are sometimes sold as Burgundy pitch, and, like the genuine article, they tend to become somewhat transparent and darker coloured on the surface, owing to loss of water, but they are devoid of the peculiar fragrance of the genuine article, and are much less soluble in glacial acetic acid. The chief constituent of Burgundy pitch is resin, which consists of two isomeric crystallisable resin acids—dextropimaric and lævopimaric acids; other constituents are oil of turpentine and a small quantity of volatile oil to which the peculiar fragrance of the drug is due.

PIX CARBONIS.

Coal Tar.

A PRODUCT of the destructive distillation of bituminous coal, prepared for medicinal use by driving off the greater portion of the ammoniacal liquor it contains, by the application of heat. When the coal is distilled, illuminating gases are evolved and a variety of volatile decomposition products, including phenol, creosol, etc., are condensed into the thick, dark, liquid or semi-liquid coal tar, while coke is left in the retort. The crude coal tar is heated in a shallow open vessel to 49° C. for an hour and stirred frequently, to drive off the ammoniacal liquor it contains, and it is then fit for medicinal purposes. The prepared coal tar possesses strong antiseptic and parasiticide properties, and is used in the preparation of Liquor Picis Carbonis (1 in 5), which is employed in cases of chronic eczema in the form of a lotion or ointment.

Coal tar (s.g. 1·1 to 1·2) is a nearly black viscid liquid, with a strong, penetrating, disagreeable odour. It is only slightly soluble in water, to which it imparts an alkaline reaction, owing to the presence of ammonium compounds, thus distinguishing it from wood tar and oil of cade, both of which impart an acid reaction to water shaken up with them. It may be split up by fractional distillation into about 5 per cent. of ammoniacal liquor, 3 per cent. of light oils, 20 per cent. of carbolic and creosote oils, 12 per cent. of anthracene oils, and 60 per cent. of pitch. Prepared coal tar should be free from ammonium compounds and other substances volatile at temperatures below 49° C.

The chief constituents of coal tar, to which its antiseptic and parasiticide properties are due, are phenol and its homologues, naphthalene and similar hydrocarbons, basic bodies like pyridine and acridine, and sulphur compounds such as thiophene. It also contains various other substances, including pitch, the greater part of which is left as a black insoluble residue when the prepared coal tar is digested in strong tincture of quillaia, as in preparing Liquor Picis Carbonis, while most of the aromatic substances it contains pass into solution. On adding water to the alcoholic solution of coal tar, most of the hydrocarbons and the higher phenols are precipitated, but they are emulsified by certain constituents of quillaia bark, and a milky fluid results.

PIX LIQUIDA.

Tar; Stockholm Tar.

A BITUMINOUS liquid obtained from the wood of the Scotch fir, *Pinus sylvestris*, Linné (N.O. Coniferæ), and other species of *Pinus*, by destructive distillation. The wood of *P. palustris*, Miller, is used largely for the production of tar in the southern states of North America, and tar is also obtained from the wood of beech, birch, and other trees, but that prepared from Coniferous wood is employed usually for medicinal purposes. The wood is sometimes cut into billets, which are placed together in a large stack or pile upon a small circular mound of earth, the upper surface of which declines gradually from the circumference to the centre, where there is a cavity communicating by a conduit with a shallow ditch surrounding the mound. The pile is then covered with earth, so as to prevent free access of air, a hole being left near the top of the mound, through which a light can be applied to the wood. The opening having been closed, a slow combustion is maintained, and the products of distillation collect in the cavity, whence they are conveyed by the conduit to the ditch, the tarry matter being subsequently transferred to barrels. Another method of production is to heat the wood in iron retorts, the gaseous products of distillation given off being conducted back to the hearth and burnt, thus economising fuel. As the result of the destructive distillation, gaseous, watery, and tarry products are given off, while charcoal is left in the retorts. The tar separates from the watery products on standing, and the latter serve as a source of acetic acid, acetone, methyl alcohol (wood naphtha), etc. The tar is known in commerce as Stockholm tar. It possesses antiseptic, expectorant, hæmostatic, and diuretic properties, and is used both internally and externally. It is best given in capsules, and is applied externally in the form of Unguentum Picis Liquidæ (5 in 7).

Tar is a dark brown or blackish semi-liquid substance (s.g. 1·02 to 1·15), with a peculiar aromatic odour and a bitter, pungent taste. It becomes thicker and opaque on keeping, and acquires a granular appearance, owing to the formation of minute crystals of pyrocatechin, resin acids, etc. Water agitated with it acquires a pale brown or yellowish colour, a sharp empyreumatic taste, and an acid reaction which is due chiefly to the presence of acetic acid. Coal tar, on the other hand, imparts an alkaline reaction to water. A filtered aqueous extract of pine tar is coloured red by very dilute solution (1·0 per cent.) of ferric chloride, as is also a similar extract of oil of cade, whereas an aqueous extract of birch tar becomes greenish. If stronger ferric chloride solution (5 per cent.) be used, the pine tar water will assume a dark olive-green colour, but the aqueous extract of oil of cade will become olive-brown. Stockholm tar is completely soluble in less than its own bulk of 90 per cent. alcohol or chloroform, separating from the solution on the addition of water; it is also soluble in 4 per cent. sodium hydroxide solution (1 in 3), and is slightly soluble in olive oil or oil of turpentine.

Wood tar may be regarded as consisting of resinous matter coloured with charcoal, and mixed with acetic acid, oil of turpentine, and various volatile empyreumatic products. On distillation it yields creosote, an empyreumatic oil called oil of tar, and pyroligneous acid, pitch being left in the retort. The chief constituents of Stockholm tar are guaiacol, cresol, pyrocatechin, phenol, creosol, phlorol, and methyl-creosol. Other constituents of medicinal importance are toluene, xylene, paraffin, naphthalene, and other hydrocarbons. Coniferous wood yields from 15 to 20 per cent. of tar which is especially rich in guaiacol and its homologues. The wood of beech, birch, and other trees yields only about 6 to 8 per cent. of tar; beech tar is rich in guaiacol and pyrogallol derivatives, whilst birch tar is rich in guaiacol and benzophenol derivatives.

PODOPHYLLI RHIZOMA.

Podophyllum Rhizome or Root; May-Apple or Mandrake.

THE dried rhizome and roots of the May-apple, *Podophyllum peltatum*, Linné (N.O. Berberidaceæ), which is indigenous to the eastern United States and Canada. It is a small herbaceous plant with a stem about 3 cm. high, which bears a single large white flower, rising from between two leaves about the size of a hand. The plant has a long, perennial, jointed, creeping rhizome, which is furnished with roots at the joints. The rhizome is occasionally forked, but produces very few lateral branches. The production of a flowering stem terminates the growth of the main axis of the rhizome, but a bud in the axil of one of the cataphyllary leaves then develops, forming a sympodial system and so continuing the growth of the plant. The rhizome, with roots attached, is collected in the late summer, after the leaves have fallen, as it is then most active. It shrinks considerably during the drying process, and is cut into short pieces before being placed upon the market. The drug is imported from North America. It possesses alterative and cathartic properties, and contains a resin which is an active cholagogue and purgative in large doses; the resin (Podophylli Resina) is used in the preparation of Tinctura Podophylli (1 in $27\frac{1}{3}$).

Podophyllum rhizome occurs usually in dark reddish-brown, nearly cylindrical pieces, about 6 to 18 cm. long and 5 to 8 mm. thick. They are nearly smooth, or slightly wrinkled longitudinally; if flattened and strongly wrinkled, the drug is of poor quality. At intervals of about 5 cm. or more the rhizome is enlarged, and bears on the upper surface of each enlargement a concave scar left by a flowering stem, surrounded by several circular leaf-scars, indicating the position of cataphyllary or scale leaves. Immediately beneath, on the under surface, occur stout, brittle, brown roots, somewhat paler than the rhizome, or scars indicating where the roots have been. The dried rhizome breaks with a short and irregular fracture ; it is usually whitish and starchy internally, but may appear yellowish-brown and horny if the heat employed to dry the drug has been sufficient to cause the starch to gelatinise. A transverse section exhibits a very thin cork, the cortical layer consisting of a double row of thick-walled yellowish cells enclosed by the epidermis ; there are also sixteen or more small, oval, yellow fibro-vascular bundles arranged in a circle in a mass of loose parenchymatous tissue. The odour of the drug is characteristic but not strong, being more pronounced when the rhizome is powdered ; the taste is at first sweetish, but afterwards bitter and slightly acrid.

The straight cylindrical pieces, with occasional stem-, leaf-, and root-scars, are distinctive characters of podophyllum rhizome, and the structure shown by transverse sections is also characteristic. Indian podophyllum rhizome, from *P. Emodi*, Wallich, is much stouter and more knotty than the American drug, and also has an abundance of stout roots. The chief constituent of podophyllum rhizome is the resin podophyllin, of which it yields from 4 to 6 per cent. Other constituents of the rhizome are starch, sugar, and quercetin. Podophyllum resin is a mixture of the active and inert principles of podophyllum rhizome, extracted by exhausting the drug with alcohol, and, after recovery of most of the alcohol by distillation, precipitating the residual strong tincture by slowly pouring it, with constant stirring, into distilled water acidulated with one twenty-fourth of its bulk of hydrochloric acid to facilitate the precipitation of the resin in a pulverulent condition. The product is an amorphous powder with a bitter taste, and varies in colour from greyish-white to pale greenish-yellow or yellowish-green, becoming darker when exposed to high temperatures. It is partly soluble in ether, and almost entirely soluble in 90 per cent. alcohol or in solution of ammonia. The chief constituents of podophyllum resin are a neutral crystalline substance (m.p. 117° C.) named podophyllotoxin, and an uncrystallisable substance named podophylloresin; other constituents of the resin are fatty matter and quercetin, a yellow colouring matter identical with that in quercitron bark. When heated with alkalies, podophyllotoxin is converted into salts of podophyllic acid, an unstable compound which readily loses water, and is then converted into its anhydride picropodophyllin (m.p. 227° C.), an inactive crystalline isomer of podophyllotoxin. The resin of Indian podophyllum closely resembles that of American podophyllum, but can be distinguished as explained in the notes on the former substance (see page 326).

PODOPHYLLI INDICI RHIZOMA.

Indian Podophyllum Rhizome.

THE dried rhizome and roots of *Podophyllum Emodi*, Wallich (N.O. Berberidaceæ), a native of Northern India. The plant is of similar character to *P. peltatum*, and its rhizome and roots possess similar alterative, cholagogue, and cathartic properties to those of the American drug. The rhizome and roots are official in the Indian and Colonial Addendum, for use as an equivalent of American podophyllum in India and the Eastern Colonies. The drug is used in the form of Indian podophyllum resin and Tinctura Podophylli Indici (1 in 27⅓).

Indian podophyllum rhizome occurs in earthy-brown, horizontal, more or less cylindrical and contorted pieces, from 6 to 8 mm. thick. The pieces of rhizome are crowded above with tuberosities, marked by depressed oval or circular scars, and give off numerous simple rootlets from the whole of the under surface. The terminal bud, when present, is enclosed in whitish papery sheaths. The rhizome breaks with a short, white and mealy, or yellow and horny fracture, and a smoothed transverse section exhibits a number of yellow fibro-vascular bundles arranged in a circle in a mass of parenchymatous tissue, which is bounded by a thin, brown, cortical layer. The drug has a very faint odour, and a bitter, acrid taste, due to the resin it contains.

The rhizome of Indian podophyllum is distinguished by its colour and contorted appearance, the tuberosities on its upper surface, and the numerous rootlets given off from its under surface. The chief constituent of the drug is from 10 to 12 per cent. of resin, which closely resembles that of *Podophyllum peltatum.* Other constituents of the rhizome are starch, sugar, and quercetin. The resin is more active than ordinary podophyllum resin, owing to the presence of a larger proportion of active constituents. It is prepared by the same process as that by which ordinary podophyllum resin is prepared from American podophyllum. The active constituents of Indian podophyllum resin are podophyllotoxin and podophylloresin, which are associated with picropodophyllin, quercetin, and fatty matter. The Indian resin produces an orange to red colour when a minute quantity is sprinkled on strong sulphuric acid, but ordinary podophyllum resin produces a yellow to brown colour with the same acid. In addition, a semisolid gelatinous mass results on shaking together, in a test tube, 0·4 gm. of the Indian resin (or the residue left on evaporating 20 c.c. of tincture to dryness), 3 c.c. of diluted alcohol (s.g. 0·920), and 0·5 c.c. of potassium hydroxide solution; if necessary, the mixture should be heated to boiling-point and then cooled. In the case of American podophyllum resin (or a tincture prepared therefrom), a similar mixture shows no signs of gelatinising.

PRUNI VIRGINIANÆ CORTEX.

Virginian Prune Bark; Wild Cherry Bark.

The bark of the wild black cherry, *Prunus serotina*, Ehrhart (N.O. Rosaceæ), collected in autumn. The tree may attain a height of 18 metres, and is distributed widely throughout the United States and other parts of North America. Though the bark is collected indiscriminately from all parts of the tree, that removed from the root or branches is believed to be superior to that obtained from the trunk. Both young and old barks are used, the latter being distinguished by the absence of both cork and cortex, while the young bark of commerce is also frequently destitute of cork. The bark is most active when collected in the autumn, and is in the best condition when recently dried, as it deteriorates on keeping. The drug possesses tonic and sedative properties, and is used in the form of Syrupus Pruni Virginianæ (3 in 20), or Tinctura Pruni Virginianæ (1 in 5), the syrup being employed as a flavouring agent or vehicle for nauseous medicines.

Virginian prune bark, so-called, occurs in curved or flattened pieces, or in fragments of irregular shape. The pieces are about 2 mm. or more in thickness, and are sometimes 12 cm. long and 5 cm. broad, though usually much smaller. Young bark is frequently covered with a smooth and sometimes glossy, thin, papery, reddish-brown cork, which is marked with numerous transversely elongated, whitish lenticels. The cork is peeled off easily in thin membranous strips, disclosing the greenish-brown cortex, which bears scars corresponding to the lenticels. If the cortex should also have been removed, as in the case of old bark, the exposed surface consists of the outer layer of bast, which is usually rough and of a nut-brown or dark cinnamon-brown colour; when examined under a lens, such bark exhibits pale longitudinal strands (sclerenchymatous cells) alternating with darker parenchymatous tissue (medullary rays). The inner surface of the bark is cinnamon-brown in colour and finely striated or fissured longitudinally, or it may be reticulated and rough, the interstices between the pale bast fibres being only partially filled with the brown parenchymatous tissue of the medullary rays. The bark breaks with a short, reddish-grey, granular fracture, and the fractured surface exhibits numerous groups of sclerenchymatous cells of characteristic irregular shape, which are contained in the bast rays that alternate with the tortuous, pale red, medullary rays. The drug has an astringent, aromatic, and bitter taste, and a slight odour, which is much more pronounced when the drug is macerated in water, and resembles that of bitter almonds when similarly treated.

The bark of the wild black cherry is incorrectly named Virginian prune bark, and care must be taken to avoid confusing it with the bark of the choke cherry, *P. virginiana*, Linné, which has a somewhat disagreeable odour. The chief constituents of wild black cherry bark are an amorphous glucoside resembling laurocerasin or amygdalin, a bitter crystalline glucoside which shows a blue fluorescence in alkaline aqueous solutions, and about 3·5 per cent. of tannin; other constituents are starch, resin, colouring and fatty matter, calcium oxalate, etc. The drug yields benzaldehyde and from 0·15 to 0·2 per cent. of hydrocyanic acid when macerated in water, owing to the hydrolysis of the amorphous glucoside by a ferment analogous to, if not identical with, emulsin or synaptase.

The bark obtained from young trees contains more of the glucoside than that from older trees, but bark from the root yields most hydrocyanic acid, whilst that obtained from twigs and branches yields more of the acid than bark from the trunk.

PRUNUM.

Prunes; French Plums.

THE dried ripe fruits of *Prunus domestica*, Linné, var. *Juliana*, De Candolle (N.O. Rosaceæ), a variety of the plum tree cultivated in France, especially in the valley of the Loire. The fresh fruit is an oval or ovoid drupe, about 2·5 cm. in length, and of a deep violet colour. It is collected when ripe, partly dried in an oven, and then exposed to the heat of the sun until quite dry. The dried fruits are imported from the south of France. They are nutritious and demulcent, but rarely used in medicine except as an ingredient of Confectio Sennæ (1 in 12½).

Prunes are irregular in shape, being flattened and somewhat ovoid or oblong. They are about 3 cm. in length, and have a shrivelled, nearly black surface. The entire fruits have a faint agreeable odour, and consist largely of a soft fleshy sarcocarp or brownish pulp which is without marked odour, but has a sweet and bland acidulous taste. The pulp surrounds a hard, oval, flattened stone, which is broadly rounded at one end and marked at the other with a shallow, slightly oblique depression, the putamen or shell being smooth or irregularly ridged. The seed is like an almond, but smaller, and has a taste like that of the bitter almond, owing to the formation of benzaldehyde when chewed.

Dried plums of other kinds are occasionally substituted for prunes or "French plums," but they can be distinguished from the latter by differences in the shape of the stones they contain. The pulp of prunes is the only portion of the fruit used in medicine, and is extracted by boiling the fruits with distilled water until disintegrated, after which the stones and epicarps are removed by straining. The chief constituents of the pulp are about 40 per cent. of uncrystallisable sugar and 2 to 3 per cent. of malic, tartaric, and other acids. The pulp also contains mucilaginous matter, etc., while the seed of the prune contains fixed oil, amygdalin, and emulsin (synaptase), benzaldehyde and hydrocyanic acid being formed when the seeds are crushed and macerated with water, as in the case of bitter almonds and wild cherry bark.

PTEROCARPI LIGNUM.

Red Sanders Wood; Red Sandal-wood.

THE heartwood of *Pterocarpus santalinus*, Linné filius (N.O. Leguminosæ), a small tree indigenous to India, and also found in Ceylon and the Southern Philippines. It grows best in mountainous districts, and is cultivated largely in Southern India, whence the wood is obtained chiefly, being imported from Madras and Ceylon in heavy, irregular, roundish or angular billets or logs of varying size and thickness, from which the rugged bark and pale sapwood have been removed. The red colour of the wood is due to a resinous colouring matter which is found in the wood fibres, wood parenchyma, and vessels of the heartwood. The only use of the wood in medicine is as a colouring agent, and it is employed for that purpose in the preparation of Tinctura Lavandulæ Composita.

Red sanders wood is imported in large heavy logs which are dark reddish-brown or blackish-brown externally, though of a deep blood-red colour when freshly cut, while a transverse section exhibits alternate dark and lighter zones. The medullary rays are just visible when the wood is examined under a lens, and the large, mostly isolated vessels are seen to be connected by fine, bright red lines of wood parenchyma. The wood is hard and easily split, but is seen usually in the form of coarse powder or small, hard, splintery raspings, of a deep blood-red to dark reddish-brown or dull purplish-red colour, according to the time which has elapsed since it was rasped. The wood is practically odourless, but exhales a faint aroma when warmed. It has a very slightly astringent taste. The red colouring matter of the wood is soluble in 90 per cent. alcohol, ether, acetic acid, and alkaline solutions, also in the oils of lavender and rosemary; it is only sparingly soluble in cold water, and the wood does not colour the saliva red when chewed.

The chief constituent of red sanders wood is a red colouring matter named santalin, and the wood is distinguished from other woods of similar appearance by differences in the solubility of their colouring matter.

Other constituents of red sanders wood are two colourless crystalline principles named pterocarpin and homopterocarpin. Santalin is a red, crystalline, resinous substance which is precipitated from alkaline solutions on adding acids. It yields a red solution with alcohol, the resulting tincture giving a deep violet precipitate with ferrous sulphate, a scarlet precipitate with mercuric chloride, and a violet precipitate with salts of lead. Alkaline solutions of santalin are of a deep red or violet colour, and yield a precipitate on the addition of hydrochloric acid; the precipitate contains a colourless crystalline principle named santal, an alcoholic solution of which assumes a deep red colour on the addition of ferric chloride.

PYRETHRI FLORES.

Pyrethrum Flowers; Insect Flowers.

THE unexpanded flower-heads of *Pyrethrum cinerariæfolium*, Treviranus (N.O. Compositæ), also known as *Chrysanthemum cinerariæfolium*, Visiani, and of other species, including *P. roseum*, Bieberstein (*C. coccineum*, Willdenow), and *P. carneum*, Bieberstein (*C. coronopifolium*, Willdenow). The first-named plant is a native of Dalmatia, but the other species are natives of Persia and the Caucasus. The finest insect-powder is prepared from the closed flowers of *P. cinerariæfolium* obtained from plants cultivated in Dalmatia and California. The plant produces depressed roundish flower-heads about 25 mm. or less in diameter, with a hemispherical and imbricate involucre, the scales having a whitish scarious margin. Each flower-head has a somewhat convex naked receptacle, bearing a single row of about twenty whitish ray florets and numerous disc florets. The ray florets are whitish, ligulate, three-toothed, and pistillate; the disc florets are yellow, tubular, five-toothed, and perfect. The fruits are obovate achenes, each bearing a short, scarious, somewhat toothed crown. The flower-heads are collected at different stages of development, the commercial varieties being known as "closed," "half-closed," and "open" flowers respectively; they are most active if collected when fully developed, but before they have expanded. The powder prepared from the flowers stupefies and kills various small insects, and retains its properties for an indefinite period if kept under suitable conditions.

Dalmatian insect flowers as met with in commerce are of a dull brownish-yellow or greyish-brown colour when closed, nearly globular in shape, and usually about 12 mm. in diameter. The bracts of the involucre are yellowish or greyish in colour, lanceolate, hairy, and membranous at the margin; they are erect in the "closed" flowers, but bend outwards as the flowers expand, the capitulum then assuming a flattened hemispherical shape. The dried ray florets have whitish or brownish ligulate corollas, while those of the disc florets are yellow and comparatively short. On removing a corolla, the calyx may be seen crowning the fruit as a raised membranous ring. The fruit is longer than the corolla and has a winged appearance, owing to the presence of five projecting ribs. Yellow shining oil-glands can be seen on both corolla and fruit when examined with a lens. The flowers have a bitter, acrid taste, and a peculiar aromatic odour. The powder obtained by grinding the flowers varies in colour from yellow or yellowish-brown to yellowish-green, the finer qualities tending towards brown and the poorer qualities being greenish. A microscopical examination shows that the powder consists of fragments of involucral scales composed of sclerenchyma, together with collenchymatous stem tissue and pollen grains, as well as fragments of the corolla and of its epidermis and papillæ.

Closed Dalmatian insect flowers are distinguished by their sub-globular shape, yellowish-white bracts, disc floret, with short corolla and membranous calyx, and fruit with five prominent ribs. The expanded flowers are frequently destitute of both ligulate and tubular corollas, and the membranous crowns on the closely packed fruits then present a reticulated appearance when the capitula are viewed from above. Persian or Caucasian insect flowers, from *Pyrethrum roseum* and other species, are almost entirely glabrous, and have nearly black involucral bracts, ray florets which are of a dull purple colour when dry, and fruits with ten ribs. They are less active than the Dalmatian flowers, and are rarely seen in commerce. The powder prepared from the Dalmatian flowers is distinguished from that of Persian flowers by numerous hairs, and it also contains fewer sclerenchymatous cells; the better the quality of the powder, the larger will be the proportion of pollen and the smaller the proportion of stem tissue. Other Composite flowers are used as adulterants of insect flowers, but usually they yield a darker-coloured powder, which is lacking in stupefying power. The presence of turmeric, quassia, fustic, lead chromate, and other substances as adulterants may be detected by the aid of the microscope, or by the powder yielding more than 8 per cent. of ash and 10 per cent. of moisture. The chief constituent of insect flowers is a toxic ether-soluble resin named pyrethrotoxic acid; other constituents of the flowers are a volatile oil, chrysanthemic acid, a liquid of alkaloidal nature named chrysanthemine, a crystalline glucoside, sugar, a hydrocarbon, and phytosterin.

PYRETHRI RADIX.

Pyrethrum Root; Pellitory Root.

THE dried root of *Anacyclus Pyrethrum*, De Candolle (N.O. Compositæ), a small plant which is indigenous to Northern Africa, the Levant, and the Mediterranean coast of Europe. The plant has a perennial root which is collected in the autumn and dried. It was formerly known as "pellitory of Spain," but is now imported chiefly from Algeria. The drug is powerfully stimulant to the salivary glands, causing a copious flow of saliva. It is employed as a masticatory in dryness of the mouth and throat, and is also used in the form of Tinctura Pyrethri (1 in 5) for relieving toothache, or as an ingredient of mouth-washes.

Pyrethrum root occurs usually in simple unbranched pieces, about 12 mm. in thickness, and varying from 5 to 10 cm. or more in length. The pieces are nearly cylindrical in shape, tapering towards the tip and frequently also towards the crown, where a tuft of grey or nearly colourless hairs is often to be found. The outer surface of the root is brown, and deeply and irregularly wrinkled longitudinally. The root is tough and breaks with a short fracture. A transverse section shows that the bark is closely adherent to the wood, which exhibits a prominently radiate structure, wide whitish medullary rays alternating with narrow yellowish wedges of vascular tissue. Scattered yellow or brown ducts or glands containing oleoresin are to be seen in the medullary rays and bark or cortex. When cut, the root appears of a horny nature, rather than starchy or fibrous. It has a distinctly characteristic odour, and a peculiar pungent taste, causing a burning and tingling sensation in the mouth and throat when chewed, and exciting a copious flow of saliva.

The radiate structure of the wood, the wide medullary rays, and the presence of numerous glands or ducts, are distinctive characters of pyrethrum root. Several other roots resemble it somewhat when dried, including those of belladonna, dandelion, and liquorice. Belladonna root, however, has no glands and usually contains starch; dandelion root has a small yellow wood and a thick, whitish, ringed bark; liquorice root has a sweet taste, contains no glands, and has much narrower medullary rays. The chief constituents of pyrethrum root are a crystalline alkaloid named pyrethrine, an acrid resin, and two acrid fixed oils; other constituents are tannin, gum, inulin, a little volatile oil, and various salts. Pyrethrine possesses an intensely pungent taste, and splits up like piperine when treated with alcoholic potassium hydroxide solution, yielding piperidine and pyrethric acid as the products of its decomposition. It should be noted that the name " pyrethrin " has been applied to a mixture of the resin and fixed oils present in pellitory root.

QUASSIÆ LIGNUM.

Quassia Wood.

THE wood of the trunk and branches of *Picræna excelsa*, Lindley (N.O. Simarubaceæ), a lofty tree which is common in Jamaica and the Caribbean Islands. Surinam quassia wood, from *Quassia amara*, Linné, was the kind originally used in medicine, but is now replaced in this country by Jamaica quassia. The wood is imported from Jamaica in logs and billets which are covered usually with a thin, smooth, dusky grey or blackish, readily separable bark. The bark is removed, and the wood prepared in the form of chips or trimmings for medicinal use. The wood is a simple bitter, without astringency, and is employed largely as a tonic, while an infusion is used as an insecticide, or as an anthelmintic enema. The chief preparations of quassia wood are Infusum Quassiæ (1 in 100), Liquor Quassiæ Concentratus (1 in 10), and Tinctura Quassiæ (1 in 10).

Quassia wood is imported in logs of varying length, which frequently exceed 15 cm. in diameter, but may be much smaller. The wood is yellowish-white, tough, dense, and easily split. It is seen usually in the form of splinters, chips, or raspings. When examined with a lens, a longitudinal section of the wood appears transversely striated by reason of the small vertical height of the medullary rays, and exhibits elongated cells (wood parenchyma) containing single crystals of calcium oxalate. In a smooth and moistened transverse section numerous medullary rays, usually two or three cells in width, can be seen traversing somewhat irregular concentric rings which simulate annual rings, but are the result of the distribution of parenchyma in more or less concentric bands. The vessels occur usually in groups of two or three, and extend frequently from one medullary ray to the next. Quassia wood has no odour, but its taste is intensely bitter. Certain dark grey or blackish markings or patches sometimes exhibited by quassia wood are due to the mycelium of a fungus, the dark-coloured hyphæ of which penetrate the cells of the wood parenchyma and medullary rays, and may form delicate patterns.

Jamaica quassia is distinguished by the size of the logs or billets in which it occurs when imported, in the width of the medullary rays in the wood, and by the presence of crystals of calcium oxalate in the wood parenchyma. Surinam quassia occurs usually in smaller billets, since the stems of *Quassia amara* never exceed 10 cm. in diameter and are usually much less; moreover, the medullary rays in Surinam quassia are usually only one cell wide, the wood parenchyma is free from crystals of calcium oxalate, and the wood itself is more dense than Jamaica quassia. The chief constituent of Jamaica quassia is picrasmin, a mixture of two homologous, crystalline, bitter principles—α-picrasmin and β-picrasmin—which differ in melting-point and solubility, though both yield picrasmic acid when heated with hydrochloric acid. Other constituents of the wood are mucilage, pectin, resin, a trace of volatile oil, and a yellow crystalline substance which exhibits a blue fluorescence in acidulated alcoholic solutions and is believed to be of alkaloidal nature. Quassia contains no tannin and yields from 7 to 8 per cent. of ash. Surinam quassia yields only 3 to 4 per cent. of ash, and contains quassin, a mixture of homologous, crystalline, bitter principles which yield quassic acid when hydrolysed by hydrochloric acid, but differ in melting-point and solubility, and are closely allied to α-picrasmin and β-picrasmin, though they have higher melting-points than those substances.

QUERCUS CORTEX.

Oak Bark.

The bark of the common British oak, *Quercus Robur*, Linné (N.O. Cupuliferæ), a tree which is distributed widely throughout Europe, and is cultivated largely for the sake of its wood and bark, the latter being highly valued for tanning purposes. Bark for medicinal purposes is collected in the early spring, when the buds are opening. The trees are felled and longitudinal incisions made in order that the bark may be removed in strips, which are dried and are then ready for the market. Some bark is also obtained from the shoots which arise from the truncated stocks of oak trees. The bark varies somewhat in appearance, according to the age of the trees from which it has been removed, but it is covered with a smooth, glossy, silvery cork when taken from trees not more than twenty years old. Young bark should be preferred for medicinal purposes, because older bark contains less unaltered tannin. As the trees increase in age, the outer portions of the bark are cut off by the formation of layers of cork in the bast, and the tannin in the outer portions becomes oxidised. The drug is an astringent, and is used occasionally in the form of powder or decoction (1 to 16).

Oak bark, as used in medicine, is seen usually in channeled pieces of variable length, about 25 mm. or more in breadth, and about 2·5 mm. or less in thickness. They are covered externally with a thin, smooth, shining, silvery-grey cork, which is firmly adherent and marked with darker transverse lenticels, or, in older bark, fissured longitudinally and marked with dark spots and patches. On removing the cork the bark appears of a reddish-brown colour, whilst the inner surface is of a cinnamon-brown or pale brownish-red colour, and strongly striated longitudinally. The bark breaks with a fracture which is short so far as the cork and cortex are concerned, but tough and coarsely fibrous in the inner or bast portion. A transverse section of young bark, examined under a lens, exhibits a thin greenish cork-layer, next to which comes the thin yellowish cortex, separated by a line of pale sclerenchymatous cells from the reddish-brown bast, which constitutes the bulk of the bark and is chequered by tangentially arranged groups of bast fibres. On applying a dilute solution of ferric chloride, the section turns black owing to the presence of tannin. The bark has no marked odour, but the tannin present causes it to have a very astringent taste.

The glossy silvery cork, striated fibrous inner surface, and the line of sclerenchymatous cells dividing the cortex from the bast, are distinctive characters of oak bark suitable for medicinal purposes. The barks of other species of *Quercus* differ in those respects, as also does older bark from *Q. Robur*, in which the secondary cork formation causes a wide difference in structure and appearance. Willow and witch-hazel barks also occur in thin channeled pieces, but are distinguished readily from oak bark. Willow bark, from *Salix alba*, Linné, and other species, has a dull greenish-brown cork, the inner surface is paler than that of oak bark, and a transverse section shows no line of sclerenchymatous cells. Witch-hazel bark, from *Hamamelis virginiana*, Linné, has a dull grey, scaly cork, and is elsewhere of a pinkish colour. The chief constituent of oak bark is quercitannic acid, a variety of tannin, which may be present to the extent of 10 to 16 per cent. It differs from gallotannic or digallic acid, obtained from galls, by not being convertible into gallic acid ; on hydrolysis it yields an anhydride named oak-red—a phlobaphene to which the reddish-brown colour of the bast in oak bark is partly, if not entirely, due. Other constituents of oak bark are small quantities of gallic and ellagic acids, together with colouring matter, pectin, resin, calcium oxalate, etc. Black oak or quercitron bark, from *Quercus tinctoria*, contains, in addition to the substances mentioned, quercitrin, a yellowish crystalline substance which yields quercetin and isodulcite on hydrolysis.

QUILLAIÆ CORTEX.

Quillaia Bark ; Panama or Soap Bark.

The inner part of the bark of *Quillaja saponaria*, Molina (N.O. Rosaceæ), a large tree indigenous to Chili and Peru, whence the drug is imported. The tree has very hard wood and a thick bark, which is removed in large pieces, freed from the outer dark-coloured portion, and dried. The name “ soap bark ” has been applied to quillaia bark because water in which it has been macerated froths like soap solution when agitated. The drug is a powerful irritant, and has been employed as an expectorant and stimulant, but it should be used with care as it contains poisonous glucosides. The chief preparation of the bark is Tinctura Quillaiæ (1 in 20), a stronger form of which (1 in 10) is the emulsifying agent employed in making Liquor Picis Carbonis.

Quillaia bark is imported usually in large flat pieces, about 4 mm. thick, 60 cm. or more long, and from 10 to 15 cm. wide. The outer surface is striated longitudinally and of a pale brownish-white or yellowish-white colour, with reddish-brown or blackish-brown streaks where the outer portion of the bark has been removed imperfectly. The pieces appear of a uniform, dull, dark red colour, and, if insufficiently trimmed, have patches of the outer bark adhering to them. The inner surface is smooth and white or yellowish-white. The bark breaks with a splintery fracture, and the fractured surface tends to separate into thin laminæ or plates. The freshly exposed laminated surfaces and the smooth inner surface of the bark exhibit glistening prismatic crystals of calcium oxalate, especially when examined with a lens. A smoothed transverse section is seen to be marked with fine radial and tangential lines, which give it a chequered appearance. The radial lines are medullary rays, and the tangential bands consist of bast parenchyma, the darker portions enclosed by the lines consisting of groups of bast fibres. The bark has an astringent and acid taste, but is almost odourless. Fine particles dislodged from the drug are extremely irritating to the nostrils and induce prolonged fits of sneezing.

The very smooth inner surface, splintering laminated fracture, and the presence of glistening crystals of calcium oxalate distinguish quillaia bark from other barks. Elm bark, from *Ulmus campestris*, Linné, resembles it somewhat, but is fibrous and has a roughish inner surface, while slippery elm bark, from *Ulmus fulva*, Michaux, is very fibrous and has a decided odour of fenugreek. The chief constituents of quillaia bark are two amorphous, toxic glucosides, sapotoxin and quillaic acid (quillain or saponin), which produce a frothing effect when their solutions are agitated. Other constituents of the bark are starch, gum, and various salts, but it contains neither tannin nor any bitter principle. Sapotoxin and quillaic acid are believed to be identical with the senegin and polygalic acid of senega root. Commercial "saponin" may be a mixture of sapotoxin and quillaic acid with an inert modification of the latter, produced during the process of manufacture.

RESINA.

Resin ; Colophony or Rosin.

THE residue left after the distillation of the oil of turpentine from the crude oleo-resin (turpentine) of various American and European species of *Pinus* (N.O. Coniferæ). The oleo-resin is a degradation product formed in schizogenous secretion ducts which form a branching system in the wood. It exudes naturally when the trees are wounded, or when the ducts are punctured on tapping the trees, as explained in the notes on Terebinthinæ Oleum. After collection, the crude turpentine is submitted to distillation with water, and, after the oil has passed over, the melted resin is removed from the stills and run through wire strainers into barrels. It is then known as "colophony" or "rosin," and when it still contains a little water it is distinguished in commerce as "yellow rosin," while resin from which the water has been removed entirely is known as "transparent rosin," and that which has acquired a very deep colour owing to the long-continued application of heat is termed "black rosin." In the case of trees which have been tapped for the first time, the crude turpentine yields about 80 per cent. of light-coloured resin, but in subsequent years the proportion of resin in the crude turpentine gradually increases, and the resin also tends to become darker. Resin is imported chiefly from America. It possesses antiseptic and slightly stimulant properties, and is used in the preparation of Emplastrum Calefaciens, Emplastrum Cantharidis, Emplastrum Menthol, Emplastrum Picis, Emplastrum Plumbi Iodidi, Emplastrum Resinæ, Emplastrum Saponis, and Unguentum Resinæ ; resin plaster is an ingredient of Emplastrum Belladonnæ, Emplastrum Calefaciens, and Emplastrum Opii.

Resin employed for medicinal purposes should occur in translucent, compact masses (s.g. 1·070 to 1·085) of a light amber colour, exhibiting a shining glassy surface when broken. It is brittle, easily powdered, possesses a faintly terebinthinate odour and taste, and is soluble in almost all proportions of 90 per cent. alcohol, oil of tur pentine, ether, benzol, carbon bisulphide, or hot olive oil. It softens at about 80° C., but does not melt completely until the temperature exceeds 100° C. It burns with a dense yellow flame and much smoke, leaving but little ash when the incineration is complete. Yellow and black resins are unsuitable for medicinal use, as is also the so-called white resin, which owes its opacity and dirty-white colour to the presence of water, added while the resin is in a state of fusion.

The chief constituent of resin is from 80 to 90 per cent. of the anhydride of abietic acid, which can be converted into crystalline abietic acid by allowing the powdered resin to remain in contact with warm diluted alcohol. Other constituents of resin are small quantities of the anhydrides of allied isomeric or polymeric acids, together with inert substances, protocatechuic acid, bitter principles, and traces of mineral constituents. Resin may also contain from 5 to 9 per cent. of unsaponifiable matter—hydrocarbons formed by decomposition of abietic acid during the distillation of the crude turpentine. When resin is distilled, a mixture of gases is given off, and "rosin oil" is produced, while soaps and greasy salts of abietic acid are formed when resin is boiled with alkaline solutions. A mixture of resin and oil of turpentine is often sold as Venice turpentine, but the substance to which that name applies properly is a yellowish, bitter, aromatic oleo-resin, collected in France and the Southern Tyrol from the larch. The oleo-resin obtained from *Pinus maritima*, collected in the south-western departments of Landes and Gironde, is known as Bordeaux turpentine, and yields a resin which consists chiefly of the anhydride of pimaric acid.

RHEI RADIX.

Rhubarb Root or Rhizome.

THE erect rhizome or so-called root of *Rheum palmatum*, Linné (N.O. Polygonaceæ), *R. officinale*, Baillon, and probably other species, deprived of more or less of its cortex and dried. The plants yielding the drug grow in China and Thibet. They produce massive, erect, sympodial rhizomes, from which proceed a few stout roots, and the drug consists chiefly of the rhizomes collected in the autumn from wild plants. After collection the rhizomes and roots are cut into pieces transversely, and the larger pieces of rhizome sliced longitudinally. The pieces are then trimmed, peeled, and sometimes perforated in order that they may be strung on cords while being dried in the sun or by artificial heat. The drug is collected in North-Western China and Eastern Thibet, and sent chiefly through Hankow to Shanghai, whence it is exported to Europe, though some of it is sent by way of Northern China and Siberia to Moscow and St Petersburg. It is known in commerce as Turkey or East Indian rhubarb, owing to the fact that it was formerly customary to convey it by caravan through Persia to the Syrian ports for exportation, or to send it from China to Calcutta, whence it was shipped to Europe. There are two chief varieties of the drug in commerce, known as Shensi and Canton rhubarb respectively, the former, which is usually the finest, being more dense than the Canton variety. The drug may be either sun-dried or kiln-dried (high-dried), the latter being darker externally and frequently somewhat burnt in appearance internally. In all cases, the pieces bear evidence of having been dressed carefully with a knife, file, or scraper, after drying, and the kiln-dried drug is distinguished from sun-dried rhubarb by the ends of the pieces being shrunken in the former. The drug is cathartic, astringent, and a stomachic tonic. It is given sometimes in powder, but is used chiefly in the form of Extractum Rhei, Infusum Rhei (1 in 20), Liquor Rhei Concentratus (1 in 2), Pilula Rhei Composita (4 in 15), Pulvis Rhei Compositus (1 in 4½), Syrupus Rhei (1 in 20), and Tinctura Rhei Composita (1 in 10).

Rhubarb root and rhizome occur in more or less hard, heavy, and compact pieces, on which portions of the dark corky layer sometimes remain. The pieces are known in commerce as "rounds" and "flats" respectively. Round rhubarb consists of cylindrical, barrel-shaped, or conical pieces, derived from roots and smaller rhizomes which have been cut transversely; while flat rhubarb consists of plano-convex or irregularly shaped pieces which have been obtained by cutting larger rhizomes longitudinally, and may present the characters of both root and rhizome, where one merges into the other. The pieces vary considerably in size, but are, on an average, from 7·5 to 10 cm. in length, and from 4 to 5 cm. in thickness. They frequently contain holes, in which may be found fragments of the cord which has been used to suspend the pieces while drying. The surface is rounded or somewhat angular, usually smooth, and frequently covered with a bright yellowish-brown powder, produced by the pieces rubbing against each other, or consisting of powdered rhubarb rubbed over them to improve their appearance. When the powder is removed, the surface is seen to be marked longitudinally with interrupted reddish-brown or dark rusty-brown lines (medullary rays), intermixed with a yellowish-brown, greyish, or whitish substance (bast parenchyma), a delicate, light-coloured, rhomboidal network being thus formed on the surface, while small, scattered, star-like marks (fibro-vascular bundles) are also frequently present. The drug breaks with an uneven fracture, and the fractured surface presents a marbled appearance, while occasionally it may present a rhomboidal network of reddish lines. A transverse section exhibits no well-marked pith, but reveals a more or less radiating mixture of medullary rays containing reddish-brown colouring matter, and whitish or iron-grey parenchyma containing starch and calcium oxalate. Sometimes a more or less continuous ring of star-like spots (fibro-vascular bundles) can be seen near the periphery of a transverse section of the rhizome. The drug has a characteristic, somewhat aromatic odour, and a bitter and feebly astringent taste, while it produces a gritty feeling when chewed, owing to the presence of cluster-crystals of calcium oxalate.

Chinese rhubarb is distinguished by the network of whitish lines on the surface, the firm hard texture of the drug, and its freedom from external wrinkles. English rhubarb, from *Rheum officinale*, is usually more spongy than Chinese rhubarb, also softer and wrinkled on the outer surface, while it has not a network of white lines on the outer surface, the dark-red and white lines usually running parallel to each other. The roots of *R. officinale* are much narrower than the rhizomes, and their transverse sections exhibit a distinctly radiate structure. Another variety of English rhubarb obtained from *R. Rhaponticum*, Linné, or a hybrid between that species and *R. undulatum*, Linné, is usually much shrunken and marked on the outer surface with parallel longitudinal white lines instead of a network. The roots of this variety are much smaller than the rhizomes, and, like those of *R. officinale*, exhibit a conspicuously radiate structure in transverse sections. The chief constituents of rhubarb root are chrysophan and other anthraglucosides, tannoglucosides — including glucogallin and tetrarin — and products of the hydrolysis of those bodies, including chrysophanic acid (dioxy-methyl-anthraquinone), emodin (trioxy-methyl-anthraquinone), rhein (tetroxy-methyl-anthraquinone), gallic and cinnamic acids, rheosmin, catechin, dextrose, rheo-nigrin, and rhubarb-red. Other constituents of the drug are mucilage, pectin, starch, calcium oxalate, and an active oxydase. The proportion of calcium oxalate present in the drug varies considerably, less being found in English than in Chinese rhubarb, though the former contains more tannin and starch. The best Shensi rhubarb may contain as much as 25 per cent. of calcium oxalate, but Canton rhubarb contains only 5 to 10 per cent., reckoned as ash. The emodin (m.p. 250°–255° C.) in rhubarb is identical with that in the bark of *Rhamnus Frangula*, and is an isomer of that which exists in senna, and in Barbados and Cape aloes.

RHŒADOS PETALA.

Red-Poppy Petals.

THE fresh petals of the field or corn poppy, *Papaver Rhœas*, Linné (N.O. Papaveraceæ), a plant which is very common in Britain and throughout Europe generally, growing in abundance in cornfields and waste places. It bears conspicuous, long-stalked flowers with four delicate, bright scarlet petals which are broader than they are long, so that their edges overlap in the expanded flower ; in the bud they are irregularly crumpled, but they appear smooth and lustrous when unfolded, and are unctuous to the touch. As the flower expands, the two sepals fall off, and the petals also fall off very quickly, assuming a dingy brownish-violet tint as they shrink up in dying. They must, therefore, be used while fresh or preserved with sugar. The petals are employed chiefly for colouring purposes, being used in the form of Syrupus Rhœados (1 in 3½).

Red-poppy petals, when fresh, are of a bright scarlet colour throughout. They are broadly or transversely elliptical in outline, about 5 cm. broad, with a smooth lustrous surface and an entire margin. They have a slightly bitter taste and a characteristic, somewhat unpleasant, narcotic odour, due to the presence of a volatile principle which is destroyed or driven off on drying the petals. However carefully they may be dried, the colouring matter darkens, changing from bright scarlet to dingy violet.

The chief constituent of fresh red-poppy petals is the colouring matter, which consists of rhœadic and papaveric acids; it dissolves readily in water or alcohol, but not in ether. Lead acetate precipitates it from an aqueous infusion of the fresh petals as a dingy violet compound, and ferric salts or alkalies change the infusion to blackish-brown. The volatile odorous principle in the fresh petals is probably identical with that present in the unripe capsules of *Papaver somniferum*, and also found in opium. A very minute proportion of morphine (0·1 to 0·7 per cent.) has been found in the dried petals; they also contain the crystalline non-poisonous alkaloid rhœadine, which is found in all parts of the plant and forms an intensely red colouring matter when decomposed with hydrochloric or sulphuric acid, while the isomeric base rhœagenine is also formed as a product of the decomposition.

RICINI OLEUM.

Castor Oil.

The oil expressed from the seeds of *Ricinus communis*, Linné (N.O. Euphorbiaceæ), a native of India. The plant grows in all tropical and subtropical countries, and may be a tree or shrub, according to the climate. It produces oblong, somewhat flattened seeds, from 8 to 12 mm. or more in length, with an arched dorsal surface and nearly flat ventral surface. They have a thin, brittle, glossy seed-coat, which varies in colour from greyish-brown to grey marbled with reddish-brown or black spots and stripes, thus differing from croton seeds, which are of a uniform, dull cinnamon-brown colour. At one extremity of the seed is a prominent and usually pale-coloured caruncle, from which the raphé runs as a distinct line to the other extremity of the seed, where it terminates in a raised chalaza. Inside the seed-coat is a delicate silvery-white membrane, surrounding a large, yellowish-white, oily endosperm, which encloses the embryo and two papery cotyledons. When fresh, the seeds have an almost imperceptible odour and a sweetish, very slightly acrid taste, but they easily become rancid and unfit for the extraction of oil for medicinal purposes. They contain about 50 per cent. of fixed oil, which is best extracted by cold pressure, without any previous treatment of the seeds, and subsequently filtered. The oil is extracted by expression in Italy, Marseilles, and London. It is usually bleached by exposure to sunlight, but may also be bleached by chemical means. It is a mild and speedy cathartic, and is used in the preparation of Mistura Olei Ricini (3 in 8).

Castor oil is a viscid liquid (s.g. 0·950 to 0·970) and should be colourless or have only a faint yellow tint, and be almost destitute of odour. The taste of the oil is at first bland, but subsequently acrid and unpleasant. The oil is entirely soluble in absolute alcohol, ether, oil of turpentine, or glacial acetic acid, and is also soluble in 90 per cent. alcohol (1 in 3½), but is insoluble in petroleum spirit. The oil absorbs from 83 to 86 per cent. its weight of iodine. It dries slowly to a varnish-like film when exposed to the air in a thin layer, and should not become brown when shaken with an equal volume of carbon bisulphide and one-third its volume of sulphuric acid, the absence of cotton-seed oil and other fixed oils being thus indicated. An additional test for the presence of other fixed oils is based on the fact that pure castor oil does not yield a clear mixture at 15·5° C. when mixed with its own volume of petroleum spirit, though a perfectly clear solution may be formed if the oil be adulterated with other fixed oils. The high specific gravity and viscosity of castor oil, and its solubility in alcohol, are its chief distinctive characters. The oil does not congeal readily when cooled, but when exposed to air it thickens slowly without becoming opaque, and tends to become rancid.

When castor oil is extracted in London, the seeds are pressed in the cold, without previous treatment, and the oil is bleached by exposure to sunlight after being filtered. In Italy the seed-coats are removed before expression, and hot iron plates are used to promote the flow of oil, but in America the seeds are gently heated in the first place, and the oily liquid obtained on expression is boiled with water to remove mucilage, starch, and albumin. A process of extraction by means of alcohol has been practised in France, but the oil so obtained is said to become rancid more quickly than expressed oils. Large quantities of oil are also produced in India, by roasting, pounding, and boiling the seeds with water, but such oil is not suitable for medicinal purposes. The chief constituent of castor oil is ricinolein—a mixture of the glycerides of ricinoleic and isoricinoleic acids; tristearin and the glyceride of dihydroxystearic acid are also present in small quantities, but olein and palmitin are absent. A purgative substance named ricinone, and a poisonous albumose named ricin, have been obtained from the cake left after castor oil has been extracted from the seeds by pressure. Ricinoleic acid is a viscid oil which yields ricinelaïdic acid, a crystalline body, when acted upon by nitrous acid; similarly, when castor oil is treated with nitrous acid, the ricinolein is converted into ricinelaïdin.

ROSÆ CANINÆ FRUCTUS.

Hips; Dog-Rose Fruits.

THE ripe fruit of the dog-rose, *Rosa canina*, Linné (N.O. Rosaceæ), and other allied species indigenous to Great Britain. The so-called fruit is a cynarrhodon, and consists of the dilated calyx-tube and hollowed thalamus, which are united and enclose numerous dry carpels or achenes —the true fruits—each of which contains a single exalbuminous seed. The pulp prepared from the fleshy receptacles of hips is the only part of the so-called fruit which is used in medicine. The hips are collected when ripe and used while fresh, the achenes and hairs being removed by beating the hips to a pulp in a mortar and rubbing the pulp through a sieve, after which it is mixed with twice its weight of sugar, for use as a pill excipient.

Hips are ovoid or somewhat oval in shape, and 18 mm. or more in length, with a smooth, scarlet or red, shining surface. They are without odour and of a dense, fleshy texture until ripe, but then become soft and pulpy internally, the fleshy receptacle assuming an orange colour and acquiring an agreeable, sweetish, subacid taste. The walls of the large interior cavity, and the numerous hard achenes or seed-like fruits, are covered with strong short hairs. The only other species of *Rosa* producing hips in any quantity is the field rose, *R. arvensis*, Hudson, which is distinguished from the dog-rose by its trailing habit and nearly globular fruit.

The dog-rose is distinguished from other species by its erect habit and ovoid fruit. The chief constituents of the pulp yielded by the fleshy receptacle are about 3 per cent. of citric acid and 7 per cent. of malic acid, together with about 30 per cent. of sugar, 25 per cent. of gum, calcium and potassium citrates and malates, and various inorganic salts.

ROSÆ CENTIFOLIÆ PETALA.

Pale-Rose Petals; Cabbage Rose Petals.

The petals of the Provence or cabbage rose, *Rosa centifolia*, Linné (N.O. Rosaceæ), a native of Western Asia, which is now cultivated universally as a garden plant. It is a shrub with prickly stems from 1 to 2 m. high, and has imparipinnate leaves, consisting of two or three pairs of leaflets, with an odd terminal leaflet, closely attached to the common footstalk, which is rough but without spines. The leaflets are broad, ovate, serrate, pointed, and hairy beneath. The flowers are large and supported upon hairy peduncles; they have many pink or pale red petals, with a fragrant odour. The petals are slightly laxative, and are sometimes administered in the form of syrup, combined with cathartic medicine. The petals have also been used in the preparation of rose water.

Pale-rose petals are roundish, obovate and retuse, or obcordate, and of a pale red or pink colour. They should be collected when the flower is fully expanded, and used while fresh, as their fragrance is somewhat impaired by drying them, though they may be preserved for a prolonged period by compressing them with alternate layers of common salt, or by beating them with twice their weight of that substance. The petals have an extremely fragrant odour, due to the presence of volatile oil, and a sweetish, somewhat bitterish, slightly acidulous and faintly astringent taste, due to the presence of acids and tannin.

The petals of *Rosa centifolia* are distinguished by thei shape, colour, odour, and taste. Red-rose petals, from *Rosa gallica*, are of a deep purplish colour, and have yellow claws; their odour is less fragrant than that of *R. centifolia*, and their taste is distinctly astringent. The chie constituents of pale-rose petals are malic and tartaric acid and a volatile oil similar to that of *R. damascena*, from which the rose water of commerce is prepared. Othe constituents of the petals are tannin, sugar, fat, resin and a colouring matter similar to that of red roses.

ROSÆ GALLICÆ PETALA.

Red-Rose Petals.

THE fresh and dried unexpanded petals of the red or Provins rose, *Rosa gallica*, Linné (N.O. Rosaceæ), obtained from cultivated plants. The red rose is a native of Southern Europe, but is now universally cultivated as a garden plant. The flowers are very large, with widely spreading petals of a rich crimson colour, numerous yellow anthers on thread-like filaments, and many hairy styles bearing papillary stigmas. The petals are slightly astringent and are used both in the fresh and dried states, being employed chiefly because of the colouring matter they contain. They are used in the preparation of Confectio Rosæ Gallicæ (1 in 4), Infusum Rosæ Acidum (1 in 40), and Syrupus Rosæ (1 in 17¼); the confection is an ingredient of Pilula Aloes Barbadensis, Pilula Aloes et Asafetidæ, Pilula Aloes Socotrinæ, and Pilula Hydrargyri.

Red-rose petals are obcordate and occur usually in small conical masses, but may be separate and are then more or less crumpled. They are collected before they have expanded, by detaching them from the calyx as a whole, and the pale-coloured claws are then removed by cutting them from the darker-coloured mass. If the confection is to be prepared, the fresh petals are beaten with refined sugar in a stone mortar. For other purposes, however, the masses of petals are carefully and rapidly dried by the heat of a stove, after which they are sifted gently to remove the stamens. The petals feel velvety to the touch, and are of a deep purplish-red colour generally, though they may be brownish-yellow near the base, where the claws have been cut off. The fragrant odour, due to the presence of volatile oil, is more marked in the dried petals. The somewhat bitter, feebly acid and astringent taste is due to quercitannic acid.

The petals of *Rosa centifolia* are more fragrant than those of *R. gallica*, and differ in shape and colour from the latter. Dried red-rose petals may be adulterated with artificially coloured rose petals, which are distinguished by their uniformly dark reddish colour. The chief constituent of red-rose petals is the deep red, amorphous, colouring matter, which is of an acid nature and turned green by alkalies; it is soluble in water and alcohol, and the colour of the solutions is deepened on adding diluted sulphuric acid. Other constituents of the petals are a very small quantity of volatile oil, to which their odour is due, together with traces of gallic and quercitannic acids, an uncrystallisable sugar, fixed oil, salts, and a yellow colouring matter which differs from quercitrin by giving an orange-red instead of a yellow precipitate with lead acetate, and by not yielding quercetin on hydrolysis, while it does not fuse readily.

ROSÆ OLEUM.

Oil of Rose; Otto of Rose.

The oil distilled from the fresh flowers of the damask rose, *Rosa damascena*, Miller (N.O. Rosaceæ), a plant which is unknown in the wild state, but is cultivated largely in European Turkey, Egypt, Persia, Cashmere, India, etc. Other species cultivated for the sake of the oil they yield are *R. sempervirens*, *R. moschata*, and *R. centifolia*. The process of distillation varies in different localities. In the district of Kizanlik, on the southern slope of the Balkans, which is the most important rose district, the flowers are gathered in May, before sunrise, and distilled with water in copper stills over an open fire. The first runnings are returned to the still, but the second portion is received in glass flasks which, when full, are kept at a temperature of about 15° C. for a day or two, after whic most of the oil has risen to the surface and is removed by means of a small tin funnel having a fine orifice and provided with a long handle. The water from which the oi has been skimmed is a saturated solution of the oil an constitutes the rose water of commerce. The average yiel of oil is about 1 kilo. from 3000 kilos. of rose petals, but th produce is extremely variable. The oil is used chiefly as perfume, and is an ingredient of Unguentum Aquæ Rosa

Oil of rose is a pale yellow, crystalline semi-solid (s.g 0·856 to 0·860 at 30° C.), with the strong fragrant odour (the damask rose, and a sweet taste. As the value of th oil is affected largely by the amount of crystalline matter contains, its congealing and melting points—from 19° t 22° C.—are of importance. Palmarosa oil, from *Andr pogon Schœnanthus*, is a common adulterant of oil of ros It lowers the melting-point, but that effect can be counte acted by the addition of spermaceti, stearin, paraffin wa or the oil of *Rosa alba*, which contains more solid stearoptene than that of *R. damascena*. An oil obtained from the wood of *Bulnesia sarmienti*, known as guaiacum wood oil (s.g. 0·970 at 30° C.), has also been used as an adulterant of oil of rose; it has a pleasant, violet-like odour, solidifies with a crystalline structure at ordinary temperatures, and liquefies at 40° to 50° C., but solidifies again rapidly on cooling. Oil of sandal-wood and other volatile oils used as adulterants of oil of rose are not semi-solid like the latter, while fixed oils leave a greasy stain on paper when heated.

The chief constituents of oil of rose are from 70 to 75 per cent. or more of geraniol and citronellol, the former constituting three-fourths of the liquid portion of the oil, and citronellol the remaining fourth. The odour of the oil is due entirely to those alcohols and their esters, traces of which are also present. Free acids resulting from decomposition of the esters also occur in the oil, and the rose water of commerce is frequently slightly acid in consequence. The solid stearoptene which crystallises out on cooling the oil to about 20° C. is a mixture of inodorous paraffin hydrocarbons. Paraffin is sometimes added to oil deficient in stearoptene, but the added paraffin crystallises with a more granular structure than the normal stearoptene of oil of rose. The presence of spermaceti and stearin as adulterants of oil of rose is indicated on saponification, the resulting salts yielding palmitic and stearic acids respectively when decomposed with hydrochloric acid, while no fatty acids are yielded on saponification of pure oil of rose.

ROSMARINI OLEUM.

Oil of Rosemary.

THE oil distilled from the flowering tops of rosemary, *Rosmarinus officinalis*, Linné (N.O. Labiatæ), an evergreen shrub which is abundant on dry rocky hills in the Mediterranean region. All parts of the plant have a strong balsamic odour, but it is most pronounced in the leaves, which have also a bitter camphoraceous taste. Though the oil is distilled to a limited extent in England, it is imported chiefly from the south of France and the Dalmatian Islands (Italian rosemary oil). The plants are subjected to distillation as quickly as possible after being cut, the flowering tops only being used, as the woody parts of the plants impart an objectionable odour to the oil. English oil is the finest, and French oil ranks next in value, the Italian oil being least valuable. The oil is aromatic, stimulant, and carminative. It is used in liniments and hair lotions, also in the preparation of Linimentum Saponis, Spiritus Rosmarini (1 in 10), and Tinctura Lavandulæ Composita.

Oil of rosemary is a colourless or pale yellow liquid (s.g. 0·900 to 0·915), with the odour of rosemary and a warm, camphoraceous taste. It is soluble in all proportions of absolute alcohol, and is also soluble in 90 per cent. alcohol (1 in 2), but is only sparingly soluble in 60 per cent. alcohol. The chief adulterants of oil of rosemary are turpentine and petroleum, which are much less soluble in alcohol. The absence of turpentine is also proved by the optical rotation of the oil not exceeding 10° to the right, while petroleum remains unvolatilised on evaporating oil containing it in a water-bath, whereas pure oil of rosemary volatilises and leaves only a slight resinous residue.

The flowering tops and dried leaves of rosemary are sometimes used for medicinal purposes, but they contain no constituent of importance except the volatile oil. The chief constituents of the oil are about 6 per cent. of borneol and 17 to 20 per cent. of bornyl acetate and other esters of borneol; other constituents of the oil are camphor, cineol, pinene, and camphene. In addition to oil of turpentine and petroleum, fractions of camphor oil and alcohol have been used to adulterate oil of rosemary, but they affect its specific gravity, while the presence of alcohol may be detected by drying the oil over calcium chloride and adding a crystal of magenta, which will dissolve and colour the oil pink if alcohol be present, though insoluble in pure oil of rosemary.

RUTÆ HERBA.

Rue ; Rue Herb.

The stems, leaves, and fruits of the common rue, *Ruta graveolens*, Linné (N.O. Rutaceæ), a small evergreen undershrub, usually 60 cm. to 90 cm. high, which is indigenous to Southern Europe and cultivated in England and elsewhere as a garden plant. It produces several branching stems which, in wild plants, are woody and covered with rough bark near the base, but smooth, green, and herbaceous in their ultimate ramifications; the stems of cultivated plants are usually entirely green. The plant flowers from June to September, the greenish-yellow flowers being disposed in an irregular corymbose cyme, more exactly described as a dichasial, cincinnal inflorescence, or two-parted cyme, in which the successive flowers are on alternate sides of the pseudaxis. After flowering, when the fruits are nearly ripe, the stems, with attached leaves and fruits, are cut and distilled with water in order to obtain the volatile oil to which the medicinal properties of the plant are due. The oil is contained in nearly spherical intercellular cavities or glands. It possesses antispasmodic, topical stimulant, rubefacient, and vesicant properties, and is sometimes administered in the form of an enema for flatulent colic in children.

Rue consists of the herbaceous stems, with leaves and nearly ripe fruits attached. The leaves are petiolate, triangular-ovate, and from 5 cm. to 10 cm. long, the upper ones being pinnatifid and the lower ones twice or thrice pinnate. The leaflets are sessile, glaucous or bluish-green, smooth, thick, and obovate, obovate-oblong, or spathulate in shape; they are also obscurely crenate and dotted with more or less transparent oil-glands, while the terminal leaflets are larger than the others. The flowers are greenish-yellow and have a persistent calyx with four or five acute segments, a corolla with four or five concave petals, which are somewhat wavy at the margin, eight or ten hypogynous stamens, and a four- or five-lobed ovary. The fruit is a four- or five-celled capsule, with six to eight seeds in each cell, and is greyish-brown when ripe. The plant has a strong disagreeable odour, and a hot, bitter, acrid taste, due to the presence of volatile oil.

The distinctive characters of rue are the shape and colour of the leaves, the presence of numerous oil-glands in all parts of the plant, and the peculiar odour, due to the volatile oil. The whole plant is active, but the leaves are probably more so than other parts, owing to the greater number of oil-glands they contain. The chief constituent of rue is 0·06 per cent. of the volatile oil (s.g. 0·833 to 0·840), a colourless or pale yellow liquid which consists almost entirely (90 per cent.) of methyl-nonyl-ketone. Other constituents of the plant are starch, gum, albumin, malic acid, and a bitter crystalline substance named rutin (rutic or rutinic acid), which occurs in light yellow needles, and is probably identical with quercitrin, as it is said to yield quercetin and isodulcite on hydrolysis.

SABINÆ CACUMINA.

Savin Tops.

THE young shoots of *Juniperus Sabina*, Linné (N.O. Coniferæ), an evergreen shrub, from 1 to 5 m. high, which is indigenous to the mountains of Southern Europe, and frequently cultivated in Britain. The main stem is covered with a rough reddish-brown bark, but the young branches are light green, and invested completely with closely appressed, minute, scale-like leaves, which become divergent as the shoots grow older. The male and female flowers are arranged in catkins and occur on different plants; the fruit is a small, purplish-black, berry-like, fleshy cone (galbulus) on a short recurved stalk. The young green shoots are sometimes collected in the spring, and used while fresh for making ointment, or for the distillation of the volatile oil, while the dried shoots are used for making a tincture (1 in 8). The drug is a powerful local and general irritant, and acts as an emmenagogue.

Savin tops consist of the young, thin, subquadrangular twigs or green shoots, which are densely covered with minute, thick, overlapping (imbricated), dark green leaves, which are closely appressed and frequently more or less adnate to the stem. The lower leaves on young shoots, and all the leaves on older branches, are more distant, also linear, subulate, acute, and more or less spreading, instead of closely appressed; older leaves are longer than those near the extremities of young shoots. The leaves are sessile, about 2 mm. long, rhomboidal or ovate-lanceolate in shape, bluntly pointed, and arranged alternately in opposite pairs. At the back the leaves are somewhat rounded, and an oval or oblong depression on each leaf corresponds to a large oil-gland in the mesophyll The strong disagreeable odour and the bitter, acrid taste of the drug are more pronounced in the fresh than in th dried tops.

The rhomboidal, appressed, bluntly pointed leaves, th oil-gland near the dorsal surface of each leaf, and th peculiar odour due to the volatile oil in the glands, ar distinctive characters of young savin tops. The chief con stituent of the drug is a volatile oil (s.g. 0·910 to 0·960), of which the tops yield from 4 to 5 per cent., according to the time of collection and the freshness of the tops. The oil consists chiefly of sabinol, which occurs partly free and partly as the acetic ester; other constituents of the oil are cadinene, pinene, and other terpenes, and an aldehyde or ketone possessing an odour resembling that of cumin aldehyde. In addition to the volatile oil, savin tops contain resin, tannin, gum, and various salts. Several species of *Juniperus* bear a considerable resemblance to savin, and the North American plant, *J. virginiana*, Linné, is sometimes mistaken for it, but the tops of that plant differ in odour and taste from those of *J. Sabina*, and contain much less volatile oil.

SACCHARUM LACTIS.

Milk Sugar; Lactose.

A CRYSTALLISED sugar obtained from the whey of milk. It is present in cows' milk to the extent of about 5 per cent., and is a bye-product in the manufacture of cheese. The whey is separated by coagulating or curdling the milk by the addition of a little diluted sulphuric acid, acetic acid, or essence of rennet, after which clots or curds of casein enclosing the butter fat are removed, and the whey, which contains the milk sugar and inorganic salts, is evaporated to about one-fifteenth of its original bulk. The brown, viscid, sweetly saline mass thus obtained is set aside for twenty-four to forty-eight hours, and the sugar crystallises out as a bright yellow, granular mass known as "sugar sand," which is subsequently decolorised by animal charcoal and purified by recrystallisation, the crystals being deposited upon cords suspended in the solution. The sugar is nutrient and diuretic, and forms a useful diluent for potent medicinal powders. It is also used for a similar purpose in the preparation of Extractum Belladonnæ Alcoholicum, Extractum Nucis Vomicæ, Extractum Physostigmatis, Extractum Strophanthi, and Pulvis Elaterini Compositus.

Milk sugar occurs in four-sided prismatic crystals, or in hard, cylindrical, crystalline, greyish-white masses, with a cord, around which the crystals have been deposited, in the axis of each mass, but it is used chiefly in the form of powder. The sugar should be free from odour, and possess only a faintly sweet taste. It is soluble in water (1 in 6), but is almost insoluble in alcohol. When incinerated with free access of air, it should not leave more than 0·25 per cent. of ash, the presence of magnesium and calcium salts as impurities being thus guarded against. Any lactic acid present should be neutralised entirely on adding 3 drops of volumetric solution of sodium hydroxide to 1 gramme of milk sugar dissolved in 10 c.c. of distilled water. The presence of magnesium and calcium salts, or of any considerable proportion of lactic acid, is objectionable, because those substances induce or hasten the coagulation of milk to which the sugar may be added in preparing food for infants.

Cows' milk is weakly alkaline and contains from 14 to 16 per cent. of solid matter dissolved or suspended in 84 to 86 per cent. of water. The solids consist of 3·3 to 4·5 per cent. of proteids (caseinogen or casein and lactalbumin, with a small quantity of nuclein), from 4 to 6 per cent. of fat, 4·5 to 5 per cent. of lactose or milk sugar, and less than 1 per cent. of iron and organic salts, the iron being combined with the nuclein. Milk sugar is isomeric with cane sugar, and can be hydrolysed by treatment with diluted sulphuric acid, galactose and dextrose resulting; but lactose differs from sucrose or cane sugar in its action on Fehling's solution, which it reduces on boiling, while cane sugar does not have that effect. The occasional presence in commercial milk sugar of magnesium or calcium salts is due to the addition of magnesia or lime to the whey during the process of crystallisation, in order to neutralise the acid used to curdle the milk.

SACCHARUM PURIFICATUM.

Refined Sugar; Cane Sugar or Sucrose.

A CRYSTALLISED sugar obtained chiefly from the juice of the sugar-cane, *Saccharum officinarum*, Linné (N.O. Graminaceæ), an herbaceous plant which is extensively cultivated in Africa, the East and West Indies, Brazil, and some of the southern United States. The same sugar is also obtained largely from the sugar beet, *Beta vulgaris*, Linné (N.O. Chenopodiaceæ), the Chinese sugar-cane, *Sorghum saccharatum* (N.O. Graminaceæ), and other plants. The sugar-cane produces several shining, jointed, solid stems or canes, which contain a white juicy pith, in the parenchymatous cells of which the sugar exists in aqueous solution. When ripe, the canes are cut down close to the ground, topped and stripped of leaves, and crushed in a mill between iron rollers to liberate the juice, or they may be cut in thin transverse slices and the juice extracted by diffusion with warm water. The juice constitutes about 90 per cent. of the canes, and contains about 17 per cent. of crystallisable sugar, though not more than 11 per cent. is extracted in practice. After extraction, the fresh juice is mixed immediately with milk of lime, which neutralises the acid naturally present, and so prevents conversion of the sucrose into uncrystallisable invert sugar, while it also causes the formation of a coagulum containing the earthy phosphates of the juice, as well as a peculiar albuminous principle, and any mechanical impurities present. The juice is next heated in a boiler to 60° C., until the coagulum rises to the surface as a thick scum, after which the clear liquid is drawn off, concentrated by heat until it assumes a granular aspect, and left to crystallise. The yellowish-brown crystals which form are separated by the aid of a centrifugal machine from the brown syrupy molasses or treacle, which contains uncrystallisable sugar and various salts, and the raw sugar thus obtained is subsequently freed from colour and odour by treatment with animal charcoal and repeated crystallisation. Sugar is nutrient and demulcent, but is employed chiefly in medicine as a sweetening agent and preservative, or to assist the suspension of powders. It is used in the preparation of various confections, mixtures, pills, and powders, and of all the official lozenges and syrups, including Syrupus (1 in 1½), a simple solution of sugar in distilled water.

Refined sugar occurs in colourless and odourless separate crystals, which are slightly soluble in 20 per cent. alcohol (1 in 100), and dissolve readily and completely in water (100 in 45), forming a clear, bright syrup. It should be free from glucose or other reducing sugar, and should yield no reaction with tests for calcium, or chlorides and sulphates. If glucose or other reducing sugar be present, a red or yellowish precipitate will be formed on heating the syrup to about 82° C. with solution of potassio-cupric tartrate (Fehling's solution), or with solution of copper sulphate and excess of solution of potassium hydroxide. The occasional presence of calcium compounds as impurities in cane sugar is due to the use of calcium bisulphite or acid calcium phosphate as a refining agent, while the presence of chlorides or sulphates indicates that the sugar has not been sufficiently purified by recrystallisation, since the ash of raw cane sugar contains potassium sulphate and sodium chloride, together with other inorganic salts, and the non-volatile residues of the salts of various organic acids. Cloudiness in syrups is frequently due to the presence of insoluble salts, or of ultramarine or Prussian blue, which has been used to " face " imperfectly refined sugar by masking its natural yellow tint.

Cane sugar in solution possesses the property of dissolving a large quantity of calcium hydroxide, forming a compound known as calcium saccharate. It also retards the oxidation of ferrous salts, and is used for that purpose in preparing Ferri Carbonas Saccharata and syrups containing iron compounds. Dilute solutions of sugar ferment readily and undergo putrefactive decomposition, but saturated or nearly saturated solutions, such as syrups, may be preserved indefinitely under proper conditions, such strong solutions being physically unfitted for the growth of moulds and bacteria, though containing a substance which, in a dilute form, provides an efficient nutrient medium. When solutions of cane sugar are boiled with dilute acids, hydrolysis occurs and " invert " sugar—a mixture of dextrose and lævulose in equal proportions—is obtained. This inversion with acids is common to the members of the sucrose group of sugars, each variety yielding two molecules of glucose. Thus, cane sugar yields dextrose and lævulose on hydrolysis, maltose yields two molecules of dextrose, while milk sugar yields dextrose and galactose, another member of the glucose group. Like glucose, lactose and maltose reduce Fehling's solution, but cane sugar does not.

SALICIS CORTEX.

Willow Bark.

THE bark of the white or common willow, *Salix alba*, Linné (N.O. Salicaceæ), and other species of *Salix*. The common willow grows on river banks and marshy ground in Britain, and is also found throughout Central and Southern Europe. The young bark is covered with a smooth and sometimes glossy cork, while older bark is dull, slightly wrinkled longitudinally, and darker in colour. Internally, the bark is of a pale reddish colour, older pieces being more coarsely striated than young bark. The inner portion of the bark is fibrous, but the outer part breaks with a short fracture. Willow bark possesses tonic and astringent properties, but is used chiefly as a source of the glucoside salicin.

Willow bark, from *Salix alba*, occurs in commerce in greenish-brown or greyish-brown channeled pieces of varying length, and from 12 to 18 mm. in width. It has an astringent, slightly bitter, and aromatic taste, and sometimes has a slight agreeable odour. The bark from various species of *Salix* contains from 1 to 3 per cent. of salicin and from 8 to 13 per cent. of tannin, together with gum and extractive matter. The salicin can be extracted by treating a boiling concentrated decoction of the bark with lead oxide to remove gum, tannin, and extractive matter, after which sulphuric acid and barium sulphide are added to remove any lead oxide which may be dissolved. The liquid is then filtered and evaporated to a syrupy consistence, and the salicin which crystallises out on standing is purified by recrystallisation. Another method of extraction is to macerate and afterwards boil the bark in water mixed with lime. The clear solution thus obtained is evaporated to dryness after concentration and digestion with charcoal, the salicin being subsequently extracted from the residue by treatment with alcohol, and purified by repeated crystallisation.

Salicin is a valuable antipyretic, antiperiodic, tonic, and bitter stomachic. It occurs in colourless, shining, trimetric, tabular crystals (m.p. 201° C.), which have a very bitter taste, and are soluble in water (1 in 28), or 90 per cent. alcohol (1 in 60), but insoluble in ether. Salicin is coloured red and dissolved by strong sulphuric acid, owing to the formation of a compound called rutulin, which is deposited as a dark red powder on adding water to the acid solution. On heating a small quantity of salicin with a little potassium bichromate, together with a few drops of strong sulphuric acid and some distilled water, an odour of meadow-sweet is given off, owing to the formation of salicylic aldehyde. The same compound is formed when crystals of salicin are heated cautiously in a test-tube until they melt. Other sources of salicin, in addition to the bark of the white willow and other species of *Salix*, are the barks of the aspen, *Populus tremula,* Linné (N.O. Salicaceæ), and other species of *Populus.* The glucoside has also been found in many flowers, especially in *Spiræa ulmaria,* Linné, and in castor, the resinous secretion found in the preputial follicles of the beaver, an animal which feeds on willow and poplar barks.

SAMBUCI FLORES.

Elder Flowers.

THE flowers of the common elder, *Sambucus nigra,* Linné (N.O. Caprifoliaceæ), separated from the stalks. The elder is a small tree indigenous to Britain and distributed throughout Central and Northern Europe. It bears small whitish flowers, disposed in umbellate cymes, which are collected in the early summer, and dried if not required for immediate use. Sometimes the flowers are dried entire, but usually they are allowed to remain in heaps for a few hours, during which time they become slightly heated, and the corollas then separate from the stalks. Having been removed from the stalks by sifting, the corollas are dried, or " pickled," with common salt, the somewhat disagreeable odour of the fresh flowers being thus gradually changed to a pleasing fragrance. The flowers have no medicinal properties, but are used, either fresh or dried, in the preparation of Aqua Sambuci.

Elder flowers are small, and have a slightly bitter taste, with a sweet but not altogether agreeable odour when fresh. The dried flowers are yellowish in colour, and have a faint but more pleasant odour. Each flower consists of a three-celled, three-seeded, inferior ovary, bearing five small green calyx teeth, and a creamy-white rotate, deeply five-lobed, monopetalous corolla, with five stamens bearing yellow anthers inserted in the very short tube. Usually, the corollas and stamens alone are used, those parts separating from the rest of the flowers when left in heaps and allowed to ferment as already described.

The flowers of the dwarf elder, *S. Ebulus,* are distinguished from those of *S. nigra* by having dark red anthers. The flowers of *Achillea millefolium* and other Composites, which have been used as adulterants of elder flowers, differ still more markedly in appearance, and their presence is readily detected. When distilled with water, elder flowers yield some ammonia, and a small proportion of volatile oil (s.g. 0·827), which is solid at ordinary temperatures. It consists of a terpene and a crystalline paraffin, and occurs usually as a light yellow or greenish-yellow butyraceous or wax-like mass. By saturating the aqueous distillate with salt, shaking out with ether, and allowing the ether to evaporate spontaneously, about 0·32 per cent. of the oil can be obtained. Without the use of ether the fresh flowers have yielded 0·037 per cent. of volatile oil, and the dried flowers 0·0027 per cent. only.

SANDARACA.

Sandarac.

A RESINOUS substance obtained from *Callitris quadrivalvis,* Ventenat (N.O. Coniferæ), an evergreen tree, about 4 to 6 m. high, which grows on the mountains of North-west Africa. The resin exudes spontaneously from the tree, and hardens in the form of small tears, but incisions are usually made in the bark to facilitate exudation. The resin is exported chiefly from Mogador. It possesses mildly stimulant properties, and was formerly given internally, besides entering into the composition of various ointments and plasters, but it is now used chiefly in making varnishes.

Sandarac occurs in elongated, pale yellow, brittle tears, 5 to 15 mm. long, which differ from those of mastic in being of a more or less cylindrical or stalactitic form, while they are sometimes united into a flattened mass. The tears are covered on the surface with a whitish dust, but they break with a glassy, conchoidal fracture, and are then seen to be clear and transparent, with small insects occasionally imbedded in the mass. When chewed, the resin breaks up into a sandy powder between the teeth, but the powder does not agglomerate subsequently into a plastic mass, as in the case of mastic. The specific gravity of sandarac is about 1·07, its melting-point is near 135° C., and the resin is completely soluble in alcohol or ether, though only partially soluble in chloroform, carbon bisulphide, or turpentine. It has a slightly terebinthinate odour, and a faintly bitter taste.

The stalactitic form of the tears is characteristic of sandarac, but the resin is also distinguished by its terebinthinate odour, and the non-formation of a plastic mass when it is chewed. Globular or pear-shaped tears, like those of mastic, are of rare occurrence in the case of sandarac; mastic also differs in odour from sandarac, and forms a plastic mass when chewed. In the case of olibanum the tears have an opalescent waxy interior, a fragrant balsamic odour, and the gum-resin softens, like mastic, to a plastic mass when chewed. Australian sandarac is the product of various species of *Callitris*, and resembles the African resin closely in appearance and characters. The chief constituents of sandarac are three resins—sandaracolic acid (85 per cent.), callitrolic acid (10 per cent.), and resinolic acid; other constituents are small quantities of volatile oil, a bitter principle, water, and ash.

SANGUINARIÆ RHIZOMA.

Sanguinaria Rhizome; Blood Root.

THE rhizome of *Sanguinaria canadensis*, Linné (N.O. Papaveraceæ), a perennial herb which is distributed widely throughout Canada and the northern United States. The plant produces a horizontal, abrupt, often contorted, reddish-brown rhizome, from which, when cut, an orange-red sap exudes; hence the name, "blood root." The rhizome is furnished with numerous slender roots, and produces offsets at the sides, from which new plants are developed. From the end of the rhizome arises a flower-scape and leaf-stalks, surrounded by the large sheaths of a terminal bud. All parts of the plant except the seeds are pervaded by the orange-red sap, but the rhizome alone is used in medicine. It is collected in the autumn and dried. The drug possesses tonic, emetic, and stimulant narcotic properties, and is used in the form of tincture (1 in 10).

Sanguinaria rhizome occurs in faintly annulated, wrinkled pieces, from 2·5 to 7·5 cm. long, and from 6 to 12 mm. or more in thickness; it frequently has abrupt offsets and many short fibrous roots attached. The rhizome is dark reddish-brown in colour, and the pieces are sometimes much shrivelled, twisted, and shrunken, though they are generally plump, nearly cylindrical, and straight or somewhat curved. The shrivelled appearance is due to the comparatively small amount of starch present when the drug has been collected before the end of the period of active growth. The bluntly conical apex of the rhizome shows only traces of a bud or aerial stem. The dark, thread-like, brittle, wiry, more or less interlaced roots given off from the under surface of the rhizome are usually detached in commercial specimens of the drug; they are easily broken off and leave inconspicuous raised scars. The short knob-like branches or offsets, when present, are given off at right angles, and traces of encircling leaf-scars may also be found. The rhizome breaks with a short fracture, the surface being waxy, whitish, and dotted with numerous small cells containing a blood-red resinous secretion. On exposure the surface tends to become dull brown, and sometimes a freshly fractured surface is of a brownish-red or nearly black colour, appearing also resinous instead of starchy, owing to the escape of the red secretion into the tissues surrounding the cells in which it was contained originally. The drug has only a slight odour, but its taste is unpleasantly bitter and acrid.

The distinctive characters of sanguinaria rhizome are its usually compressed cylindrical shape, the comparative absence of roots, the colour of a transverse section, and the inconspicuous fibro-vascular bundles. The appearance of transverse sections from different parts of the rhizome varies, but there is a large pith and a thin bark, near which the small, inconspicuous, fibro-vascular bundles are arranged in one or two loose circles. The roots have a thick bark, and a thin, central, fibro-vascular column. The axially elongated resin-cells, containing the red or orange secretion, are scattered singly throughout the parenchyma; a yellow secretion is contained in short vessels found in the inner bark. The colour and structure of the drug suffice to distinguish it from hydrastis rhizome, but the latter also possesses a characteristic odour. The chief constituents of sanguinaria rhizome are the alkaloids sanguinarine, chelerythrine, protopine, and homochelidonine; other constituents are citric and malic acids, starch, and resins. The alkaloid sanguinarine occurs in colourless needles, but it forms bright red salts. This base must not be confused with the resinoid sanguinarin, which is obtained by precipitating a strong tincture of the drug with water. Chelerythrine, the alkaloid present in largest quantity, forms lemon-coloured salts. Protopine is identical with the alkaloid of that name found in opium, and in the root of the celandine, *Chelidonium majus*. The homochelidonine of sanguinaria is believed to be identical with the compound, β-homochelidonine, which is also found in celandine root.

SANGUIS DRACONIS.

Dragon's Blood.

A RESINOUS secretion which exudes spontaneously from the ripening fruit of *Dæmonorops Draco*, Blume (N.O. Palmaceæ), also known as *Calamus Draco*, Willdenow, and of other species. The plants are climbing palms which are indigenous to Borneo, Sumatra, and the adjacent islands. The fruits are about the size of a cherry and covered with hard, yellowish, overlapping (imbricated) scales, from which a reddish resin exudes and more or less completely covers the fruit as it ripens. The ripe fruits are collected and rubbed, or shaken together in a basket or sack, the friable resin being thus separated. The resin is then sifted in order to remove scales and other portions of the fruits, after which it is softened by exposure to the heat of the sun, or in a closed vessel with boiling water, and subsequently moulded into sticks, balls, cakes, or large blocks. An inferior quality is said to be extracted from the crushed fruit by boiling with water and making the resin into blocks of irregular form, which are frequently adulterated with other substances. The resin is sometimes used for colouring plasters, but it is much more largely employed for colouring lacquers and varnishes.

Dragon's blood is of a dull, dark red colour, and is covered usually with a bright red powder produced by the pieces rubbing against one another. It may occur in cylindrical sticks, balls, cakes, or large blocks. The cylindrical sticks, known as "reed" dragon's blood, are from 20 to 30 cm. long and 12 to 25 mm. thick, sticks of the finest quality being wrapped carefully in palm leaves. Dragon's blood of fine quality may also occur, though somewhat rarely, in oval masses or globular pieces about 35 mm. in diameter, which are also covered with palm leaves. Another variety is in large, round, flattened cakes or "saucers," about 5 cm. or more in thickness, while ordinary "lump" dragon's blood, which is the kind most commonly seen, occurs in large rectangular blocks or irregular masses. The resin is brittle and friable when of good quality, breaking with a glossy, irregular, uneven, and porous fracture. In the mass it is opaque, but minute fragments appear translucent and of a deep garnet-red colour. When crushed, it yields a bright red powder. Inferior qualities are tougher, exhibit less powder on the surface of the pieces, and yield a powder which is not so bright coloured, being often of a dull brick-red colour. The resin is without odour, but becomes aromatic, like benzoin, when heated, fumes of benzoic acid being given off as it melts (120° C.). It is insoluble in water or petroleum spirit, but is more or less soluble in alcohol, ether, volatile and fixed oils, chloroform, benzene, alkalies, etc., forming red solutions. The resin may have a slightly sweetish but somewhat acrid taste.

The colour and brittle nature of dragon's blood are characteristic, and resin of good quality is also distinguished by the bright red powder it yields, and by its solubility in alcohol. Dragon's blood is adulterated frequently with fragments of the scales of the fruits or with earthy matter, and is said to be nearly always mixed with the milky juice of *Garcinia parviflora*, Miguel. The chief constituent of dragon's blood is a red resin consisting of draco-resinotannol combined with benzoic and benzoyl-acetic acids. Of this resin as much as 56·86 per cent. has been found in dragon's blood, together with 13·58 per cent. of draco-resin, 2·5 per cent. of a white amorphous body named draco-alban, small quantities of ether-insoluble resin and phlobaphene, 18·4 per cent. of vegetable débris, and 8·3 per cent. of ash. Socotra dragon's blood, the product of *Dracæna Cinnabari*, Balfour filius (N.O. Liliaceæ), occurs in translucent garnet tears which break with a glassy fracture and the surface of which is covered by a dull red powder. Zanzibar dragon's blood, from *Dracæna Schizantha*, Baker, occurs in small tears and fragments, seldom exceeding 25 mm. in length, which break with a clean, glassy, conchoidal fracture, thin pieces appearing transparent and of a fine ruby colour. It is imported from Bombay or Zanzibar, and is known as drop dragon's blood. It has an acid taste, does not evolve fumes of benzoic acid when heated, and contains no draco-alban. The name dragon's blood has also been applied to a resin obtained in the Canary Islands from incisions in the stem of *Dracæna Draco*, Linné (N.O. Liliaceæ), as well as to a kino-like exudation from *Pterocarpus Draco*, Linné (Leguminosæ), a native of the West Indies and South America, and to a resinous substance yielded by *Croton Draco*, Schlecht (N.O. Euphorbiaceæ), but those substances are not found in European commerce.

SANTALI OLEUM.

Oil of Sandal Wood; Oil of Santal.

THE oil distilled from the wood of *Santalum album*, Linné (N.O. Santalaceæ), a small tree which is cultivated in Southern India, chiefly in Mysore, for the sake of its wood and the oil it yields. Sandal wood is also produced in Eastern Java, and in the islands of Sumba and Timor. This variety is known as Macassar sandal wood, and yields an oil which is hardly inferior to that obtained from East Indian sandal wood. The volatile oil is found in all the elements of the wood, the yield varying from 3 to 5 per cent. in the case of East Indian sandal wood, while Macassar sandal wood yields from 1·6 to 3 per cent. only. After the trees have been uprooted and deprived of their bark and part of the sapwood, the trunks are sawn into logs and trimmed, the roots being also freed from bark. The logs of East Indian sandal wood are about 1 metre in length, from 15 to 20 cm. in diameter, and consist of the yellowish or pale reddish heartwood only. After being prepared for the market, the logs are exported from Mysore to London, either direct or through Bombay. Some oil is produced in Mysore by distillation over an open fire, but it is of very inferior quality, and most of the oil in commerce is distilled in London, where the wood is rasped as fine as possible by special machinery and distilled with high-pressure steam. The product is known in commerce as East Indian sandal-wood oil. It acts as a stimulating disinfectant to the mucous membranes, and is generally given in capsules or in mixtures suspended with mucilage.

Oil of sandal wood (s.g. 0·975 to 0·980) is somewhat viscid in consistence and pale yellow in colour, with a strongly aromatic odour and a pungent, spicy taste. It is soluble in less than its own weight of 90 per cent. alcohol, and—except in the case of old or badly preserved specimens—should form a clear solution with six times its volume of 70 per cent. alcohol, the absence of cedar-wood oil, and possibly of other oils, being thus indicated. The high boiling-point of sandal-wood oil is characteristic; at 14 mm. pressure nothing should distil under 150° C., but 80 to 90 per cent. of cedar-wood oil passes over below that temperature. The oil of sandal wood is lævo-rotatory, and its freedom from other varieties of sandal-wood oil is indicated by the optical rotation being not less than

−16°, and not more than −20°, in a tube 100 mm. long.

East Indian oil of sandal wood is adulterated frequently with other varieties of sandal-wood oil; cedar-wood oil, castor oil, gurjun oil, copaiba oil, etc., may also be used as adulterants, but the specific gravity, solubility in alcohol, and polarisation test serve in most cases to detect the adulteration. The chief constituent of East Indian sandal-wood oil is from 94 to 98 per cent. of santalol—a mixture of two sesquiterpene alcohols with different boiling-points; other constituents of the oil are esters and an aldehyde santalal. West Australian sandal-wood oil (s.g. 0·963 to 0·965), from *Santalum cygnorum*, contains only about 75 per cent. of santalol. West Indian sandal-wood oil (s.g. 0·953 to 0·966), from *Amyris balsamifera*, is dextro-rotatory and does not contain more than 30 to 50 per cent. of an alcohol named amyrol. African sandal-wood oil (s.g. 0·965) is of unknown origin, but somewhat resembles the West Indian oil. Fiji sandal wood, the product of *S. Yasi*, yields 6·25 per cent. of oil (s.g. 0·977). The oil of *S. Preissianum* (s.g. 1·02), a South Australian tree, differs considerably from ordinary sandal-wood oil; it becomes solid when cooled, and yields a solid alcoholic constituent and crystalline esters.

SANTONICA.

Wormseed; Semen Cinæ; Semen Contra.

The dried unexpanded capitula or flower-heads of *Artemisia maritima*, var. *Stechmanniana*, Besser (N.O. Compositæ), a small perennial plant which is widely distributed throughout Europe and Asia. The plant varies greatly, but the different forms appear to be merely varieties of the same species, and the typical form is found in the salt marshes of the British Islands. It has oblique knotted rootstalks, from which arise glabrous woody stems, the numerous branches of which bear many bi- or multipinnatifid leaves about 25 mm. long. The erect flowering stems or branches are about 30 cm. long, and bear very minute leaves, the upper ones simple. Levant, Aleppo, or Alexandria wormseed, the kind used chiefly for the production of santonin, is obtained from a variety of the plant which grows freely in the deserts or steppes of the Kirghiz, in Northern Turkestan, and large quantities of santonin are prepared in the town of Chimkent (Tschemkend). Barbary wormseed, obtained from species of *Artemisia* growing in Palestine and Arabia, consists of broken peduncles with the attached calyx, or of the detached calyx leaflets, the flowers being usually wanting or in the shape of minute globular buds. In smell and taste it resembles Levant wormseed, but it is lighter in weight and darker in colour than the latter, and is also covered with a whitish down. The drug possesses anthelmintic properties, and is used chiefly in the preparation of santonin, which is given usually in powders or in the form of Trochiscus Santonini (1 grain).

Wormseed consists of very small seed-like flower-heads about 2 to 4 mm. long, each consisting of three to six tubular florets, and having twelve to eighteen involucral scales. The capitula of *A. maritima* are collected and dried in July and August, before they have expanded, as they then contain most santonin, the proportion diminishing rapidly after flowering is over. When fresh, they are of a greenish-yellow colour, but they turn darker when dried and kept awhile. As seen in commerce they are brown in colour, of an elongated ovoid shape and somewhat angular, with a shining glabrous, or only slightly hairy, surface. The overlapping imbricated bracts constituting the involucre are ovate or lanceolate in shape, and furnished with a distinct keel, on each side of which shining oil-glands can usually be seen on careful examination with a powerful lens. The unexpanded florets are completely enclosed by the upper bracts of the involucre, but if a flower-head be well soaked in water the bracts can be removed, and the florets then become visible. The drug has a bitter camphoraceous taste, and an agreeable aromatic odour when crushed.

The chief constituent of wormseed is the crystalline principle santonin, to which its anthelmintic effects are due, and of which the drug may contain from 2 to 3·6 per cent. Other constituents are a crystalline substance named artemisin (m.p. 200° C.), and from 2 to 3 per cent. of a volatile oil (s.g. 0·915 to 0·940) consisting chiefly of cineol, the camphoraceous odour of which is modified by the presence of a terpene or cymene and a lævo-rotatory oxygenated substance. Santonin is the anhydride of monobasic santoninic acid, soluble salts of which are formed by warming the anhydride with alkalies, whilst prolonged boiling with baryta water results in the formation of the isomeric santonic acid, which can be resolved into santonin and water by heating to 120° C. The santonin may be extracted from the flower-heads by treating them with milk of lime, converting the calcium compound of santonin so formed into a soluble sodium salt, and then decomposing the salt by the action of sulphuric or other acid. On cooling the acid liquid, the santonin crystallises out, and may be freed from traces of acid by adding a little ammonia to the water used for washing. It occurs in colourless, flat, rhombic prisms (m.p. 170° C.), which possess a feebly bitter taste, are neutral to litmus paper moistened with alcohol, and turn yellow when exposed to light. Santonin dissolves very sparingly in water, more freely in 90 per cent. alcohol (1 in 40) or ether (1 in 160), and still more freely in chloroform (1 in 2). It is also slightly soluble in olive oil (1 in 400), glycerin, and solutions of caustic alkalies, but is insoluble in diluted mineral acids. A violet-red or pinkish-red colour, which gradually disappears, is produced when santonin is added to a warm alcoholic solution (10 per cent.) of potassium hydroxide. Exposure of santonin to light causes it to decompose into uncrystallisable photosantonic acid, formic acid, and a reddish resinous substance. The use of santonin is sometimes accompanied by disturbances of vision, white or brightly illuminated objects appearing of a yellow, greenish-yellow, or violet colour, the altered vision being due to functional disturbance of the optic nerve.

SAPPAN.

Sappan; Sappan-wood.

The heartwood of *Cæsalpinia Sappan*, Linné (N.O. Leguminosæ), a tree which is a native of India and cultivated in Madras. The tree grows about 9 to 12 m. high, and yields a brownish-red wood, which is used as a dye and also possesses astringent properties. It is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of logwood, being employed in the form of Decoctum Sappan (1 in 20).

Sappan occurs in hard, heavy sections of variable size, or in the form of fine orange-red chips. A transverse section of the wood exhibits well-marked concentric rings, numerous narrow medullary rays, and large vessels which are easily seen when the section is examined under a lens.

The wood is odourless, and has only a slightly astringent taste, which is due to the red colouring matter present. The red colour communicated by the wood to 90 per cent. alcohol or water changes to carmine-red upon the addition of potassium hydroxide solution, whereas similar solutions of the colouring matter of logwood are changed to purple by the same reagent.

The chief constituent of sappan wood is a colouring principle named sappanin. It is a crystalline body, closely resembling hæmatoxylin, and similar to, if not identical with, brazilin, the crystalline colouring principle of brazil wood (*Cæsalpinia* sp.). Sappanin can be obtained in the form of colourless rhombohedrons, or in short monoclinic prisms, which become orange-coloured in the air, and give a carmine-red coloration with alkalies, owing to the formation of brazilein or some similar body by oxidation. When similarly treated, hæmatoxylin (hæmatin) is converted into purplish hæmatein, while brazilin yields brazilein.

SARSÆ RADIX.

Sarsaparilla; Jamaica Sarsaparilla.

The dried root of *Smilax ornata*, Hooker filius (N.O. Liliaceæ), a native of Costa Rica, and probably of various other species indigenous to Central America, including *S. officinalis*, Kunth, *S. medica*, Chamisso et Schlechtendal, and *S. papyracea*, Duhamel. It is a climbing plant with a woody stem and a stout knotty rhizome which throws off horizontally a number of slender, cylindrical, creeping roots, a short distance beneath the surface of the ground. After collection, the roots are dried and made into bundles for exportation. There are many varieties of sarsaparilla root in commerce, but the best is that commonly known as Jamaica sarsaparilla, because it was formerly exported to Europe through Jamaica, though not produced there. The root is collected chiefly in Central America and sent to New York, whence it is exported to Europe. The two chief varieties of the root in commerce are known as "red" and "grey" sarsaparilla respectively, a dark reddish-brown colour being regarded as characteristic of good Jamaica (Costa Rica) sarsaparilla. Lima sarsaparilla (*Smilax* sp.), collected in Panama, is greyish-brown, and a variety of unknown botanical origin, imported from British Honduras, is of a dirty greyish, yellowish, or pale reddish-brown colour. The drug possesses alterative and tonic properties, and is used chiefly in the form of Extractum Sarsæ Liquidum (1 in 1), or Liquor Sarsæ Compositus Concentratus (1 in 1), formerly known as Decoctum Sarsæ Compositum.

Sarsaparilla consists of very long, nearly cylindrical, tough, flexible roots, 5 mm. thick, which are folded together into bundles and bound loosely with a similar root, each bundle measuring about 46 cm. long and 12·5 cm. in diameter, and weighing about 1 kilo. The bark is rough and dark reddish-brown or greyish-brown in colour, while the roots are much shrunken and deeply furrowed longitudinally, with numerous branching wiry rootlets. A transverse section usually exhibits a narrow, dark reddish-brown cortex or bark surrounding a ring of yellowish-white wood with large, radially arranged vessels, which encloses a white starchy pith; the cells of the endodermis appear nearly square in transverse section, and are uniformly thickened, that character distinguishing the root of sarsaparilla from those of other species of *Smilax*. A certain amount of sarsaparilla is produced in Jamaica from cultivated plants of *S. officinalis*, but differs markedly from the Costa Rica drug, being of a pale reddish or greyish-brown colour, with somewhat stout rootlets, and having a pale bark which is seen, in transverse sections, to be separated by a distinct line from a rather darker stele. Sarsaparilla of good quality has no odour, possesses only a slightly bitter taste, and should leave a decidedly acrid impression in the mouth after being chewed for a short time.

The shrunken appearance of sarsaparilla, the absence of transverse cracks, the presence of numerous wiry rootlets, and the appearance of a transverse section, are the chief distinctive characters of the drug. Costa Rica or Jamaica sarsaparilla is distinguished by its dark reddish-brown colour, shrunken bark, and the presence of fibrous rootlets. Lima, Honduras, Guayaquil, and Vera Cruz or Mexican sarsaparilla are other commercial varieties obtained from species of *Smilax*, but the Lima variety alone bears any close resemblance to Jamaica sarsaparilla. The Lima root is imported in bundles about 60 cm. long and 12·5 to 14 cm. in diameter, is greyish-brown in colour, and rougher and thicker than Jamaica sarsaparilla, while the cells of the endodermis are less uniformly thickened than in the latter. Honduras sarsaparilla is imported in bundles about 75 cm. long and 5 to 6·5 cm. in diameter, and consists of dirty greyish, pale yellowish, or brownish roots which are more plump and starchy than the Costa Rica drug, and have fewer rootlets attached, while the bark is usually thicker. Guayaquil sarsaparilla is imported in flattish bundles about 50 cm. long and 15 cm. in diameter, and consists of mahogany-brown roots which are usually larger than Jamaica sarsaparilla. Vera Cruz or Mexican sarsaparilla, from *S. medica*, consists of both rhizome and roots, and is of a dull greyish-brown colour. Indian sarsaparilla, from *Hemidesmus indicus*, is marked with transverse cracks, has a distinctive odour, and is rigid and tortuous instead of flexible. The chief constituents of sarsaparilla are parillin (formerly known as "smilacin"), sarsa-saponin, and smilacin (smila-saponin) or sarsaparill-saponin, three homologous glucosidal principles belonging to the saponin class. Other constituents of the root are starch, resin, colouring matter, a trace of volatile oil, calcium oxalate, and other salts. Parillin and sarsa-saponin are crystalline, but smilacin is amorphous. Sarsa-saponin is the most active constituent of the drug, but all three saponins produce salivation, vomiting, and diarrhœa.

SASSAFRAS RADIX.

Sassafras Root.

THE dried root of *Sassafras officinale*, T. Nees and Ebermaier (N.O. Lauraceæ), a tree of medium size, indigenous to North America. All parts of the plant secrete an aromatic volatile oil in special cells, but the root-bark is richest in oil, and the most active part medicinally, though the whole root is used as a rule. It is collected after the occurrence of frost in autumn, then dried and exported in large branching logs, 15 to 30 cm. in diameter, the logs often including the lower portion of the stem. The drug possesses aromatic, stimulant, and diaphoretic properties, but it is employed chiefly as an adjuvant to other medicines. It is used in the preparation of Liquor Sarsæ Compositus Concentratus (1 in 10).

Sassafras root occurs in large branched pieces, which are more or less covered with rough greyish-brown or rusty-brown bark. The root-bark is whitish at first, but becomes coloured on exposure, immediately after collection, owing to decomposition of the tannin it contains. Internally, the bark is smooth, glistening, and rusty-brown, with an agreeable aromatic odour and a peculiar aromatic, somewhat astringent taste. The wood is soft, light, and easily cut, greyish-yellow or greyish-red in colour, with similar taste and odour to those of the bark, though not so pronounced. A transverse section of the wood exhibits distinct annual rings, traversed by fine dark medullary rays, and containing large vessels. Oil-cells are found in the wood, but are more numerous in the bark.

The chief constituent of sassafras root is a volatile oil (s.g. 1·070 to 1·080), of which the drug contains about 2 per cent., though air-dried root-bark yields as much as 6 to 9 per cent. Other constituents of sassafras root are tannin and starch; in addition, the bark contains gum, resin, wax, salts, and a peculiar decomposition product of tannic acid named sassafrid, which bears some analogy to cinchona-red and other phlobaphenes. The tannin is present in much larger proportion in fresh bark than in that which has been long kept, and its oxidation is the cause of the change of colour which takes place. The oil of sassafras consists chiefly of safrol, other constituents being pinene, phellandrene, camphor, and traces of eugenol, a sesquiterpene, and other substances of high boiling-point. It is sometimes adulterated with camphor oil, which contains safrol and other substances found in oil of sassafras, and may have a similar specific gravity.

SCAMMONIÆ RADIX.

Scammony Root.

The dried root of *Convolvulus Scammonia*, Linné (N.O. Convolvulaceæ), a twining plant which is indigenous to Syria and other places in the Eastern Mediterranean. The plant has a perennial tapering root, which varies in size according to its age, but may attain a length of 1 m. or more and a thickness of 20 to 30 cm. It is covered with a greyish bark and contains a milky resinous juice (see Scammonium). The drug is imported from Syria and Asia Minor, and is used in the preparation of scammony resin, which is an energetic hydragogue cathartic and also acts as an anthelmintic. The resin is an ingredient of Extractum Colocynthidis Compositum (1 in 6), Pilula Colocynthidis Composita (1 in 3), Pilula Colocynthidis et Hyoscyami (1 in 4½), Pilula Scammonii Composita (1 in 3), and Pulvis Scammonii Compositus (1 in 2).

Scammony root occurs in hard, heavy and woody, brownish - grey or yellowish - grey, tapering or nearly cylindrical pieces, which vary usually from 2·5 to 7·5 cm. or more in diameter, and are enlarged slightly at the crown, where may be seen the remains of the slender aerial stems. The root is frequently contorted or spirally twisted, and is invested with a thin inconspicuous bark, while the rough surface is furrowed longitudinally. Any lateral rootlets present are split usually into fibrous strands. The root breaks with a coarsely fibrous fracture, strands of wood projecting from the fractured surface, which is seen to be whitish or grey when smoothed. A transverse section exhibits an abnormal and characteristic structure, as there is no distinct central wood, but numerous irregularly arranged wood-bundles appear as ill-defined circles, in which groups of vessels are surrounded by parenchymatous tissue containing resin-cells that appear as dark points. The whole of the parenchymatous tissue of the root contains starch grains of characteristic shape. The peculiar odour of the drug recalls that of jalap, and is more distinct when the surface is freshly cut ; the taste is sweetish at first, but afterwards slightly acrid.

The large size, fibrous fracture, greyish colour, and jalap-like odour of scammony root distinguish it readily. Belladonna root is usually much smaller, breaks with a short mealy fracture, and is free from odour, whilst a transverse section exhibits a dark cambium line, separating the greyish bark from the whitish wood, in which are scattered dark groups of vessels and fibres. The chief constituent of scammony root is a glucosidal resin or glucoresin, of which it contains about 5 per cent. ; the root also contains sugar and starch. The resin of scammony consists almost entirely of scammonin, which is identical with the ether-soluble portion of jalap resin, and with the resins of Tampico jalap and male jalap. When purified by the removal of colouring matter, scammonin occurs as a white powder. The resin is obtained by exhausting scammony root in coarse powder with 90 per cent. alcohol, recovering the greater part of the alcohol by distillation, and slowly pouring the remaining liquid into three times its volume of distilled water, the liquid being constantly stirred meanwhile. The resin is then allowed to subside, after which it is washed with distilled water and dried on a water-bath. The product occurs in brownish, translucent, brittle pieces, which break with a shining fracture and possess a sweet, fragrant odour. It is distinguished from the gum-resin of scammony by not forming an emulsion when triturated with water, and from jalap resin by being almost entirely soluble in ether.

SCAMMONIUM.

Scammony; Virgin Scammony.

A GUM-RESIN obtained by incision from the living root of *Convolvulus Scammonia*, Linné (N.O. Convolvulaceæ), a twining plant indigenous to Syria and other parts of the Eastern Mediterranean district. It occurs as a milky juice in cells arranged in vertical rows in the cortex of the root of the plant, and in the parenchyma surrounding each of the wood-bundles or columns existing in the root. The gum-resin is collected in June, incisions being made in a slanting direction 5 to 10 cm. below the crown of the root, in such a way that the contents drain from a series of cells by the breaking of the transverse walls. The exuding milky juice is received in fresh-water mussel shells placed just beneath the incisions, and, towards evening, the shells are usually removed, while the cut surfaces are scraped with a knife so as to remove any partially dried drops of gum-resin. Only a small quantity is collected from each root, the product of several plants being mixed into a homogeneous mass and allowed to harden. If the gum-resin be left to dry as it exudes, it has a fine golden-brown colour and translucent appearance, but the effect on the mixed product of long standing in a more or less moist condition is that it undergoes a fermentative change, so that the dried drug has usually a darker colour and a porous appearance when broken. The drug is known in commerce as "virgin scammony," and is imported chiefly from Smyrna and Aleppo. It is an energetic hydragogue cathartic, but is variable in strength and is now replaced largely by scammony resin.

Scammony is imported usually in flattened cakes about 12 mm. thick and 10 or 12 cm. in diameter, or in irregular fragments of varying size. It is brown, dark grey, or nearly black externally, and often covered with a greyish-white powder formed by the pieces rubbing against each other. The cakes are very brittle and, when broken, the freshly exposed surfaces appear glossy, resinous, more or less porous, and of a uniform dark brown or nearly black colour, though thin fragments are brown and more or less translucent when viewed by transmitted light. The drug is reduced easily to an ash-grey powder, which readily forms a milky emulsion when rubbed with water. It has a peculiar odour, and produces an acrid sensation in the throat when tasted. Inferior scammony is usually tough and has a dull fracture, small splinters being opaque. At least 70 per cent. of the drug should be soluble in ether, and not more than 3 per cent. of ash should be left on incineration, a larger proportion indicating adulteration with inorganic matter.

The peculiar cheese-like odour of scammony is probably due to the formation of a volatile fatty acid as a fermentation product during the process of drying. Scammony resin is distinguished from the gum-resin by its much more agreeable odour, different colour, solubility in ether, and the fact that it does not form an emulsion with water. The chief constituents of scammony are gum and 70 to 90 per cent. of resin, the latter consisting of scammonin and being almost entirely soluble in ether. The gum-resin is adulterated frequently, whilst in the soft state, with the expressed juice of the stalks and leaves of the scammony plant, other adulterants being wheat flour, chalk, ashes, sand, and foreign resins. The absence of guaiacum resin is indicated by the absence of blue colour when test solution of ferric chloride (5 per cent.) is added to an alcoholic solution of the drug. Inferior qualities of the drug may consist wholly or in part of the expressed juice of the root, evaporated to dryness by exposure to the sun or by artificial heat, the masses thus formed being heavy, dull, clayey, and not easily broken between the fingers, while the fracture is not clean and glossy, and small splinters are opaque. Adulteration with inorganic matter is indicated by the abnormal amount of ash left on incineration, while the presence of foreign starch can be detected by examining the powdered drug under the microscope. Though scammony naturally contains a little starch, the blue coloration afforded on applying the iodine test should be only slight.

SCILLA.

Squill.

The bulb of *Urginea Scilla*, Steinheil (N.O. Liliaceæ), divested of its dry membranous outer scales, cut into slices, and dried. The plant is perennial, and indigenous to countries bordering on the Mediterranean. It produces a pear-shaped, truncated bulb, which may attain a weight of several kilogrammes. The bulb consists of fleshy scales which are attenuated at their outer edges, closely applied over each other, and invested by very thin and dry exterior scales which appear to constitute a membranous coat. There are two varieties of the drug, the white squill collected in Malta being preferred in England, whilst the red squill collected in Algeria is used in France. When fresh, the bulb abounds in a viscid, very acrid juice, which is capable of causing inflammation of the skin; on drying, the bulb loses four-fifths of its weight, and its acridity is largely diminished, with but slight loss of medicinal activity. The drying process is difficult, on account of the abundance and viscidity of the juice; it is necessary, therefore, to cut the bulb into thin transverse slices, which are dried separately by solar or artificial heat. The drug is a stimulant expectorant, and a diuretic and cardiac tonic, acting in a similar manner to digitalis, though more irritating to the gastro-intestinal mucous membrane. It is used in the form of Acetum Scillæ (1 in 8), Oxymel Scillæ (1 in 15), Pilula Ipecacuanhæ cum Scilla (1 in 6), Pilula Scillæ Composita (1 in 4), and Tinctura Scillæ (1 in 5); the vinegar of squill is used in the preparation of Syrupus Scillæ (1 of squill in 18).

Squill bulbs are sometimes imported entire, the bulb of the white squill consisting of white or yellowish scales, whereas the red squill has deep reddish-brown outer scales and yellowish-white inner scales, covered with a pinkish epidermis. The outer scales are rejected because they are dry and destitute of activity, and it is also customary to reject the innermost scales, as they are very fleshy and mucilaginous, besides being destitute of bitterness. As seen usually in commerce, squill occurs in narrow, flattish, curved strips or slices of the inner scales of the bulb, from 2·5 to 5 cm. long, and about 3 mm. thick. The strips are yellowish-white or somewhat pinkish in colour, more or less translucent, and taper frequently towards both ends. When quite dry, the strips are brittle and can easily be powdered, but they are tough and flexible when moist. The odour of the drug is very slight, but the taste is disagreeably bitter and acrid, owing to the presence of bitter glucosides.

The shape and colour of the strips in which it is usually seen, and the nauseously bitter taste of the drug, are distinctive characters of squill. The drug is seen occasionally in vertical slices, some of which adhere at their base. The entire bulbs are rarely imported, as they preserve their vitality for a long time and are difficult to keep, tending to develop aerial shoots if left in a warm place. The chief constituents of squill are three bitter glucosidal substances —scillitoxin (scillain), scillipicrin, and scillin. The first two are amorphous, and act upon the heart; scillin is crystalline, and causes numbness and vomiting. Other constituents of squill are mucilaginous and saccharine matters, including a peculiar mucilage named sinistrin, which is analogous to dextrin and easily converted into sugar; calcium oxalate is also present, in bundles of long acicular crystals which easily penetrate the skin when the bulbs are handled, and cause intense irritation.

SCOPARII CACUMINA.

Broom Tops.

The fresh and the dried tops of *Cytisus scoparius*, Link (N.O. Leguminosæ), a woody shrub indigenous to England and distributed throughout temperate Europe. The dark green stem of the plant produces numerous straight, pentangular, flexible branches, on which are borne small, oblong, downy leaves and numerous large golden-yellow Papilionaceous flowers, while the fruits are compressed legumes which are hairy at the sutures. The whole plant has a bitter, nauseous taste and a strong peculiar odour when bruised, but only the tops of the stems and branches are used in medicine. The odour disappears and the leaves easily fall off the branches on drying, the dried tops consisting usually of dark brownish-green stems and branches only, without leaves, flowers, or fruits. The drug is a diuretic, and acts, in large doses, as a cathartic. Fresh broom tops are used in the preparation of Succus Scoparii, while the dried tops are employed in the form of Infusum Scoparii (1 in 10).

Broom tops consist of the young stems, with long, straight, slender, alternate branches; the branches and the upper part of the stem bear five distinct wings and are glabrous, tough, and flexible. The tops are dark green when fresh and dark brownish-green when dried. The small alternate leaves are downy whilst young, but are usually absent in the case of dried tops; when present, they are sessile and simple above, but stalked and trifoliate below. The bitter, nauseous taste of the drug is due to sparteine. The fresh tops have a characteristic odour, which is largely due to the volatile oil present, and is especially marked when the tops are bruised.

The chief distinctive characters of broom tops are the winged branches, bitter taste, and peculiar odour when fresh. The chief constituent of the drug is the liquid volatile alkaloid sparteine, which has a peculiar bitter taste, resembles aniline in odour, and forms crystalline salts. Other constituents of the drug are a volatile oil, tannin, fat, wax, sugar, and an indifferent substance, named scoparin, which forms yellow crystals and yields phloroglucin and protocatechuic acid when fused with potassium hydroxide. Sparteine is converted into oxysparteine by the action of potassium bichromate and sulphuric acid, and oxysparteine yields trioxysparteine when acted upon by hydrogen peroxide, while dioxysparteine is similarly formed when hydrogen peroxide is allowed to act directly upon sparteine.

SENEGÆ RADIX.

Senega Root.

The dried root of *Polygala Senega*, Linné (N.O. Polygalaceæ), a small plant found in almost all parts of the United States and in the southern parts of British North America. It is collected largely in Minnesota and Manitoba, and is known as western senega. Northern senega, collected in the north-western United States, from *P. Senega*, var. *latifolia*, seldom reaches the European market; it is much larger than the ordinary variety, darker in colour, less tortuous, and shows the keel less distinctly, if at all. Senega is a stimulating expectorant, moderately diaphoretic, and diuretic. It is used in the form of Infusum Senegæ (1 in 20), Liquor Senegæ Concentratus (1 in 2), and Tinctura Senegæ (1 in 5).

Senega root occurs in slender, greyish-yellow or brownish-yellow pieces with but few branches, the pieces varying from 5 to 10 cm. in length, and being enlarged at the top into a knotty crown, to which are attached the remains of numerous slender aerial stems and small shoots, beset with the scars or remains of purplish scaly leaves. The root is frequently curved and contorted, longitudinally wrinkled, and sometimes also transversely wrinkled near the crown, whilst a prominent keel may usually be found on the concave surface of the curves of the root, following a somewhat spiral course. The root breaks with a short fracture. A transverse section exhibits a yellowish, horny, translucent cortex or bark, which is free from starch grains and encloses a whitish wood; the wood is frequently developed irregularly, one or two wedge-shaped portions being replaced often by parenchymatous tissue, which fills transverse cracks and longitudinal fissures in the wood, as can be seen on soaking a keeled root in water, and stripping off the bark. The drug has a distinctive odour, recalling that of wintergreen, and a sweetish taste, which is more or less masked by the acridity and irritating sensation in the fauces caused by the saponins present.

The prominent keel, irregular wood as seen in transverse sections, distinctive odour, and sweetish yet acrid taste, are distinctive characters of senega root. The keels on the concave sides of curved roots are due to a largely developed bast, and do not arise from any abnormal development of the wood. White or false senega, collected in the southern United States from *P. alba*, Nuttall, is more slender than the genuine root; the branches descend without spreading, and the root has a normal cylindrical wood; the root is also lighter in colour than true senega, and keelless. The spindle-shaped root of American ginseng (*Panax quinquefolium*, Linné), and various rhizomes which are mixed with senega root occasionally, as accidental admixtures, are readily distinguished from it. The chief constituents of senega root are two homologous glucosides — senegin and polygalic acid, which are identical with the saponins— sapotoxin and quillaic acid — found in quillaia bark, and can be obtained as a white inodorous powder, with a pungent, acrid taste. Other constituents of senega root are fixed oil, resin, sugar, pectin, yellow colouring matter, malates, a lævo-rotatory glucoside, and a small quantity of volatile oil which contains methyl salicylate and an ester of valerianic acid.

SENNA ALEXANDRINA.

Alexandrian Senna.

THE dried leaflets of *Cassia acutifolia*, Delile (N.O. Leguminosæ), a small shrub found growing wild in the Middle and Upper Nile territories. It produces alternate and paripinnate compound leaves, which are collected chiefly by Bedouins between Suakim and Kassala. The leaflets are separated from the petioles, dried, and sent to the Red Sea ports or Alexandria for exportation. In some parts, however, the senna plants are cut down by the natives and dried in the sun, after which the leaflets and pods are stripped off, packed in bales, and sent to Boulak, near Cairo, where they are sorted. Alexandrian senna frequently arrives in this country in a more or less broken condition, owing to the brittle nature of the leaflets, and is sometimes mixed with the flat, curved, brown or greenish-brown pods, and fragments of the leaf-stalks. The drug is an efficient purgative, but is given usually with aromatics, as it causes griping and nausea when taken alone. It is used in the preparation of Confectio Sennæ (1 in 11), Infusum Sennæ (1 in 10), Liquor Sennæ Concentratus (1 in 1), Pulvis Glycyrrhizæ Compositus (1 in 6), Syrupus Sennæ (1 in 1¾), and Tinctura Sennæ Composita (1 in 5); the infusion is an ingredient of Mistura Sennæ Composita.

Alexandrian senna consists of pale greyish-green, thin, brittle, slightly curled leaflets, which vary usually from 20 to 32 mm. in length. They are mostly lanceolate in shape, though sometimes oval-lanceolate, with an acute apex and entire margin; they are also unequal at the base, and the greatest diameter is frequently below the middle of the leaflet. Both surfaces of the leaflets are frequently finely pubescent, especially near the veins, which are distinct on the under surface. When examined by the aid of a microscope, the hairs on the epidermis are seen to be one-celled and thick-walled, a distinction being thus afforded between senna leaflets and argel leaves, the hairs of which are three-celled. The odour of senna is faint and herb-like, and its taste is mucilaginous and somewhat unpleasant, the odour and taste being largely due to resin and a trace of volatile oil, which are soluble in alcohol and can be removed without greatly affecting the purgative action of the drug.

The leaflets of Alexandrian senna are readily distinguished from those of East Indian senna (*C. angustifolia*, Vahl), which are usually longer in proportion to their width, flat, yellowish-green in colour, less conspicuously asymmetrical and also less pubescent. Both varieties may be used in making the official preparations of senna, as they possess the same properties and are of nearly equal value medicinally. The leaflets of *Cassia obovata*, Colladon, are occasionally found mixed with Alexandrian senna; they are broadly obovate and mucronate, with an abruptly tapering apex and distinctly pinnate venation. Argel leaves, from *Solenostemma argel*, Hayne, are distinguished by their thick rigid texture and finely wrinkled surface, whilst they are equal at the base, and their veins are not evident; they are also distinctly bitter and have three-celled hairs. The chief constituents of Alexandrian senna leaves are emodin, cathartic acid, gluco-sennin, and anthragluco-sennin; other constituents of the drug are iso-emodin, chrysophanic acid, rhamnetin, senna-nigrin, resin, volatile oil, sugar (sennite or cathartomannite), and mucilage. The emodin (m.p. 223° to 224° C.) of senna is identical with that found in Barbados and Cape aloes, and iso-emodin has the same percentage composition.

SENNA INDICA.

East Indian Senna; Tinnevelly Senna.

THE dried leaflets of *Cassia angustifolia*, Vahl (N.O. Leguminosæ), a shrub which is indigenous to Southern Arabia, but is now cultivated largely in Southern India, especially in the district of Tinnevelly. The plant attains an unusual size under cultivation, and produces larger leaves than when growing wild. The leaves are paripinnate, with larger leaflets than those of *C. acutifolia*. After collection the leaflets are dried, pressed into bales, and exported from Tuticorin. They are much more largely used than Alexandrian senna, and may be employed in making the same preparations, as the two drugs possess the same properties and their medicinal value is nearly equal.

East Indian senna consists of yellowish-green thin leaflets, which vary usually from 25 to 50 cm. in length. In shape they are lanceolate, with an acute apex and entire margin; they are also unequal at the base, and the greatest diameter is usually near the middle of the leaflet. The upper surface is smooth, and the lower surface somewhat duller in colour and glabrous, or slightly pubescent. The herb-like odour and slight taste of the drug are very similar to those of Alexandrian senna, and are due to the presence of resin and volatile oil.

The leaflets of East Indian senna are distinguished by their more elongate-lanceolate shape, as compared with the leaflets of Alexandrian senna, and are also somewhat firmer in texture. As a result, the leaflets are usually less broken when they arrive in this country. Tinnevelly senna is rarely adulterated or mixed with other leaves. Arabian or Mecca senna, collected in Southern Arabia from wild plants of *Cassia angustifolia*, is sometimes imported, but usually the leaflets are mixed with stalks and discoloured, owing to lack of care in collecting and drying. The fruits of *C. angustifolia* closely resemble those of *C. acutifolia*, but they are rather narrower, and the remains of the base of the style are usually more distinct. The chief constituents of Tinnevelly senna are cathartic acid, emodin, gluco-sennin, and anthragluco-sennin; other constituents of the drug are iso-emodin, chrysophanic acid, rhamnetin, senna-nigrin, volatile oil, resin, sugar, and mucilage, being practically the same as those found in Alexandrian senna.

SERPENTARIÆ RHIZOMA.

Serpentary Rhizome; Virginian Snakeroot.

THE dried rhizome and roots of the Virginian snakeroot, *Aristolochia Serpentaria*, Linné (N.O. Aristolochiaceæ), or of the Texan or Red River snakeroot, *A. reticulata*, Nuttall. Both plants are natives of the United States, *A. Serpentaria* being a small herbaceous plant which grows to the east of the Mississippi, while *A. reticulata* grows in the south-western United States, and is the chief source of the serpentary rhizome of commerce. The rhizome of *A. Serpentaria* is short and produces numerous slender roots, of which the drug consists chiefly. The roots are collected in the autumn, dried, and sent to Philadelphia in bales containing about 45 kilo., the leaves and stems of the plant being often present as impurities, as well as adhering dirt. The product of

A. reticulata is somewhat bolder in appearance than Virginian snakeroot, and the roots are less interlaced.

Serpentary rhizome, from *A. Serpentaria*, is tortuous, slender, about 2·5 cm. in length and 3 mm. in diameter. On the upper surface of the rhizome may be seen the remains of aerial stems, while numerous wiry interlacing roots, often about 7·5 cm. long, occur on the under surface, forming matted masses. The fresh rhizome and roots are yellowish, but they become dull yellowish-brown with age. The drug has a camphoraceous odour and a strong aromatic bitter taste. The rhizome and roots of *A. reticulata* resemble those of *A. Serpentaria* in colour, odour, and taste, but they are longer and thicker. The roots are also less curved in this variety of the drug, they are not wiry or interlacing, and they approximate frequently in thickness to the rhizome from which they spring. Serpentary rhizome and roots of both kinds are brittle, breaking with a short fracture. A transverse section of the rhizome exhibits an eccentric whitish pith which is much nearer the upper than the under surface, also numerous yellow curved wood-bundles, and a thin yellowish-brown bark; a similar section of the root shows a slender yellow wood, enclosed by a thick whitish bark.

The slender rhizome, eccentric pith, and peculiar odour and taste of serpentary distinguish it clearly from other drugs. Small pieces of valerian rhizome sometimes bear a superficial resemblance to serpentary, but the different odour and taste suffice to distinguish them. The rhizome of Indian pink (*Spigelia marilandica*, Linné) lacks the characteristic odour and taste of serpentary, is darker in colour, and has an oval or crescent-shaped pith, surrounded by a ring of wood which exhibits no characteristic structure. Hydrastis rhizome (*Hydrastis canadensis*, Linné) is yellow, and differs in structure and odour from serpentary, as also do other rhizomes and roots which have at times been confused with it. The chief constituents of both kinds of serpentary are a bitter crystalline alkaloid named aristolochine, and from 1 to 2 per cent. of volatile oil; other constituents of the drug are tannin, starch, sugar, and resin. The volatile oil of *A. Serpentaria* has a valerian-like odour and consists chiefly of borneol; that of *A. reticulata*, which has an odour recalling camphor and valerian, also contains borneol, combined with an acid which has not yet been identified, and a terpene which is probably pinene.

SESAMI OLEUM.

Sesame Oil; Benne or Teel Oil.

An oil obtained by expression from the seeds of *Sesamum indicum*, Linné (N.O. Pedaliaceæ), an annual herb which is indigenous to India. The plant is cultivated widely for the sake of the oil, which is laxative in large doses, and is used largely as an emollient. It is official in the Indian and Colonial Addendum, for use in India and the African, Eastern, and North American Colonies, as a substitute for olive oil in making liniments, ointments, and plasters.

Sesame oil is a limpid liquid (s.g. 0·921 to 0·924), with a pale yellow colour, a faint odour, and a bland taste. It congeals at $-5°$ C. After shaking the oil vigorously with an equal volume of concentrated hydrochloric acid, containing about 6 per cent. of pyrogallol, the lower acid layer, which separates on standing, should become coloured gradually when boiled for five minutes, appearing purple by transmitted light and blue by reflected light. This reaction, which serves to distinguish sesame oil from olive, almond, and other fixed oils, is due to the presence of sesamol.

If sesame oil be shaken with hydrochloric acid alone, the latter will usually assume a bright emerald-green colour, especially if the oil has been exposed for some time to the action of air and light. The subsequent addition to the mixture of 10 per cent. of sugar causes the formation, after again shaking, of a blue colour, which changes to violet and, finally, to deep crimson. The chief constituent of sesame oil is about 76 per cent. of olein; other constituents are the glycerides of palmitic, stearic, and myristic acids, a small quantity of a resinoid substance, a higher alcohol (m.p. 137° C.), a crystalline substance named sesamin, and a phenolic compound named sesamol which is the cause of the characteristic colour reactions of the oil. Sesamol gives a green colour with sulphuric acid and hydrogen peroxide, the acid layer becoming yellow with a green fluorescence on dilution with water.

SEVUM PRÆPARATUM.

Prepared Suet.

The internal fat of the abdomen of the sheep, *Ovis Aries*, Linné (Order Ungulata), purified by melting and straining. The fat is contained in the omentum (flare) or fold which covers the intestines of the sheep and is taken chiefly from the region of the kidneys, the omentum being cut into pieces, which are crushed thoroughly so as to break the membranous vesicles in which the fat is enclosed, after which a moderate heat is applied and the melted fat subsequently strained through linen or flannel. Mutton suet is of a firmer consistence and requires a higher temperature to melt it than other animal fats, but in order to avoid applying too much heat the crude suet is sometimes purified by boiling it in water. Prepared suet is used in the preparation of Unguentum Hydrargyri, and may replace lard in making official preparations for use in India.

Prepared suet is a smooth white solid (s.g. 0·948 to 0·953), and should be almost free from odour. It melts at 44·4° to 48·9° C., and, after being melted, begins to solidify again at about 37·8° C. The high melting-point is a very distinctive character of prepared suet. It is freely soluble in petroleum spirit (1 in 2), dissolves slowly in benzol, and is slightly soluble (1 in 60) in ether, or in boiling 90 per cent. alcohol (1 in 44), but is insoluble in cold alcohol.

The chief constituents of suet are 70 to 80 per cent. of stearin and palmitin, which are mixed with about 20 to 30 per cent. of olein. On cooling melted suet, constituents of a high melting-point tend to separate in a more or less granular form; it should, therefore, be stirred whilst cooling, so as to maintain it in a homogeneous condition. Benzoated suet is prepared in the same way as benzoated lard, except that prepared suet replaces prepared lard in the process; the product may replace benzoated lard in making Unguentum Mylabridis and Unguentum Myrobalani for use in India.

SIMARUBA CORTEX.

Simaruba Bark.

THE bark of the root of *Simaruba amara*, Aublet (N.O. Simarubaceæ), a native of Guiana and Northern Brazil, and of *S. glauca*, De Candolle, a native of the West Indian Islands and Florida. They are both trees of considerable height, and their medicinal properties reside in the bark, chiefly that of the root, though the stem-bark may also be collected. After the roots have been beaten to loosen the bark, the latter is stripped off, freed from the outer corky layer by rasping, and dried. The drug is a bitter tonic, and also acts as a diaphoretic and diuretic. It is best given in the form of infusion, but is seldom employed in European medicine.

Simaruba bark occurs in long fibrous strips, from 0·5 to 1 m. in length, and from 3 to 6 mm. thick. They are usually more or less fissured and rent longitudinally, as the result of beating, and are rough, warty, and yellowish-brown externally, where the cork has been removed. The inner surface of the bark is yellowish, longitudinally striated, and fibrous, while a transverse section exhibits numerous fine yellow medullary rays extending from the inner nearly to the outer surface. The drug has no odour, but a very bitter taste.

The distinctive characters of simaruba bark are its marked fibrous character, its yellowish colour and bitter taste, and the appearance of a transverse section. The chief constituent of the drug is quassin or picrasmin—a mixture of homologous, crystalline, bitter principles, similar to those found in quassia wood. Other constituents of the bark are resin, volatile oil, malic and gallic acids, and various salts.

SINAPIS ALBÆ SEMINA.

White Mustard Seed.

The dried ripe seeds of the white mustard, *Brassica alba,* Boissier (N.O. Cruciferæ), a native of Europe. It is an erect annual plant, rather smaller than *Brassica sinapioides,* Roth, which it resembles closely, though the fruits of the two plants differ considerably in shape, those of white mustard being also more or less horizontal and hairy, while black mustard pods are erect and smooth. The fruits of the white mustard are spreading, bristly, rugged, roundish pods (siliquas), which are ribbed, swollen where the seeds are situated, and each provided with a very long sword-shaped (ensiform) beak. Each pod contains from four to six pale yellow, exalbuminous seeds, about twice the diameter of black mustard seeds. The dried ripe seeds are alone official. They possess rubefacient and vesicant properties, and are mixed with black mustard seeds to produce Charta Sinapis and mustard flour. A product of better flavour is obtained by mixing the two varieties, and it also appears probable that the ferment present in white mustard seeds helps to produce the maximum amount of volatile oil more rapidly than would be possible if black mustard seeds alone were used for preparing mustard flour. Mustard is a powerful stimulant and sialogogue, and forms a useful emetic.

White mustard seeds are hard, pale yellow in colour, spheroidal in shape, about 2 mm. in diameter, and 6·5 mgm. in weight. The testa or seed-coat appears smooth, but when examined with a lens is seen to be covered with very minute pits, and finely reticulated. The seeds become coated with mucilage when they are soaked in water, and the seed-coats can then easily be removed, revealing two folded yellow and oily cotyledons which embrace the small radicle. No endosperm is present. The seeds are inodorous even when powdered, but a slight odour is developed when the powder is moistened with water, owing to the formation of sinalbin mustard oil, which also causes the somewhat pungent taste of the seeds. Neither white nor black mustard seeds contain starch when ripe, and any starch found in commercial mustard flour must be derived from starch-bearing seeds which are accidentally mixed with the mustard seed, unless it has been added purposely as a diluent. The presence of starch is best detected by the aid of the microscope, as the iodine test for the presence of starch may be rendered negative owing to the ready absorption of iodine by the volatile oil formed on preparing a decoction of mustard.

The epidermal cells of the seed-coat of white mustard seeds contain mucilage, and the cotyledons contain from 23 to 26 per cent. of fixed oil (s.g. 0·915 to 0·920), which consists of the glycerides of oleic, stearic, and erucic or brassic acids. The seeds also contain the crystalline glucoside sinalbin, and the enzyme myrosin, which hydrolyses the sinalbin in the presence of water, with the production of acrinyl isothiocyanate, or sinalbin mustard oil, as represented in the following equation :—

$$\underset{\text{Sinalbin}}{C_{30}H_{42}N_2S_2O_{15}} + \underset{\text{Water}}{H_2O} = \underset{\substack{\text{Acrinyl}\\\text{Isothiocyanate}}}{C_7H_7ONCS} + \underset{\text{Dextrose}}{C_6H_{12}O_6} + \underset{\substack{\text{Sinapine}\\\text{Acid Sulphate}}}{C_{16}H_{24}NO_5HSO_4}$$

The oil is only sparingly volatile with water vapour, and cannot therefore be obtained by distillation, but must be extracted by boiling alcohol after the seed has been deprived of its fixed oil. When cold, the volatile oil possesses only a faint anise-like odour, but it gives off a pungent odour when heated. It can be prepared artificially by acting on p-hydroxy-benzylamine with carbon bisulphide.

SINAPIS NIGRÆ SEMINA.

Black Mustard Seed.

THE dried ripe seeds of the black mustard, *Brassica sinapioides*, Roth (N.O. Cruciferæ), a native of Europe. It is an erect annual plant, about 1 m. or more in height, and is cultivated largely in England, Holland, Italy, Germany, and elsewhere for the sake of the seed. The fruits of the plant are smooth, erect, flattened (appressed) siliquas, which dehisce by both sutures when ripe. Each pod is furnished with a short slender beak, and contains about ten or twelve minute, dark-coloured, exalbuminous seeds, which are collected when ripe, and dried. They are much smaller than white mustard seeds, but possess similar properties, and are mixed with them to produce Charta Sinapis and mustard flour; black mustard seeds are also used in the preparation of the volatile oil of mustard, which is an ingredient of Linimentum Sinapis (1 in 27). The oil is obtained by distillation from the seeds, after they have been deprived of fixed oil and macerated with water to allow of the interaction of the substances which yield the volatile oil, the fixed oil being expressed from the seeds by means of hydraulic presses, after which the residual cake is macerated in tepid water for several hours to allow fermentation to take place, and then distilled with water vapour.

Black mustard seeds are hard, dark reddish-brown or greyish-brown in colour, spherical or slightly ovoid in shape, about 1 mm. in diameter, and 1·3 mgm. in weight. Sometimes the seeds are nearly black, and they may be covered partially with a very thin, whitish, membranous coat. The testa or seed-coat is thin and brittle, and is seen to be covered with minute pits when examined with a lens, whilst the hilum can be distinguished as a paler-coloured point. The seeds become coated with mucilage when they are soaked in water, and the seed-coats can then easily be removed, revealing two folded greenish-yellow and oily cotyledons which embrace the small radicle. No endosperm is present. The seeds are inodorous even when powdered, but a strong pungent odour is developed when the powder is moistened with water, owing to the formation of volatile oil of mustard. The bitterness perceived when the seeds are first tasted is probably due to sinigrin, and is followed immediately by extreme pungency, due to the volatile oil formed. The volatile oil of mustard (s.g. 1·018 to 1·030) is colourless or pale yellow, with an intensely penetrating odour and a very acrid taste. It contains from 95 to 99 per cent. of allyl isothiocyanate, to which the high specific gravity of the oil is due. When applied to the skin, the oil produces almost immediate vesication. It distils between 147° and 152° C., and the absence of ethylic alcohol or petroleum, which may be present as adulterants, is proved by the first and last portions of the distillate having the same specific gravity as the original oil.

The only seeds resembling those of black mustard are colchicum seeds, which are larger, rougher, harder, bitter, and not pungent. The epidermal cells of the seed-coat of black mustard seeds contain much less mucilage than those of white mustard seeds, but the cotyledons of the black mustard seeds contain from 31 to 33 per cent. of fixed oil (s.g. 0·915 to 0·920), which consists of the glycerides of oleic, stearic, erucic or brassic, and behenic acids. The seeds also contain the crystalline glucoside sinigrin (potassium myronate) and the enzyme myrosin. These substances are stored in separate cells, and when they are brought in contact, in the presence of water, the glucoside is hydrolysed by the myrosin, with the formation of 0·5 to 0·75 of the volatile oil of mustard, of which allyl isothiocyanate is the chief constituent. The reaction is represented in the following equation:—

$$\underset{\text{Sinigrin}}{C_{10}H_{16}NS_2KO_9} + \underset{\text{Water}}{H_2O} = \underset{\substack{\text{Allyl}\\ \text{Isothiocyanate}}}{CSNC_3H_5} + \underset{\text{Dextrose}}{C_6H_{12}O_6} + \underset{\substack{\text{Potassium}\\ \text{Acid Sulphate}}}{KHSO_4}$$

In addition to the volatile oil, allyl isothiocyanate contains small and variable amounts of allyl cyanide, carbon bisulphide, and probably of the isomeric allyl thiocyanate. If the seeds be first subjected to a temperature exceeding 70° C., no fermentation takes place, because the myrosin is coagulated by the heat and cannot then act upon the sinigrin.

SPIGELIA.

Indian Pink; Pink Root.

THE rhizome and rootlets, or the entire plant, of the Carolina pink, *Spigelia marilandica*, Linné (N.O. Loganiaceæ), a native of the southern United States. It is an herbaceous perennial plant, from 30 to 50 cm. high, with a smooth simple stem, which is rounded below, quadrangular above, and bears a few opposite and sessile ovate-lanceolate leaves, about 7·5 cm. long, acuminate at the apex, and tapering towards the base. The stem sometimes terminates in a spike of brilliant red flowers. The entire plant is collected in the autumn and dried, the rhizomes and rootlets being separated from the aerial parts of the plant, or several entire plants are made into a bundle and tied. The drug possesses poisonous properties, similar to those of gelsemium, and is used as an anthelmintic, being employed usually in the form of powder or infusion.

Indian pink rhizome is 5 cm. or more in length, and 2 or 3 mm. thick. It is dark brown externally, tortuous, and knotty, with numerous slender wiry rootlets attached, while it bears on the upper side short branches marked with the cup-shaped scars of the stems of former years. Internally the rhizome has a whitish wood, and a dark-coloured or decayed pith. The rootlets have a thick bark, and are about 10 cm. long, thin, brittle, and lighter coloured than the rhizome. The drug has a somewhat aromatic odour, and a sweetish but bitter and pungent taste.

The rhizome of *Phlox Carolina*, Linné (N.O. Polemoniaceæ), is also known as Carolina pink, but is smoother and lacks the cup-shaped scars, while the rootlets are straighter, thicker, and less wiry than those of Indian pink. The chief constituents of Indian pink are an acrid, bitter substance, soluble in water or alcohol, but insoluble in ether, and a poisonous alkaloid named spigeline; other constituents are volatile oil, resin, tannin, wax, fat, and gum.

STAPHISAGRIÆ SEMINA.

Stavesacre Seeds.

The dried ripe seeds of *Delphinium Staphisagria*, Linné (N.O. Ranunculaceæ), a plant indigenous to Asia Minor and Southern Europe, and cultivated in France and Italy. It is a stout erect herb, and produces fruits consisting of three follicles or carpels, which open by a ventral suture to which the closely packed seeds are attached. The seeds are collected when ripe, and dried. The endosperm of the seed contains a fixed oil which acts as a parasiticide; the oil is extracted from the seeds in the preparation of Unguentum Staphisagriæ (1 in 5).

Stavesacre seeds are blackish-brown when fresh, but become dull greyish-brown and dusty on keeping. The dried seeds are about 6 mm. long, rather less in breadth, and irregularly triangular or obscurely quadrangular in shape, one side being arched or curved outwards, while the others are nearly flat or depressed. The testa or seed-coat bears reticulate ridges which give it a wrinkled appearance, and is deeply pitted, the characteristic markings becoming more evident when the surface is freed from the greyish dust which masks the dark brown colour of the seed. When examined with a lens, the elevations and depressions on the seed are seen to be covered with minute papillæ. One end of the seed, near which the hilum is visible as a narrow line, is usually more pointed than the other. If a seed be soaked in water and cut transversely just below the hilum, the minute embryo may be found imbedded in the large, soft, whitish or yellowish oily endosperm. The drug has no marked odour, and the seed-coat is nearly tasteless, but the endosperm has a nauseous, bitter, and acrid taste.

The chief constituents of stavesacre seeds are from 20 to 25 per cent. of fixed oil, and about 1 per cent. of alkaloidal matter which consists chiefly of the bitter, acrid, crystalline alkaloid delphinine, the amorphous alkaloid delphinoidine, which resembles delphinine in its physiological action, and a second crystalline alkaloid named delphisine, which is identical in composition with delphinine and assumes the same crystalline form. An amorphous mixture of the three bases has been named staphisagrine. The seeds also contain traces of volatile oil, proteids, and mucilage.

STRAMONII FOLIA.

Stramonium Leaves.

The dried leaves of the thorn apple, *Datura Stramonium*, Linné (N.O. Solanaceæ), a native of Asia, which is very common on waste ground in temperate and warmer regions. The plant is a large bushy annual, and is cultivated in England, as well as in Germany, France, and Hungary, whence the supply of the drug is derived largely. The leaves may be collected at any time, from the appearance of the flowers till the autumnal frosts, and are used in the dried state. Very young leaves are covered with stout curved hairs, which fall off as growth proceeds, the full-grown leaves being smooth and destitute of hairs (glabrous), or nearly so. They possess antispasmodic and sedative properties, and are much used in asthma, in the form of cigarettes and smoking mixtures. They are also used in the preparation of Tinctura Stramonii (1 in 5).

Stramonium leaves are ovate, unequal at the base, and stalked (petiolate), with a wavy, coarsely toothed (sinuate-dentate) margin, and gradually diminishing (acuminate) apex. They vary in length from 10 to 15 cm., are dark greyish-green in colour and minutely wrinkled on the upper surface, but paler beneath. When dried they are usually much shrivelled and wrinkled. The midrib is distinct on the under surface, and the lateral veins leave it at an angle of about forty-five degrees, dividing near the margin into two branches, one of which passes into the pointed lobe of the leaf, whilst the second unites with other veins, the connection forming a reticulation (anastomosis). The cells of the mesophyll or interior ground-tissue of the leaf contain cluster-crystals of calcium oxalate, which can be seen on submitting a transverse section to microscopical examination. The fresh leaves have an unpleasant bitter taste and a fetid, narcotic odour, which disappears to a considerable extent upon drying.

The distinctive characters of stramonium leaves are their sinuate-dentate outline, the angle between the midrib and the lateral veins, the presence of cluster-crystals of calcium oxalate in the mesophyll, and the minutely wrinkled surface of the leaves when dried. It is necessary to distinguish them carefully from belladonna, hyoscyamus, and digitalis leaves. Belladonna leaves are almost inodorous when dried, and have whitish raised points—consisting of pulverulent crystals of calcium oxalate—on the surface. Hyoscyamus leaves are hairy, and contain prismatic crystals of calcium oxalate. Digitalis leaves are also hairy, but contain no crystals of calcium oxalate. The chief constituents of stramonium leaves are the two isomeric, bitter, crystalline alkaloids, hyoscyamine and atropine, of which they contain on an average about 0·3 per cent., and the amorphous base, hyoscine or scopolamine. Other constituents of the leaves are gum, resin, albumin, and calcium oxalate. Hyoscyamine exists in the leaves in larger proportion than atropine, the latter base being formed chiefly from hyoscyamine during the process of extraction. A mixture of hyoscyamine and atropine has been named daturine.

STRAMONII SEMINA.

Stramonium Seeds.

THE dried ripe seeds of the thorn apple, *Datura Stramonium*, Linné (N.O. Solanaceæ), which is a native of Asia, but cultivated in England, Germany, France, and Hungary. The seeds are contained in large numbers in the fleshy, erect, roundish-ovate, four-valved capsules, which are thickly covered with spines, and open at the summit when ripe, the four valves separating from apex to base (septifragal dehiscence). The seeds are collected when ripe, and dried. They possess antispasmodic and sedative properties resembling those of belladonna, and are used in the preparation of Extractum Stramonii.

Stramonium seeds are dull dark-brown or nearly black in colour, about 3 to 4 mm. long, kidney-shaped (reniform), and flattened. The hilum is distinct, and appears as a light spot on the concave or flattened edge. The seed-coat is marked with reticulate depressions and minute pits, the latter being seen on the ridges as well as in the depressions, when the seed is examined by the aid of a lens. On splitting a seed longitudinally, a curved embryo can be distinguished, imbedded in a white oily endosperm; in a transverse section the embryo is seen to be rounded or cylindrical, and, owing to its curved shape, it is usually cut at two or three different points in making the section. The seeds have no marked odour, but they give off a disagreeable odour when crushed. They also have a slightly bitter taste.

The size, shape, and colour of stramonium seeds are distinctive, as also are their reticulated and pitted surface, and the curved embryo imbedded in the oily endosperm. The chief constituents of the seeds are the alkaloids hyoscyamine, atropine, and hyoscine or scopolamine, the total alkaloid present amounting to about 0·4 per cent., of which the major portion is hyoscyamine. Other constituents of the seeds are resin, mucilage, proteids, and about 20 to 25 per cent. of a fixed oil which has a slight odour of valerianic acid, and contains daturic acid, a homologue of palmitic and stearic acids.

STROPHANTHI SEMINA.

Strophanthus Seeds.

THE dried ripe seeds of *Strophanthus Kombé*, Oliver (N.O. Apocynaceæ), and other species, freed from their awns. They are large climbing plants indigenous to eastern tropical Africa, being found especially in the valley of the Shiré river, the Nyanza district, and the Kombé country. The seeds are imported chiefly from Somba, Quilimane, Inhambane, and other East African ports, and are known in commerce as "Kombé" seeds. The fruit is a pod consisting of two follicles, about 30 cm. long and 2·5 cm. broad, which are slightly narrowed at the base and taper towards the apex. The pods are collected by the natives when they ripen in June, and are deprived of their husks, consisting of the epicarp and fleshy mesocarp, before drying, so that the smooth tawny-coloured pods which appear in commerce consist simply of the leathery endocarp enclosing the ripe seeds, packed closely together. Each seed, at its apex, has a long plume (awn) of white silky hairs, about 5 cm. long, attached by a slender brittle extension of the seed-coat, the entire seed measuring from 9 to 12 cm. in length. The seeds must be freed from their awns before use, and are usually separated from the fruits and deprived of their awns before exportation. They are intensely poisonous, and an extract prepared from the seeds is used in Africa as an arrow poison. The drug acts as a cardiac tonic, and is used in the form of Extractum Strophanthi and Tinctura Strophanthi (1 in 40).

Strophanthus seeds vary considerably in shape and size. They are usually more or less elongate-oval in shape, gradually diminishing (acuminate) towards the apex, and also narrowing towards the blunt (obtuse) or rounded base. When deprived of their awns, they measure about 15 mm. in length and 4 mm. in breadth. They vary in colour from greyish-green to greenish-fawn, and are covered with stiff (not "silky") silvery hairs, which lie flat (appressed) on the seeds. The latter are flattened and have a longitudinal ridge which extends half or two-thirds the length of the seed, and terminates at the apex in a broken point, indicating where the awn has been broken off. The scar of the funicle appears at some point on this ridge as a small white dot. The nucleus or embryo of the seed is white and oily, consisting of two straight cotyledons, joined by a well-marked radicle, and surrounded by a thin endosperm or albumen, as may be seen in a transverse section. The seed-coats and endosperm are longitudinally ridged and grooved, the grooves in the seed-coats being filled up with the appressed epidermal hairs. Strong sulphuric acid colours a transverse section of a seed dark green, owing to the presence of strophanthin, the action being constant in the case of the endosperm, but variable as regards the embryo; thus, the cotyledons may exhibit varying shades of green, or green mottled with red, or one cotyledon may be coloured green and the other red, the red coloration being due to the presence of sugar. The seeds have a faint unpleasant odour, and an intensely bitter taste.

The seeds of different species of *Strophanthus* are difficult to distinguish from one another, and seeds from the same pod may differ considerably in shape, size, and colour. No seeds have yet been obtained which are known definitely to have been collected from *Strophanthus Kombé*, the "Kombé" seeds of commerce being probably derived from several species of *Strophanthus*. The seeds of *S. hispidus*, De Candolle, give a green colour with sulphuric acid, but they have a distinctly brown colour, and bear but few brownish, usually short hairs, and do not possess the silvery appearance which characterises the official seeds. Other species of *Strophanthus* produce seeds which differ in colour, etc., from "Kombé" seeds, and their transverse sections are usually coloured red instead of green by sulphuric acid. The seeds of the white or woolly strophanthus, *S. Nicholsoni*, Holmes, are covered with white hairs, and those of *S. gratus*, Franchet, are brown, glabrous, and minutely pitted. The colour of the genuine seeds varies with the position of the observer with regard to the seed and to the incident light, owing to the disposition of the stiff silvery hairs, which point upwards and are arranged in longitudinal rows; when the hairs are removed by scraping, the seeds appear green or brownish-green. The chief constituent of strophanthus seeds is the exceedingly poisonous, bitter, crystalline glucoside strophanthin (m.p. 170° C.), of which they may contain as much as 3 per cent., chiefly in the endosperm. It gives a green coloration with strong sulphuric acid, and is converted into strophanthobiose methyl-ester and strophanthidin (m.p. 169° to 170° C.) on hydrolysis. Other constituents of the seeds are choline, trigonelline, kombic acid, resin, mucilage, and fixed oil. Pseudo-strophanthin (m.p. 179° C.), a glucoside found in the seeds of some species of *Strophanthus*, is more active than strophanthin and yields saccharobiose and pseudo-strophanthidin (m.p. 195° C.) on hydrolysis. It gives a red coloration with sulphuric acid, but a similar colour may be produced by sugar present in the seeds. Pseudo-strophanthin is probably identical with the intensely poisonous glucoside named ouabain, which has been extracted from some varieties of strophanthus seed.

STYRAX PRÆPARATUS.

Prepared Storax; Levant Storax.

A BALSAM obtained from the trunk of *Liquidambar orientalis*, Miller (N.O. Hamamelidaceæ), and purified by solution in ethylic alcohol, filtration, and evaporation of the solvent. The tree yielding the drug is a native of Asia Minor, where it is found in forests. The balsam is a pathological product secreted in reservoirs (schizo-lysigenous ducts) formed by the splitting of the common walls of the cells of the young wood, and by the breaking down of surrounding tissues when the bark of the tree is wounded, secretion being induced by making incisions in the bark or by beating it gently. The secretion cavities become filled with the balsam formed by the transformation of part of the tissues, and the viscid liquid subsequently exudes into the wounded bark, which is removed when saturated. As the balsam is found in the inner bark only, the outer bark is first separated from the trunk and rejected; the inner bark is then removed by scraping, and pressed until the balsam exudes, or it is boiled with sea-water and then pressed. In the former case a further supply of balsam may be obtained from the bark, after expression, by boiling it with water and skimming off the resin which separates, or by pouring boiling water upon it, and again applying pressure. The crude balsam is an opaque, greyish, viscid liquid, containing from 10 to 25 per cent. or more of water, together with fragments of bark and other vegetable débris, while inorganic impurities are derived frequently from the sea-water used in extracting the drug. The portion of the crude balsam (60 to 80 per cent.) which is soluble in alcohol is used for medicinal purposes. It possesses stimulant, disinfectant, and expectorant properties, and is used as an ingredient of Tinctura Benzoini Composita (1½ in 20).

Prepared storax is a semi-transparent, brownish-yellow semi-liquid (s.g. 1·109 to 1·114 at 100° C.), with a strong and agreeable odour, due to the presence of styrene and other aromatic principles, and a sharp, pungent, balsamic taste, which is due chiefly to styrene and cinnamic acid. It should be completely soluble in 90 per cent. alcohol, ether, chloroform, carbon bisulphide, glacial acetic acid, and in most essential oils. When a test-tube containing prepared storax is placed in boiling water, the contents should become more fluid; whilst, if the drug has not been properly purified and contains water, moisture will be given off. An odour resembling that of essential oil of bitter almonds is evolved on boiling prepared storax with solution of potassium bichromate and sulphuric acid, owing to the formation of benzaldehyde as a product of the oxidation of cinnamic acid and its compounds, benzoic acid being also formed during the operation. Prepared storax should be practically free from moisture and leave no ash on incineration.

The absence of turpentine, fixed oils, or added resin is indicated by the formation of only a slight froth when prepared storax is mixed with an equal volume of 90 per cent. alcohol and shaken with ammonia. The chief constituents of Levant storax are about 20 per cent. of cinnamic acid, and two isomeric resin alcohols—α-storesinol (m.p. 160°–168°) and β-storesinol (m.p. 140°–145°)—which are present both free and in the form of cinnamic esters. Other constituents of storax are the cinnamates of cinnamyl (styracin), phenylpropyl, benzyl, and ethyl, together with vanillin, ethylvanillin, phenyl-ethylene (styrene, styrol, or cinnamene), and from 0·5 to 1 per cent. of volatile oil (s.g. 0·89 to 1·1). American storax, from *L. Styraciflua*, contains free cinnamic acid, vanillin, styresinol (a substance closely resembling storesinol) and its cinnamic ester, styracin, cinnamic phenyl-propyl ester, styrol, and a volatile oil which differs from that of Levant storax in being dextro-rotatory.

Styrax Calamita consists of the bark from which storax has been extracted, coarsely powdered and mixed with some liquid storax.

SUCCINUM.

Amber.

A FOSSIL resinous exudation from *Pinus succinifer*, Conwentz (N.O. Coniferæ), and other extinct species. It occurs in alluvial deposits in different parts of the world, but is obtained chiefly from Prussia, where it is frequently found on the Baltic coast. Baltic amber or succinite is seen generally in small detached masses, but it may occur in pieces weighing several pounds. The trees yielding it contained schizogenous secretion ducts filled with oleoresin, which was produced in large quantities and became hardened by exposure. The resin was subsequently buried in earthy deposits, from which it is recovered chiefly by mining, though a certain quantity of amber is washed by the sea from the exposed surface of the stratum containing it, and thrown up by the waves on the shore. The resin possesses antiseptic and slightly stimulant properties, and is sometimes given in the form of tincture (1 in 16); it is also used in the preparation of oil of amber, which is applied externally in the form of liniment (1 in 3) as a stimulant and rubefacient.

Amber is a hard, brittle solid (s.g. 1·07), occurring in pieces of varying size and shape, which usually have rounded edges and break with a lustrous conchoidal fracture. The masses are yellow, yellowish-brown, or yellowish-red in colour, and may be covered with a dark crust. Internally, amber is transparent, translucent, or opaque, the opaque variety being known as cloudy amber. The resin is tasteless, but it gives off a slight characteristic odour when warmed. It is partially soluble in alcohol, ether, or chloroform, and melts at 280° to 290° C., being then decomposed. It is distinguished from other resins by its peculiar odour when heated, as well as by differences in colour and fracture.

The chief constituents of amber are two resins, the portion soluble in alcohol (25 per cent.) consisting principally of succino-abietic acid, a small portion of which is combined with borneol. Succinin, the resin which is not soluble in alcohol, is a compound of succinic acid with succino-resinol, a resin alcohol. Other constituents of amber are traces of sulphur, silica, lime, and alumina. When submitted to destructive distillation, amber yields a dark tarry oil which can be obtained by re-distillation as a transparent, pale yellow or brownish-yellow, limpid liquid. Oil of amber thus obtained possesses a characteristic disagreeable odour and a burning, acrid taste. It is soluble in alcohol (1 in 8), ether, chloroform, carbon bisulphide, and fixed oils. On exposure to light and air, it tends to darken in colour and become solid. The oil of amber is sometimes adulterated with oil of turpentine, and is not often seen in the pure state, the commercial article being frequently obtained by the destructive distillation of other resins, such as copal and dammar.

SUMBUL RADIX.

Sumbul Root; Musk Root.

The dried transverse slices of the root of *Ferula Sumbul*, Hooker filius (N.O. Umbelliferæ), a plant which grows in Turkestan and produces a large fleshy, somewhat napiform root, with a bristly rootstock or erect rhizome. The root gives off numerous twisted rootlets in the early spring, and increases in size every year, retaining its more or less oval form until it has accumulated a sufficient reserve of nutritive materials to enable it to send up a large fruiting stem. As found in commerce and used in medicine, the drug occurs in dried transverse slices of varying size, many of which are parts of rootstocks or erect rhizomes rather than roots, whilst others appear to be derived from a plant—probably *F. suaveolens*—with a more cylindrical root than that of *F. Sumbul*, having a firmer substance and being branched near the apex. The drug is imported from Russia. It acts as a nervine tonic, carminative, and antispasmodic, and is used chiefly in the form of Tinctura Sumbul (1 in 10).

Sumbul root occurs in extremely light, more or less cylindrical pieces, which vary much in size, but are usually from 2·5 to 7·5 cm. in diameter, and from 18 to 25 mm. or more in thickness. The pieces are covered externally with a thin, tough, papery, dusky-brown, transversely wrinkled cork, which can be stripped off easily. Pieces derived from the crown or rootstock are also beset with short bristly fibres—the remains of the fibro-vascular bundles of leaves. The fibres, or scars left by detached fibres, are arranged in encircling lines which follow the course of the regular transverse wrinkles in the bark. Internally the drug is spongy, coarsely fibrous, and of a dirty yellowish colour, mottled with whitish patches and often with blackish spots of exuded resin. A transverse section of a small piece of rootstock shows a pale bark enclosing a ring of narrow, yellow, finely porous wood-bundles, and a central mass of parenchymatous tissue through which vascular bundles pass in different directions. The fibrous nature of the drug appears to be due to this arrangement of the vascular bundles, which is usually less marked in larger pieces of rootstock. The drug has a strong musk-like odour, and a bitter aromatic taste.

The distinctive characters of sumbul root are the transverse wrinkles in the cork, from which the short fibres proceed, the musky odour, and the fibrous spongy interior, with its whitish spots. The chief constituents of the drug are a volatile oil and a resin with a musk-like odour; other constituents of the root are fixed oil, angelic (sumbulic), valerianic, and methyl-crotonic acids, a bitter principle, starch, and sugar. When submitted to dry distillation the root yields umbelliferone. The volatile oil (s.g. 0·954 to 0·964), of which the drug yields from 0·2 to 0·4 per cent., is viscous, dark-coloured, and has a musk-like odour like that of the resin.

TABACI FOLIA.

Tobacco Leaves.

The leaves of *Nicotiana Tabacum*, Linné (N.O. Solanaceæ), a plant which is indigenous to America, and cultivated largely in temperate and sub-tropical countries. It is an annual herb with an erect unbranched stem which attains a height of 1 to 2 m., and bears numerous alternate, shortly petiolate or sessile leaves, the lowest of which may exceed 50 cm. in length. Both stem and leaves are clothed with long glandular hairs which secrete a viscid resinous substance. In Virginia the young shoots produced from seeds thickly sown in beds are transplanted into the fields during May, and, during the period of growth, the development of leaves is promoted by removing the tops of the plants so as to prevent the production of flowers and seeds. During August the ripe plants are cut off above the large fibrous roots and dried under cover in houses where they are exposed to a considerable degree of heat. After the curing process is complete, the leaves are stripped from the stems, tied in bundles, and packed in hogsheads for export. The drug is a powerful depressant, and has a sedative and anti-spasmodic action when smoked. It is sometimes used in the form of an enema (20 grains to 8 fluid ounces).

Tobacco leaves, as they occur in commerce, measure up to 50 cm. or more in length, vary in shape from oval to ovate-lanceolate, and are of a yellowish-brown colour. They are acute, entire, friable, and covered with glandular hairs. The fresh leaves have a peculiar heavy odour, but that is changed on drying, as the result of fermentation, the strong, penetrating, narcotic odour of the dried leaves differing considerably from that of the fresh leaves. The dried leaves also have a nauseous, bitter, and acrid taste.

The leaves of *Nicotiana Tabacum* are distinguished from those of other species and varieties by their shape, but the product of the same species may differ considerably, according to the soil and mode of cultivation, and several varieties of tobacco are recognised in commerce. The chief constituent of tobacco is the extremely poisonous volatile liquid alkaloid nicotine, which may be present to the extent of 5 per cent. or more. Other constituents are resin, gum, salts, and a scaly volatile substance named nicotianin, which has been variously described as a salt of nicotine, a camphoraceous compound, and a fatty acid contaminated with a little volatile oil.

TAMARINDUS.

Tamarinds.

THE fruits of *Tamarindus indica*, Linné (N.O. Leguminosæ), freed from the brittle outer part of the pericarp and preserved with sugar. The tamarind tree is indigenous to tropical Africa, and is cultivated throughout India and the West Indies. The fruit is a legume with a rough, brittle, brownish shell or epicarp, which is easily broken and separated from the juicy acid mesocarp or pulp. The mesocarp is traversed by a number of stout, branching, fibro-vascular bundles, which pass from the stalk towards the apex of the fruit. The endocarp is a tough, leathery membrane, which encloses the polished brown, flattened, four-sided seeds in separate cells. The preserved fruits are imported chiefly from the West Indies, where they are prepared by collecting them when ripe, removing the epicarps, packing the rest of the fruits in layers in barrels, and pouring hot syrup over them as a preservative; or, the prepared fruits may be packed in stone jars, with alternate layers of powdered sugar. The preserved fruits are refrigerant and slightly laxative. They are used in the preparation of Confectio Sennæ, and are sometimes infused with water to form a cooling drink, or given with milk in the form of tamarind whey (1 in 40).

Tamarinds occur usually as a reddish-brown, moist, sugary mass, containing strong branched fibres (fibro-vascular bundles), and shining reddish-brown seeds enclosed in cells formed by the tough membranous endocarp. The pulp has an agreeable odour, and a slightly acid, refreshing taste. If the fruits have been preserved in copper vessels, traces of copper may be present in the pulp, and a reddish deposit will then be formed upon a piece of bright iron left for thirty minutes in contact with the pulp, after diluting the latter somewhat with water. The presence of copper may also be detected by applying the usual tests for that metal.

Though the tamarinds of commerce are chiefly of West Indian origin, the fruits are prepared and packed in a similar manner in India, but the Indian fruit is more frequently prepared for market by simply stripping off the epicarps and pressing the pulpy mass into firm black cakes, without the addition of sugar. The cakes have a strongly acid taste, but scarcely any odour. The chief constituents of tamarinds are about 10 per cent. of citric and tartaric acids; other ingredients of the fruit are traces of malic and acetic acids, and from 3 to 5 per cent. of potassium bitartrate, together with sugar and pectin. The testa of the seeds contains tannin.

TARAXACI RADIX.

Taraxacum Root.

The fresh and the dried roots of the common dandelion, *Taraxacum officinale*, Wiggers (N.O. Compositæ), an herbaceous plant which is distributed widely throughout Europe, Asia, and North America. All parts of the plant contain a somewhat bitter milky juice (latex), in vessels which are arranged in a reticulate manner (anastomosed), but the root is the only part of the plant used for medicinal purposes. It is perennial, tapering, and passes imperceptibly, towards its upper part, into a rootstock or erect rhizome, which may be simple or branched. The root is traversed vertically by ten to twenty concentric rings of anastomosing laticiferous vessels, and is most active in the autumn, at which season of the year it is usually collected. The drug is a mild laxative and bitter tonic. The fresh root is used in the preparation of Extractum Taraxaci and Succus Taraxaci, while the dried root is used in preparing Extractum Taraxaci Liquidum (1 in 1).

Taraxacum root, when fresh, is frequently 30 cm. or more in length, and 12 mm. or more in diameter. It is smooth and yellowish - brown externally, whitish and fleshy within, and breaks readily with a short fracture ; a bitter milky juice (latex) exudes from the fractured surface, and is seen, on careful examination of a transverse section, to proceed from faint concentric rings of tissue in which the anastomosing laticiferous vessels are situated. The dried root is dark brown or nearly black, more or less shrivelled, and deeply wrinkled longitudinally. The root tapers but little at its lower extremity, and is often divided into several branches at the opposite extremity, where it merges into the rootstock. The branches, or the rootstock itself, may be crowned with the short remains of leaves, near the point of insertion of which brownish hairs can be detected. The fracture of the dried root is short, and the fractured surface, like that of the fresh root, shows a small, yellow, porous, central wood, surrounded by a very thick whitish bark or cortex, in which numerous irregular, brownish, concentric rings of laticiferous tissue are visible. The dried root is hygroscopic, and becomes tough when slightly moist. It possesses a bitter taste, but neither the fresh nor the dried root has any odour.

Dried taraxacum root somewhat resembles pellitory and liquorice roots, but pellitory root differs in having oil-glands and a large radiate wood with conspicuous medullary rays, while liquorice root also has a large radiate wood. The chief constituent of taraxacum root is a crystalline bitter substance named taraxacin, of which the yield varies in roots collected at different seasons ; it is soluble in water or alcohol, and decomposes very readily. Other constituents of the root are taraxacerin—an acrid wax-like body which is insoluble in water but soluble in alcohol, pectin, resin, variable quantities of sugar, inulin — a substance resembling starch, and lævulin — a substance resembling dextrin and having a similar composition to inulin, but very soluble in water, and devoid of rotatory power. Taraxacum root contains no starch, but early in the year it contains much uncrystallisable sugar and lævulin, which diminish in quantity during the summer and become replaced in the autumn by inulin, of which the root may contain as much as 24 per cent. In the fresh root the inulin present is dissolved in the cell-sap, but in the dry root it occurs as an amorphous, transparent solid, which is only slightly soluble in cold water.

TEREBINTHINA CANADENSIS.

Canada Turpentine; Canada Balsam.

The oleo-resin obtained from the balsam fir, *Abies balsamea*, Miller (N.O. Coniferæ), a native of Canada, Nova Scotia, and the northern and north-western United States. The drug is collected chiefly in the Laurentine Hills, in the province of Quebec. The bark of the tree contains schizogenous ducts in which the oleo-resin is secreted, and cavities are also formed, in which the liquid accumulates, producing pustules or swellings on the trunk and larger branches of the tree. The oleo-resin is collected by puncturing the pustules with the pointed lip or spout of a small iron can, into which the viscid liquid exudes slowly. It possesses similar medicinal properties to oil of turpentine, but is seldom given internally. The oleo-resin is an ingredient of Collodium Flexile.

Canada turpentine is a pale yellow, transparent, viscid liquid, and often exhibits a slight greenish fluorescence. It is of the consistence of thin honey when fresh, but becomes more viscid on keeping, and on exposure to the air gradually dries to a hard, transparent, varnish-like resin, which shows no signs of granular or crystalline structure. It is soluble in all proportions of benzene, chloroform, or ether, and is also freely soluble in oil of turpentine, but less soluble in absolute alcohol (1 in 3) or 90 per cent. alcohol (1 in 1). The oleo-resin is dextro-rotatory, though it contains a lævo-rotatory volatile oil, to which its peculiar, but agreeable, terebinthinate odour is due. The slightly bitter and feebly acrid taste of the oleo-resin are due to a bitter principle and resin. When mixed with about one-sixth its weight of magnesia moistened with a little water, the oleo-resin should solidify gradually, thus showing the absence of other turpentines, but as the solidification depends simply upon the formation of magnesium salts of the resin acids, it will occur in the case of all coniferous resins.

The chief constituents of Canada turpentine are about 63 per cent. of acid resin, from 11 to 12 per cent. of an indifferent resin named canadoresene, and from 23 to 24 per cent. of a volatile oil, which consists chiefly of lævo-pinene. Rather more than half of the resin it contains is soluble in alcohol, while the remainder is sparingly soluble. Other constituents are a caoutchouc-like substance resembling the resin soluble in alcohol, bitter principles and other extractive matter, and traces of acetic and succinic acids. The term "balsam" is incorrectly applied to Canada turpentine, as it should strictly be limited to oleo-resins which contain or yield benzoic or cinnamic acid. The freedom from crystallisation of Canada turpentine renders it particularly useful as a medium for preserving microscopical preparations, for which purpose the oleo-resin is usually heated until it ceases to lose weight, and the residue, after cooling, dissolved in benzene, oil of turpentine, xylol, or other suitable solvent.

TEREBINTHINÆ OLEUM.

Oil of Turpentine.

THE oil distilled by the aid of steam from the oleo-resin (turpentine) obtained from *Pinus sylvestris*, Linné (N.O. Coniferæ), and other species of *Pinus*, and rectified if necessary. The trees yielding the oleo-resin grow in America, France, Germany, Russia, and elsewhere, but most of the oil of turpentine used is imported from the United States, the only other kind of commercial importance being French oil. The oleo-resin is contained in a branching system of schizogenous secretion ducts in the wood, and exudes when the ducts are punctured. In order to start the flow of crude turpentine, the trees are deprived of their bark and part of the young wood, to the height of about a metre, and triangular incisions are made in the older wood; from these incisions the oleo-resin flows (in America) into deep cavities cut in the trunks of the trees near their base, or (in France) into suitable vessels placed beneath the lowest incisions. Further strips of bark are removed as required, and fresh incisions are made in the wood, from time to time, so as to increase the flow of liquid. The crude turpentine is distilled with water in copper stills set in brick furnaces. The oil of turpentine passes over with the water, from which it is subsequently separated, and the resin (colophony) remains in the stills. About 20 per cent. of oil is yielded by the first year's yield of crude turpentine, but the proportion of oil diminishes and that of resin increases year by year, very little oil being obtained from the oleoresin yielded by trees after five or six years, while the resin is then very dark in colour and of inferior quality.

Oil of turpentine is a limpid, colourless liquid (s.g. 0·855 to 0·880), with a strong peculiar odour which varies in the different kinds of oil, and a pungent, somewhat bitter taste. It is soluble in 90 per cent. alcohol (1 in 6½), and in all proportions of absolute alcohol, carbon bisulphide, chloroform, ether, or glacial acetic acid. Since the oil of turpentine absorbs oxygen when exposed to the air, becoming thicker and yellowish owing to the formation of resin, it usually requires to be rectified by re-distillation with water when intended for medicinal purposes. Purification of the oil may also be effected by means of lime water or a solution of potassium hydroxide, any free acid being thus neutralised and removed, or the resinified portion of the oil may be removed by agitation with alcohol and water alternately. The oil should begin to boil below 160° C. and distil almost entirely below 180° C., little or no residue remaining. From 75 to 80 per cent. passes over between 155° and 162° C., the mercury rising rapidly above the latter point and a soft colophony-like resin being left in the still. Petroleum spirit, resin spirit, and the volatile portions of shale oil and coal tar have been used as adulterants of oil of turpentine, but the temperature of distillation rises gradually in the case of an oil so adulterated, and, if the adulteration be at all excessive, no large fractions are obtained at any definite temperature. The absence of petroleum, paraffin oils, or resin is shown by the oil leaving only a very slight residue when evaporated on a water-bath. Ordinary petroleum spirit lowers the flash point of oil of turpentine, as little as 1 per cent. of the adulterant lowering the flash point by about six degrees Centigrade.

American oil of turpentine (s.g. 0·858 to 0·877), the kind most frequently used in this country, is chiefly the product of *P. australis* and *P. Tæda.* It is almost invariably dextro-rotatory (+10° to +15°), though it may be slightly lævo-rotatory, as it contains both dextro- and lævo-rotatory terpenes, and the latter is sometimes in excess. French oil of turpentine (s.g. 0·859 to 0·876) is chiefly obtained from *P. maritima* or *P. pinaster*, and is always strongly lævo-rotatory (−18° to −40°). The chief constituents of oil of turpentine are two physically isomeric bodies—dextro- and lævo-pinene. Other constituents of the oil are resin acids, camphene, and fenchene, whilst dipentene—the optically inactive form of limonene—and polymeric terpenes may occur, as the result of the action of the acids present on pinene. The oil may also contain, as oxidation products, traces of formic, acetic, and camphoric acids, as well as camphoric aldehyde, to the presence of which the peculiar odour of "rancid" turpentine is probably due. The American oil consists chiefly of dextro-pinene, with some lævo-camphene, fenchene, and a little dipentene. French oil of turpentine is very similar in composition to American oil, but it consists chiefly of lævo-pinene. Terebene is a mixture of dipentene and other hydrocarbons, obtained by agitating the oil of turpentine with successive quantities of sulphuric acid until it no longer rotates the plane of a ray of polarised light, and then distilling in a current of steam. It may be prepared from either French or American oil of turpentine, but it is doubtful if an optically inactive product can be obtained from the latter. The composition of terebene necessarily varies with the constituents of the oil from which it is prepared, but it has been shown to consist chiefly of dipentene and terpinene, with some cymene (cymol) and camphene.

THEÆ FOLIA.

Tea.

THE dried leaves of *Camellia Thea*, Link (N.O. Ternstrœmiaceæ), an evergreen shrub which has been cultivated from time immemorial in China and Japan, and is now also cultivated in Assam, Ceylon, Java, and elsewhere. The plants are usually from 12 to 24 dcm. high, but are capable of attaining a much greater height in favourable situations. They bear numerous alternate branches, furnished with shining green leaves which, when dried and fermented, possess astringent, tonic, stimulant, and nervine properties. Black tea is prepared by exposing the leaves upon trays until they appear withered, then rolling them by machinery, and subsequently fermenting them by exposure on mats to the air. The colour of the leaves changes from green to yellow, and finally becomes quite dark, probably owing to a change in the tannin present, while the peculiar odour of tea is developed. After fermentation, the leaves are dried, sifted, and sorted. Green tea is prepared by roasting slightly withered leaves in pans over an open fire, then cooling, rolling into balls, and allowing them to ferment. The green colour of the leaves is retained in this process, apparently because the preliminary roasting prevents the change in the tannin which occurs in the preparation of black tea. The drug is used chiefly in the form of infusion, but it is also employed in the preparation of caffeine.

Tea consists of shortly petiolate, lanceolate, or elliptical-oblong leaves, from 5 to 10 cm. long when fully grown, and from 12 to 25 mm. broad. They have an irregularly serrate margin, near which the lateral veins anastomose. The leaves are dark green and covered with silky hairs when young, though glabrous when mature. They are somewhat blunt at the apex, and tapering towards the base. As seen in commerce, the leaves are rolled and of a bluish or blackish colour, with a peculiar but agreeable odour and a pleasantly astringent and bitterish taste. The distinctive characters of tea, as found in commerce, are the rolled leaves, the irregular serration of the margins, and the character of the venation. Other leaves which have been used to adulterate tea differ in shape, venation, and margin.

The commercial value of tea is determined chiefly by the appearance and size of the leaves, the presence of unexpanded leaf-buds (the so-called "tip"), and the taste of the infusion. Tea leaves which have been exhausted are sometimes used to adulterate fresh tea, after being rolled and dried. The chief constituents of tea are from 2·5 to 4·5 per cent. of caffeine (theine) and 10 to 24 per cent. of tannin; other constituents are traces of theobromine and its isomer theophylline, volatile oil, boheic acid, resin, and other plant principles. Caffeine can be extracted from tea by evaporating aqueous infusions from which astringent and colouring matters have first been removed. It is also found in coffee, the dried seeds of *Coffea arabica*, Linné (N.O. Rubiaceæ), which contain 1 to 1·5 per cent., and in guarana (*Paullinia Cupana*), kola nuts (*Cola acuminata*), and Paraguay tea (*Ilex paraguayensis*). When crystallised from aqueous solutions, it contains one molecule of water, and occurs in colourless silky needles, which are soluble in water (1 in 68), 90 per cent. alcohol (1 in 40), or chloroform (1 in 7), and sparingly soluble in ether (1 in 400). Caffeine citrate is prepared by dissolving citric acid in water, and stirring caffeine into the heated solution. The mixture is then evaporated to dryness on a water-bath and the residue reduced to powder, the product being soluble in water (1 in 32), 90 per cent. alcohol (1 in 22), and in a mixture of chloroform with half its volume of 90 per cent. alcohol (1 in 10). Effervescent caffeine citrate is made by granulating a mixture of caffeine citrate, tartaric and citric acids, sodium bicarbonate, and sugar, the finished preparation containing 4 per cent. of caffeine citrate.

THEOBROMATIS SEMINA.

Cacao Seeds.

THE prepared seeds of *Theobroma Cacao*, Linné (N.O. Sterculiacæ), a tree from 4 to 6 metres in height, found native in Mexico, South America, and the West Indies, and cultivated largely in Guayaquil, Venezuela, Mexico, Trinidad, Java, Ceylon, the Philippines, and other tropical countries. It bears an orange or deep-red oblong-ovate pod, 15 to 20 cm. long, with a thick, coriaceous, somewhat ligneous rind, enclosing a scanty, whitish, mucilaginous, sweet acid pulp, in which are imbedded from forty to fifty nearly white, fleshy seeds. When the pods are collected they are opened, and the seeds allowed to ferment, after which they are dried carefully in the sun, becoming dark-coloured in the process, and then constituting the cacao or chocolate nuts of commerce. They possess nutritive and stimulant properties, and yield the oil of theobroma or cacao butter, which is employed largely in making suppositories.

Cacao seeds are about 25 mm. long, and of a flattened ovoid shape. The thin, brittle, reddish or chocolate-brown seed-coat encloses a brown oily kernel, which consists chiefly of two irregularly folded, chocolate-coloured cotyledons. The cotyledons are very brittle, and separate easily into the small, angular, reddish-brown fragments known in commerce as "cocoa nibs." They have a slightly aromatic and bitter, mild, oily taste, with an agreeable odour when bruised or heated. Seeds which have not been fermented before drying are more astringent and bitter, and are of less value than fermented seeds, as are also seeds which have become black whilst drying.

The colour, shape, and bitter oily taste of cacao seeds are distinctive. The chief constituents of the seeds are about 1·5 per cent. of the alkaloid theobromine and 46 per cent. of the solid fat or fixed oil known as oil of theobroma, which consists chiefly of the glycerides of stearic, palmitic, and oleic acids, together with small quantities of the glycerides of arachidic, linolic, and other fatty acids. Other constituents of the seeds are starch, proteids, sugar, and colouring matter. The oil is obtained chiefly as a bye-product in the manufacture of chocolate and cocoa essences. It can be extracted from the crushed seeds, moistened with water, by expression between hot, tinned-iron plates, the heat applied being preferably below that of boiling water. The oil may also be extracted by roasting the seeds slightly and boiling them with water, or by the action of a solvent, such as carbon bisulphide. As seen in commerce, oil of theobroma (s.g. 0·990 to 0·998) occurs in oblong cakes which break with a smooth fracture, and are yellowish-white when fresh, though they become whiter on keeping. The oil has an odour resembling that of cocoa, a bland and agreeable taste, and should be free from rancidity. It softens at 26·6° C., and melts between 31° and 34° C. The absence of paraffin, wax, stearin, coco-nut oil, tallow, suet, or other fats which may be used as adulterants of oil of theobroma, is proved by dissolving 1 gramme of the oil in 3 c.c. of ether, and exposing the solution to cold. If the oil be pure, the liquid will not become turbid nor deposit a granular mass in less than three minutes, when cooled to 0° C.; whilst, after congelation, a clear solution should result on heating the mass to 15·5° C.

THUS AMERICANUM.

Gum Thus; American Frankincense.

The concrete oleo-resin which is scraped off the trunks of *Pinus palustris,* Miller (N.O. Coniferæ), and *P. Tæda,* Linné. It consists of the last portions of the crude turpentine which flows from incisions made in the trees, as explained in the notes on oil of turpentine. As the flow of liquid gradually ceases, the exuded oleo-resin suffers loss of oil by evaporation, and forms a yellowish-white incrustation on the trunk of the tree. The concrete oleo-resin is removed by scraping, and exported under the name of common or American frankincense, being also known as "scrape" or "gum thus." A similar product obtained in France from *P. maritima* is known as "galipot," but the commercial article is imported chiefly from America. Common frankincense must not be confused with olibanum or true frankincense, obtained from *Boswellia Carterii*, Birdwood (N.O. Burseraceæ), and other species of *Boswellia*, which grow in Southern Arabia and Somaliland. It is used externally for the same purposes as common resin, and is an ingredient of Emplastrum Picis.

American or common frankincense occurs when fresh as a rather soft, pale yellow, opaque, tough solid, with a terebinthinate odour. It is mixed as a rule with pine leaves, fragments of wood, and other impurities, so that it requires straining before it is used. The oleo-resin becomes hard on keeping, and is seen usually in dark yellow masses, which are dry, brittle, and translucent, with only a faint odour. It differs, therefore, from olibanum, which occurs in pale yellow, brittle tears of varying shape, from 6 to 25 mm. long, covered with whitish dust externally, and opalescent and waxy internally. Olibanum also softens when chewed, has a fragrant balsamic odour and a slightly bitter aromatic taste, and yields a whitish emulsion when triturated with water.

The chief constituents of American frankincense are abietic and pimaric acids, which cause it to exhibit a crystalline structure when examined under the microscope. It also contains more or less oil of turpentine, and a bitter principle, and otherwise resembles colophony resin in composition. Olibanum, or true frankincense, consists chiefly of a resin acid (boswellic acid)—partly free and partly combined as an ester — and indifferent resins (olibanoresenes); other constituents of olibanum are a bitter principle, 27 to 35 per cent. of gum, chiefly arabin, with a little bassorin—and 3 to 8 per cent. of volatile oil, which consists for the greater part of three terpenes—lævo-pinene (olibene), dipentene, and phellandrene.

THYMOL.

Thymol.

A CRYSTALLINE substance obtained from the volatile oils of *Thymus vulgaris*, Linné (N.O. Labiatæ), *Monarda punctata*, Linné (N.O. Labiatæ), and *Carum copticum* (*C. Ajowan*), Bentham and Hooker filius (N.O. Umbelliferæ), purified by recrystallisation from alcohol. The phenol also occurs in the volatile oils of *Mosla japonica, Cunila Mariana, Thymus Serpyllum*, and other plants, and sometimes crystallises from old oils when cooled, but it can only be removed completely by shaking them with caustic alkali. Thymol may be obtained by distilling off the greater part of the hydrocarbons present in the oils containing it, then shaking the residue with a solution of sodium hydroxide, which combines with the phenol to form a soluble phenate. Any uncombined oil is caused to separate by adding hot water, and hydrochloric acid is then added to the alkaline solution to liberate the thymol, which collects as an oily layer. Crystallisation is induced in the oily liquor, after separation and cooling, by the addition of a crystal of thymol, and further purification can be effected by recrystallisation from alcohol. Thymol is a powerful antiseptic for both internal and external use; it is also employed as a deodorant and local anæsthetic.

Thymol occurs in large, colourless, oblique, prismatic crystals (m.p. 44° to 51° C.), which have the odour of thyme and a pungent aromatic taste. The crystals sink in cold water, but melt on heating the mixture above 44° C., rising to the surface as an oily layer, which volatilises completely at the temperature of a water-bath, the absence of paraffin, spermaceti, etc., being thus indicated. The crystals are almost insoluble in water (1 in 1500), but freely soluble in 90 per cent. alcohol (8 in 3), ether (8 in 3), or chloroform (8 in 5); they are also soluble in petroleum spirit (1 in 6), oil of turpentine (1 in 3), olive oil (1 in 2), glacial acetic acid (4 in 3), solution of potassium hydroxide (1 in 6), and glycerin (1 in 190). A solution of thymol in half its bulk of glacial acetic acid assumes a reddish-violet colour when warmed with an equal volume of strong sulphuric acid, whilst, if a small crystal of thymol be dissolved in 1 c.c. of glacial acetic acid, the solution will assume a deep bluish-green colour on adding 6 drops of sulphuric acid and 1 drop of nitric acid.

Since thymol is a phenol, isopropyl-meta-cresol, it dissolves in aqueous solutions of potassium and sodium hydroxides to form soluble phenates, and this property is utilised to separate thymol from the non-phenolic constituents of volatile oils which contain it. As has already been explained, the oil is shaken with caustic lye, and, after separation from the oil, the lye is washed and acidulated with hydrochloric acid, which liberates the thymol. As a rule, thymol is present in oils in larger proportion than its isomer carvacrol, and it is also associated with a third phenol, together with cymene, thymene (l-pinene), borneol, and linalool. In the oil of *Thymus vulgaris* the amount of thymol and carvacrol present is usually from 20 to 30 per cent., though as much as 42 per cent. has been obtained. The oil of *Monarda punctata* contains 61 per cent. of thymol, while ajowan oil, from *Carum copticum* (*C. Ajowan*), contains from 45 to 55 per cent. Thymol can be prepared artificially from the hydrocarbon para-cymene, or from menthone, a ketone found in oil of peppermint and other oils.

THYROIDEUM.

Thyroid.

The fresh and healthy thyroid gland of the sheep, *Ovis Aries* (Order Ungulata). The thyroid gland consists of two lobes which lie closely applied to the windpipe (trachea), one on each side, and are most conveniently removed by cutting out the two lobes separately, without the connecting bridge of tissue, directly after the animal is killed. The lobes are distinguished easily from the surrounding tissues by their dark red colour. Their upper extremities are connected by a bridge of tissue, which crosses the trachea, but is often so thin or pale-coloured as to be difficult to detect. When freed from all external fat and connective tissue, the lobes are of a broad almond-shape, and should consist of a firm succulent mass of tissue. If, when cut across, they appear hypertrophied, or contain cysts or are otherwise abnormal, they must be rejected. Thyroid is used in the treatment of myxœdema and other obscure diseases, being given in the form of powder (Thyroideum Siccum), or as Liquor Thyroidei.

Thyroid yields a light dull-brown powder, with a very faint meat-like odour and taste, but free from any trace of putrescence. It absorbs moisture and deteriorates on exposure to the air. In preparing the powder, the healthy glands are thinly sliced and minced or pounded, then dried as rapidly as possible in a current of warm air, the pounded mass being spread in a thin layer to dry and the temperature not exceeding 32° to 38° C., though a higher temperature is not likely to prove harmful, since the active constituent of the glands is not readily affected by heat. It is important to remove the bulk of the moisture in the glands as quickly as possible, and the mass is preferably dried in a vacuum. When sufficiently dry, the thyroid should be coarsely powdered, all fat removed from the product by treatment with petroleum spirit, and the powder finally dried completely by spreading it in a thin layer and leaving it in a desiccator for a day or two. The fat is removed in order to prevent rancidity, but that stage in the process is unnecessary if the thyroid be dried thoroughly in a desiccator directly after being powdered, and subsequently preserved in such a way as to avoid hygroscopic influences.

The thyroid gland of the sheep is used for medicinal purposes because it is the most easily obtainable, and also that with which most of the clinical and experimental work was done when the thyroid was first introduced as a medicinal agent. The chief constituent of the thyroid gland is a substance which contains iodine, is very resistant to heat, and is soluble in water or in diluted glycerin. On acidifying solutions containing it with phosphoric acid, and then neutralising the liquid with lime water, the precipitate of calcium phosphate formed carries down with it the active constituent of the gland. A soluble ferment named thyroidinase has also been obtained from the thyroid gland, in the form of a fine white powder which is soluble in water or glycerin, but is precipitated from its solutions by alcohol. A preparation named thyroglandin is obtained by macerating the prepared glands in cold water and evaporating the solution to dryness, the powdered extract thus obtained representing the iodo-globulin, and a small proportion of saline matter. The residue of the glands is then boiled for an hour with dilute sodium hydroxide solution, and, after cooling and removal of fat, the liquid is neutralised with hydrochloric acid and evaporated to dryness; the residue, which contains all the thyroiodin (iodothyrin), is then powdered and mixed with the iodoglobulin powder to form thyroglandin. The name thyroglobulin has been applied to an albuminoid body which is said to exist in the thyroid gland and to contain the whole of the iodine present in combination.

TINOSPORA.

Tinospora; Gulancha.

THE dried stem of *Tinospora cordifolia*, Miers (N.O. Menispermaceæ), a climbing shrub indigenous to tropical India. The young shoots of the plant are used in India as an emetic, and the stem is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, being collected in the hot season and dried. It possesses tonic, antiperiodic, and diuretic properties, and is sometimes used as a substitute for calumba root. The chief preparations of the drug are Infusum Tinosporæ (1 in 10), Liquor Tinosporæ Concentratus (1 in 2), and Tinctura Tinosporæ (1 in 5).

Tinospora occurs in cylindrical, straight, or twisted pieces, from 6 to 50 mm. in diameter, or in transversely cut slices. The stem is covered with a strongly shrunken, smooth and wax-like, brown or greenish-brown bark, bearing numerous round elevated scars, and marked with deep longitudinal fissures; the bark is separated easily from the porous, pale yellowish-grey wood of which the central cylinder consists. A transverse section of the stem exhibits a single loose ring of xylem bundles, which contain large vessels and are separated by distinct starchy medullary rays. The drug breaks with a tough and fibrous fracture. It possesses no marked odour, but has a bitter taste. A cooled decoction of the drug gives the starch reaction with iodine.

The stem of *Tinospora cordifolia* is distinguished by its brownish wax-like bark and porous wood. The structure of the central part of the stem resembles that of cissampelos. The chief constituents of the drug are berberine and a bitter principle of glucosidal nature; other constituents are starch and salts. A substitute for the stem of *T. cordifolia* is that of an allied species, *T. crispa*, Miers, which possesses similar properties and is esteemed highly in the Indian Archipelago as a febrifuge.

TODDALIA.

Toddalia ; Kaka Toddali.

The dried root-bark of *Toddalia aculeata*, Persoon (N.O. Rutaceæ), a shrub of moderate size, which grows in India and Ceylon, and is dispersed widely throughout tropical Asia. The root-bark possesses bitter tonic and stomachic properties, and is sometimes used as a substitute for cusparia bark. The drug is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. The chief preparations of the bark are Infusum Toddaliæ (1 in 10) and Liquor Toddaliæ Concentratus (1 in 2).

Toddalia occurs in quilled pieces, from 2 to 3 mm. thick, covered with a soft yellowish periderm, which is fissured longitudinally and exhibits a subjacent bright yellow layer and a deeper brown layer. A transverse section shows the yellowish periderm surrounding a narrow, bright yellow, intermediate layer, and an inner, broad, radiate layer of brown phloem, in which are situated numerous cavities containing oleo-resin. The inner surface of the bark is brown and somewhat granular. The bark breaks with a short, close fracture ; it has a faint aromatic odour and an aromatic, pungent, bitter taste.

The root-bark of *Toddalia aculeata* is distinguished by its soft yellowish periderm, the longitudinal fissures, and the peculiar odour and taste of the drug. The chief constituents of the bark are a bitter principle, a yellow resin, and a volatile oil somewhat resembling citron peel in odour ; other constituents are calcium oxalate and starch. Native Indian physicians ascribe stimulating properties to all parts of the plant, and the fresh root-bark is used largely as a remedy for " hill-fever."

TONCO SEMINÆ.

Tonco Seeds ; Tonka or Tonquin Beans.

The seeds of *Dipteryx odorata*, Willdenow (N.O. Leguminosæ), a native of Guiana, and *D. oppositifolia*, Willdenow, a native of Brazil. Both trees are of considerable size, and each produces an indehiscent, drupaceous fruit or oblong-ovate pod, about the size of an egg, with a fibrous pericarp enclosing a single seed. When ripe the seeds are removed from the pods and dried, after which they are sometimes steeped in rum and spread on floors to a depth of 20 to 30 cm., being left thus until a white crystalline crust has formed on the surface of the seeds. The crystalline crust consists of coumarin, and the term " frosted " is applied in commerce to distinguish seeds bearing it from those which have not been subjected to the same treatment. Tonco beans possess stimulant properties, but their chief use is as a flavouring agent, and in perfumery.

Tonco beans are usually from 3 to 4 cm. in length, and closely resemble Jordan almonds in shape. Externally, however, they are very dark brown or nearly black in colour, and the thin, fragile, somewhat glossy testa is veined and coarsely wrinkled, besides being sometimes covered with minute whitish crystals of coumarin. At one end the seed is rounded, but it terminates at the other extremity in a broad flattened point, just below which the micropyle appears near the hilum, in the form of a brownish scar on the obtuse margin of the seed. Internally, the seed consists of two dark-yellow, yellowish-brown, or nearly black cotyledons, without endosperm, enclosing a plumule with folded leaves and a short thick radicle directed towards the micropyle. The fragrant odour and bitter aromatic taste of the seeds are due to coumarin.

The dark-coloured wrinkled testa of tonco beans, their agreeably fragrant odour, and the whitish crystalline crust of coumarin on " frosted " seeds, are characteristic features. The chief constituent of the seeds is about 3 per cent. of coumarin, the odorous principle of *Asperula odorata*, *Melilotus officinalis*, and various other plants belonging to the Leguminosæ, Graminaceæ, Orchidaceæ, etc. Other constituents of the seeds are sugar, mucilage, and about 25 per cent. of fixed oil. Coumarin has been prepared synthetically by heating salicylic aldehyde with sodium acetate and acetic anhydride, the resulting aceto-coumaric acid splitting up into coumarin and acetic acid; coumarin has also been produced by the action of phenol upon malic acid.

TRAGACANTHA.

Tragacanth.

A GUMMY exudation obtained by incision from *Astragalus gummifer*, Labillardière (N.O. Leguminosæ), and some other species of *Astragalus*. It is known in commerce as Syrian or Persian tragacanth. The trees producing the gum are natives of Southern and Eastern Europe, Asiatic Turkey, and Persia. The gum is produced by the transformation (gummosis) of the cell-walls of the medullary rays and pith. It absorbs water readily and, as a result, swells and exerts pressure on the surrounding tissues. If the stem, whilst in this state of tension, be accidentally wounded or incised, the expanded tissues contract and the gum is expressed forcibly in the form of a ribbon, carrying with it the starch grains present in the cells. Though much tragacanth exudes spontaneously, transverse incisions are often made artificially, near the base of the stem, in order to promote the flow of gum. The flow continues for several days, and the exudation dries in thick ribbon-like flakes, which are collected and packed in bags. Syrian or Persian gum is collected in the Baktiari Mountains, south of Ispahan, and the neighbouring districts, and conveyed from ports in the Persian Gulf to Bombay, whence it is exported to Europe. Smyrna or Turkish gum is collected chiefly in Anatolia and shipped from Smyrna. Tragacanth is demulcent, and is used for the suspension of heavy insoluble powders in liquids ; it is also used in the preparation of Confectio Sulphuris, Glycerinum Tragacanthæ (1 in 5), Mistura Cretæ, Mistura Guaiaci, Mucilago Tragacanthæ (1 in 74), Pilula Quininæ Sulphatis, Pulvis Opii Compositus, and Pulvis Tragacanthæ Compositus (1 in 16) ; the mucilage of tragacanth is an ingredient of Lotio Hydrargyri Nigra.

Tragacanth occurs in thin, white or pale yellowish-white, ribbon-shaped flakes, which are translucent and horny. The flakes are of varying length and breadth, but are frequently 2·5 cm. long and 12 mm. wide. They are irregularly oblong or more or less curved, and marked on the surface with numerous concentric ridges. The pieces break with a short fracture. The gum is inodorous, nearly tasteless, and only sparingly soluble in water, but readily soluble in alkaline liquids, with the formation of a yellow colour. Tragacanth swells considerably in water, forming a gelatinous mass which may be tinged violet or blue by solution of iodine, owing to the presence of starch. The distinctive characters of Syrian tragacanth are the ribbon-like flakes in which it occurs, its insolubility in water, and the presence of but little starch. Smyrna tragacanth occurs in flakes of a less ribbon-like character, is more opaque than Syrian tragacanth, and contains much more starch.

The finest tragacanth is the Syrian or Persian variety, which is readily distinguished from the Smyrna or Turkey gum by its pronounced ribbon-like character and greater translucency. Caramania gum, and other inferior varieties of tragacanth, are usually darker in colour than Syrian or Smyrna tragacanth, and occur in tear-like masses or irregular vermiform pieces which are sometimes whitened with lead carbonate, the presence of which can readily be detected by shaking the pieces with diluted nitric acid and applying to the liquid the usual tests for lead. The chief constituent of tragacanth is about 60 or 70 per cent. of bassorin (adraganthin or traganthin), an insoluble compound of arabic acid, which is capable of conversion into a soluble form (arabin) under the influence of certain enzymes. Other constituents of the gum are oxybassorin, starch, cellulose (fragments of cells), nitrogenous matter, and about 8 or 10 per cent. of arabin, which is the chief constituent of gum acacia. Tragacanth exhibits many properties analogous to those of pectose and, on hydrolysis, yields arabinose and fucose. It contains no active oxydase. Bassorin is converted by the action of alkalies into two acid bodies which yield tragacanthose and bassoric acid as the products of hydrolysis.

TURPETHUM.

Turpeth ; White Nisot or Nishotar.

THE dried root and stem of *Ipomœa Turpethum*, R. Brown (N.O. Convolvulaceæ), a native of India and Ceylon. It is known in India by a variety of names, such as " nisot," " white nisot," " nishotar," etc., and is distinguished from black turpeth or " black nisot "—a drug possessing similar properties and supposed to be derived from *Lettsomia atropurpurea*, Clarke—by its larger size and pale colour. When intact, turpeth resembles a piece of rattan cane and has a central column which consists of large dotted vessels connected by narrow portions of woody fibre, and is divided into four parts by medullary rays. The drug was formerly much used in medicine, and has now been re-introduced as an equivalent of jalap. It possesses hepatic stimulant and hydragogue cathartic properties, and is official in the Indian and Colonial Addendum for use in India, the Eastern Colonies, and the North American Colonies. It may be administered in powder, and is an ingredient of Tinctura Jalapæ Composita (1 in 100).

Turpeth root and stem occur usually in commerce in pieces from 1·5 to 5 cm. in diameter, the central woody portion of which has often been removed by splitting the bark on one side. The pieces are of a dull grey colour, and have a twisted rope-like or columnar appearance, owing to the presence of deep longitudinal furrows. A transverse section of the drug, from which the woody portion has not been removed, shows a yellowish-white cortical portion, surrounding a porous central column which is sometimes of a paler colour. The fracture of the drug is short in the cortex, but fibrous in the central portion, when that is present. The faint odour and nauseous taste, which are only perceptible after the drug has been for some time in the mouth, are due to the volatile oil and resin it contains.

The twisted appearance, faint odour, and nauseous taste are distinctive characters of turpeth. The pieces of root and stem are sometimes seen entire, but the whole of the central woody column has frequently been removed. The chief constituent of turpeth is about 10 per cent. of a resin named turpethin, which is identical with jalapin or convolvulin. Other constituents of the drug are starch, a small quantity of resin soluble in ether, and traces of volatile oil, fatty matter, and other plant principles. The resin is found only in the bark, the remainder of the root or stem being practically inert. The starch exists in the parenchymatous tissues, which also contain rosette-like raphides and large resin-cells.

TUSSILAGO.

Coltsfoot.

The dried leaves, or the flowering stems, of *Tussilago Farfara*, Linné (N.O. Compositæ), indigenous to Northern Asia and Europe, and abundant in Great Britain. It is a small perennial herb with a creeping rhizome, and produces its flowers before the leaves. The leaves and flowering stems are collected separately, but both are used in domestic medicine. The drug possesses demulcent and tonic properties, and is used in the form of decoction as a remedy for coughs.

Coltsfoot stems are simple, hairy, and about 15 cm. in height. They bear numerous small, narrow, alternate, reddish bracts, with terminal solitary flower-heads, which are surrounded by reddish involucral bracts. The flower-heads consist of flat receptacles, bearing several tubular disc-florets, and numerous ray-florets with short, very narrow, bright yellow, ligulate corollas. The fruits are cylindrical, tapering towards the base, and each one has a pappus of white simple hairs. Coltsfoot leaves are radical, cordate, from 10 to 12·5 cm. in breadth, and borne on long stalks. They are smooth and green above, covered with loose, white, felted, woolly hairs below, and have a sinuate-dentate outline, the teeth terminating in hard brown points. The drug is inodorous, but has a slightly bitter and astringent, mucilaginous taste.

The chief distinctive characters of coltsfoot are the short and very narrow ligulate corolla, the cylindrical fruit with pappus, and the shape, margin, and hairy under surface of the leaves. The leaves are used more largely than other parts of the plant, and should be gathered when fully expanded, but before attaining their greatest magnitude. The chief constituent of the drug is mucilage, but it also contains a little tannin and traces of a bitter amorphous glucoside.

TYLOPHORÆ FOLIA.

Tylophora Leaves.

The dried leaves of *Tylophora asthmatica*, Wight et Arnott (N.O. Asclepiadaceæ), a twining shrub with slender branches, indigenous to India, Ceylon, and the Moluccas. Both the root and leaves have been used in medicine, and the dried leaves are official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. The drug possesses expectorant, diaphoretic, and emetic properties, and is used as an equivalent of ipecacuanha. It is administered usually in the form of powder.

Tylophora leaves are opposite, entire, and petiolate, from 5 to 12·5 cm. long, and from 18 to 65 mm. broad. They are somewhat variable in shape, being lanceolate-ovate, ovate, or sub-rotund, usually cordate at the base, and abruptly acuminate or almost mucronate. The dried leaves are thick, somewhat leathery, glabrous and brownish-green on the upper surface, pubescent and yellowish-green on the lower surface. They have only a very slight odour, and are almost devoid of taste.

The leaves of *Tylophora asthmatica* are distinguished by their somewhat leathery texture and glabrous upper surface, and usually downy under surface, but there is a variety of the plant known, in which the leaves are entirely free from down. The chief constituent of the leaves is a crystalline alkaloid tylophorine, which possesses purgative and emetic properties. The leaves also contain mineral matter to the extent of 15 per cent. Tylophorine is very soluble in ether or alcohol, slightly soluble in water, and forms a crystalline hydrochloride. A concentrated infusion of the leaves has a slightly acrid taste, yields an abundant precipitate on the addition of tannic acid, neutral lead acetate, or potassium hydroxide, and is turned greenish-black by ferric chloride.

ULMI CORTEX.

Elm Bark.

THE bark of the common elm, *Ulmus campestris*, Linné (N.O. Urticaceæ), a large tree which attains a height of 30 m. or more. It is a native of Central and Southern Europe, but is also common in England. The bark is easily separated from the trunk and branches in the spring. After collection, the dark, rough, corky outer portion is removed from the bark, and the dried whitish bast portion constitutes the elm bark of commerce. It possesses bitter, demulcent, tonic, and astringent properties, and is used in the form of decoction (1 in 8).

Elm bark occurs usually in pieces about 10 to 12·5 cm. long, 2·5 to 5 cm. wide, and nearly 6 mm. thick. The outer surface is yellowish or pale rusty-brown in colour, but is frequently discoloured, and bears patches of the dark brown cork. Internally, the bark is longitudinally striated or nearly smooth. Though tough, the bark breaks with a rather short and not very fibrous fracture. When examined under a lens, a smoothed transverse section exhibits numerous dark, usually oblique, medullary rays which completely traverse the bark, thus proving it to consist entirely of bast. Numerous groups of bast fibres cross the medullary rays at right angles, appearing as rows of tangentially elongated, whitish masses. The bark has no odour, but possesses a slightly astringent, mucilaginous taste.

The distinctive characters of elm bark are its occurrence in thick, flattened pieces, the somewhat fibrous but not splintery fracture, and the usually striated inner surface. Slippery elm bark is thinner, very fibrous, and has an odour resembling that of fœnugreek ; quillaia bark has a perfectly smooth inner surface, a splintery, laminated fracture, and an acrid taste. The chief constituents of elm bark are mucilage and tannin, but it also contains a bitter principle, and starch may be present if the outer portion of the bark has not been removed entirely.

ULMI FULVÆ CORTEX.

Slippery Elm Bark.

THE bark of *Ulmus fulva*, Michaux (N.O. Urticaceæ), an American tree about 15 to 20 m. high, which is indigenous to the central and northern United States. The bark is separated from the trunk and larger branches in the spring, deprived of its outer corky portion, as in the case of elm bark, and dried. It possesses demulcent and emollient properties, and is employed for external application, in the form of a poultice.

Slippery elm bark occurs in flat pieces, which are often about 60 to 90 cm. long, 4 to 5 cm. or more in width, and 3 mm. or less in thickness. The outer surface is reddish-yellow or pale brownish-white in colour, longitudinally striated, and bears patches of reddish-brown cork. Internally it is tawny-yellow, or somewhat reddish, and also finely striated longitudinally. The bark is extremely tough and fibrous, breaking with a somewhat mealy fracture. A transverse section, examined under a lens, is seen to be traversed completely by medullary rays, between which bast fibres and parenchyma are arranged in the form of small tangential bands, thus giving the section a delicately chequered appearance. If the section be moistened, the mucilage contained in large cells in the bast becomes swollen. The bark has a fœnugreek-like odour and an insipid, mucilaginous taste.

The bark of *Ulmus fulva* is distinguished by its striated outer and inner surfaces, fibrous fracture, fœnugreek-like odour, and mucilaginous taste. Ordinary elm bark is nearly smooth internally, less fibrous, and odourless ;

quillaia bark is perfectly smooth internally, has a splintery, laminated fracture, and an acrid taste. The chief constituent of slippery elm bark is a mucilage which is precipitated from aqueous solutions by lead acetate or subacetate, but not by alcohol; tannin is also present in the bark, but no starch.

URGINEA.

Urginea; Indian Squill.

The younger bulbs of *Urginea indica*, Kunth (N.O. Liliaceæ), or of *Scilla indica*, Baker (N.O. Liliaceæ), which is also known as *Ledebouria hyacinthina*, Roth. Both plants are indigenous to India. The bulbs should be collected soon after the plants have flowered, and kept in a dry place. The drug possesses stimulant, expectorant, and diuretic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies, as an equivalent of ordinary squill. The chief preparations of the drug are Acetum Urgineæ (1 in 8), Oxymel Urgineæ (1 in 15), Pilula Urgineæ Composita (1 in 4), and Tinctura Urgineæ (1 in 5).

Urginea varies in appearance according to its source. The bulbs of *Urginea indica* consist of fleshy coats or scales, which enclose each other completely. They are tunicated like common onions, which they also resemble in size. The scales are whitish, and have a bitter, acrid taste. The bulbs of *Scilla indica* are about the size and shape of a small pear, being somewhat smaller than those of *Urginea indica*, and consist of thick, very smooth, fleshy, imbricated scales. The outer scales are dry and of a whitey-brown colour; the inner scales are fleshy and cream-coloured. The bulbs have a nauseous odour and a bitter, acrid taste.

In the bulbs of *Urginea indica*, the fleshy scales enclose each other completely, whereas the scales of *Scilla indica* are so closely imbricated that they might be mistaken for entire coats if not examined carefully. The chief constituents of both drugs are bitter principles similar to the glucosidal substances—scillitoxin, scillipicrin, and scillin—found in ordinary squill. The bulbs also resemble that of ordinary squill in containing mucilage and needle-shaped crystals of calcium oxalate, which readily penetrate the skin when the bulbs are handled, causing much irritation.

UVÆ.

Raisins; Uvæ Passæ.

The dried ripe fruit of *Vitis vinifera*, Linné (N.O. Ampelidaceæ), a native of Western Asia and the Caucasian provinces of Russia, but now cultivated largely in Central and Southern Europe, California, and Australia. The fruit is collected when ripe and dried, partly on the vine, by the heat of the sun, and partly by artificial heat. The dried grapes are exported from Spain, Italy, and Asia Minor. Muscatel raisins, from Malaga, are imported in entire bunches, packed carefully in boxes, while Valencia raisins, which are more often used in pharmacy, occur usually without the stalks. Calabrian raisins are similar to those produced in Malaga, while Smyrna or sultana raisins are stoneless and, like the Corinthian raisins or currants imported from Greece, are used chiefly for culinary purposes. Raisins possess demulcent, nutrient, and gently laxative properties, but are used chiefly in medicine for the sake of the saccharine matter they contain, in the preparation of Tinctura Cardamomi Composita (1 in 10) and Tinctura Sennæ Composita (1 in 10).

Raisins are of a dark purplish-black colour, and more or less shrivelled, compressed, and smooth. They are sometimes termed Passulæ Majores, to distinguish them from currants or Passulæ Minores. The grape is a superior two-celled berry, the dissepiment in which disappears as the fruit reaches maturity, while the interior becomes pulpy. The pulp is soft and very sweet, and usually contains a few seeds. The dried fruit has an agreeably fragrant odour, and should be free from any sugary or saline incrustation. When used as an ingredient of tinctures, raisins should be deprived of the seeds, as the fixed oil they contain tends to impart an objectionable flavour to the preparations. The juice of fresh grapes yields wine on fermentation. White wines, such as sherry, are prepared from the juice or " must " of either white or black grapes, freed from seeds, stems, and skins; whereas red wines are derived from the " must " of black grapes, fermented with their skins and seeds.

The chief constituents of raisins are sugar and potassium acid tartrate, which are present in the pulp; the skin contains tannic acid and colouring matter, while the seeds contain from 5 to 6 per cent. of tannic acid and 15 to 18 per cent. of fixed oil, consisting largely of the glyceride of erucic acid, with a little palmitin and stearin. The general process for making wine from grapes is to express the juice from the ripe fruit and allow the "must," as the liquid is called, to ferment at about 15°·5 C. in vats, fermentation being due to the presence of enzymes secreted by yeast-cells. The temperature of the "must" rises gradually, a large quantity of carbon dioxide is evolved, causing a frothy mass (the "head") to form on the surface of the liquid, and the sweet liquid becomes vinous owing to the conversion of the grape sugar into alcohol. The process continues for a prolonged period, and the frothy matter is ultimately precipitated with colouring matter and tartar, thus forming a deposit which constitutes the wine-lees. Wines are sweet or dry, according as they contain more or less sugar, a dry wine being without marked sweetness or acidity. Sherry consists mainly of ethyl alcohol and water, together with other alcohols, essential oil, various esters, grape sugar, tartaric and malic acids, salts, colouring matter, tannin, etc. The peculiar vinous odour of most wines is due to œnanthylic ethyl ester; the bouquet—flavour and aroma—in different kinds varies, being due to various essential oils and esters.

Sherry is used largely for making medicinal preparations. It should possess a dry aromatic flavour and fragrance, with very little acidity, and should contain sufficient alcohol—about 16 per cent.—to preserve it without the addition of salicylic acid or other preservatives. Grape juice naturally yields a fermented fluid containing about 13 per cent. of alcohol, but sherry is "fortified" by the addition of rectified spirit after fermentation. For medicinal purposes it is advisable to remove any tannin present in the wine by macerating it with gelatin, particularly if it is to be used as a vehicle or menstruum for drugs containing alkaloids. Brandy is a spirituous liquid obtained by the distillation of wine and matured by age. It should contain not less than 43·5 per cent. by volume of ethyl hydroxide, together with volatile oil, colouring matter, tannin, œnanthic ether, a little acetic ether, and a little aldehyde. The yellow colour of pale brandy is derived from the casks in which it is kept; the deep red colour of high-coloured brandy is imparted to it by the addition of burnt sugar. The finest brandy is prepared from French wines, the varieties known as Cognac and Armagnac being most esteemed.

UVÆ URSI FOLIA.

Bearberry Leaves.

THE dried leaves of *Arctostaphylos Uva-ursi*, Sprengel (N.O. Ericaceæ), a small, procumbent, evergreen shrub which is indigenous to Great Britain and distributed throughout Central and Northern Europe, and North America. The plant has branching decumbent stems and scattered leaves with short petioles. The dried leaves alone are used in medicine. They are astringent and diuretic, resembling buchu leaves in their action, but the astringency of bearberry leaves is more marked. The chief preparation of the drug is Infusum Uvæ Ursi (1 in 20).

Bearberry leaves are yellowish-green in colour, but darker on the upper than on the under surface. They are more or less rigid, brittle, of a leathery texture (coriaceous), about 18 mm. long, and reversed ovate (obovate) or like a spatula (spatulate) in shape, the lamina or blade being rounded at the apex and tapering gradually towards the base to a very short stalk or petiole. The margin is entire and slightly rolled back (revolute). In the case of young leaves the margin is fringed with short hairs (ciliate), but those are not often seen, the dried leaves being usually quite smooth and free from hairs (glabrous). The upper surface has a shining and reticulate appearance, a network of depressed veins and veinlets making the surface appear chequered or wrinkled. The greyish-green under surface is also reticulately marked, though very faintly; the veins are somewhat darker in colour than the rest of the under surface and are often slightly raised. The leaves have no distinctive odour, but they have a very astringent taste.

The spathulate outline, entire margin, and rounded apex are the chief distinctive characters of bearberry leaves. Buchu leaves are about the same size, but have a rhomboidal outline, toothed margin, recurved apex, and a characteristic odour, due to the oil contained in the oil-glands. Other leaves which somewhat resemble bearberry leaves are those of the box (*Buxus sempervirens*), which have a notch cut out at the apex (emarginate), and those of the cowberry (*Vaccinium Vitis-idæa*), which have brown dots scattered over their under surface. The leaves of the pipsissewa or winter-green (*Chimaphila umbellata*) are larger and longer than bearberry leaves, and have serrate margins. The chief constituent of bearberry leaves is a crystallisable glucoside named arbutin; other constituents of the leaves are methyl-arbutin, ericolin (an ill-defined glucoside), ursone (a crystalline substance of resinous character), ellagic and gallic acids, a yellow colouring principle resembling quercetin, and 6 to 7 per cent. of tannin.

VALERIANÆ INDICÆ RHIZOMA.

Indian Valerian Rhizome.

The rhizome and rootlets of *Valeriana Wallichii*, De Candolle (N.O. Valerianaceæ), an herbaceous plant indigenous to India, being found in the temperate Himalaya region. The dried rhizome and rootlets are used for medicinal purposes, and the drug is known in India as "tagar." It possesses stimulant and antispasmodic properties, and is official in the Indian and Colonial Addendum, for use in India and the Eastern Colonies. The chief preparation of the drug is Tinctura Valerianæ Indicæ Ammoniata (1 in 5).

Indian valerian rhizome occurs in crooked pieces of a dull brown colour, about 5 cm. long and from 6 to 12 mm. in diameter, with a number of bracts at the crown, and blunt at the lower extremity. The rhizome is marked with transverse ridges and studded thickly with prominent circular tubercles, to a few of which thick rootlets may be found attached. The drug is very hard and tough, and shows a greenish-brown surface when fractured. Its odour, due to the presence of volatile oil, resembles that of ordinary valerian rhizome, but is much stronger.

The rhizome of *Valeriana Wallichii* is distinguished by its crooked appearance, greenish-brown fracture, and very powerful odour. The chief constituent of the drug is the volatile oil to which its odour is due, but it also contains valerianic and other organic acids, together with resin, tannin, etc. As in the case of ordinary valerian, the valerianic acid is probably formed by the gradual decomposition of one or more esters present in the volatile oil.

VALERIANÆ RHIZOMA.

Valerian Rhizome; Valerian Root.

The dried erect rhizome and roots of *Valeriana officinalis*, Linné (N.O. Valerianaceæ), collected in the autumn. The plant is common in England, and widely distributed throughout Europe and Northern Asia. The drug is obtained chiefly from cultivated plants grown in England, Holland, and Germany, English valerian being largely the product of *V. officinalis*, var. *Mikanii*, Syme. The roots of valerian tend to merge into a short conical rootstock or erect rhizome, the development of which proceeds for several years before a flowering stem is sent up, but slender horizontal branches which terminate in buds are given off earlier, and from those buds proceed aerial shoots or stolons, which bear cataphyllary leaves and produce fresh plants where they take root. The erect rhizome and roots are collected in the autumn and dried, the lateral shoots being cut off for the purpose of propagating the plant, and the rhizomes, especially when of large size, cut longitudinally into halves or quarters before being dried. The drug is a nervine stimulant and antispasmodic, and is used in the preparation of Tinctura Valerianæ Ammoniata (1 in 5).

Valerian consists usually of the entire or sliced erect rhizome, which is dark yellowish-brown externally, not more than 25 mm. long or 12 mm. thick, and gives off numerous slender brittle roots from 7·5 to 10 cm. long, whilst short, slender, lateral branches (stolons) are also occasionally present. The rootstock, which is sometimes crowned with the remains of flowering stems and leaves, is usually firm, horny, and whitish or yellowish internally, but old specimens may be hollow, with portions of the tissue remaining as transverse septa or partitions. A transverse section is irregular in outline and exhibits a comparatively narrow bark, separated by a dark line (cambium) from an irregular circle of wood-bundles of varying size. The drug may also consist partly of small undeveloped rhizomes about 6 mm. long, crowned with the remains of leaves and bearing short slender roots, the young rhizomes having been formed where the stolons given off from mature rootstocks have taken root and produced independent plants. The roots of valerian are of similar colour to the erect rhizome, about 1·5 to 2 mm. thick, striated longitudinally, and usually not shrivelled to any great extent; a transverse section shows a thick bark and small wood. The drug has a characteristic disagreeable odour, which becomes stronger during the process of drying, owing to a change which occurs in the composition of the volatile oil contained in the sub-epidermal layer of cells. Valerian also has an unpleasant, camphoraceous, and slightly bitter taste.

The colour and odour of valerian rhizome distinguish it readily from other drugs. Serpentary rhizome, which somewhat resembles small pieces of valerian rhizome, is more slender, while portions of stem arise from the upper surface in close succession, the pith is eccentric, and the drug has a totally different odour and taste. The chief constituent of valerian is about 0·5 to 1 per cent. of a yellowish-green to brownish-yellow volatile oil (s.g. 0·93 to 0·96), which is lævo-rotatory, has a strongly acid reaction, and contains the terpenes pinene, camphene, and dextro-rotatory limonene (citrene), together with borneol and its formic, acetic, butyric, and isovaleric esters, terpineol and other alcohols, and a sesquiterpene. Other constituents of the drug are a glucoside, tannin, resin, starch, and the alkaloids chatinine and valerine, concerning which but little is known, except that they form crystalline salts. The bornyl isovalerate in the oil of valerian decomposes gradually, yielding free isovaleric (ordinary valerianic) acid, a colourless oily liquid, with a very strong, sour, disagreeable taste, and possessing the characteristic odour of the drug. The gradual formation of the acid accounts for the increasing intensity of the odour of valerian rhizome during the process of drying, and the oil usually contains much free valerianic acid, thus formed.

VANILLÆ FRUCTUS.

Vanilla.

The fruit of *Vanilla planifolia*, Andrews (N.O. Orchidaceæ), a climbing plant which grows wild in hot damp woods in Eastern Mexico, and is also cultivated largely in Réunion, Mauritius, Java, the Seychelles, and other tropical countries. The plant is an epiphyte, with a smooth, fleshy, dark green, much-branched stem, furnished at the nodes with aerial roots which cling to a supporting tree or wooden framework. The dark green, tough leaves of the plant are alternate, oval, sessile, attenuate at the apex, fleshy and veinless. The plant produces pale greenish-yellow, sessile flowers, which are about 50 mm. in diameter, arranged in loose axillary racemes of eight or ten, and require to be fertilised by artificial means when cultivated elsewhere than in Mexico, owing to the absence of the insects which naturally perform that function. The fruit is a slender pod, 15 to 20 cm. long, filled with an oily mass containing numerous small, black, shining seeds. It is collected in the late autumn, when nearly mature, and submitted to a curing process, being dried slowly by exposure to the sun or to artificial heat, or the fruit may be dried in closed vessels containing quicklime, the loss of aroma being prevented by this method. When picked, the fruits are yellowish-green to brown in colour, and without the characteristic vanilla odour, but during the curing process they become dark brown or nearly black, whilst they are reduced in weight nearly 80 per cent., and certain aromatic principles are formed, to which the characteristic odour is due. The dried fruits are assorted and tied into bundles, which are packed in tins for exportation. They are used almost exclusively for flavouring purposes, but are said to possess carminative, stimulant, aphrodisiac, and anti-hysteric properties.

Vanilla occurs in commerce in bundles of slender, dark brown or nearly black, flexible, stick-like pods, about 15 to 20 cm. long and 6 to 9 mm. thick, of a flattened cylindrical shape owing to the mutual pressure of the pods in the bundles, and tapering towards each end. The surface of the pods is wrinkled longitudinally and, in the best qualities, covered with numerous minute glistening crystals of vanillin, which make their appearance after the cured fruits have been packed in boxes for exportation. A transverse section of a fruit shows that it is one-celled, the seeds being borne in double rows upon placentæ which project into a thick-walled, irregularly triangular cavity. The seeds are black, very small, and imbedded in a dark-coloured, aromatic, balsamic fluid, which is believed to contain the materials out of which vanillin is elaborated; the fluid is secreted by the cells of the inner epidermis of the pericarp, which are developed into short, hair-like, unicellular processes, projecting into the cavity of the fruit. Beneath the epicarp of the fruit is a lax tissue containing numerous fine acicular crystals of calcium oxalate and an oily substance possessing the characteristics of vanillin, to which the extremely fragrant odour and agreeably aromatic taste of the fruit are chiefly due.

Mexican vanilla is the finest variety, but there are several others of importance. Java vanilla is a fine variety, with short pods and a very powerful odour; it is consumed chiefly in Holland. Bourbon vanilla, produced in Réunion, is somewhat shorter in the tapering portions and not so firm, while its odour recalls that of Tonka beans. Seychelles and Mauritius vanilla have shorter and lighter-coloured pods, with a faint odour. Other varieties are the produce of different species of *Vanilla*, and have an inferior odour which is sometimes totally unlike that of genuine vanilla fruit. The fruits of certain wild or uncultivated vanillas, including the Guadeloupe and Maranham varieties, are known in commerce as vanillons. The chief constituent of vanilla, to which its characteristic odour is due, is vanillin or methyl-proto-catechuic aldehyde, of which 1·7 per cent. has been found in Mexican vanilla, 2 per cent. in Bourbon vanilla, and 2·75 per cent. in Java vanilla. Other constituents of vanilla are a fixed oil, resin, sugar, mucilage, etc. Pods from which the vanillin has been extracted are sometimes offered for sale, but they are almost destitute of odour and flavour.

VERATRI ALBI RHIZOMA.

White Hellebore; Veratrum Rhizome.

THE rhizome and rootlets of *Veratrum album*, Linné (N.O. Liliaceæ), a perennial herbaceous plant indigenous to the mountainous regions of Central and Southern Europe, being especially abundant in the Alps and Pyrenees. The plant produces a cylindrical or sub-conical fleshy rootstock or erect rhizome, from the crown of which proceed a number of large, ovate, radical leaves, while numerous stout whitish or yellowish rootlets are given off below. The production of a flowering stem terminates the growth of the main axis, but one or more of the buds situated in the axils of the inner radical leaves may then develop, branches of the rhizome being thus produced. All parts of the plant are said to be acrid and poisonous, but only the rhizome and rootlets are used in medicine; sometimes even the rootlets are separated and rejected before drying, although they are stated to be more active than the rhizome. The plants are dug up in the autumn, the radical leaves—and flowering stem, if present—are cut off close to the crown, and the rhizome is usually dried entire, with or without the roots, though it is sometimes cut longitudinally into two or four pieces, in order to facilitate drying. When fresh, the rhizome has a disagreeable garlic-like (alliaceous) odour, which disappears on drying. The drug is imported chiefly from Germany, and is said to deteriorate on keeping. It is poisonous, and possesses powerful emetic, purgative, and errhine properties; it is only rarely given internally. The powdered drug excites violent sneezing, and is applied externally, in the form of ointment, as a parasiticide.

White hellebore rhizome occurs in commerce in simple or branched, entire or longitudinally sliced pieces, about 5 to 7·5 cm. long and 18 to 25 mm. in thickness. The upper part of the rhizome is nearly cylindrical, but the lower part is usually more or less conical, and sometimes has a truncate or broken-off appearance, caused by decay of the extremity as growth of the plant proceeds. The thin dry remains of numerous concentrically arranged leaf bases occur at the top of the rhizome, the outer ones being coarsely fibrous, owing to the disappearance of parenchymatous tissue and consequent exposure of the leaf veins. The outer surface of the dried rhizome is blackish, wrinkled, and rough; it is also encircled with leaf scars and marked with circular root scars, which are especially numerous in the lower portion. The untrimmed rhizome is enveloped in stout, dull grey or yellowish rootlets, which tend to shrivel longitudinally rather than transversely. The drug breaks with a short fracture, and is firm, compact, and starchy internally. A transverse section exhibits a blackish bark, about 3 mm. thick, which is separated by a wavy brownish line (endodermis) from the whitish central cylinder or stele, the latter being traversed by irregularly arranged, yellowish, fibro-vascular bundles. The drug has only a slight odour, but it possesses a bitter, acrid taste.

The rhizome of *Veratrum album* is distinguished by the cylindrical or subconical and usually entire pieces, the greyish or yellowish, longitudinally shrivelled roots, and the arrangement of the yellowish fibro-vascular bundles in a transverse section. American veratrum or "green hellebore" rhizome, from *Veratrum viride*, Aiton, closely resembles that of white hellebore, but occurs usually in pieces which have been cut longitudinally; in addition, the rootlets are usually yellowish-brown in colour and more shrivelled than those of white hellebore. The chief constituents of white hellebore are several alkaloids—including jervine, pseudojervine, rubijervine, protoveratrine, and protoveratridine. Other constituents of the drug are resin and starch. Protoveratrine is the most poisonous alkaloid present in the drug, and is the cause of the violent sneezing excited by powdered white hellebore when inhaled; it is present to the extent of 0·03 per cent., the rootlets being said to contain more than the rhizome.

VERATRI VIRIDIS RHIZOMA.

Green Hellebore; American Veratrum.

THE rhizome and rootlets of *Veratrum viride*, Aiton (N.O. Liliaceæ), a perennial herb which is indigenous to the eastern United States. The plant produces a thick fleshy rootstock or erect rhizome, the upper portion of which is tunicated, or composed of overlapping scales, while the lower portion is solid and gives off numerous whitish rootlets. The flowering stem bears bright green leaves, and is also embraced by large, oval, acuminate, radical leaves, which form a sheath at its base. The plants are dug up in the autumn, the leaves cut off close to the crown, and the rhizomes usually cut longitudinally into two or four pieces, in order to facilitate drying. As in the case of white hellebore, the rootlets are sometimes cut off, but they are more frequently left attached to the rhizome. The drug deteriorates on keeping, and should, therefore, be used within twelve months of collection. It possesses emetic, diaphoretic, sedative, and errhine properties. A tincture of green hellebore (1 in 5) is sometimes used.

Green hellebore rhizome occurs in somewhat conical, mostly simple pieces, closely resembling white hellebore in size and appearance, but usually cut longitudinally instead of being mostly entire. The rhizome is crowned with the remains of leaf bases, and is truncate below, blackish-grey externally, and enveloped in yellowish-brown rootlets about 20 cm. long and 2 mm. thick. Internally, the drug is whitish, a transverse section showing the fibro-vascular bundles as darker-coloured dots and short wavy lines, arranged irregularly as in the case of white hellebore rhizome. The drug is practically inodorous, but possesses a bitter, acrid taste.

The rhizome of *Veratrum viride* closely resembles that of white hellebore, but the pieces are rarely entire and the roots are usually of a brighter yellowish-brown colour and more shrivelled in appearance than those of the latter.

The plant yielding it so closely resembles *V. album* that it is doubtful if the two constitute distinct species. Certain Alpine forms of *V. album* are said to resemble *V. viride* closely. The constituents of the two drugs are also similar, but, in addition to jervine and pseudo-jervine, American veratrum is said to contain the alkaloid cevadine (veratrine), which is not found in white hellebore. It should be noted that the name green hellebore is sometimes applied to the rhizome of *Helleborus viridis*, Linné, which closely resembles that of black hellebore.

VIBURNUM.

Black Haw.

The dried bark of *Viburnum prunifolium*, Linné (N.O. Caprifoliaceæ), a shrub which is indigenous to the United States. The bark possesses astringent, tonic, diuretic, and uterine sedative properties, and is official in the Indian and Colonial Addendum, for use in India, and in the Eastern and North American Colonies. The chief preparation of the bark is Extractum Viburni Prunifolii Liquidum (1 in 1).

Black haw occurs in thin, slightly curved pieces or narrow quills. The former have been obtained from old wood, and are covered with a greyish or reddish-brown periderm, which frequently scales off, revealing the reddish-brown or yellowish-red subjacent tissues. The quills are glossy and purplish-brown externally, with a few scattered warts and minute black dots. The inner surface of the bark is striated longitudinally and of a pale reddish-yellow colour. The drug breaks with a short fracture. It has a faint valerian-like odour, and a somewhat bitter taste.

The distinctive characters of black haw are its colour, odour, and short fracture. Cramp bark, from *Viburnum Opulus*, Linné, occurs in flattish or curved bands or quills, which are ash - grey or brownish - grey externally, with scattered, somewhat transversely elongated, brownish warts, due to abrasion. They are also more or less marked with blackish dots, and with irregular black lines or thin ridges in a longitudinal direction. The inner surface is dingy white or brownish. The bark is inodorous and breaks with a tough fracture. The chief constituents of black haw are tannin and two resinous bodies, one of which has been named viburnin. Other constituents of the drug are sugar, various salts, and traces of an alkaloidal body, while the faint odour of the bark appears to be due to valerianic (viburnic) acid.

WINTERA.

Winter's Bark.

THE dried bark of *Drimys Winteri*, Forster (N.O. Magnoliaceæ), a tree found in the western part of South America, and first brought to Europe by Captain Winter in 1579. It is a stimulating tonic and antiscorbutic, much used in Brazil for diarrhœa and gastric debility, but is now rarely seen in this country. False Winter's bark, from *Cinnamodendron corticosum*, Miers (N.O. Canellaceæ), was formerly used as a substitute for the genuine drug, while, more recently, true Winter's bark has been replaced in medicine by canella bark and the bark of *Croton Malambo*, Karston (N.O. Euphorbiaceæ).

Winter's bark occurs in quills or channeled pieces about 2 to 8 mm. thick, young pieces having an ashy-grey suberous coat beset with lichens, while older pieces are sometimes whitish and silvery, but more often of a dark rusty-brown colour externally. The inner surface is also of a dark rusty-brown colour, with small short and sharp longitudinal ridges or striations, and occasional fissures indicative of great contraction of the inner layer in drying. The bark breaks with a short fracture, and the short ridges are then seen to be the ends of rays of white bast fibres which diverge towards the circumference in a radiate manner, with the dark parenchyma intervening. A smooth transverse section exhibits numerous large oil-cells and large medullary rays. The odour of the bark is terebinthinous, while the taste is intensely pungent.

The rays of bast fibres in Winter's bark distinguish it from canella and cinnamodendron barks. The chief constituent of the drug is 0·64 per cent. of a volatile oil, which consists chiefly of a sesquiterpene. Other constituents of Winter's bark are tannin, resin, starch, and mucilage. A cooled decoction of the bark does not give a deep red or purplish-brown coloration with solution of iodine, such as is given by a decoction of cinnamodendron bark, but it assumes a dark violet coloration on adding solution of potash, and is thus distinguished from a decoction of canella bark, which is only slightly affected by the same treatment.

ZINGIBER.

Ginger.

THE scraped and dried rhizome of *Zingiber officinale*, Roscoe (N.O. Scitaminaceæ), a native of Asia, which is cultivated in Jamaica and the West Indies, Africa (Sierra Leone), India, Japan, and other tropical countries. It is a reed-like plant with branching rhizomes, and is propagated artificially by dividing the rhizomes into "fingers," and planting the divisions about 30 cm. apart. Each "finger" contains a bud which produces roots and a new rhizome, and the latter gives off numerous branches in an upward direction when its growth is terminated by the production of an aerial shoot or stem. The rhizomes are fit to be collected about twelve months after planting, when the aerial stems have withered. They are then dug up, cleaned, freed from roots, and sometimes scalded in boiling water in order to destroy their vitality, before being dried by artificial means. The product constitutes the ordinary ginger of commerce, but, in the case of Jamaica ginger, the cork and part of the parenchyma are removed by peeling the washed rhizomes with narrow-bladed knives, after which the rhizomes are again washed and dried in the sun. The product is "scraped" or unbleached Jamaica ginger. It is an aromatic stimulant and carminative. It is used in the preparation of Infusum Sennæ, Mistura Sennæ Composita, Pilula Aloes et Ferri, Pilula Cambogiæ Composita, Pilula Scillæ Composita, Pulvis Cinnamomi Compositus, Pulvis Jalapæ Compositus, Pulvis Opii Compositus, Pulvis Rhei Compositus, Pulvis Scammonii Compositus, Syrupus Zingiberis (1 in 40), and Tinctura Zingiberis (1 in 10) ; the tincture is an ingredient of Acidum Sulphuricum Aromaticum, Infusum Cinchonæ Acidum, Liquor Sennæ Concentratus, and Pilula Scammonii Composita.

Ginger consists of flattish, irregularly branched pieces, which vary in length, but are usually from 7·5 to 10 cm. long, each branch being marked at its summit by a depressed scar. Jamaica ginger is of a pale buff colour externally, and the pieces break readily with a short, mealy, or sometimes resinous fracture, short scattered fibres — fibro-vascular bundles — usually protruding from the fractured surface. The outer surface of the rhizome is striated and fibrous, the fibres being leaf-traces which pass through the bark to the leaves and are laid bare by the removal of the cork. Coated or "unscraped" ginger may retain the whole of the cork, or have been deprived of it on the flatter sides only. So-called "bleached" ginger has usually been treated with sulphurous acid or chlorine, or may simply have been dusted over with lime, in order to give it a whitish appearance. A transverse section of the drug exhibits a large stele or central column which is sharply divided from a narrow bark by a fine yellow line; numerous yellow oil-cells are present in both stele and bark. The drug has an agreeable aromatic odour, and a hot, pungent taste.

Jamaica ginger is the finest variety. It occurs in pieces which are known in commerce as "races" or "hands," and is distinguished by the fibrous surface of the pieces, the short fracture of the rhizome, the fibres protruding from the fractured surface, and the yellow oil-cells. Cochin ginger, the next best variety, occurs usually in smaller pieces, with shorter branches and a less agreeable aroma; it may be either coated or scraped, the reddish-grey cork on the ventral and dorsal surfaces of the coated rhizomes being coarsely wrinkled both longitudinally and transversely, while the surface of the scraped rhizomes is striated and of a rather paler reddish-grey colour. Japanese ginger resembles Cochin, but the pieces are usually smaller and less regular. African ginger is more pungent than Jamaica ginger, and occurs in pieces which are about the same size as the Cochin variety, or rather larger; it is always coated, the ventral and dorsal surfaces bearing patches of earthy-brown wrinkled cork, while the lateral surfaces, from which alone the cork has been removed, are either dingy grey or nearly black. An inferior kind of Jamaica ginger, known as "ratoon" ginger, is produced by allowing part of the rhizome to remain in the ground and develop, after the first crop has been collected; it resembles ordinary Jamaica ginger in shape, but is of a dull greyish-brown colour, darker than Cochin ginger, and of inferior aroma and pungency. The chief constituents of ginger are about 2 to 3 per cent. of an aromatic volatile oil, and an intensely pungent, yellowish, oily body named gingerol, which is soluble in fats, volatile oils, alcohol, and ether; other constituents of the drug are resin and about 20 per cent. of starch. A thick, clear, dark brown oleo-resinous liquid, which is extracted from ginger by percolation with ether, and contains the whole of the virtues of the drug, is known as gingerine.

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PHARMACY OF OFFICIAL DRUGS
OF
VEGETABLE AND ANIMAL ORIGIN

THE following notes refer exclusively to galenical preparations made from drugs of vegetable and animal origin, which are official in the British Pharmacopœia, 1898, or in the Indian and Colonial Addendum, 1900, and preparations of which these drugs or their active constituents or derivatives are ingredients. For further information on many points, and explanations of purely chemical processes and preparations which are official, reference should be made to 'Pharmacopedia'. The strengths of the preparations are approximate only in certain cases, as are also some of the metric doses given as equivalents of the official doses in imperial weights and measures.

Acetum Cantharidis (CANTHARIDES, 1 in 10).—Prepared by macerating and percolating bruised cantharides with a menstruum of distilled water and glacial acetic acid, equal parts.

Acetum Ipecacuanhæ (EXTRACT, 1 in 20).—Prepared by diluting liquid extract of ipecacuanha, 1, with 90 per cent. alcohol, 2, and diluted acetic acid, 17. The vinegar should, therefore, contain from 0·1 to 0·1125 part of ipecacuanha alkaloids in 100 parts by volume, The alcohol is added as a preservative. Dose.—½ to 2 mils (10 to 30 minims).

Acetum Mylabridis (MYLABRIS, 1 in 10).—Prepared in the same way as Acetum Cantharidis, except that mylabris replaces cantharides.

Acetum Scillæ (SQUILL, 1 in 8).—Prepared by macerating bruised squill in diluted acetic acid. Dose.—½ to 2 mils (10 to 30 minims).

Acetum Urgineæ (URGINEA, 1 in 8).—Prepared in the same way as Acetum Scillæ, except that urginea replaces squill. Dose.—$\frac{1}{2}$ to 2 mils (10 to 30 minims).

Adeps Benzoatus (BENZOIN, 1 in $33\frac{1}{3}$).—Prepared by melting lard on a water-bath, adding powdered benzoin (from carefully selected pieces), and heating for two hours, frequently stirring meanwhile. The residue of the benzoin is then removed by straining, and granulation prevented by stirring the lard until cold. During digestion the lard extracts the benzoic acid and other aromatic constituents from the benzoin, and the presence of those antiseptic bodies inhibits the growth of the organisms to whose development the rancidity of stale lard is partly due.

Adeps Induratus.—Prepared by depriving lard of part of its oil (lard oil or lard olein) by pressure. In countries where, owing to prevailing high temperatures, ointments and plasters prepared with lard are too soft for convenient use, indurated lard may be employed instead, except in India, where caste prejudices render it desirable that prepared suet should be used in place of lard.

Adeps Lanæ Hydrosus (WOOL FAT, 1 in $1\frac{3}{7}$).—Prepared by placing wool fat in a warm mortar and adding, gradually and with constant trituration, distilled water. The product is capable of incorporating about half its weight of water and makes an excellent ointment basis when mixed with an equal weight of soft paraffin. The water present in hydrous wool fat can be determined approximately by dissolving 10 grammes in 10 mils of chloroform and measuring the water which separates.

Aqua Anethi (DILL FRUIT, 1 in 10).—Prepared by adding dried ripe dill fruit to water and distilling one-half. In India and other tropical countries, dill water may be prepared by triturating the corresponding quantity of oil of dill with twice its weight of calcium phosphate and five hundred times its volume of distilled water, then filtering.

Aqua Anisi (ANISE FRUIT, 1 in 10).—Prepared by adding dried ripe anise fruit to water and distilling one-half. An alternative process is described under Aqua Anethi.

Aqua Aurantii Floris.—Prepared by diluting, with twice its volume of distilled water, the so-called 'triple' orange-flower water of commerce, obtained by distillation from the fresh flowers of the bitter-orange tree, *Citrus auran-*

tium, var. *Bigaradia*, Hooker filius (N.O. Rutaceæ). The commercial article is a saturated solution of the volatile oil of the flowers. The freshly distilled water may possess a somewhat empyreumatic odour and a strong, somewhat acrid taste, but those disappear on keeping. The fragrant odour of the water, recalling that of the fresh flowers, is due to the volatile oil in solution. Orange-flower water should be colourless or possess only a slight greenish-yellow tint. The presence of much colour, an offensive odour, or mouldiness, indicates the presence of organic impurity. The water should be neutral to litmus paper and free from lead or other metallic impurities derived from the solder used in making the tinned copper cans in which the orange-flower water of commerce is imported.

Aqua Camphoræ (CAMPHOR, 1 in 1000).—Prepared by adding an alcoholic solution of camphor to distilled water in successive portions and shaking after each addition, so as to diffuse the camphor, which is at first precipitated in a cloudy condition, but dissolves on shaking. This method is more expeditious and yields a more uniform product than immersing crushed camphor in water.

Aqua Carui (CARAWAY FRUIT, 1 in 10).—Prepared by adding dried caraway fruit to water and distilling one-half. An alternative process is described under Aqua Anethi.

Aqua Cinnamomi (CINNAMON BARK, 1 in 10).—Prepared by adding bruised cinnamon bark to water and distilling one-half. An alternative process is described under Aqua Anethi.

Aqua Fœniculi (FENNEL FRUIT, 1 in 10).—Prepared by adding dried ripe fennel fruit to water and distilling one-half. An alternative process is described under Aqua Anethi.

Aqua Laurocerasi (CHERRY-LAUREL LEAVES, 1 in 1¼).—Prepared by adding crushed fresh cherry-laurel leaves to water and distilling two-fifths. The product differs from the other medicated waters in two respects; first, the volatile constituents do not pre-exist in the drug, but are only formed by the hydrolysis of the glucoside—closely allied to, if not identical with, amygdalin—when the crushed leaves are immersed in the water; secondly, hydrocyanic acid is one of the products of hydrolysis so that the distilled product is a distinctly potent liquid. In order to render this potency uniform, the hydrocyanic acid is determined by titration with decinormal silver nitrate solution and the strength of the preparation adjusted, by dilution with distilled water or addition of Acidum Hydrocyanicum Dilutum, so that it shall contain one-tenth per cent. of hydrocyanic acid, HCN. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Aqua Menthæ Piperitæ (PEPPERMINT OIL, 1 in 1000).—Prepared by adding oil of peppermint to water and distilling two-thirds. An alternative process is described under Aqua Anethi.

Aqua Menthæ Viridis (SPEARMINT OIL, 1 in 1000).—Prepared by adding oil of spearmint to water and distilling two-thirds. An alternate process is described under Aqua Anethi.

Aqua Pimentæ (PIMENTO, 1 in 5).—Prepared by adding bruised, dried, full-grown, unripe pimento fruit to water and distilling one-half. An alternative process is described under Aqua Anethi.

Aqua Rosæ.—Prepared by diluting, with twice its volume of distilled water, the so-called 'triple' rose water of commerce, obtained by distillation from the fresh flowers of *Rosa damascena*, Linné (N.O. Rosaceæ). The commercial article is a saturated solution of the volatile oil (otto) of the flowers.

Aqua Sambuci (ELDER FLOWERS, 1 in 1).—Prepared by adding fresh elder flowers, or an equivalent quantity of flowers preserved with common salt, to water and distilling one-fifth.

Collodium (PYROXYLIN, 1 in 49).—Prepared by dissolving pyroxylin in a mixture of ether and alcohol (90 per cent.).

Collodium Flexile (PYROXYLIN, 1 in 52).—Prepared by adding a little castor oil and Canada turpentine (so-called Canada balsam) to ordinary collodion, so as to render the film left on evaporation of the solvent tougher and less contractile.

Collodium Vesicans (CANTHARIDES, 1 in 2).—Prepared by dissolving pyroxylin in Liquor Epispasticus, so that the film left on evaporation of the solvent exhibits the characteristic properties of cantharides.

Confectio Piperis (Black Pepper, 1 in 10).—Prepared by mixing powdered black pepper and caraway fruit with clarified honey. Dose.—4 to 8 grammes (60 to 120 grains).

Confectio Rosæ Gallicæ (Rose Petals, 1 in 4).—Prepared by beating together, in a stone mortar, fresh red-rose petals and refined sugar. The product is used as a pill excipient.

Confectio Sennæ (Senna, 1 in 11).—Prepared by boiling figs and prunes with water, adding tamarinds and cassia pulp, allowing to digest for two hours, and rubbing the softened pulp of the fruits through a hair sieve, so as to remove seeds and other hard parts; refined sugar and extract of liquorice are dissolved in the sifted pulp by the aid of gentle heat, after which senna leaves and coriander fruits, both in fine powder, are incorporated. Dose.—4 to 8 grammes (60 to 120 grains).

Confectio Sulphuris (Sulphur, 1 in 2).—Prepared by mixing sublimed sulphur and acid tartrate of potassium with syrup, glycerin, and tincture of orange as a flavouring agent, while a little powdered tragacanth is added to give sufficient viscosity to the preparation, so that the solids do not settle too rapidly. The presence of glycerin prevents the confection from becoming dry. Dose.—4 to 8 grammes (60 to 120 grains).

Decoctum Acaciæ Corticis (Acacia Bark, 1 in 16).—Prepared by boiling bruised acacia bark with distilled water for ten minutes, then straining and adding sufficient water to make the required quantity. Dose.—15 to 60 mils ($\frac{1}{2}$ to 2 fluid ounces).

Decoctum Agropyri (Couch Grass, 1 in 20).—Prepared by boiling couch grass, cut small, with distilled water for ten minutes, then straining and adding sufficient water to make the required quantity. Dose.—15 to 60 mils ($\frac{1}{2}$ to 2 fluid ounces).

Decoctum Aloes Compositum (Aloes Extract, 1 in 100).—Prepared by boiling extract of Barbados aloes and myrrh with potassium carbonate (which aids the solution of the resinous constituents of the two drugs), extract of liquorice, and distilled water. After boiling, saffron is added, and, when cold, tincture of cardamoms; after standing for two hours the liquid is strained and brought to the required volume by the addition of distilled water. The saffron is added after boiling so that its colour and aroma may not be affected, while the tincture of cardamoms is not added to the liquid until cold so that the alcohol it contains may not be dissipated. The preservative action of the tincture depends upon the presence of alcohol, which inhibits the growth and development of moulds and other organisms which may gain access to the liquid decoction. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Cissampeli (CISSAMPELOS, 1 in 8).—Prepared by boiling thinly sliced cissampelos with distilled water for fifteen minutes, then straining and adding sufficient water to make the required quantity. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Gossypii Radicis Corticis (COTTON ROOT BARK, 1 in 5).—Prepared by boiling bruised cotton root bark with water until the liquid is reduced to one-half, and then straining. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Granati Corticis (POMEGRANATE BARK, 1 in 5).—Prepared by boiling powdered pomegranate bark with distilled water for ten minutes, straining, and adding sufficient water to make the required quantity. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Hæmatoxyli (LOGWOOD, 1 in 20).—Prepared by boiling logwood chips with distilled water for ten minutes, and adding a little bruised cinnamon bark towards the end of the operation, straining, and adding sufficient water to make the required quantity. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Hygrophilæ (HYGROPHILA, 1 in 10).—Prepared by boiling hygrophila, cut small, with distilled water until the liquid is reduced to one-third, and straining. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Ispaghulæ (ISPAGHULA, 1 in 73).—Prepared by boiling bruised ispaghula with distilled water for ten minutes, then straining and adding sufficient water to make the required quantity. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Decoctum Sappan (SAPPAN, 1 in 20).—Prepared in the same way as Decoctum Hæmatoxyli, except that sappan replaces logwood. Dose.—15 to 60 mils (½ to 2 fluid ounces).

Emplastrum Ammoniaci cum Hydrargyro (AMMONIACUM, 1 in 1¼).—Prepared by adding purified ammoniacum to metallic mercury which has been finely subdivided by trituration with sulphurised oil, obtained by heating olive oil with sublimed sulphur, and stirring until they are uniformly blended. The ammoniacum is purified by boiling with successive portions of water, and straining the resulting emulsions to remove insoluble particles, then mixing and evaporating the emulsions to a suitable consistence.

Emplastrum Belladonnæ (BELLADONNA LIQUID EXTRACT, 1 in 1½).—Prepared by evaporating standardised liquid extract of belladonna to remove most of the alcohol, and incorporating the residue with resin plaster. The product contains about 0·5 per cent. of belladonna alkaloids.

Emplastrum Calefaciens (CANTHARIDES, 1 in 25).—Prepared by infusing cantharides in boiling water, and incorporating the concentrated infusion with yellow beeswax, resin, plaster, and soap plaster. This plaster is intended to have only a mild action, and not to produce blisters.

Emplastrum Calefaciens Mylabridis (MYLABRIS, 1 in 25).—Prepared in the same way as Emplastrum Calefaciens, except that mylabris replaces cantharides. In India and the Colonies, more or less hard soap, indurated lard, prepared suet, resin, or yellow beeswax may be employed to harden this and other plasters, if prevailing high temperatures render such a course desirable, but the proportion of active ingredient must in all cases be maintained.

Emplastrum Cantharidis (CANTHARIDES, 1 in 3).—Prepared by incorporating powdered cantharides with yellow beeswax, lard, resin, and soap plaster, by sprinkling the powder into the melted mixture, and stirring as the plaster cools. The product is soft and plastic at ordinary temperatures, so that spread 'blisters' may be removed from the skin without injury to the latter.

Emplastrum Hydrargyri (MERCURY, 1 in 3).—Prepared by adding melted lead plaster to mercury which has been finely divided by trituration with sulphurised olive oil, prepared as in the case of Emplastrum Ammoniaci cum Hydrargyro.

Emplastrum Menthol (MENTHOL, 1 in $6\frac{2}{3}$).—Prepared by incorporating menthol with yellow beeswax and resin at a temperature just above the melting point of the mixture (71°–77° C.) so as to avoid loss of menthol by volatilisation.

Emplastrum Mylabridis (MYLABRIS, 1 in 3).—Prepared in the same way as Emplastrum Cantharidis, except that mylabris replaces cantharides, and prepared suet is used in India instead of lard.

Emplastrum Opii (OPIUM, 1 in 10).—Prepared by incorporating finely powdered opium with melted resin plaster on a water-bath.

Emplastrum Picis (BURGUNDY PITCH, 1 in 2).—Prepared by melting together Burgundy pitch, frankincense, resin, and yellow beeswax, then adding olive oil and distilled water, the water being subsequently removed by evaporation with constant stirring.

Emplastrum Plumbi (LEAD OXIDE, 1 in 3).—Prepared by boiling lead oxide and distilled water with olive oil, by the aid of a steam bath. The plaster consists chiefly of lead oleate and stearate, with some glycerin and water.

Emplastrum Plumbi Iodidi (LEAD IODIDE, 1 in 10).—Prepared by mixing finely powdered lead iodide with lead plaster and resin, previously melted together at as low a temperature as possible.

Emplastrum Resinæ (RESIN, 1 in $9\frac{1}{2}$).—Prepared by mixing resin with lead plaster and a smaller proportion of hard soap, each ingredient being melted separately at as low a temperature as possible. The plaster is similar in composition to soap plaster, but the larger proportion of resin makes it more adhesive.

Emplastrum Saponis (HARD SOAP, 1 in $7\frac{1}{6}$).—Prepared by mixing hard soap with lead plaster and a smaller proportion of resin, each ingredient being melted separately at a low temperature. The product is less tenacious than resin plaster.

Extractum Acalyphæ Liquidum (ACALYPHA, 1 in 1).—Prepared by exhausting dried acalypha, in No. 40 powder, by percolation with alcohol (90 per cent.), after moistening the powder thoroughly with the menstruum and setting it aside in a closed vessel for forty-eight hours. The first portion of percolate, equivalent in volume to three-fourths of the liquid extract required, is reserved, the alcohol is recovered from the remainder by distillation, the residue evaporated to a soft extract, and dissolved in the reserved percolate, after which sufficient menstruum is added to produce the required quantity of liquid extract. As the first portion of percolate contains the greatest proportion of the soluble constituents of the drug, the deleterious action of heat on those constituents is avoided by subjecting only the weaker succeeding portions of percolate to evaporation. Since the menstruum employed is really a mixture of alcohol and water, a further advantage of not evaporating the whole bulk of percolate by the aid of heat is the avoidance of a gradual reduction of its alcoholic strength, and consequent deposit of substances which —though soluble in stronger alcohol—would not remain dissolved in the weaker alcoholic liquid. Filtration of the extract would then be necessary, with the result that the deposited substances, on which the medicinal activity of the drug might depend, would be removed from the finished product. Dose.—¼ to 2 mils (5 to 30 minims).

Extractum Adhatodæ Liquidum (ADHATODA, 1 in 1).—Prepared by exhausting dried adhatoda, in No. 40 powder, after moistening it with the menstruum, by percolation with alcohol (60 per cent.), reserving the first portion of percolate, equivalent in volume to seventeen-twentieths of the liquid extract required, recovering the alcohol from the remainder by distillation, evaporating the residue to a soft extract, dissolving that in the reserved portion of percolate, and adding sufficient menstruum to produce the required quantity of liquid extract. In India and other tropical countries, the proportion of alcohol in this and similar liquid extracts may be increased to a proportion not exceeding 25 per cent. by weight of alcohol (90 per cent.), in order to prevent fermentation. Dose.—1 to 4 mils (20 to 60 minims).

Extractum Agropyri Liquidum (COUCH GRASS, 1 in 1).—Prepared by exhausting couch grass, cut small, by repeated digestion with boiling distilled water, evaporating the mixed liquids to a volume equivalent to three-fourths of the liquid extract required, then adding one-third the quantity of alcohol (90 per cent.). After standing for twenty-four hours, the liquid is filtered and sufficient alcohol added to produce the required quantity of liquid extract. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Extractum Aloes Barbadensis.—Prepared by exhausting Barbados aloes with boiling distilled water and evaporating the strained liquor to dryness at a temperature not exceeding 60° C. The product so obtained is not completely soluble in water, though extracted from the drug by that liquid, the reason being that some change in the matter extracted takes place during the process of evaporation and affects its solubility. This change is accelerated by the application of excessive heat, hence the necessity of evaporating the liquid at a low temperature. Dose.—½ to 2½ decigrams (1 to 4 grains).

Extractum Anthemidis.—Prepared by exhausting chamomile flowers with boiling water, and subsequently evaporating to the consistence of a soft extract. Since the oil of chamomile, which forms an important constituent of this drug, is dissipated during evaporation, a small quantity of oil is added towards the end of the process. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Belæ Liquidum (BAEL FRUIT, 1 in 1).—Prepared by exhausting bruised bael fruit by repeated maceration with distilled water, filtering and evaporating the mixed liquids, and adding alcohol (90 per cent.) as a preservative. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Extractum Belladonnæ Alcoholicum (ALKALOIDS, 1 in 100).—Prepared by evaporating four fluid parts of the standardised liquid extract and adding sufficient milk sugar to produce three parts by weight of the solid extract, so that the product contains 1 per cent. of the alkaloids of belladonna root. The amount of milk sugar required will depend upon the amount of total solids in the liquid extract employed, and must be determined each time by evaporating a portion of the liquid extract. By adding the milk sugar while the extract is still liquid, it is distributed uniformly, and the evaporation is then continued until the product, which should be a yellowish-brown slightly coherent powder, is reduced to the required weight. Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Belladonnæ Liquidum (ALKALOIDS, 1 in 133).—Prepared by submitting belladonna root to a process of re-percolation with a menstruum composed of alcohol (90 per cent.), 7, and distilled water, 1, such a mixture having been shown to be capable of removing the alkaloids most easily, and unaccompanied by an undesirable amount of inert extractive matter. The belladonna root, in No. 20 powder, is divided into four equal portions, the first of which is moistened with the menstruum, set aside for six hours, and then packed in a percolator, after which more of the menstruum is added, and the whole set aside for twenty-four hours. Percolation is then allowed to proceed and the liquid collected is passed through the second percolator, that collected from the second is passed through the third, and that from the third through the fourth, until the final percolate measures 12½ parts by volume for each 32 parts by weight of belladonna root taken. The liquid will contain about 80 per cent. of the total alkaloids of the root and should be sherry coloured. In order to extract the whole of the alkaloids it would be necessary to collect a larger quantity of percolate, express the residues, and concentrate the weaker liquors by the application of heat, as the result of which the colour of the liquid extract would be changed from sherry colour to brown or blackish-brown besides violating the idea underlying the whole process, which is to produce an extract of the root containing the active principles of belladonna unaltered by exposure to heat. The strong percolate is assayed, as explained in 'Pharmacopedia,' and then diluted with sufficient menstruum to adjust the strength of the preparation so that it shall contain 0·75 part of alkaloids—chiefly atropine and hyoscyamine—in 100 parts by volume.

Extractum Belladonnæ Viride.—Prepared from the juice expressed from fresh leaves and young branches of *Atropa Belladonna*, Linné. The expressed juice is heated to 54° C. in order to cause the separation of the green colouring matter (chlorophyll), which is then removed by straining the heated juice through calico. The strained liquid is next heated to 93° C., to cause the albumin to coagulate, and, after the coagulum has been filtered out, the filtrate is evaporated to the consistence of a thin syrup at a temperature below 100° C., a water-bath being used to avoid the risk of injury by over-heating. The green colouring matter previously separated is then added to the syrupy liquid, having first been passed through a hair sieve in order to subdivide it, and, after the mixture has been well stirred, evaporation is continued at a temperature not exceeding 60° C., until the extract attains the desired consistence. The chlorophyll is removed in the first instance because it is desired to retain it—unaltered and free from albumin—in the finished extract, and it would, otherwise, be strained out with the coagulum of albumin subsequently produced; it would also be injured by heating it to the temperature required to cause the albumin to coagulate. The albumin is removed from the extract because it would promote decomposition if allowed to remain. The resulting green extract of belladonna has been shown to contain from 0·5 to nearly 2 per cent. of alkaloids—most samples containing a little over 1 per cent. Dose.—15 to 60 milligrams ($\frac{1}{4}$ to 1 grain).

Extractum Cannabis Indicæ.—Prepared by exhausting Indian hemp, in coarse powder, by percolation with alcohol (90 per cent.), and subsequently evaporating the percolate to the consistence of a soft extract. Dose.—15 to 60 milligrams ($\frac{1}{4}$ to 1 grain).

Extractum Cascaræ Sagradæ.—Prepared by exhausting cascara sagrada, in No. 20 powder, by percolation with distilled water, the percolate being subsequently evaporated to dryness on a water-bath. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Cascaræ Sagradæ Liquidum (CASCARA SAGRADA, 1 in 1).—Prepared by exhausting cascara sagrada, in No. 20 powder, by maceration and subsequent percolation with distilled water. The total percolate is evaporated to 12 parts by volume for each 20 parts of drug taken, and 8 parts by volume of a mixture in equal proportions of alcohol (90 per cent.) and distilled water added to the concentrated product. Cold water exhausts cascara sagrada, the extraction of the resinous constituents of the drug being apparently rendered possible by their association with other substances in the presence of which they become soluble in aqueous menstrua. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Extractum Cimicifugæ Liquidum (CIMICIFUGA, 1 in 1).—Prepared by exhausting cimicifuga, in No. 60 powder, with alcohol (90 per cent.), in a similar way to Extractum Acalyphæ Liquidum. The drug is first macerated with twice its volume of the menstruum, and then percolated with more of the alcohol until exhausted, the first portion of the percolate, equivalent in volume to three-fourths of the liquid extract required, being collected separately and set aside. Percolation is then continued until the contents of the percolator are exhausted, and the percolate so obtained is evaporated to the consistence of a soft extract. This evaporated residue, which is of relatively small bulk, is dissolved in the reserved portion of percolate and the volume of the mixed product adjusted by the addition of more menstruum. Dose.—$\frac{1}{6}$ to 2 mils (5 to 30 minims).

Extractum Cinchonæ Liquidum (ALKALOIDS, 1 in 20).—Prepared by submitting red cinchona bark, in No. 60 powder, to percolation with distilled water, after maceration with water to which small proportions of hydrochloric acid and glycerin have been added. The addition of acid is necessary because a large proportion of the alkaloids in the bark is thus extracted, and the glycerin is added because it is useful in preventing the separation of flocculent material during concentration, besides assisting in the process of extraction. The percolate is concentrated at a temperature below that of boiling water in order to minimise the possibly deleterious effect of heat, and the use of metal evaporating pans must be avoided because of the presence of free hydrochloric acid. Evaporation is continued until the product contains, approximately, the required proportion of alkaloids ; it is then assayed as explained in ‘ Pharmacopedia,’ and its volume finally adjusted by evaporation or dilution with water so that it shall contain 5 parts of cinchona alkaloids in 100 parts by volume, after the addition of sufficient alcohol for the preservation of the extract. Dose.—3 to 10 decimils (5 to 15 minims).

Extractum Cissampeli Liquidum.—Prepared in the same way as Extractum Pareiræ Liquidum, except that cissampelos replaces pareira root.—Dose.—2 to 8 mils ($\frac{1}{2}$ to 2 fluid drachms).

Extractum Cocæ Liquidum (COCA LEAVES, 1 in 1).—Prepared in the same way as Extractum Cimicifugæ Liquidum, except that the drug is employed in coarser (No. 20) powder, weaker alcohol (60 per cent.) is used and the weaker percolate is evaporated at a temperature below 80° C. in order to avoid decomposition of the cocaine present. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Extractum Colchici.—Prepared from the juice expressed from fresh colchicum corms, deprived of their coats. After the feculence due to the presence of starch has been allowed to subside, the clear liquid is heated to 100° C., to cause albuminous matter to separate, then strained and evaporated to a soft pilular consistence.—Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Colocynthidis Compositum (COLOCYNTH PULP, 1 in 4).—Prepared by macerating colocynth pulp in alcohol (60 per cent.) for four days, pressing out the tincture, removing the alcohol by distillation, adding extract of Barbados aloes, scammony resin, and curd soap, and evaporating the mixture to the consistence of a firm extract. A small proportion of finely powdered cardamom seeds is added, but not until evaporation is nearly completed, in order that the aroma of the cardamoms may not be impaired. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Ergotæ.—Prepared by exhausting ergot, in No. 40 powder, by percolation with alcohol (60 per cent.). evaporating the percolate, and diluting the concentrated alcoholic liquid with distilled water in order to precipitate inert oily and resinous substances. The filtrate is rendered acid by the addition of diluted hydrochloric acid, which causes the precipitation of some colouring matter. The liquid is then neutralised by adding sufficient sodium carbonate to neutralise the acid previously added, and evaporated to a soft extract. Neutralisation is necessary to avoid the possible action of the hydrochloric acid upon the constituents of the extract during evaporation, and also because the product is often administered hypodermically. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Ergotæ Liquidum (ERGOT, 1 in 1).—Prepared by repeated digestion of crushed ergot with distilled water. The ergot is crushed, and not finely powdered, because a powder would form with water a magma from which it would be difficult to separate the liquid. After the crushed ergot has twice been digested with cold water for twelve hours, and the residual liquor expressed from the marc, the mixed liquors are strained, evaporated to a low bulk, and mixed when cold with nearly half their volume of alcohol (90 per cent.), this comparatively large proportion of alcohol being employed because of the facility with which an aqueous extract of ergot decomposes. Dose.—$\frac{1}{2}$ to 2 mils (10 to 30 minims).

Extractum Euonymi Siccum.—Prepared by exhausting euonymus bark, in No. 20 powder, by percolation with alcohol (45 per cent.). The alcohol is then removed by evaporation or distillation, and the tough hygroscopic residue reduced to powder and mixed with one-fourth its weight of calcium phosphate—a non-hygroscopic substance, after which the mixture is dried and powdered. It must be preserved in a well-closed bottle, to prevent access of moisture. Dose.—6 to 12 centigrams (1 to 2 grains).

Extractum Filicis Liquidum.—Prepared by exhausting male fern rhizome, in No. 20 powder, by percolation with ether, the ether being subsequently removed by evaporation or recovered from the percolate by distillation. The residue is a thick green oil. Dose.—3 to 6 mils (45 to 90 minims).

Extractum Gentianæ.—Prepared by infusing gentian root in ten times its weight of distilled water for two hours, then boiling for ten minutes, the liquid obtained being subsequently evaporated to produce a soft extract. The drug is not exhausted by this process, and the effect of boiling is to extract much more pectin from the root than would otherwise be the case. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Glycyrrhizæ.—Prepared by exhausting liquorice root, in No. 20 powder, by repeated maceration with cold water, heating the mixed liquids to 100° C., to coagulate albumin, straining to remove the inert albuminous coagulum, and evaporating to a soft extract.

Extractum Glycyrrhizæ Liquidum.—Prepared by exhausting liquorice root, in No. 20 powder, by maceration with two successive portions of cold water, straining and pressing after each maceration. The mixed liquors are heated to 100° C. to coagulate albumin, the coagulated flocks removed by straining and the strained liquor evaporated until it has, when cold, a specific gravity of 1·200. It is preserved by the addition of one-fourth its volume of alcohol (90 per cent.), this being the smallest proportion which will effect the desired result.

Extractum Glycyrrhizæ Spirituosum (EXTRACT OF LIQUORICE, 1 in 2).—Prepared by mixing extract of liquorice with distilled water, and adding sufficient alcohol (90 per cent.) to act as a preservative. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Extractum Gossypii Radicis Corticis Liquidum (COTTON ROOT BARK, 1 in 1).—Prepared by percolating cotton root bark, in No. 30 powder, with a mixture of glycerin, 1, and alcohol (90 per cent.), 3, then continuing the percolation with alcohol alone, distilling and evaporating the second percolate, dissolving the residue in the reserved portion, and adding sufficient alcohol to produce the required volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Extractum Grindeliæ Liquidum (GRINDELIA, 1 in 1).—Prepared by exhausting grindelia, in No. 40 powder, by maceration and percolation with alcohol (90 per cent.), after which the alcohol is recovered by distillation, and the residue dissolved in distilled water, to which sodium bicarbonate has previously been added, in order to neutralise the acid resin of the drug. After effervescence ceases, sufficient distilled water is added to make the volume of liquid equivalent to three-fourths of the liquid extract required, and sufficient alcohol is then added to produce the required volume. Dose.—6 to 12 decimils (10 to 20 minims).

Extractum Hamamelidis Liquidum (HAMAMELIS LEAVES, 1 in 1).—Prepared by exhausting hamamelis leaves, in No. 40 powder, by percolation with alcohol (45 per cent.), and proceeding as in the case of Extractum Adhatodæ Liquidum. Dose.—3 to 10 decimils (5 to 15 minims).

Extractum Hydrastis Liquidum (HYDRASTIS RHIZOME, 1 in 1).—Prepared by exhausting hydrastis rhizome, in No. 60 powder, by percolation with alcohol (45 per cent.), and proceeding as in the case of Extractum Adhatodæ Liquidum. Dose.—3 to 10 decimils (5 to 15 minims).

Extractum Hyoscyami Viride.—Prepared from the juice expressed from fresh leaves, flowering tops, and young branches of *Hyoscyamus niger*, Linné, in the same way as Extractum Belladonnæ Viride is prepared from belladonna juice. Commercial samples of the extract contain from 0·15 to 0·45 per cent. of alkaloids, mostly about 0·20 per cent. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Ipecacuanhæ Liquidum (Alkaloids, 1 in 50).—Prepared by exhausting ipecacuanha root, in No. 20 powder, by maceration and percolation with alcohol (90 per cent.). When the percolate measures 13½ parts by volume for each 16 parts of root taken, it is reserved, percolation being continued until nothing more is extracted. The marc is then mixed with slaked lime and set aside for twenty-four hours, after which percolation is continued to exhaustion. The addition of lime is necessary to liberate the alkaloids of ipecacuanha in an alcohol-soluble condition, and the addition is made at this stage, rather than at the beginning, because it is desirable to remove the natural constituents of the drug as far as possible by alcohol, without the use of an alkali. The alcohol is recovered from the last two percolates by distillation, and the residue dissolved in the strong reserved percolate. After being assayed, as explained in 'Pharmacopedia,' the liquid is diluted with alcohol (90 per cent.) so that it shall contain 2·0 to 2·25 parts of alkaloids in 100 parts by volume. As ipecacuanha root contains about 2 per cent. of alkaloids, one fluid ounce of the liquid extract is equivalent to one ounce of average quality root. Dose.—3 to 12 centimils (½ to 2 minims) as an expectorant; 10 to 12 decimils (15 to 20 minims) as an emetic.

Extractum Jaborandi Liquidum (Jaborandi Leaves, 1 in 1).—Prepared by submitting jaborandi leaves, in No. 20 powder, to percolation with alcohol (45 per cent.), and proceeding as in the case of Extractum Adhatodæ Liquidum, except that the volume of the final percolate must not exceed two and a half times that of the liquid extract required. Dose.—3 to 10 decimils (5 to 15 minims).

Extractum Jalapæ.—Prepared by macerating jalap, in coarse powder, for seven days in alcohol (90 per cent.), removing the tincture, and subsequently macerating the marc in distilled water for four hours. The two liquids are evaporated separately to soft extracts, which are mixed and further evaporated, at a temperature not exceeding 60° C., to the consistence of a firm extract. The purgative properties of jalap are entirely due to the two characteristic resins—jalapin and scammonin—contained in the drug, and these are extracted by the alcohol; the aqueous extract contains only sugar, mucilage and other inert substances. The idea underlying the employment of the mixed extracts is that the water-soluble portion will subdivide, and assist in the disintegration of, the alcoholic portion which, being chiefly resinous, will be insoluble in aqueous fluids, so that pills made entirely with an alcoholic extract might pass through the alimentary canal unaffected by the solvent action of the intestinal juices. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Kavæ Liquidum (KAVA RHIZOME, 1 in 1).—Prepared by submitting kava rhizome, in No. 20 powder, to maceration and percolation with alcohol (90 per cent.), followed by percolation with alcohol (45 per cent.), distillation and evaporation of the second percolate, solution of the residue in the reserved portion, and addition of sufficient alcohol (90 per cent.) to produce the required volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Extractum Krameriæ.—Prepared by exhausting coarsely powdered krameria root with cold distilled water by maceration and subsequent percolation, the liquor being afterwards evaporated to dryness. The extract would be tough in the plastic condition, and is more easily manipulated in the dry state, which enables it to be used in the form of powder. Dose.—3 to 1 decigrams (5 to 15 grains).

Extractum Nucis Vomicæ (STRYCHNINE, 1 in 20).—Prepared from the standerdised liquid extract in the same way as Extractum Belladonnæ Alcoholicum is prepared from the standardised liquid extract of belladonna. As the liquid extract contains 1·5 parts of strychnine in 100 fluid parts, and the solid extract is required to contain 5 per cent., it follows that 50 parts by volume of the former must be concentrated to 15 parts by weight of the latter in order to secure the desired result; in the preliminary experimental evaporation, therefore, the weight of the residue from one fluid ounce is deducted from 131·25 grains in order to find the amount of milk sugar necessary for the dilution. Dose.—15 to 60 milligrams ($\frac{1}{4}$ to 1 grain).

Extractum Nucis Vomicæ Liquidum (STRYCHNINE, 1 in $66\frac{2}{3}$).—Prepared by submitting nux vomica, in No. 20

powder, to maceration and percolation with alcohol (70 per cent.). The powder is soaked and slowly percolated with alcohol, the strength of which is such that it dissolves but little of the fat occurring in nux vomica. The first and stronger fraction of the percolate is reserved, the remainder evaporated to a low bulk, mixed with sufficient alcohol (90 per cent.) to make the alcoholic strength of the mixture approximate to that of alcohol (70 per cent.), and then added to the reserved portion. The addition of strong alcohol to the residue of the evaporation is probably intended to prevent precipitation of dissolved substances when the evaporated portion is added to the reserved percolate, but the mixture is seldom clear, and should be filtered after subsidence. After being assayed, as explained in 'Pharmacopedia,' the liquid is diluted with alcohol (70 per cent.), so that it shall contain 1½ parts of strychnine in 100 parts by volume. Dose.—½ to 2 decimils (1 to 3 minims).

Extractum Opii (MORPHINE, 1 in 5).—Prepared by repeated maceration of sliced opium with cold distilled water. The mixed liquors are strained through flannel, and evaporated so as to obtain a residue equal to about half the weight of the opium employed. The extract must now be assayed by the official process for assaying opium, and, the proportion of morphine having been thus determined, the weight of product is adjusted so that the extract contains 20 per cent. of morphine. As any suitable variety of opium may be used for preparing the extract, provided it contains, when dry, not less than 7½ per cent. of morphine, the consistence of the extract may vary considerably, owing to variation in the relative proportion of morphine and total extractive matter yielded by different samples of opium. The finished product usually has the consistence of a firm extract, but if a given sample of opium yield a high proportion of extractive, the extract may be solid before it is concentrated sufficiently to contain 20 per cent. of morphine, and in such case it must be combined with another extract richer in alkaloid. On the other hand, a sample of opium may yield a relatively low proportion of total extractive, and in that case the evaporated product would be unduly soft when it contains the necessary 20 per cent. of morphine. This condition may be remedied by further concentration and addition of sufficient milk sugar to bring the extract to the required total weight. Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Opii Liquidum (Morphine, 1 in 133⅓).—Prepared by mixing standardised extract of opium with distilled water and adding sufficient alcohol (90 per cent.) to act as a preservative. The mixture is allowed to stand in a cool place for twenty-four hours and then filtered. Assuming that the whole of the morphine of the solid extract is dissolved by the mixture of water and alcohol, the filtrate should contain 0·75 part of morphine per 100 fluid parts; it will therefore contain the same proportion of morphine as tincture of opium. Dose.—¼ to 2 mils (5 to 30 minims).

Extractum Pareiræ Liquidum.—Prepared by exhausting pareira root, in No. 40 powder, by maceration and percolation with boiling distilled water. The total solid, contained in the liquor are determined by evaporating a small measured quantity on a water-bath to a firm consistence. The bulk is then evaporated, so that the concentrated fluid shall contain one-third its weight of such extractive, and every three volumes are increased to four by the addition of alcohol (90 per cent.) to act as a preservative. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Extractum Physostigmatis.—Prepared by submitting Calabar bean, in No. 40 powder, to maceration and percolation with alcohol (90 per cent.), recovering most of the alcohol by distillation, and evaporating the residue so as to leave a soft extract; the product is then mixed with three times its weight of milk sugar so as to form a firm extract, this addition being necessary to reduce the strength of the finished preparation and bring its dose within suitable limits. Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Picrorhizæ Liquidum (Picrorhiza, 1 in 1).—Prepared in the same way as Extractum Adhatodæ Liquidum, except that picrorhiza, in No. 60 powder, replaces adhatoda. Dose.—1 to 4 mils (20 to 60 minims).

Extractum Rhei.—Prepared by exhausting rhubarb root, in No. 20 powder, by percolation with alcohol (60 per cent.), recovering most of the alcohol by distillation, and evaporating the residual liquid to dryness. Dose.—1 to 5 decigrams (2 to 8 grains).

Extractum Sarsæ Liquidum (SARSAPARILLA, 1 in 1).—Prepared by dividing sarsaparilla, in No. 40 powder, into three portions, and submitting the drug to repercolation with alcohol (20 per cent.). Glycerin is added to the strong percolate, with the object of preventing the formation of a deposit in the liquid extract on keeping. Dose.—8 to 15 mils (2 to 4 fluid drachms).

Extractum Stramonii.—Prepared by exhausting stramonium seeds, in No. 40 powder, by percolation with alcohol (70 per cent.), recovering most of the alcohol by distillation, and evaporating the residual liquid to the consistence of a firm extract. Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Strophanthi.—Prepared by percolating strophanthus seeds, in No. 30 powder and dried at 43° C., with purified ether to remove inert oil and resin, then drying and powdering the marc, and submitting the powder to maceration and percolation with alcohol (90 per cent.). After removing most of the alcohol from the percolate by evaporation, the residual liquid is concentrated and mixed with sufficient milk sugar to produce two parts of finished extract for each part of seeds taken. The addition of milk sugar is required in order to bring the dose within the limits considered most suitable for extracts of this kind, because the alcoholic extract alone would be too powerful. Dose.—15 to 60 milligrams (¼ to 1 grain).

Extractum Taraxaci.—Prepared from the juice expressed from fresh taraxacum root, in practically the same manner as extract of colchicum is prepared from the juice of colchicum corms. Dose.—3 to 10 decigrams (5 to 15 grains).

Extractum Taraxaci Liquidum (TARAXACUM ROOT, 1 in 1.)—Prepared from dried taraxacum root, in No. 20 powder, by successive maceration with alcohol (60 per cent.) and distilled water, the alcoholic liquid being simply expressed, while the aqueous liquor is expressed, strained, and concentrated by evaporation before being mixed with the tincture. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Extractum Viburni Prunifolii Liquidum (BLACK HAW, 1 in 1).—Prepared in the same way as Extractum Adhatodæ

Liquidum, except that black haw, in No. 60 powder, replaces adhatoda, and alcohol (70 per cent.) is used as a menstruum. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Glycerinum Amyli (STARCH, 1 in 9).—Prepared by mixing starch, glycerin, and water, heating them together, and stirring constantly until a translucent jelly is formed.

Glycerinum Pepsini (PEPSIN, 1 in 11).—Prepared by dissolving pepsin in a mixture of glycerin and water acidulated with hydrochloric acid. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Glycerinum Tragacanthæ (TRAGACANTH, 1 in 5).—Prepared by mixing tragacanth in powder with glycerin, adding distilled water, and triturating until a homogeneous paste is produced.

Infusum Alstoniæ (ALSTONIA, 1 in 20).—Prepared by infusing bruised alstonia with boiling distilled water for half an hour and straining the liquid. In preparing this and other infusions a covered vessel is used and the liquid is simply strained. In no case should the residue be pressed in order to obtain the maximum quantity of infusion, because such procedure would result in the production of a turbid liquid which could not readily be filtered bright, owing to the presence of mucilaginous or albuminous matters expressed from the tissues of the drug. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Infusum Andrographidis (ANDROGRAPHIS, 1 in 20).—Prepared by infusing andrographis, cut small, with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Infusum Aurantii (BITTER-ORANGE PEEL, 1 in 20).—Prepared by infusing dried bitter-orange peel, cut small, with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Infusum Aurantii Compositum (BITTER-ORANGE PEEL, 1 in 40).—Prepared by infusing dried bitter-orange peel, cut small, fresh lemon peel, cut small, and bruised cloves, with boiling distilled water for fifteen minutes. In India and the Colonies, dried lemon peel may be used when the fresh peel cannot be obtained. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Infusum Azadirachtæ Indicæ (INDIAN AZADIRACH, 1 in 100).—Prepared by infusing Indian azadirach with cold distilled water for fifteen minutes. Cold water is used in preparing this infusion because it extracts the bitter principle as well as boiling water, but the infusion will not keep so well. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Buchu (Buchu Leaves, 1 in 20).—Prepared by infusing freshly broken buchu leaves with boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Calumbæ (Calumba Root, 1 in 20).—Prepared by infusing thinly sliced calumba root with cold distilled water for half an hour. If boiling water were used in this case it would extract the starch from the drug and make a thick and unsightly preparation. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Caryophylli (Cloves, 1 in 40).—Prepared by infusing bruised cloves with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Cascarillæ (Cascarilla, 1 in 20).—Prepared by infusing cascarilla, in No. 10 powder, with boiling distilled water. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Chiratæ (Chiretta, 1 in 20).—Prepared by infusing chiretta, cut small, with boiling distilled water. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Cinchonæ Acidum (Red Cinchona Bark, 1 in 20).—Prepared by mixing red cinchona bark with boiling distilled water, adding a small proportion of aromatic sulphuric acid to facilitate the extraction of alkaloids, and infusing for one hour. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Coscinii (Coscinium, 1 in 20).—Prepared by infusing coscinium, thinly sliced, with cold distilled water for half an hour. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Cuspariæ (Cusparia Bark, 1 in 20).—Prepared by infusing cusparia bark, in No. 20 powder, with boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Digitalis (Digitalis Leaves, 1 in 146).—Prepared by infusing digitalis leaves, in No. 20 powder, with boiling distilled water for fifteen minutes. Dose.—8 to 15 mils (2 to 4 fluid drachms).

Infusum Ergotæ (Ergot, 1 in 20).—Prepared by infusing freshly crushed ergot with boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Gentianæ Compositum (GENTIAN ROOT, 1 in 80). —Prepared by infusing thinly sliced gentian root, dried bitter-orange peel and fresh lemon peel, both cut small, with boiling distilled water for fifteen minutes. In India and the Colonies, dried lemon peel may be used when the fresh peel cannot be obtained. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Krameriæ (KRAMERIA ROOT, 1 in 20).—Prepared by infusing bruised krameria root with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Lupuli (HOPS, 1 in 20).—Prepared by infusing freshly broken hops with boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Quassiæ (QUASSIA WOOD, 1 in 100).—Prepared by infusing finely rasped quassia wood with cold distilled water for fifteen minutes. Cold water is used in this case for the same reason as in preparing Infusum Azadirachtæ Indicæ. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Rhei (RHUBARB ROOT, 1 in 20).—Prepared by infusing rhubarb root, in thin slices, with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Rosæ Acidum (RED-ROSE PETALS, 1 in 40).— Prepared by infusing dried and broken red-rose petals for fifteen minutes in boiling distilled water, to which a small proportion of diluted sulphuric acid has previously been added in order to produce a bright red colour. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Scoparii (BROOM TOPS, 1 in 10).—Prepared by infusing dried and bruised broom tops in boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Senegæ (SENEGA ROOT, 1 in 20).—Prepared by infusing senega root, in No. 10 powder, with boiling distilled water for half an hour. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Sennæ (SENNA, 1 in 10).—Prepared by infusing senna and sliced ginger with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce); as a draught, 60 mils (2 fluid ounces).

Infusum Serpentariæ (SERPENTARY RHIZOME, 1 in 20).—Prepared by infusing serpentary rhizome, in No. 10 powder, with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Tinosporæ (TINOSPORA, 1 in 20).—Prepared by infusing tinospora, thinly sliced, with cold distilled water for half an hour. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Infusum Toddaliæ (TODDALIA, 1 in 20).—Prepared by infusing toddalia, in No. 20 powder, with boiling distilled water for fifteen minutes. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Infusum Uvæ Ursi (BEARBERRY LEAVES, 1 in 20).—Prepared by infusing bruised bearberry leaves with boiling distilled water for fifteen minutes. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Injectio Apomorphinæ Hypodermica (APOMORPHINE HYDROCHLORIDE, 1 in 100).—Prepared by dissolving apomorphine hydrochloride in freshly sterilised distilled water, to which 1 per cent. of diluted hydrochloric acid has been added. Dose, by subcutaneous injection.—3 to 6 decimils (5 to 10 minims).

Injectio Cocainæ Hypodermica (COCAINE HYDROCHLORIDE, 1 in 10).—Prepared by dissolving cocaine hydrochloride in freshly sterilised distilled water, to which while hot a small quantity of salicylic acid has been added as a preservative. Dose, by subcutaneous injection.—1 to 3 decimils (2 to 5 minims).

Injectio Ergotæ Hypodermica (ERGOTIN, 1 in 3).—Prepared by adding extract of ergot to distilled water which has been freshly sterilised by boiling and in which a small proportion of phenol has been dissolved as a preservative. Dose, by subcutaneous injection.—2 to 6 decimils (3 to 10 minims).

Injectio Morphinæ Hypodermica (MORPHINE TARTRATE, 1 in 20).—Prepared by dissolving morphine tartrate in freshly sterilised distilled water. Dose, by subcutaneous injection.—1 to 3 decimils (2 to 5 minims).

Jalapæ Resina.—Prepared from jalap, in No. 40 powder, as described at page 241. Dose.—1 to 3 decigrams (2 to 5 grains).

Kaladamæ Resina.—Prepared from kaladama, in No. 40 powder, by the process for preparing Jalapæ Resina from jalap, described at page 241. Dose.—1 to 5 decigrams (2 to 8 grains).

Lamellæ Atropinæ (ATROPINE SULPHATE, 1 in 100).—Prepared by adding a solution of atropine sulphate in freshly sterilised distilled water to an aqueous glyco-gelatin basis containing gelatin, 16·5 per cent., and glycerin, 1·25 per cent. The distilled water is boiled and cooled, the glycerin added, and the gelatin allowed to soak in the mixture until softened; the mixture is then heated gently until solution is effected, and strained through muslin. A solution of the medicament in recently boiled and cooled distilled water is added to the melted basis, and the medicated gelatin is then poured upon a sheet of plate glass, which has been coated thinly with white beeswax, and heated to about 38° C., the film being confined by means of a shape cut out of thick writing paper. When solidified, the film is allowed to dry upon the glass, after which it is detached and cut into discs measuring about 3½ millimetres (one seventh of an inch) in diameter, by means of a suitable punch. Each disc should contain 0·013 milligramme (1-5000 grain) of atropine sulphate.

Lamellæ Cocainæ (COCAINE HYDROCHLORIDE, 1 in 1⅔).—Prepared by adding a solution of cocaine hydrochloride in freshly sterilised distilled water to a glyco-gelatin basis, as in the case of Lamellæ Atropinæ. Each disc should contain 1·3 milligramme (1-50 grain) of cocaine hydrochloride.

Lamellæ Homatropinæ (HOMATROPINE HYDROBROMIDE, 1 in 2).—Prepared by adding a solution of homatropine hydrobromide in freshly sterilised distilled water to a glyco-gelatin basis, as in the case of Lamellæ Atropinæ. Each disc should contain 0 65 milligramme (1-100 grain) of homatropine hydrobromide.

Lamellæ Physostigminæ (PHYSOSTIGMINE SULPHATE, 1 in 20).—Prepared by adding a solution of physostigmine sulphate in freshly sterilised distilled water to a glyco-gelatine basis, as in the case of Lamellæ Atropinæ. Each disc should contain 0·065 milligramme (1-1000 grain) of physostigmine sulphate.

Limonis Cortex Siccatus.—Prepared by removing the fresh outer part of the pericarp of the fruit of *Citrus Medica*, Linné, var. *B-Limonum*, Hooker filius, and drying it carefully. The dried peel may be used in India and the Colonies, when fresh lemon peel cannot be obtained, for preparing Infusum Aurantii Compositum, Infusum Gentianæ Compositum, Syrupus Limonis, and Tinctura Limonis.

Linimentum Aconiti (ACONITE, 1 in $1\frac{1}{2}$).—Prepared by submitting aconite root, in No. 40 powder, to maceration and percolation with alcohol (90 per cent.) and dissolving a small proportion of camphor in the percolate.

Linimentum Ammoniæ (SOLUTION OF AMMONIA, 1 in 4).—Prepared by mixing almond and olive oils with solution of ammonia, which partly saponifies them. The liniment thus made is said to be less prone to solidify than if made with olive oil alone.

Linimentum Belladonnæ (LIQUID EXTRACT OF BELLADONNA, 1 in 2).—Prepared by diluting liquid extract of belladonna with one-fifth its volume of distilled water, and adding to alcohol (90 per cent.) containing a small proportion of dissolved camphor. The liniment contains 0·375 part of belladonna alkaloids in 100 fluid parts.

Linimentum Calcis (SOLUTION OF LIME, 1 in 2).—Prepared by mixing olive oil with solution of lime, which partly saponifies it.

Linimentum Camphoræ (CAMPHOR, 1 in 5).—Prepared by dissolving camphor in olive oil.

Linimentum Camphoræ Ammoniatum (CAMPHOR, 1 in 8).—Prepared by dissolving camphor and oil of lavender in alcohol (90 per cent.), and adding strong solution of ammonia gradually to form a clear solution.

Linimentum Chloroformi (CHLOROFORM, 1 in 2).—Prepared by mixing chloroform with liniment of camphor.

Linimentum Crotonis (CROTON OIL, 1 in 8).—Prepared by mixing croton oil and oil of cajeput with alcohol (90 per cent.).

Linimentum Hydrargyri (MERCURY, 1 in $1\frac{1}{2}$).—Prepared by triturating ointment of mercury with liniment of camphor, and adding the liquid to a mixture of liniment of camphor and strong solution of ammonia, the oil and lard present being partly saponified by the alkali.

Linimentum Opii (TINCTURE OF OPIUM, 1 in 2).—Prepared by mixing tincture of opium with liniment of soap.

Linimentum Potassii Iodidi cum Sapone (POTASSIUM IODIDE, 1 in 33⅓).—Prepared by triturating a solution of curd soap in distilled water and glycerin with potassium iodide, so as to form a gelatinous creamy product, to which a small quantity of oil of lemon is added as a perfume. The gelatinous condition is probably caused by the partial precipitation or 'salting out' of the soap from the saline solution of potassium iodide.

Linimentum Saponis (SOFT SOAP, 1 in 11¾).—Prepared by dissolving soft soap in distilled water, and adding a solution of camphor and oil of rosemary in alcohol (90 per cent.).

Linimentum Sinapis (OIL OF MUSTARD, 1 in 27½).—Prepared by dissolving camphor in alcohol (90 per cent.), and adding volatile oil of mustard and castor oil.

Linimentum Terebinthinæ (OIL OF TURPENTINE, 1 in 1½).—Prepared by dissolving camphor in oil of turpentine, and emulsifying the solution by trituration with soft soap and distilled water.

Linimentum Terebinthinæ Aceticum (OIL OF TURPENTINE, 1 in 2¼).—Prepared by mixing oil of turpentine, glacial acetic acid, and liniment of camphor.

Liquor Andrographidis Concentratus (ANDROGRAPHIS, 1 in 2).—Prepared by macerating and percolating andrographis, in No. 40 powder, with alcohol (20 per cent.). In the case of this and similar preparations (concentrated infusions), the powdered drug is moistened with half its volume of the alcohol, packed in a percolator, and set aside for three days, after which percolation is allowed to proceed. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Aristolochiæ Concentratus (ARISTOLOCHIA, 1 in 2).—Prepared by macerating and percolating aristolochia, in No. 40 powder, with alcohol (20 per cent.), as in the case of Liquor Andrographidis Concentratus. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Liquor Atropinæ Sulphatis (ATROPINE SULPHATE, 1 in 100).—Prepared by dissolving atropine sulphate in freshly sterilised distilled water, with the addition of a small quantity of salicylic acid to act as a preservative. Dose.—3 to 6 centimils (½ to 1 minim).

Liquor Berberidis Concentratus (BERBERIS, 1 in 2).—Prepared by macerating and percolating berberis, in No. 40 powder, with alcohol (20 per cent.), as in the case of

Liquor Andrographidis Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Calumbæ Concentratus (CALUMBA ROOT, 1 in 2).—Prepared by macerating calumba root, in No. 5 powder, for twenty-four hours with distilled water and pressing strongly, then repeating the operation and clearing the mixed liquids by heating to 82° C. for five minutes ; when cold, alcohol (90 per cent.) is added as a preservative and the liquid made up to the required volume by the addition of distilled water. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Caoutchouc (INDIA-RUBBER, 1 in 20).—Prepared by macerating india-rubber, cut in fine shreds, in a mixture of benzol and carbon bisulphide, until solution is effected.

Liquor Chiratæ Concentratus (CHIRETTA, 1 in 2).—Prepared by macerating and percolating chiretta, in No. 40 powder, with alcohol (20 per cent.) as in the case of Liquor Andrographidis Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Coscinii Concentratus (COSCINIUM, 1 in 2).—Prepared from coscinium, in No. 5 powder, by the process employed for Liquor Calumbæ Concentratus, but the quantity of alcohol (90 per cent.) added as a preservative is increased to two-fifths. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Cuspariæ Concentratus (CUSPARIA BARK, 1 in 2).—Prepared by macerating and percolating cusparia bark, in No. 40 powder, with alcohol (20 per cent.), as in the case of Liquor Andrographidis Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Epispasticus (CANTHARIDES, 1 in 2).—Prepared by macerating and percolating cantharides, in No. 20 powder, with acetic ether. This menstruum is employed because it is a good solvent of cantharidin and volatilises quickly when the solution is applied to the skin.

Liquor Epispasticus Mylabridis (MYLABRIS, 1 in 2).—Prepared by macerating and percolating mylabris, in No. 20 powder, with acetic ether.

Liquor Hamamelidis (HAMAMELIS LEAVES, 1 in 1).—Prepared by macerating in a still for twenty-four hours fresh hamamelis leaves with water to which 10 per cent. of alcohol (90 per cent.) has been added, then distilling one-half. As the result of some decomposition, an aromatic body is formed during the process of distillation and imparts a distinctive odour to the distillate.

Liquor Krameriæ Concentratus (KRAMERIA ROOT, 1 in 2).—Prepared by macerating and percolating krameria root, in No. 40 powder, with alcohol (20 per cent.), as in the case of Liquor Andrographidis Concentratus. The addition of 10 per cent. of glycerin is to prevent the loss of extractive by precipitation. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Morphinæ Acetatis (MORPHINE ACETATE, 1 in 100).—Prepared by dissolving morphine acetate in a mixture of alcohol (90 per cent.) distilled water, and diluted acetic acid, then adding sufficient distilled water to produce the required volume. The small proportion of acetic acid prevents the dissociation of the morphine acetate.—Dose.—½ to 4 mils (10 to 60 minims).

Liquor Morphinæ Hydrochloridi (MORPHINE HYDROCHLORIDE, 1 in 100).—Prepared by dissolving morphine hydrochloride in a mixture of alcohol (90 per cent.), distilled water, and diluted hydrochloride acid, then adding sufficient distilled water to produce the required volume. The morphine hydrochloride is less liable to dissociate in solution than the acetate. Dose.—½ to 4 mils (10 to 60 minims).

Liquor Morphinæ Tartratis (MORPHINE TARTRATE, 1 in 100).—Prepared by dissolving morphine tartrate in a mixture of alcohol (90 per cent.) and distilled water, then adding sufficient distilled water to produce the required volume. Morphine tartrate is more soluble in water than the hydrochloride, and does not become basic and insoluble like the acetate. Dose.—½ to 4 mils (10 to 60 minims).

Liquor Pancreatis (PANCREAS, 1 in 4).—Prepared from the fresh pancreas of the pig, freed from fat and external membrane, by digestion for seven days with alcohol (20 per cent.). The pancreas must be finely divided by trituration with washed sand or powdered pumice stone and, after digestion in a closed vessel, the mixture must be filtered. The alcohol acts as an antiseptic and thus preserves the solution, while the quantity present is insufficient to precipitate the pancreatin or to interfere with its digestive action.

Liquor Picis Carbonis (COAL TAR, 1 in 5).—Prepared by digesting prepared coal tar with a tincture of quillaia bark for two days, at a temperature of 49° C., then cooling, and decanting or filtering the clear liquid. The tincture (1 in 10) is prepared by percolating quillaia bark, in No. 20 powder, with alcohol (90 per cent.). The alcohol in the tincture extracts from the coal tar many of the numerous aromatic antiseptic bodies it contains, including napthalin, which is probably the most important. Being mostly insoluble in water, these aromatic bodies are precipitated when the alcoholic solution is diluted with water, but the saponin extracted from the quillaia bark causes the precipitated substances to be finely emulsified. The solution thus forms a milky liquid when diluted with water.

Liquor Quassiæ Concentratus (QUASSIA WOOD, 1 in 10).—Prepared by macerating and percolating quassia wood, in No. 40 powder, with alcohol (20 per cent.). In this case, the powdered drug is moistened with an equal volume of alcohol, before being packed in a percolator, but the process is otherwise the same as that employed for Liquor Andrographidis Concentratus, Liquor Chiratæ Concentratus, and similar preparations. Dose—2 to 4 mils (½ to 1 fluid drachm).

Liquor Rhei Concentratus (RHUBARB ROOT, 1 in 2).—Prepared by macerating and percolating rhubarb root, in No. 5 powder, with alcohol (20 per cent.), as in the case of Liquor Andrographidis Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Sarsæ Compositus Concentratus (SARSAPARILLA, 1 in 1).—Prepared by infusing sarsaparilla, cut transversely and bruised, with distilled water, for one hour at 71° C., repeating the operation twice, and adding to the mixed infusions a decoction prepared from sassafras root and guaiacum wood, in shavings, bruised dried liquorice root, and mezereon bark, cut small. After rapid concentration by evaporation, the liquid is cooled and about 25 per cent. of alcohol (90 per cent.) added as a preservative. Dose.—8 to 30 mils (2 to 8 fluid drachms).

Liquor Senegæ Concentratus (SENEGA ROOT, 1 in 2).—Prepared by extracting senega root, in No. 20 powder, with a mixture of alcohol (20 per cent.) with half its volume of alcohol (45 per cent.). The powdered drug is moistened with two-fifths its volume of the menstruum, packed in a percolator, and set aside for three days, after which percolation is allowed to proceed. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Sennæ Concentratus (Senna, 1 in 1).—Prepared by submitting senna, in No. 5 powder, to maceration and re-percolation with distilled water, the drug being divided into three equal portions. The percolate is heated to 82° C., for five minutes, to coagulate albumin, and a mixture of tincture of ginger and alcohol (90 per cent.) added, the tincture acting as a carminative and the alcohol as a preservative. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Serpentariæ Concentratus (Serpentary Rhizome, 1 in 2).—Prepared by macerating serpentary rhizome, in No. 40 powder, with alcohol (20 per cent.), as in the csae of Liquor Andrographidis Concentratus. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Liquor Strychninæ Hydrochloridi (Strychnine Hydrochloride, 1 in 100).—Prepared by dissolving strychnine hydrochloride in a mixture of alcohol (90 per cent.) and distilled water. Dose.—1 to 5 decimils (2 to 8 minims).

Liquor Thyroidei.—Prepared from the fresh and healthy thyroid glands of sheep, after being sliced and bruised, by maceration for twenty-four hours with a menstruum composed of equal parts of glycerin and distilled water, to which 0·5 per cent. phenol has been added. After maceration the mixture is strained through linen, with strong pressure, and to the product is added sufficient of the menstruum to make 6 mils (100 minims) representing one complete gland. As the glands contain about 75 per cent. of water, the proportions of glycerin and phenol are too small to prevent the development of putrefactive organisms in the finished liquid, and it has therefore been recommended that the bruised glands should be macerated with three-fourths their volume of glycerin for twenty-four hours, strained with strong pressure, and a mixture of equal parts of glycerin and distilled water added to produce the required volume. The finished liquid will then contain about 50 per cent. by volume of glycerin and the addition of any other preservative will be unnecessary. Before making the solution the hands of the operator should be well scrubbed with a liberal supply of soap, and the utensils employed should be cleansed by well rinsing them with freshly boiled water, or sterilised by immersion for a few minutes in boiling water, being afterwards allowed to cool just before they are required. Dose.—3 to 10 decimils (5 to 15 minims).

Liquor Tinosporæ Concentratus (Tinospora, 1 in 2).—Prepared from tinospora, in No. 5 powder, by the process employed for Liquor Calumbæ Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Liquor Toddaliæ Concentratus (Toddalia, 1 in 2).—Prepared by macerating and percolating toddalia, in No. 40 powder, with alcohol (20 per cent.), as in the case of Liquor Andrographidis Concentratus. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Lotio Hydrargyri Nigra (Mercurous Chloride, 1 in 146).—Prepared by triturating mercurous chloride with glycerin and mucilage of tragacanth, and adding solution of lime to precipitate black mercurous oxide, the precipitate being held in suspension by the mucilage of tragacanth. No suspending agent is used in preparing Lotio Hydrargyri Flava, which consists simply of yellow mercuric oxide and water.

Mel Boracis (Borax, 1 in 9½).—Prepared by mixing borax, in fine powder, with glycerin and clarified honey.

Mistura Ammoniaci (Ammoniacum, 1 in 32).—Prepared by emulsifying ammoniacum by trituration with distilled water, and flavouring the emulsion with syrup of tolu. The mixture is strained through muslin in order to remove grit and other foreign particles in the ammoniacum, without removing the less fine particles of suspended resin. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Mistura Amygdalæ (Compound Powder of Almonds, 1 in 9).—Prepared by triturating compound powder of almonds with distilled water to form a thin paste, then adding the remainder of the water to form a smooth uniform mixture, and straining through muslin to remove the coarser particles. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Mistura Creosoti (Creosote, 1 in 480).—Prepared by shaking creosote with a large volume of distilled water, and then adding syrup with spirit of juniper to flavour the mixture. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Mistura Cretæ (Prepared Chalk, 1 in 32).—Prepared by suspending prepared chalk in cinnamon water by means of tragacanth powder, and flavouring the mixture with sugar. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Mistura Ferri Composita (FERROUS SULPHATE, 1 in 184).—Prepared by suspending freshly precipitated ferrous carbonate, produced by reaction between ferrous sulphate and potassium carbonate, in an emulsion of myrrh in rose water, which is flavoured with spirit of nutmeg and sugar. The mixture is green when freshly prepared, but becomes reddish-brown on keeping, owing to rapid oxidation of the ferrous carbonate to ferric oxyhydrate, which is not so active. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Mistura Guaiaci (GUAIACUM RESIN, 1 in 40).—Prepared by suspending finely divided guaiacum resin in cinnamon water by means of tragacanth powder, and flavouring the mixture with sugar. Dose.—15 to 30 mils ($\frac{1}{2}$ to 1 fluid ounce).

Mistura Olei Ricini (CASTOR OIL, 1 in $2\frac{2}{3}$).—Prepared by emulsifying castor oil with mucilage of acacia, cinnamon water, and orange-flower water, the aromatic waters serving also as flavouring agents. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Mistura Sennæ Composita (MAGNESIUM SULPHATE, 1 in 4).—Prepared by dissolving magnesium sulphate in infusion of senna, then adding liquid extract of liquorice as a flavouring agent, and compound tincture of cardamoms and aromatic spirit of ammonia as carminatives and preservatives. This preservative action of the tincture and spirit is due to the alcohol they contain, and they act as carminatives by virtue of their alcohol, ammonia, and aromatic constituents, preventing to some extent the griping pain associated with the action of the purgative drugs. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Mistura Spiritus Vini Gallici (BRANDY, 1 in $2\frac{1}{2}$).—Prepared by adding a mixture of brandy and cinnamon water to yolk of egg beaten up with sugar. Dose.—30 to 60 mils (1 to 2 fluid ounces).

Mucilago Acaciæ (GUM ACACIA, 1 in $2\frac{3}{16}$).—Prepared by dissolving gum acacia, in small pieces, in distilled water. The gum should first be rinsed with water to remove dust and other loosely adherent impurities. The mucilage is usually faintly acid when freshly made, but becomes more acid on keeping, and its emulsifying properties are thereby impaired. The change may be prevented to a large extent by keeping the mucilage under aseptic conditions, or by the addition of antiseptics, but is accelerated by careless storage and in hot weather.

Mucilago Gummi Indici (Indian Gum, 1 in 4⅜).—Prepared in the same way as Mucilago Acaciæ, except that Indian gum replaces gum acacia.

Mucilago Tragacanthæ (Tragacanth, 1 in 74).—Prepared by diffusing powdered tragacanth in a small quantity of alcohol (90 per cent.), in which it is insoluble, and then rapidly mixing it with sufficient distilled water to produce the required volume. The formation of clotty lumps, such as are produced when the gum is added directly to water without previously mixing it with alcohol, is prevented by this method.

Oleum Phosphoratum (Phosphorus, 1 in 100).—Prepared by dissolving dry phosphorus in almond oil which has been freed from air and moisture by the application of heat, so as to prevent oxidation of the phosphorus. Solution is hastened by immersing the bottle containing the oil and phosphorus in hot water until the temperature of the mixture is 82° C., and the stopper of the bottle must be removed occasionally to allow of the escape of expanded air. Dose.—½ to 3 decimils (1 to 5 minims).

Oxymel (Clarified Honey, 1 in 1¼).—Prepared by mixing clarified honey with acetic acid and sufficient distilled water to produce a liquid having the specific gravity 1·320. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Oxymel Scillæ (Squill, 1 in 15).—Prepared by digesting bruised squill with acetic acid and distilled water, and mixing the resulting concentrated vinegar of squill with clarified honey, so as to produce an oxymel of specific gravity 1·320. If the more dilute Acetum Scillæ were used, it would be necessary to concentrate the mixture with honey by evaporation, in order to obtain a product having the desired activity and keeping properties, and much acetic acid would be lost during the process. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Oxymel Urgineæ (Urginea, 1 in 15).—Prepared in the same way as Oxymel Scillæ, except that urginea replaces squill. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Pilula Aloes Barbadensis (Barbados Aloes, 1 in 2).—Prepared by massing Barbados aloes and oil of caraway with hard soap and confection of roses. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Aloes et Asafetidæ (Socotrine Aloes, 1 in 4).—Prepared by massing Socotrine aloes and an equal weight of asafetida with hard soap and confection of roses. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Aloes et Ferri (Barbados Aloes, 1 in 4½).—Prepared by massing Barbados aloes, exsiccated ferrous sulphate, and compound powder of cinnamon with syrup of glucose. Soap is not used in this case, because it would react with the ferrous sulphate and produce a comparatively insoluble iron oleate. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Aloes et Myrrhæ (Socotrine Aloes, 1 in 2¼).—Prepared by massing Socotrine aloes and half its weight of myrrh with syrup of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Aloes Socotrinæ (Socotrine Aloes, 1 in 2).—Prepared by massing Socotrine aloes and oil of nutmeg with hard soap and confection of roses. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Cambogiæ Composita (Gamboge, 1 in 6).—Prepared by massing gamboge, Barbados aloes, and compound powder of cinnamon with hard soap and syrup of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Colocynthidis Composita (Colocynth Pulp, 1 in 6).—Prepared by massing colocynth pulp, Barbados aloes, scammony resin, oil of cloves, and potassium sulphate, with distilled water. The potassium sulphate is used as a triturant for the oil of cloves. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Colocynthidis et Hyoscyami (Colocynth Pulp, 1 in 9).—Prepared by mixing compound pill of colocynth with half its weight of extract of hyoscyamus, the latter being added to modify the action of the purgative by its influence upon the intestinal nerves. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Ferri (Ferrous Carbonate, 1 in 5).—Prepared by adding exsiccated ferrous sulphate to a mixture of syrup, glycerin, and distilled water, then adding exsiccated sodium carbonate and mixing so as to form ferrous carbonate. When the reaction is complete, the mixture is made into a mass by the addition of powdered tragacanth and gum acacia. The exsiccated salts are used because the exclusion of the water present in the crystalline salts allows of the reaction taking place between the iron and sodium compounds in the presence of a relatively considerable quantity of syrup and glycerin, which protect the ferrous carbonate by retarding oxidation. If the crystalline salts were used under the same conditions, the mass produced would require an unduly large proportion of gum acacia and tragacanth to produce a plastic pill-mass. Dose.—3 to 10 decigrams (5 to 15 grains).

Pilula Galbani Composita (GALBANUM, 1 in 3½).—Prepared by massing equal weights of galbanum, asafetida, and myrrh with syrup of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Hydrargyri (MERCURY, 1 in 3).—Prepared by finely dividing metallic mercury by trituration with confection of roses, the mass being stiffened by the addition of powdered liquorice root. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Hydrargyri Subchloridi Composita (MERCUROUS CHLORIDE, 1 in 4½).—Prepared by massing mercurous chloride, sulphurated antimony, and guaiacum resin with castor oil and alcohol (90 per cent.). Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Ipecacuanhæ cum Scilla (OPIUM, 1 in 20).—Prepared by massing compound powder of ipecacuanha, squill, and ammoniacum with syrup of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Ipecacuanhæ cum Urginea (OPIUM, 1 in 20).—Prepared in the same way as Pilula Ipecacuanhæ cum Scillæ, except that urginea replaces squill. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Phosphori (PHOSPHORUS, 1 in 50).—Prepared by dissolving phosphorus in carbon bisulphide and mixing the solution with a warm semi-solid mixture of white beeswax and lard. The solvent evaporates rapidly and leaves the phosphorus in a finely divided state, probably partly dissolved, in the fatty mixture. Some kaolin is then incorporated and the mass preserved under water to prevent oxidation of the phosphorus. When dispensed, the mass is incorporated with one-third its weight of powdered gum acacia. The pills should be varnished to preserve the phosphorus from oxidation. Dose.—6 to 12 centigrams (1 to 2 grains).

Pilula Plumbi cum Opio (OPIUM, 1 in 8).—Prepared by massing lead acetate and opium with syrup of glucose. Dose.—1 to 2½ decigrams (2 to 4 grains).

Pilula Quininæ Sulphatis (QUININE SULPHATE, 1 in 1⅕).—Prepared by mixing quinine sulphate with a small proportion of tartaric acid and massing with glycerin and powdered tragacanth. In ordinary doses quinine sulphate makes a bulky pill with plastic excipients, but the addition of tartaric acid enables the mass to be made by the use of a comparatively small proportion of excipient. Dose.—1 to 5 decigrams (2 to 8 grains).

Pilula Rhei Composita (RHUBARB ROOT, 1 in 3¾).—Prepared by massing powdered rhubarb root, Socotrine aloes, myrrh, and oil of peppermint, with hard soap and syrup of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Saponis Composita (OPIUM, 1 in 5).—Prepared by massing opium with hard soap and syrup of glucose. Dose.—1 to 2½ decigrams (2 to 4 grains).

Pilula Scammonii Composita (SCAMMONY RESIN, 1 in 3).—Prepared by dissolving scammony resin, jalap resin, and hard soap in tincture of ginger, and evaporating the solution to a pilular consistence. The use of a considerable proportion of soap is necessary to secure the disintegration of the resinous mass. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Scillæ Composita (SQUILL, 1 in 4).—Prepared by massing powdered squill, ammoniacum, and ginger with hard soap and spirit of glucose. Dose.—2½ to 5 decigrams (4 to 8 grains).

Pilula Urgineæ Composita (URGINEA, 1 in 4).—Prepared in the same way as Pilula Scillæ Composita, except that urginea replaces squill. Dose.—2½ to 5 decigrams (4 to 8 grains).

Podophylli Indici Resina.—Prepared from Indian podophyllum rhizome, in No. 40 powder, by the process for preparing Podophylli Resina, described at page 324. Dose.—15 to 60 milligrams (¼ to 1 grain).

Podophylli Resina.—Prepared from podophyllum rhizome, in No. 40 powder, as described at page 324. Dose.—15 to 60 milligrams (¼ to 1 grain).

Pulvis Amygdalæ Compositus (SWEET ALMONDS, 1 in 1⅝).—Prepared by mixing blanched and dried sweet almonds, rubbed to a coarse powder, with powdered sugar and gum acacia. The almonds must be dried thoroughly in a cloth after blanching, as they can then be rubbed to a smoother consistence, and the resulting powder keeps better. When rubbed down with an aqueous vehicle the powder forms a smooth bland milky fluid, owing to the emulsification of the almond oil by the gum. The powder is used for suspending insoluble substances in mixtures.

Pulvis Buteæ Seminum.—Prepared by soaking butea seeds in water until their integuments can be removed, then drying and powdering the kernels. Dose.—6 to 12 decigrams (10 to 20 grains).

Pulvis Catechu Compositus (CATECHU, 1 in 2½).—Prepared by mixing the three astringent drugs—catechu, kino, and rhatany root—with two aromatics—cinnamon bark and nutmeg, all being previously powdered. Dose.—½ to 2½ grammes (10 to 40 grains).

Pulvis Cinnamomi Compositus (CINNAMON BARK, 1 in 3).—Prepared by mixing the three aromatics, cinnamon, cardamoms, and ginger. Dose.—½ to 2½ grammes (10 to 40 grains).

Pulvis Cretæ Aromaticus (PREPARED CHALK, 1 in 83).—Prepared by mixing prepared chalk with the aromatics, cinnamon, nutmegs, cloves, and cardamoms, sweetened by the addition of sugar. When prescribed in the form of a mixture, the aromatic powder of chalk should be rubbed to a smooth paste with a little of the vehicle, no addition of gum being necessary to suspend the chalk, because the mucilage in the tissues of the drugs present forms a viscid liquid with water. Dose.—½ to 4 grammes (10 to 60 grains).

Pulvis Cretæ Aromaticus cum Opio (OPIUM, 1 in 40).—Prepared by mixing opium, in powder, with aromatic powder of chalk. Dose.—½ to 2½ grammes (10 to 40 grains).

Pulvis Elaterini Compositus (ELATERIN, 1 in 40).—Prepared by mixing elaterin with milk sugar, so as to bring the dose of the preparation within the limits which can be safely and expeditiously weighed by means of ordinary dispensing scales. Dose.—½ to 2½ decigrams (1 to 4 grains).

Pulvis Glycyrrhizæ Compositus (SENNA, 1 in 6).—Prepared by mixing finely powdered senna and sublimed sulphur with the aromatic, fennel fruit, and adding powdered liquorice root and sugar as flavouring agents. Dose.—4 to 8 grammes (60 to 120 grains).

Pulvis Ipecacuanhæ Compositus (OPIUM, 1 in 10).—Prepared by mixing opium and ipecacuanha root, in fine powder, with potassium sulphate, a dry, non-hygroscopic powder which forms a convenient medium for the dilution of potent remedies. Dose.—3 to 10 decigrams (5 to 15 grains).

Pulvis Jalapæ Compositus (JALAP, 1 in 3).—Prepared by mixing powdered jalap and acid potassium tartrate with the carminative, ginger. Dose.—1 to 4 grammes (20 to 60 grains).

Pulvis Kaladanæ Compositus (KALADANA, 1 in 3).—Prepared in the same way as Pulvis Jalapæ Compositus, except that kaladana replaces jalap as the chief constituent. Dose.—1 to 4 grammes (20 to 60 grains).

Pulvis Kino Compositus (OPIUM, 1 in 20).—Prepared by mixing powdered kino, opium, and cinnamon bark. Dose.—3 to 12 decigrams (5 to 20 grains).

Pulvis Opii Compositus (OPIUM, 1 in 10).—Prepared by mixing opium with black pepper, ginger, caraway fruit, and tragacanth, all in powder. Dose.—1 to 6 decigrams (2 to 10 grains).

Pulvis Rhei Compositus (RHUBARB ROOT, 1 in 4½).—Prepared by mixing powdered rhubarb root with an antacid and purgative, light magnesia, and a carminative, ginger. If a less bulky preparation be desired heavy magnesia may be employed. Dose.—1 to 4 grammes (20 to 60 grains).

Pulvis Scammonii Compositus (SCAMMONY RESIN, 1 in 2).—Prepared by mixing powdered scammony resin and jalap with a carminative, ginger. Dose.—6 to 12 decigrams (10 to 20 grains).

Pulvis Tragacanthæ Compositus (TRAGACANTH, 1 in 6).—Prepared by mixing tragacanth with gum acacia, starch, and sugar, all in powder. The compound powder is more convenient to use than simple tragacanth powder, for imparting viscosity to mixtures in order to suspend insoluble substances, because the separation of the particles of tragacanth by the other constituents reduces the tendency to form clotty lumps when the powder is rubbed down with water. Dose.—1 to 4 grammes (20 to 60 grains).

Pyroxylinum.—Prepared by immersing cotton wool in a mixture of sulphuric and nitric acids, in equal parts, and washing the resulting dimitrocellulose with distilled water until free from acid. A detailed explanation of the process will be found in ‘Pharmacopedia.’

Sapo Animalis.—Prepared by heating purified animal fat, consisting chiefly of stearin, with sodium hydroxide and water. Glycerin is formed as a bye-product, and remains in solution when sodium chloride is added to the liquid to separate the soap (chiefly sodium stearate) as a curd.

Sapo Durus.—Prepared by heating olive oil, which consists chiefly of olein, with sodium hydroxide and water, glycerin being formed as a bye-product and remaining in solution when the soap (chiefly sodium oleate) is ‘salted out’ by adding sodium chloride to the liquid. The olive oil may be replaced by arachis oil or sesame oil, when this soap is made in India.

Sapo Mollis.—Prepared by heating olive oil with potassium hydroxide and water, and allowing the mixture to cool. The product is a jelly-like mass of soft soap, which consists chiefly of potassium oleate and contains the glycerin formed in the reaction. Soft soap cannot be ‘salted out,’ because the sodium chloride would react with the potassium oleate to form hard soap (sodium oleate) and potassium chloride.

Scammoniæ Resina.—Prepared from scammony root, in coarse powder, as described at pages 372–3. Dose.—2 to 5 decigrams (3 to 8 grains).

Sevum Benzoatum.—Prepared in the same way as Adeps Benzoatus, except that prepared suet replaces lard. Benzoated suet should be used instead of benzoated lard in preparing ointments for use in India.

Sevum Præparatum.—Prepared as described at pages 383–4. It should be used instead of lard in preparing ointments and plasters for use in India.

Spiritus Ammoniæ Aromaticus (AMMONIA, 1 in 46⅓).—Prepared by dissolving oil of lemon and oil of nutmeg in a mixture of alcohol (90 per cent.) and distilled water, distilling the liquid, dissolving ammonium carbonate under pressure in the last fraction of the distillate, mixed with strong solution of ammonia, filtering the solution when cold through cotton wool, and gradually mixing the filtrate with the alcoholic liquid first distilled. The preliminary distillation of the oils with alcohol blends and improves the flavour of the product, and excludes some constituent of the oil of nutmeg which would cause rapid darkening of the spirit on the addition of the ammonia. The finished product should contain about 2·16 parts of ammonia in 100 parts by volume. It should be transparent and nearly colourless, but it is liable to darken slightly on keeping, probably owing to the action of ammonia on the oil of lemon, or of furfural in the alcohol, if the latter be of inferior quality. The specific gravity of the spirit is 0·888 to 0·893. Detailed information regarding the tests for the spirit will be found in 'Pharmacopedia.' Dose.—1 to 2½ mils (20 to 40 minims) if repeated, but 4 to 6 mils (60 to 90 minims) for a single administration.

Spiritus Ammoniæ Fetidus (ASAFETIDA, 1 in 13⅓).—Prepared by macerating asafetida in alcohol (90 per cent.), distilling the resulting tincture, mixing the alcoholic distillate with strong solution of ammonia, and adding sufficient alcohol to produce the required volume. The finished spirit should contain at least 2·88 parts of ammonia in 100 parts by volume. It should be nearly colourless, as it contains only the volatile oil of asafetida, which distils over with the alcohol, while the resinous, gummy, colouring, and other constituents are left behind in the still. Dose.—1 to 2½ mils (20 to 40 minims) if repeated, but 4 to 6 mils (60 to 90 minims) for a single administration.

Spiritus Anisi (OIL OF ANISE, 1 in 10).—Prepared by dissolving oil of anise in alcohol (90 per cent.). Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Armoraciæ Compositus (HORSERADISH ROOT, 1 in 8).—Prepared by mixing freshly scraped horseradish root, bruised bitter-orange peel, and bruised nutmegs with distilled water, allowing the pungent odour of the horseradish to develop (see page 47), then adding alcohol (90 per cent.), and distilling. The distillate contains the volatile oil of horseradish and the aromatic constituents of the orange peel and nutmegs. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Spiritus Cajuputi (OIL OF CAJUPUT, 1 in 10).—Prepared by dissolving oil of cajuput in alcohol (90 per cent.).—Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Camphoræ (CAMPHOR, 1 in 10).—Prepared by dissolving camphor in alcohol (90 per cent.). Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Cinnamomi (OIL OF CINNAMON, 1 in 10).—Prepared by dissolving oil of cinnamon in alcohol (90 per cent.) Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Juniperi (OIL OF JUNIPER, 1 in 20).—Prepared by dissolving oil of juniper in alcohol (90 per cent.), a smaller proportion of oil being taken than in other cases because oil of juniper varies in composition according to its geographical source, and is frequently less soluble than other oils, The solution should be filtered through powdered talc if necessary to remove insoluble constituents which are sometimes present in the oil. Dose.—3 to 4 mils (20 to 60 minims).

Spiritus Lavandulæ (OIL OF LAVENDER, 1 in 10).—Prepared by dissolving oil of lavender in alcohol (90 per cent.). Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Menthæ Piperitæ (OIL OF PEPPERMINT, 1 in 10).—Prepared by dissolving oil of peppermint in alcohol (90 per cent.). Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Myristicæ (OIL OF NUTMEG, 1 in 10).—Prepared by dissolving oil of nutmeg in alcohol (90 per cent.), and filtering through powdered talc if necessary to remove insoluble constituents which are sometimes present in the oil. Dose.—3 to 12 decimils (5 to 20 minims).

Spiritus Rectificatus (ALCOHOL, 1 in $1\frac{1}{9}$).—Prepared by submitting fermented saccharine liquids to distillation (*vide* 'Pharmacopedia'), removing oily impurities from the distillate by the addition of water and filtration through charcoal, separating the aldehyde and higher homologues of ethyl alcohol by fractional distillation, and dehydrating the spirit until it contains 90 per cent. by volume of ethyl hydroxide.

Spiritus Rosmarini (OIL OF ROSEMARY, 1 in 10).—Prepared by dissolving oil of rosemary in alcohol (90 per cent.).

Spiritus Vini Gallici (ALCOHOL, 1 in $2\frac{1}{3}$).—Prepared by distilling French wine and allowing the distillate to mature by age (see page 425).

Succus Acalyphæ.—Prepared by mixing the juice expressed from fresh acalypha with one-third its volume of alcohol (90 per cent.), setting the mixture aside for seven days to deposit, and filtering to remove gummy and albuminous matters precipitated by the alcohol. Dose.—4 to 15 mils (1 to 4 fluid drachms).

Succus Adhatodæ.—Prepared by expression from the bruised fresh leaves of *Adhatoda Vasica*, Neis., and straining. Dose.—4 to 15 mils (1 to 4 fluid drachms).

Succus Belladonnæ.—Prepared by mixing the juice expressed from the bruised fresh leaves and young branches of *Atropa Belladonna*, Linné., with one-third its volume of alcohol (90 per cent.), and filtering after seven days, as in the case of Succus Acalyphæ. Dose.—3 to 10 decimils (5 to 15 minims).

Succus Conii.—Prepared by mixing the juice expressed from the bruised fresh leaves and young branches of *Cornum maculatum*, Linné, with one-third its volume of alcohol (90 per cent.), and filtering after seven days, as in the case of Succus Acalyphæ. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Succus Hyoscyami.—Prepared by mixing the juice expressed from fresh leaves, flowering tops, and young branches of *Hyoscyamus niger*, Linné, with one-third its volume of alcohol (90 per cent.), and straining after seven days, as in the case of Succus Acalyphæ. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Succus Limonis.—Prepared by expression from the fresh ripe fruit of *Citrus medica*, Linné, var. *β-Limonum*, Hooker filius. The slightly turbid yellowish liquid should contain from 7 to 9 parts of citric acid in 100 parts by volume. Specific gravity 1·030 to 1·040.

Succus Scoparii.—Prepared by mixing the juice expressed from bruised fresh broom tops with one-third its volume of alcohol (90 per cent.), and filtering after seven days, as in the case of Succus Acalyphæ. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Succus Taraxaci.—Prepared by mixing the juice expressed from bruised fresh taraxacum root with one-third its volume of alcohol (90 per cent.), and filtering after seven days, as in the case of Succus Acalyphæ. Dose.—4 to 8 mils (1 to 2 fluid drachms).

Suppositoria Acidi Carbolici (PHENOL, 1 in 15).—Prepared by dissolving phenol in oil of theobroma and white beeswax, previously melted together at a low temperature, and pouring the mixture into moulds capable of containing about 1 gramme (15 to 16 grains) of oil of theobroma. In India and the Colonies, part of the oil of theobroma may be replaced by an equivalent amount of white beeswax. Each suppository should contain 67 milligrams (1 grain) of phenol.

Suppositoria Acidi Tannici (Tannic Acid, 1 in 5).—Prepared by triturating tannic acid intimately with a small quantity of melted oil of theobroma, then adding more of the melted fat and pouring the mixture, as it begins to thicken, into moulds of suitable size. Full information regarding the method of procedure in this and similar instances will be found in 'Pharmacopedia.' Each suppository should contain 2 decigrams (3 grains) of tannic acid.

Suppositoria Belladonnæ (Extract of Belladonna, 1 in 10).—Prepared in the same way as Suppositoria Acidi Tannici, except that alcoholic extract of belladonna replaces tannic acid as the active constituent. Each suppository should contain 1 decigram ($1\frac{1}{2}$ grains) of Extractum Belladonnæ Alcoholicum and, approximately, 1 milligram ($\frac{1}{60}$ grain) of the alkaloids of belladonna root.

Suppositoria Glycerini (Glycerin, 1 in $1\frac{3}{7}$).—Prepared by allowing gelatin to absorb sufficient distilled water to soften it, then adding glycerin, heating on a water-bath until the gelatin liquefies, and evaporating until the mixture contains 70 per cent. of glycerin. The product is finally poured into moulds of suitable capacity.

Suppositoria Iodoformi (Iodoform, 1 in 5).—Prepared in the same way as Suppositoria Acidi Tannici, except that iodoform replaces tannic acid as the active ingredient. Each suppository should contain 2 decigrams (3 grains) of iodoform.

Suppositoria Morphinæ (Morphine Hydrochloride, 1 in 60).—Prepared in the same way as Suppositoria Acidi Tannici, except that morphine hydrochloride replaces tannic acid as the active ingredient. Each suppository should contain 17 milligrams ($\frac{1}{4}$ grain) of morphine hydrochloride).

Suppositoria Plumbi Composita (Opium, 1 in 15).—Prepared in the same way as Suppositoria Acidi Tannici, except that powdered opium and lead acetate replace tannic acid as the active constituents. Each suppository should contain 67 milligrams (1 grain) of opium and 2 decigrams (3 grains) of lead acetate.

Syrupus (Refined Sugar, 1 in 1⅛).—Prepared by adding refined sugar to half its weight of boiling distilled water, heating until dissolved, and adding sufficient boiling distilled water to make up any loss by evaporation. Specific gravity 1·330.

Syrupus Aromaticus (Tincture of Orange, 1 in 4).—Prepared by mixing tincture of orange and cinnamon water, removing the turbidity produced, by shaking the mixture with powdered talc, then filtering, and adding syrup. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Aurantii (Tincture of Orange, 1 in 8).—Prepared by mixing tincture of orange with syrup. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Aurantii Floris (Orange-Flower Water, 1 in 6¾).—Prepared by dissolving refined sugar in boiling distilled water, heating until dissolved, and adding undiluted orange-flower water. The orange-flower water is added after the sugar is dissolved in order to avoid dissipating its aroma by the prolonged application of heat. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Calcii Lactophosphatis (Calcium Lactophosphate, 1 in 40.—Prepared by dissolving precipitated calcium carbonate in diluted lactic acid, to form calcium lactate, adding concentrated phosphoric acid and triturating until the precipitate formed is dissolved, then diluting the solution with distilled water, after which undiluted orange-flower water is added as a flavouring agent, and sugar dissolved in the liquid without the aid of heat. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Cascaræ Aromaticus (Liquid Extract of Cascara, 1 in 2½).—Prepared by mixing liquid extract of cascara, tincture of orange, alcohol (90 per cent.), cinnamon water, and syrup. The nauseous, bitter taste of the cascara sagrada is to some extent covered by the added flavouring agents. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Syrupus Chloral (Chloral Hydrate, 1 in 5½).—Prepared by dissolving chloral hydrate in about its own weight of distilled water and adding syrup, so that the finished product contains 10 grains of chloral hydrate in 1 fluid drachm. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Syrupus Codeinæ (Codeine Phosphate, 1 in 220).—Prepared by dissolving codeine phosphate in about four times its weight of distilled water and adding syrup, so that the finished product shall contain ¼ grain of codeine phosphate in 1 fluid drachm. Codeine phosphate is used because it is much more readily soluble than the free alkaloid. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Syrupus Ferri Iodidi (FERROUS IODIDE, 1 in 10).—Prepared by filtering a freshly prepared solution of ferrous iodide into a strong solution of sugar in boiling distilled water, rinsing the flask in which the solution of ferrous iodide has been prepared and the filter, with boiling diluted syrup, then passing sufficient boiling distilled water through the filter to produce the required volume of syrup. Ferrous iodide is very unstable, and oxidises rapidly with formation of a red ferric oxyiodide and free iodine, hence the necessity for freshly preparing the salt and at once filtering its solution into the syrup. In presence of sugar, oxidation of the iodide is much retarded, and if stored in bottles, quite filled and well closed, the syrup may be preserved in good condition for a long period. It should have a specific gravity of 1·380 to 1·387, and contain one part of ferrous iodide in 10 parts by volume. An explanation of the official test will be found in 'Pharmacopedia.' Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Ferri Phosphatis (FERROUS PHOSPHATE, 1 in 55).—Prepared by dissolving iron wire in concentrated phosphoric acid diluted with an equal bulk of distilled water, by the aid of gentle heat, hydrogen being evolved and ferrous phosphate formed. This salt is insoluble in water, but dissolves in the excess of phosphoric acid present. When cold, the acid solution of ferrous phosphate is filtered (to remove insoluble impurities from the iron) into syrup, the flask and filter are washed with water to remove any adherent solution, and sufficient distilled water is added to produce the required volume of syrup. The finished syrup should contain 1 grain of anhydrous ferrous phosphate in 1 fluid drachm. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Ferri Phosphatis cum Quinina et Strychnina. (STRYCHNINE, 1 in 1750.—Prepared by dissolving strychnine and quinine sulphate in a freshly prepared acid solution of ferrous phosphate, filtering the mixture into syrup, and adding sufficient distilled water to produce the required volume of syrup. The finished syrup should contain the equivalent of 1 grain of ferrous phosphate, $\frac{4}{5}$ grain of quinine sulphate, and $\frac{1}{32}$ grain of strychnine in 1 fluid drachm. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Syrupus Glucosi (GLUCOSE, 1 in $2\frac{1}{4}$).—Prepared by mixing commercial liquid glucose with twice its weight of simple syrup by the aid of gentle heat. This mixture forms a useful pill excipient, as pill-masses made with it do not harden and become crumbly so quickly as those made with syrup alone, owing to the uncrystallisable nature of the glucose, while the pills are less hygroscopic than those made with excipients containing glycerin.

Syrupus Hemidesmi (HEMIDESMUS ROOT, 1 in 12).—Prepared by infusing bruised hemidesmus root in boiling distilled water for four hours and straining, setting the infusion aside until clear, then decanting the clear liquid, adding sugar, and dissolving by the aid of gentle heat. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Syrupus Limonis (FRESH LEMON PEEL, 1 in 50).—Prepared by macerating thinly sliced or grated fresh lemon peel by maceration in alcohol (90 per cent.) and adding the tincture so obtained to a solution of sugar in lemon juice, clarified by subsidence. In India and the Colonies, dried lemon peel may be used when the fresh peel cannot be obtained. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Syrupus Pruni Virginianæ (WILD CHERRY BARK, 1 in $6\frac{2}{3}$).—Prepared by macerating and percolating wild cherry bark, in No. 20 powder, with distilled water, dissolving sugar in the percolate, adding glycerin, and straining. The glucoside in the bark is decomposed during the maceration with water and the percolate will contain the essential oil and hydrocyanic acid resulting from the decomposition. In order to avoid loss of those principles, the sugar is dissolved in the percolate without the employment of heat. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Syrupus Rhei (RHUBARB ROOT, 1 in 15).—Prepared by macerating and percolating rhubarb root and coriander fruit, both in No. 20 powder, with a menstruum consisting of alcohol (90 per cent.) mixed with three times its volume of distilled water, then concentrating the percolate by evaporation, filtering, and dissolving sugar in the filtrate by the aid of heat. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Syrupus Rhœados (RED-POPPY PETALS, 1 in 3⅓).—Prepared by dissolving sugar in a strong hot infusion of fresh red-poppy petals, allowing the solution to become nearly cold, then adding alcohol (90 per cent.) and sufficient distilled water to produce the required weight. The alcohol is added as a preservative, because the syrup is very liable to ferment and become mouldy. In India and the Colonies, a larger proportion of alcohol must be used for this purpose. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Rosæ (DRIED RED-ROSE PETALS, 1 in 17¼).—Prepared by dissolving sugar in an infusion of dried red-rose petals in boiling distilled water. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Scillæ (SQUILL, 1 in 17½).—Prepared by dissolving sugar in vinegar of squill, by the aid of gentle heat. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Sennæ (SENNA, 1 in 1¾).—Prepared by dissolving sugar in a specially prepared tincture of senna, and flavouring the syrup with oil of coriander. The senna is macerated with three successive portions of alcohol (20 per cent.)., the marc strongly expressed after each period of maceration, and the third portion of expressed liquid concentrated by evaporation before adding it to the two portions previously expressed. By this means the prolonged application of heat to the stronger liquids is avoided. The mixed liquid is heated to 82° C. for a few minutes, to cause the separation of albuminous matter, and then set aside for the coagulum to deposit, after which sugar is dissolved in the filtrate by the aid of gentle heat, and oil of coriander, dissolved in alcohol (90 per cent.), added to flavour the product. The employment of dilute alcohol as a menstruum in making this syrup is intended to prevent fermentation, the sugar alone being, in this case, insufficient to prevent the development of organisms in the finished product. Dose.—2 to 8 mils (½ to 2 fluid drachms).

Syrupus Tolutanus (BALSAM OF TOLU, 1 in 28).—Prepared by boiling balsam of tolu with distilled water for half an hour, replacing any water lost by evaporation, filtering the liquid when cold, and dissolving sugar in the filtrate by the aid of heat. The insoluble resin in the balsam forms a cake at the bottom of the vessel, while a deposit of white scaly crystals of cinnamic acid forms as the liquid cools, being less soluble in cold than in hot water. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Urgineæ (URGINEA, 1 in 17½).—Prepared in the same way as Syrupus Scillæ, except that urginea replaces squill. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Syrupus Zingiberis (GINGER, 1 in 40).—Prepared by dissolving sugar in a strong tincture, obtained by percolating ginger, in fine powder, with alcohol (90 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Terebenum.—Prepared from oil of turpentine as described at page 406. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Aconiti (ACONITE ROOT, 1 in 20).—Prepared by percolating aconite root, in No. 40 powder, with alcohol (70 per cent.). In the case of this and other tinctures prepared by percolation, unless otherwise specified, the powdered drug is moistened uniformly with sufficient of the menstruum to convert it into a damp powder, the quantity required in each case being indicated in the official formula for the particular tincture. The moistened drug is then allowed to stand for twenty-four hours in a closed vessel in order that the tissues may swell, thus enabling the menstruum to permeate the cells and render the brittle, dry tissue more pliable, so that it can more easily be packed uniformly in a percolator. At the same time the cell contents are brought into a plastic condition, so that the soluble constituents are more readily extracted by the subsequent percolation with more of the menstruum. The mixture is then packed in a percolator in such a way that the material is uniformly distributed, and the formation of channels avoided, the tightness of the packing being such that, working on a small quantity of tincture, a rapid succession of drops, but not a continuous stream, of percolate should be obtained when the menstruum is poured on. Next, pour over the contents of the percolator, at intervals, further portions of the menstruum, always maintaining a layer of liquid above the materials, so as to prevent air spaces being formed in the upper part, or the succeeding portion of menstruum added would immediately flow into and fill up such spaces without passing slowly through the overlying material. Percolation is allowed to proceed slowly at first and afterwards less slowly, until a sufficient quantity of menstruum has been used to produce about three-fourths of the finished tincture, or until exhaustion of the solid materials has been effected, the last fraction of percolate being then almost or quite colourless. When liquid ceases to pass, remove the marc from the percolator, submit it to pressure, and filter the expressed liquid, if necessary, either at once or after standing for twenty-four hours, so as to remove insoluble cell contents which may be mechanically suspended in the liquid. The filtrate is then mixed with the percolate, and added to a sufficient quantity of menstruum to produce the required volume of tincture. Dose.—3 to 10 decimils (5 to 65 minims); if very frequently repeated, 1 to 3 decimils (2 to 5 minims).

Tinctura Adhatodæ (ADHATODA, 1 in 8).—Prepared by percolating adhatoda, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Aloes (EXTRACT OF ALOES, 1 in 40).—Prepared by macerating extract of Barbados aloes with alcohol (45 per cent.), until dissolved, then adding liquid extract of liquorice, filtering, and passing sufficient alcohol through the filter to produce the required volume. Dose.—2 to 4 mils (½ to 1 fluid drachm) if repeated, but 6 to 8 mils (1½ to 2 fluid drachms) for a single administration.

Tinctura Alstoniæ (ALSTONIA, 1 in 20).—Prepared by macerating alstonia with alcohol (60 per cent.). In the case of this and other tinctures prepared by maceration, unless otherwise specified, the prepared drug is added to the whole of the menstruum in a closed vessel, and agitated frequently, so as to ensure the extraction of all soluble matter. Frequent agitation is necessary to prevent the layers of liquid in immediate contact with the drug from becoming saturated with the soluble matters extracted, as that would retard the process of solution. After seven days' maceration, the liquid is strained, the marc pressed, the expressed liquid mixed with the other, and the whole filtered. The finished tincture must not be made up to a fixed volume by the addition of more menstruum. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Andrographidis (ANDROGRAPHIS, 1 in 10).—Prepared by percolating andrographis, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Aristolochiæ (Aristolochia, 1 in 5).—Prepared by percolating aristolochia, in No. 40 powder, with alcohol (70 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Arnicæ (Arnica Rhizome, 1 in 20).—Prepared by percolating arnica rhizome, in No. 40 powder, with alcohol (70 per cent.).

Tinctura Arnicæ Florum (Arnica Flowers, 1 in 10).—Prepared by percolating arnica flowers, in No. 20 powder, with alcohol (45 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Asafetidæ (Asafetida, 1 in 5).—Prepared by macerating bruised asafetida in alcohol (70 per cent.) for seven days, then filtering and passing sufficient alcohol through the filter to produce the required volume of tincture. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Aurantii (Bitter-Orange Peel, 1 in 4).—Prepared by macerating fresh bitter-orange peel, cut small, with alcohol (90 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Azadirachtæ Indicæ (Indian Azadirach, 1 in 10). —Prepared by macerating Indian azadirach, rasped, with alcohol (45 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Belladonnæ (Liquid Extract of Belladonna, 1 in 15).—Prepared by diluting liquid extract of belladonna with alcohol (60 per cent.). The product should yield from 0·048 to 0·052 part of alkaloids in 100 parts by volume when examined by the assay process for Extractum Belladonnæ Liquidum. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Benzoini Composita (Benzoin, 1 in 10).—Prepared by macerating coarsely powdered benzoin, prepared storax, balsam of tolu, and Socotrine aloes with alcohol (90 per cent.) for two days, then filtering, and adding sufficient alcohol to produce the required volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Berberidis (Berberis, 1 in 10).—Prepared by percolating berberis, in No. 60 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Buchu (Buchu Leaves, 1 in 5).—Prepared by percolating buchu leaves, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Calotropis (CALATROPIS, 1 in 10).—Prepared by percolating calotropis, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Calumbæ (CALUMBA ROOT, 1 in 10).—Prepared by macerating calumba root, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Camphoræ Composita (MORPHINE, 1 in 2174).—Prepared by diluting standardised tincture of opium with alcohol (60 per cent.) in which benzoic acid, camphor, and oil of anise have been dissolved. It should contain 0·046 part of anhydrous morphine in 100 parts by volume, or the equivalent of $\frac{1}{30}$ grain of morphine hydrochloride (or ¼ grain of opium) in 1 fluid drachm. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Cannabis Indicæ (EXTRACT OF INDIAN HEMP, 1 in 20).—Prepared by dissolving extract of Indian hemp in alcohol (90 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Cantharidis (CANTHARIDES, 1 in 80).—Prepared by macerating cantharides, in No. 40 powder, in alcohol (90 per cent.). Dose.—3 to 10 decimils (5 to 15 minims) if repeated, but 1 to 3 decimils (2 to 5 minims) for a single administration.

Tinctura Capsici (CAPSICUM, 1 in 20).—Prepared by macerating capsicum, in No. 20 powder, with alcohol (70 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Cardamomi Composita (CARDAMOMS, 1 in 80).—Prepared by macerating bruised cardamom seeds, caraway fruit, and cinnamon bark, with alcohol (60 per cent.), adding raisins, freed from seeds, as a flavouring agent, and cochineal, which imparts to the tincture a red colour. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Cascarillæ (CASCARILLA, 1 in 5).—Prepared by percolating cascarilla, in No. 40 powder, with alcohol (70 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Catechu (CATECHU, 1 in 5).—Prepared by macerating coarsely powdered catechu and bruised cinnamon bark with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Chiratæ (CHIRETTA, 1 in 10).—Prepared by percolating chiretta, in No. 40 powder, with alcohol

(60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Chloroformi et Morphinæ Composita (Morphine Hydrochloride, 1 in 100).—Prepare by mixing chloroform, tincture of capsicum, tincture of Indian hemp, oil of peppermint, and glycerin with alcohol (90 per cent.), and adding diluted hydrocyanic acid. A ten-minim dose of the preparation contains $\frac{3}{4}$ minim of chloroform, $\frac{1}{2}$ minim of diluted hydrocyanic acid, and $\frac{1}{11}$ grain of morphine hydrochloride. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Cimicifugæ (Cimicifuga, 1 in 10).—Prepared by percolating cimicifuga, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Cinchonæ (Alkaloids, 1 in 100).—Prepared by macerating and percolating red cinchona bark, in No, 40 powder, with alcohol (70 per cent.), assaying the filtered percolate by the assay process for Extractum Cinchonæ Liquidum, and adjusting the strength of the finished tincture so that it shall contain 1 part of alkaloids in 100 parts by volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Cinchonæ Composita (Alkaloids, 1 in 200).—Prepared by mixing tincture of cinchona with an equal volume of a tincture obtained by macerating well-bruised dried bitter-orange peel, serpentary rhizome in No. 40 powder, cochineal in powder, and saffron with alcohol (70 per cent.) for seven days. The compound tincture is exactly half the strength of the simple tincture, and contains 1 part of cinchona alkaloids in 200 parts by volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Cinnamoni (Cinnamon Bark, 1 in 5).—Prepared by percolating cinnamon bark, in No. 40 powder, with alcohol (70 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Cocci (Cochineal, 1 in 10).—Prepared by macerating powdered cochineal with alcohol (45 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Colchici Seminum (Colchicum Seeds, 1 in 5).—Prepared by percolating colchicum seeds, in No. 30 powder, with alcohol (45 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Conii (Conium Fruit, 1 in 5). Prepared by percolating conium fruit, recently reduced to No. 40 powder, with alcohol (70 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Coscinii (Coscinium, 1 in 10).—Prepared by macerating coscinium, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm.)

Tinctura Croci (Saffron, 1 in 20).—Perpared by macerating saffron with alcohol (60 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Cubebæ (Cubebs, 1 in 5).—Prepared by percolating powdered cubebs with alcohol (90 per cent.).—Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Daturæ Seminum (Datura Seeds, 1 in 4).—Prepared by percolating bruised datura seeds with alcohol (70 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Digitalis (Digitalis Leaves, 1 in 8).—Prepared by percolating digitalis leaves, in No. 20 powder, with alcohol (60 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Ergotæ Ammoniata (Ergot, 1 in 4).—Prepared by percolating ergot, in No. 20 powder, with a mixture of alcohol (60 per cent.) and solution of ammonia, without setting aside for twenty-four hours after moistening with the menstruum. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Gelsemii (Gelsemium Root, 1 in 10).—Prepared by percolating gelsemium root, in No. 40 powder, with alcohol (60 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Gentianæ Composita (Gentian Root, 1 in 10).—Prepared by macerating well bruised gentian root, dried bitter-orange peel, and cardamom seeds, with alcohol (45 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Guaiaci Ammoniata (Guaiacum Resin, 1 in 5).—Prepared by dissolving powdered guaiacum resin in a mixture of strong solution of ammonia and alcohol (90 per cent.), then filtering, adding oil of nutmeg and oil of lemon, and passing sufficient alcohol through the filter to produce the required volume. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Hamamelidis (Hamamelis Bark, 1 in 10).—Prepared by percolating hamamelis bark, in No. 20

powder, with alcohol (45 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Hydrastis (HYDRASTIS RHIZOME, 1 in 10).—Prepared by percolating hydrastis rhizome, in No. 60 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Hyoscyami (HYOSCYAMUS, 1 in 10).—Prepared by percolating hyoscyamus leaves and flowering tops, in No. 20 powder, with alcohol (45 per cent.).—Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Jaborandi (JABORANDI LEAVES, 1 in 5).—Prepared by percolating jaborandi leaves, in No. 40 powder, with alcohol (45 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Jalapæ (JALAP RESIN, 1 in 66$\frac{2}{3}$).—Prepared by percolating jalap, in No. 40 powder, with alcohol (70 per cent.)., and standardising by the process described for extracting Jalapæ Resina, so as to contain 1$\frac{1}{2}$ parts of resin in 100 parts by volume. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Jalapæ Composita (JALAP, 1 in 33$\frac{1}{3}$).—Prepared by percolating jalap, scammony, and turpeth, all in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Kaladanæ (KALADANA, 1 in 5).—Prepared by percolating kaladana, in No. 40 powder, with alcohol (70 per cent.) Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Kino (KINO, 1 in 10).—Prepared by macerating powdered kino with a mixture of glycerin, distilled water, and alcohol (90 per cent.) for twelve hours, the kino being first rubbed to a smooth paste with part of the glycerin and water. The glycerin is added with the object of retarding gelatinisation, but a more satisfactory method is to heat the mixture of kino and water to boiling point and allowing to cool before adding the alcohol (see page 248). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Krameriæ (KRAMERIA ROOT, 1 in 5).—Prepared by percolating krameria root, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Lavandulæ Composita (OIL OF LAVENDER, 1 in 213).—Prepared by macerating bruised cinnamon bark, bruised nutmeg, and red sanders wood with alcohol

(90 per cent.), adding oil of lavender and oil of rosemary when the maceration is nearly completed. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Limonis (LEMON PEEL, 1 in 4).—Prepared by macerating fresh lemon peel, cut small, with alcohol (90 per cent.). In India and the Colonies, dried lemon peel may be used when the fresh peel cannot be obtained. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Lobeliæ Ætherea (LOBELIA, 1 in 5).—Prepared by percolating lobelia, in No. 40 powder, with spirit of ether. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Lupuli (HOPS, 1 in 5).—Prepared by macerating hops with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Myrrhæ (MYRRH, 1 in 5).—Prepared by macerating coarsely powdered myrrh with four times its volume of alcohol (90 per cent.) and adding sufficient alcohol to produce the required volume. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Nucis Vomicæ (LIQUID EXTRACT OF NUX VOMICA, 1 in 6).—Prepared by diluting liquid extract of nux vomica with one and a half times its volume of distilled water, and adding sufficient alcohol (90 per cent.) to produce the required volume of tincture. The finished preparation should contain 1 part of strychnine in 400 parts by volume. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Oliveri Corticis (OLIVER BARK, 1 in 10).—Prepared by percolating oliver bark, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Opii (MORPHINE, 1 in 133⅓).—Prepared by rubbing opium to a paste with hot water, setting the mixture aside to macerate for six hours, then adding alcohol (90 per cent.) and macerating for twenty-four hours more, after which the liquid is strained off, the marc pressed, and the mixed products filtered after standing for twenty-four hours longer. The opium is effectually disintegrated and exhausted by this process, without preliminary drying and powdering. The filtered tincture, obtained as described, is assayed for morphine and afterwards diluted with a mixture of equal volumes of distilled water and alcohol (90 per cent.), so that the finished product shall contain the soluble matter of 4·1 grains of opium in 1 fluid drachm, or the equivalent of 1 part of anhydrous morphine in 133⅓ parts by volume. The proportion of morphine present is determined by the assay process for opium, (*see* ' Pharmacopedia '), but the measured quantity of tincture taken for assay is subjected to a preliminary evaporation in order to remove most of the alcohol, as that would interfere with the precipitation of the morphine in the later stages of the process. Dose.—3 to 10 decimils (5 to 15 minims) if repeated, but 1 to 2 mils (20 to 30 minims) for a single administration.

Tinctura Opii Ammoniata (Morphine, 1 in 888$\frac{8}{9}$).—Prepared by mixing standardised tincture of opium with alcohol (90 per cent.) in which benzoic acid and oil of anise have been dissolved, and adding solution of ammonia. The finished product should contain the soluble matter of 0·62 grain of opium in 1 fluid drachm. Dose. —2 to 4 mils (½ to 1 fluid drachm).

Tinctura Picrorhizæ (Picrorhiza, 1 in 8).—Prepared by percolating picrorhiza, cut small and well bruised, with alcohol (45 per cent.).—Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Podophylli (Podophyllum Resin, 1 in 27½).—Prepared by dissolving podophyllum resin in alcohol (90 per cent.), so that the tincture shall contain 2 grains of resin in 1 fluid drachm. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Podophylli Indici (Indian Podophyllum Resin, 1 in 27½).—Prepared by dissolving Indian podophyllum resin in alcohol (90 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Pruni Virginianæ (Wild Cherry Bark, 1 in 5).—Prepared by macerating wild cherry bark, in No. 20 powder, with water for twenty-four hours, then adding alcohol (90 per cent.), and completing the macerating process. If the alcohol were added at first it would coagulate the ferment present in the bark, and so prevent decomposition of the glucoside, resembling amygdalin, which yields benzaldehyde and hydrocyanic acid when decomposed in the presence of water. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Pyrethri (Pyrethrum Root, 1 in 5).—Prepared by percolating pyrethrum root, in No. 40 powder, with alcohol (70 per cent.).

Tinctura Quassiæ (QUASSIA WOOD, 1 in 10).—Prepared by macerating rasped quassia wood, with alcohol (45 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Quillaiæ (QUILLAIA BARK, 1 in 20).—Prepared by percolating quillaia bark, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Quininæ (QUININE HYDROCHLORIDE, 1 in 50).—Prepared by dissolving quinine hydrochloride in tincture of orange. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Quininæ Ammoniata (QUININE SULPHATE, 1 in 50).—Prepared by adding quinine sulphate to alcohol (60 per cent.), mixed with 10 per cent. of solution of ammonia. The alkaloid is precipitated by the ammonia, but the precipitate dissolves in the alcohol. After standing for three days, the tincture should be filtered to remove any deposited cinchonidine present as an impurity in the quinine sulphate used. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Rhei Composita (RHUBARB ROOT, 1 in 10).—Prepared by percolating rhubarb root, in No. 20 powder, and bruised cardamom seeds and coriander fruit, with alcohol (60 per cent.), 10 per cent. of glycerin being added to the percolate to prevent the formation of a deposit on keeping. Dose.—2 to 4 mils (½ to 1 fluid drachm) if repeated, but 8 to 15 mils (2 to 4 fluid drachms for a single administration.

Tinctura Scillæ (SQUILL, 1 in 5).—Prepared by macerating bruised squill with alcohol (60 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Senegæ (SENEGA ROOT, 1 in 5).—Prepared by percolating senega root, in No. 40 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Sennæ Composita (SENNA, 1 in 5).—Prepared by macerating senna, broken small, raisins freed from seeds, and bruised caraway and coriander fruits, with alcohol (45 per cent.), a more active tincture being thus obtained than if stronger alcohol were used. Dose.—2 to 4 mils (½ to 1 fluid drachm) if repeated, but 8 to 15 mils (2 to 4 fluid drachms) for a single administration.

Tinctura Serpentariæ (SERPENTARY RHIZOME, 1 in 5).—Prepared by percolating serpentary rhizome, in No. 40 powder, with alcohol (70 per cent.). Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Stramonii (STRAMONIUM LEAVES, 1 in 5).—Prepared by percolating stramonium leaves, in No. 20 powder, with alcohol (45 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Strophanthi (STROPHANTHUS SEEDS, 1 in 40).—Prepared by exhausting strophanthus seeds, in No. 30 powder, by percolation with alcohol (70 per cent.), the powder being packed in a percolator, moistened with alcohol, and set aside for forty-eight hours before percolation is allowed to proceed. As exhaustion of the drug is effected when half the final volume of liquid has been obtained by percolation, the process may be stopped at this point and the remainder of the alcohol added directly to the percolate. Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Sumbul (SUMBUL ROOT, 1 in 10).—Prepared by macerating bruised sumbul root with alcohol (70 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Tinosporæ (TINOSPORA, 1 in 5).—Prepared by macerating tinospora, in No. 20 powder, with alcohol (60 per cent.). Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Tolutana (BALSAM OF TOLU, 1 in 10).—Prepared by dissolving balsam of tolu in alcohol (90 per cent.), filtering, and adding sufficient alcohol to produce the required volume of tincture. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Urgineæ (URGINEA, 1 in 5).—Prepared by macerating bruised urginea with alcohol (60 per cent.). Dose.—3 to 10 decimils (5 to 15 minims).

Tinctura Valerianæ Ammoniata (VALERIAN RHIZOME, 1 in 5).—Prepared by macerating valerian rhizome, in No. 40 powder, with alcohol (60 per cent.) mixed with 10 per cent. of solution of ammonia, oil of nutmeg and oil of lemon being added as flavouring agents, so that the total mixed menstruum resembles closely in composition aromatic spirit of ammonia. The ammonia in this tincture develops the strong characteristic odour of the valerian and assists the stimulant action of the drug. Dose.—2 to 4 mils ($\frac{1}{2}$ to 1 fluid drachm).

Tinctura Valerianæ Indicæ Ammoniata (INDIAN VALERIAN, 1 in 5).—Prepared by macerating Indian valerian rhizome, in No. 40 powder, with a mixture of alcohol (60 per cent.) and solution of ammonia, flavoured with the oils of nutmeg and lemon, as in the case of Tinctura

Valerianæ Ammoniata. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Tinctura Zingiberis (Ginger, 1 in 10).—Prepared by percolating ginger, in No. 40 powder, with alcohol (90 per cent.). A stronger tincture (1 in 2) is used only for preparing Syrupus Zingiberis. Dose.—2 to 4 mils (½ to 1 fluid drachm).

Trochiscus Acidi Benzoici.—Prepared with fruit basis, the benzoic acid being mixed intimately with refined sugar and gum acacia, both in fine powder, and the mixture made into a mass of suitable consistence by the addition of mucilage of gum acacia, softened black currant paste, and distilled water. The resulting stiff paste is rolled to a uniform thickness and divided by means of a suitable stamp or cutter into equal portions, which should be dried slowly in an oven or hot-air chamber at a moderate temperature. Each lozenge should contain 3¼ centigrams (½ grain) of benzoic acid.

Trochiscus Acidi Carbolici.—Prepared with tolu basis, the phenol being mixed intimately with tincture of balsam of tolu, refined sugar in fine powder, and gum acacia in powder, and the mixture made into a stiff paste by the addition of mucilage of gum acacia and distilled water. The paste is then divided into equal portions and dried, as in the case of Trochiscus Acidi Benzoici, so that each lozenge shall contain 6½ centigrams (1 grain) of phenol.

Trochiscus Acidi Tannici.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing 3¼ centigrams (½ grain) of tannic acid.

Trochiscus Bismuthi Compositus.—Prepared with rose basis, bismuth oxycarbonate, heavy magnesium carbonate, and precipitated calcium carbonate being mixed intimately with refined sugar and gum acacia, both in fine powder, and the mixture made into a stiff paste by the addition of mucilage of gum acacia and rose water. The paste is then divided into equal portions and dried, as in the case of Trochiscus Acidi Benzoici, so that each lozenge shall contain 13 centigrams (2 grains) each of bismuth and magnesium carbonates, and 26 centigrams (4 grains) of calcium carbonate.

Trochiscus Catechu.—Prepared with simple basis, the catechu being mixed intimately with refined sugar and gum acacia, all in fine powder, and the mixture made into a stiff paste by the addition of mucilage of gum acacia and distilled water. The paste is then divided into equal portions and dried, as in the case of Trochiscus Acidi Benzoici, so that each lozenge shall contain $6\frac{1}{2}$ centigrams (1 grain) of catechu.

Trochiscus Eucalypti Gummi.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing $6\frac{1}{2}$ centigrams (1 grain) of eucalyptus gum.

Trochiscus Ferri Redacti.—Prepared with simple basis, as in the case of Trochiscus Catechu, each lozenge containing $6\frac{1}{2}$ centigrams (1 grain) of reduced iron.

Trochiscus Guaiaci Resinæ.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing $19\frac{1}{2}$ centigrams (3 grains) of guaiacum resin.

Trochiscus Ipecacuanhæ.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing 16 milligrams ($\frac{1}{4}$ grain) of ipecacuanha root, in powder.

Trochiscus Krameriæ.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing $6\frac{1}{2}$ centigrams (1 grain) of extract of krameria.

Trochiscus Krameriæ et Cocainæ.—Prepared with fruit basis, as in the case of Trochiscus Acidi Benzoici, each lozenge containing $6\frac{1}{2}$ centigrams (1 grain) of extract of krameria, and $3\frac{1}{4}$ milligrams ($\frac{1}{20}$ grain) of cocaine hydrochloride.

Trochiscus Morphinæ.—Prepared with tolu basis, the morphine hydrochloride being dissolved in distilled water, the solution mixed intimately with refined sugar and gum acacia, and the process completed as in the case of Trochiscus Acidi Carbolici. Each lozenge should contain $1\frac{4}{5}$ milligrams ($\frac{1}{36}$ grain) of morphine hydrochloride.

Trochiscus Morphinæ et Ipecacuanhæ.—Prepared with tolu basis, as in the case of Trochiscus Morphinæ, each lozenge containing $1\frac{4}{5}$ milligrams ($\frac{1}{36}$ grain) of morphine hydrochloride, and $5\frac{1}{2}$ milligrams ($\frac{1}{12}$ grain) of ipecacuanha root, in powder.

Trochiscus Potassii Chloratis.—Prepared with rose basis, as in the case of Trochiscus Bismuthi Compositus, each lozenge containing $19\frac{1}{2}$ centigrams (3 grains) of potassium chlorate.

Trochiscus Santonini.—Prepared with simple basis, as in the case of Trochiscus Catechu, each lozenge containing 6½ centigrams (1 grain) of santonin.

Trochiscus Sodii Bicarbonatis.—Prepared with rose basis, as in the case of Trochiscus Bismuthi Compositus, each lozenge containing 19½ centigrams (3 grains) of sodium bicarbonate.

Trochiscus Sulphuris.—Prepared by mixing precipitated sulphur, acid potassium tartrate, refined sugar, and gum acacia, all in fine powder, adding tincture of orange as a flavouring agent, and making the mixture into a stiff paste by the addition of mucilage of gum acacia. The paste is then divided into equal portions and dried, as in the case of Trochiscus Acidi Benzoici, so that each lozenge shall contain 3¼ decigrams (5 grains) of precipitated sulphur, and 6½ centigrams (1 grain) of acid potassium tartrate.

Unguentum Aconitinæ (ACONITINE, 1 in 50).—Prepared by dissolving aconitine in eight times its weight of oleic acid, by the aid of gentle heat, and mixing the solution with lard. By dissolving the alkaloid in oleic acid, in this and similar instances, the uniform distribution of the base is ensured and a homogeneous mixture formed with the lard.

Unguentum Aquæ Rosæ.—Prepared by incorporating rose water, by constant trituration in a warmed mortar, with a melted mixture of white beeswax, spermaceti, and almond oil, then adding oil of rose and continuing the trituration, or whipping the mixture, until the ointment is cold.

Unguentum Atropinæ (ATROPINE, 1 in 50).—Prepared like Unguentum Aconitinæ, by dissolving atropine in four times its weight of oleic acid, and mixing the solution with lard.

Unguentum Belladonnæ (ALKALOIDS, 1 in 166⅔).—Prepared by concentrating liquid extract of belladonna to about one-eighth its volume by evaporation, and mixing the residue with benzoated lard. The ointment should contain 0·6 per cent. of the alkaloids of belladonna root.

Unguentum Cantharidis (CANTHARIDES, 1 in 10).—Prepared by digesting bruised cantharides in benzoated lard for twelve hours at a temperature of about 49° C., then straining through calico, pressing the residue gently, and stirring until cold. This process does not exhaust the cantharides.

Unguentum Capsici (CAPSICUM FRUIT, 1 in 50).—Prepared by digesting bruised capsicum fruit in a melted mixture of spermaceti and olive oil for one hour in a water-bath. The mixture should be stirred occasionally, but it should be allowed to cool, after straining out the insoluble residue, without further stirring.

Unguentum Cetacii (SPERMACETI, 1 in 5).—Prepared by heating benzoin, in coarse powder, with a melted mixture of spermaceti, white beeswax, and almond oil, the mixture being stirred frequently and the application of heat continued for two hours. After being removed from the source of heat the mixture should be strained and allowed to cool, constant stirring being unnecessary.

Unguentum Chrysarobini (CHRYSAROBIN, 1 in 25).—Prepared by triturating chrysarobin gradually with melted benzoated lard, heating until the chrysarobin is dissolved, and then stirring until the ointment is cold.

Unguentum Cocainæ (COCAINE, 1 in 25).—Prepared like Unguentum Aconitinæ, by dissolving cocaine in four times its weight of oleic acid, and mixing the solution with lard.

Unguentum Conii (CONIUM JUICE, 1 in ½).—Prepared by evaporating the juice of conium on a water-bath to one-eighth of its volume, at a temperature not exceeding 60° C., and mixing the residue with hydrous wool fat.

Unguentum Eucalypti (OIL OF EUCALYPTUS, 1 in 10).—Prepared by mixing oil of eucalyptus with a mixture of hard and white soft paraffins, and stirring until the ointment is cold.

Unguentum Gallæ (GALLS, 1 in 5).—Prepared by mixing galls, in very fine powder, with benzoated lard.

Unguentum Gallæ cum Opio (OPIUM, 1 in 13⅓).—Prepared by mixing opium, in very fine powder, with Unguentum Gallæ. The ointment should contain 7½ per cent. of opium.

Unguentum Gynocardiæ (GYNOCARDIA OIL, 1 in 10).—Prepared by adding gynocardia oil to a melted mixture of hard and white soft paraffins, and stirring until the ointment is cold.

Unguentum Hamamelidis (LIQUID EXTRACT, 1 in 10).—

Prepared by mixing liquid extract of hamamelis with hydrous wool fat.

Unguentum Hydrargyri (MERCURY, 1 in 2$\frac{1}{16}$).—Prepared by triturating mercury with lard and a small proportion of prepared suet until metallic globules cease to be visible.

Unguentum Hydrargyri Compositum (MERCURY, 1 in 5).—Prepared by adding camphor, in flowers, to a melted mixture of yellow beeswax, olive oil, and mercury ointment, and triturating until the ointment is cold.

Unguentum Hydrargyri Iodidi Rubrum (MERCURIC IODIDE, 1 in 25).—Prepared by mixing mercuric iodide, in fine powder, with benzoated lard.

Unguentum Hydrargyri Nitratis.—Prepared by dissolving mercury in strong nitric acid, without the aid of heat, and adding the resulting acid solution of mercurous nitrate to a melted mixture of lard and olive oil heated to a temperature of about 143° C. The mercury solution, which contains nitrous acid formed by reduction of part of the nitric acid, must be added gradually, with constant stirring to promote the disengagement of nitrous fumes, and the temperature of the mixture must be kept above 93° C. until frothing ceases, after which the stirring is continued until the ointment is cold. The olein of the lard and olive oil is converted by the nitrous acid present into elaidin, the melting point of which is much higher than that of its isomer olein, and the finished pale lemon-coloured ointment is consequently much firmer than a similar mixture of unaltered lard and oil.

Unguentum Hydrargyri Nitratis Dilutum.—Prepared by diluting Unguentum Hydrargyri Nitratis with four times its weight of yellow soft paraffin.

Unguentum Hydrargyri Oleatis (MERCURIC OLEATE, 1 in 4). —Prepared by mixing mercuric oleate with benzoated lard.

Unguentum Hydrargyri Subchloridi (MERCUROUS CHLORIDE, 1 in 10).—Prepared by mixing mercurous chloride with benzoated lard.

Unguentum Iodi (IODINE, 1 in 25).—Prepared by triturating iodine, potassium iodide, and glycerin, in a glass or porcelain mortar, and mixing gradually with lard.

Unguentum Mylabridis (MYLABRIS, 1 in 10).—Prepared in the same way as Unguentum Cantharidis, except that mylabris replaces cantharides and benzoated suet may be used in India instead of benzoated lard.

Unguentum Myrobalani (Myrobalans, 1 in 5).—Prepared by mixing myrobalans, in very fine powder, with benzoated lard or suet.

Unguentum Myrobalani cum Opio (Opium, 1 in 13⅓).—Prepared by mixing opium, in very fine powder, with Unguentum Myrobalani. The ointment should contain 7½ per cent. of opium.

Unguentum Picis Liquidæ (Tar, 1 in 1⅖).—Prepared by adding tar to melted yellow beeswax and stirring until the ointment is cold.

Unguentum Potassi Iodidi (Potassium Iodide, 1 in 10).—Prepared by mixing gradually with benzoated lard, in a slightly warmed mortar, a solution of potassium iodide and potassium carbonate in distilled water.

Unguentum Resinæ (Resin, 1 in 3¾).—Prepared by adding lard and olive oil to a melted mixture of resin and yellow beeswax, then straining and stirring until the ointment is cold.

Unguentum Staphisagriæ (Stavesacre Seeds, 1 in 10).—Prepared by digesting crushed stavesacre seeds in benzoated lard for two hours, on a water-bath, then straining and pressing through calico, melting yellow beeswax in the strained liquid by the aid of heat, and stirring until the ointment is cold.

Unguentum Sulphuris (Sublimed Sulphur, 1 in 10).—Prepared by mixing finely sifted sublimed sulphur with benzoated lard.

Unguentum Sulphuris Iodidi (Sulphur Iodide, 1 in 25).—Prepared by triturating sulphur iodide with glycerin in a slightly warmed mortar until a smooth paste is formed, then adding benzoated lard gradually, and stirring until the ointment is cold.

Unguentum Veratrinæ (Veratrine, 1 in 56).—Prepared like Unguentum Aconitinæ, by dissolving veratrine in four times its weight of oleic acid, and mixing the solution with lard.

Unguentum Zinci (Zinc Oxide, 1 in 6⅔).—Prepared by adding finely sifted zinc oxide gradually to benzoated lard, previously melted at a low temperature, and stirring constantly until the ointment is cold.

Vinum Antimoniale (Tartarated Antimony, 1 in 218¾).—

Prepared by dissolving tartarated antimony in boiling distilled water, and mixing the solution with sherry. As the tartarated antimony does not dissolve readily in alcoholic liquids, solution of the salt in a small proportion of boiling water, in which it is freely soluble, prevents the risk of any portion remaining undissolved. Dose.—½ to 2 mils (10 to 30 minims); as an emetic, 8 to 15 mils (2 to 4 fluid drachms).

Vinum Aurantii (ALCOHOL, 1 in 10).—Prepared as described at pages 51–2. Orange wine should be of a golden sherry colour, and contain 10 to 12 per cent. by volume of ethyl hydroxide. Tannin may be removed from the wine by allowing gelatin, in No. 100 powder, to macerate in the liquid for twenty-four hours, at a temperature not exceeding 15·5° C., one part of gelatin being sufficient to detannate 640 parts by volume (1 ounce to 4 gallons) of orange wine.

Vinum Colchici (COLCHICUM CORM, 1 in 5).—Prepared by macerating colchicum corm, in No. 20 powder, with sherry, as in the case of Tinctura Aurantii. Dose.—½ to 2 mils (10 to 30 minims).

Vinum Ferri (IRON, 1 in 500).—Prepared by partially immersing fine iron wire in sherry for thirty days in a closed vessel, shaking the vessel frequently, and removing the stopper occasionally, then filtering the liquid. The product is a weak and variable preparation of iron, containing, in good average samples, about 0·2 per cent. of iron, dissolved by the action of various free organic acids and acid salts, which attack the iron as it rusts in the presence of air and water, and form soluble compounds. The formation of rust or iron oxide is promoted by the partial immersion of the metal in the wine and occasional admission of a fresh supply of air, because the oxide thus formed is more readily attacked by acid liquids than is the metallic iron. Dose.—4 to 15 mils (1 to 4 fluid drachms).

Vinum Ferri Citratis (IRON AND AMMONIUM CITRATE, 1 in 55).—Prepared by dissolving iron and ammonium citrate in orange wine, and containing 1 grain of the citrate in 1 fluid drachm. This is an alternative preparation to Vinum Ferri, and has the advantage of containing a more definite proportion of iron. Dose.—4 to 15 mils (1 to 4 fluid drachms).

Vinum Ipecacuanhæ (ALKALOIDS, 1 in 1000).—Prepared by mixing liquid extract of ipecacuanha with sherry, preferably detannated. The mixture is set aside for forty-eight hours, and then filtered, to remove the deposit of wax, resin, etc., which are not soluble in the weakly alcoholic wine, though present in the liquid extract, which is made with strong alcohol. The wine should contain not less than 0·1 part of ipecacuanha alkaloids in 100 parts by volume. Dose.—½ to 2 mils. (10 to 30 minims), as an expectorant; 15 to 23 mils (4 to 6 fluid drachms), as an emetic.

Vinum Quininæ (QUININE HYDROCHLORIDE, 1 in 438).—Prepared by dissolving quinine hydrochloride in orange wine, preferably detannated. The product should contain 1 grain of the quinine salt in 1 fluid ounce. Dose.—15 to 30 mils (½ to 1 fluid ounce).

Vinum Xericum (ALCOHOL, 1 in 6¼).—Prepared in Spain by fermenting grape juice and adding alcohol to fortify the product after fermentation is completed (see page 425). Sherry used for medicinal purposes should be of a pale yellowish-brown colour, and contain not less than 16 per cent. by volume of ethyl hydroxide. When intended for use as a menstruum for drugs containing alkaloids, it should be detannated as explained in the case of Vinum Aurantii, by allowing gelatin to macerate in the wine for twenty-four hours at a temperature not exceeding 15·5° C., so that the tannin naturally present may combine with the gelatin.

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NAMES OF PLANTS AND ANIMALS IN ITALICS

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