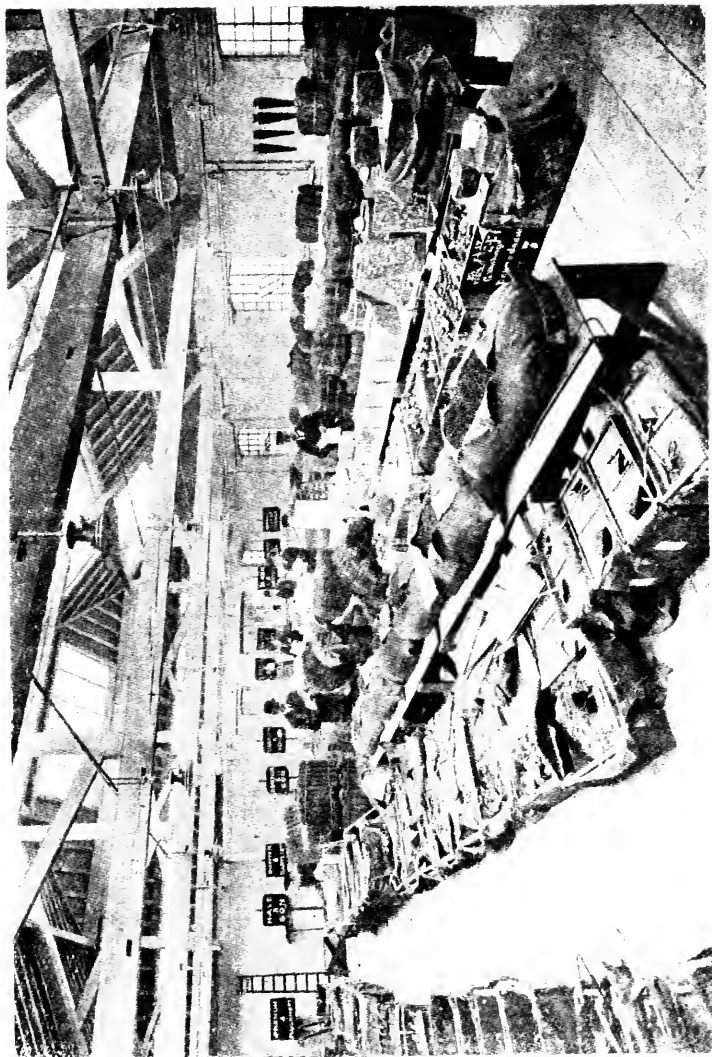


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DRUGS IN COMMERCE



SHOW OF CRUDE DRUGS AT PORT OF LONDON AUTHORITIES' WAREHOUSE, CUTLER STREET, E.C.

PITMAN'S COMMON COMMODITIES

AND INDUSTRIES

DRUGS IN COMMERCE

THEIR SOURCE, PREPARATION, FOR
THE MARKET, AND DESCRIPTION

BY
JOHN HUMPHREY,
Ph.C., F.J.I.

WITH ILLUSTRATIONS



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PREFACE

BRIEF particulars are given in the following pages of the source and method of preparation for the market of the chief drugs of vegetable or animal origin at present in commerce. The list includes all the more important drugs which are official in the British Pharmacopoeia, together with such others as the space available has rendered it possible to deal with. Short descriptions of the drugs should serve as a guide to their identification, and references to their chief constituents are added for the sake of completeness. It has been far from easy to compile the information given respecting the commerce of drugs, especially in view of the market disturbances caused by the war, and this work can only be regarded as a tentative effort to convey such information in book form. Much study and compilation of facts and statistics will be required to enable anyone to present an exhaustive account of the commerce of drugs, but those who have occasion to extend their knowledge of this subject will find a mine of wealth in the weekly Trade Report published by the *Chemist and Druggist*, to which frequent reference has been made in the course of writing this book. Acknowledgment must also be made to Fluckiger and Hanbury's "Pharmacographia," the British Pharmaceutical Codex, and Greenish's admirable "Materia Medica." Thanks are due to the Editor of the *Chemist and Druggist* for the loan of blocks for several of the illustrations; also to Messrs. Chas. Smith, Gowland & Son, for permission to reproduce the frontispiece.

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DRUGS IN COMMERCE

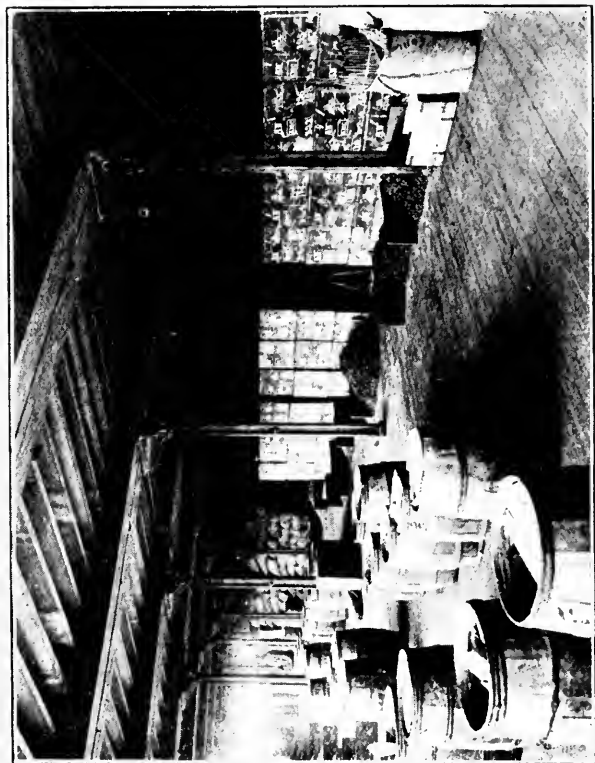
CHAPTER I

INTRODUCTORY

DRUGS in commerce—Vegetable and animal drugs—Foreign drugs mostly used—Ports of entry—London as the chief port—Transshipment from foreign ports—Packages in which drugs arrive—Drug sales and drug shows—Preparation for the market.

DRUGS in commerce are very numerous, and it has been necessary in the present work to restrict attention mainly to those which are commonly kept in stock by wholesale druggists and retail dealers, though particulars are included of a few which are official in the British Pharmacopoeia for use in outlying parts of the Empire. The word “drug” is employed generally in its original sense, of a dried substance of vegetable or animal origin, which is used for medicinal purposes. Crude drugs are those which have undergone no material alteration since collection and drying. This definition naturally excludes fixed and volatile oils, and other products of more or less definite chemical composition, which have been extracted from seeds and other crude drugs. Such substances, however, are dealt with in the following pages, as well as various purified drugs.

All parts of plants are found among vegetable drugs—roots, rhizomes or underground stems, aerial stems, leaves, flowers, fruits and seeds. On occasion two or more parts of a plant may be collected, and sometimes



SPICE FLOOR AT LONDON DOCKS

the entire plant or herb. Natural plant products, such as gums, resins, gum-resins, etc., also find place in the list, and many products of medicinal value are extracted from the crude drugs, either before exportation, or after arrival in this country. Crude drugs of animal origin are but few in number, and their use in medicine is far from common. No attempt at classification of the various drugs described has been attempted in this volume, a simple alphabetical arrangement appearing to commend itself as more desirable.

It is noteworthy that most of the drugs in common use in this country have been imported from the continent of Europe, or from countries still farther afield. London is the chief port of entry for drugs and spices, but many American, West Indian and African products arrive at Liverpool and Southampton, while others are shipped from abroad to Bristol, Hull and Manchester. In certain instances drugs consigned to various foreign ports are transhipped to London, Liverpool, or Southampton.

London receives drugs direct from all parts of Europe, also from East and North-West Africa, Arabia, Persia, India, China, Japan, Australia, New Zealand, the West Indies, and all parts of the American continent. Other drugs reach London from the West Indies and Batavia via Amsterdam, from the Eastern Mediterranean and Saigon via Marseilles, from China via Havre, from North America via Havre and Cherbourg, and from the Malay islands via Singapore and Penang. Before the Great War, drugs from the Eastern Mediterranean reached London from Trieste, and many from Central America, East Africa and China via Hamburg.

Liverpool imports include drugs from various

Mediterranean ports, Spain, all parts of America and Africa, Zanzibar and the West Indies. Southampton imports also include drugs from North and South America, and from North-West and South Africa, while some West Indian products arrive at Bristol. Hull imports drugs from many different parts of the world, and Manchester receives a few from the United States and elsewhere.

The packages in which drugs arrive in this country are very varied in character and size. They include bags, bales, barrels, baskets, bottles, boxes, caddies, cases, casks, kegs, leaden canisters, mats, pockets, serons of raw hide, and tins, the last-mentioned being usually enclosed in cases which may contain several tins. Some of the packages employed have been made for the purpose, frequently of standard shapes and sizes, but certain drugs are enclosed in cases and tins which have previously been used for exporting goods from this country.

On arrival at the British ports, the packages of drugs are conveyed to the dock warehouses, and subsequently sold by private treaty or public auction. In London there are fortnightly drug sales, which are preceded by exhibitions of samples, or drug shows, at the offices of the drug brokers to whom the goods are consigned. Certain drugs and spices are mixed or sorted, and repacked, before they are sold at the auctions, and in practically all cases the drugs purchased by merchants and wholesale druggists are cleaned by sifting, graded, and sometimes assayed, before passing into the usual channels of distribution.

CHAPTER II

ACACIA bark, gum Arabic and Ghatti gum—Aconite root and leaves—Aloes and aloin—Alstonia bark—Ammoniacum—Anise fruits and oil—Areca nuts—Arnica flowers and root—Asafetida—Barberry bark and Berberis—Bearberry leaves—Belladonna leaves and root—Benzoin and benzoic acid—Buchu leaves—Butea seeds and gum—Cade oil—Cajuput oil—Calendula flowers—Calabar beans—Calumba root.

Acacia Bark, Gum Arabic and Ghatti Gum. Acacia bark is the product of *Acacia arabica*, a native of Arabia and Africa, or *Acacia decurrens*, a tree which is indigenous to Australia. The first-mentioned tree is also found in India, where the bark is known as "Babul bark." When required for medicinal use, the bark is collected from wild or cultivated trees which are not less than seven years old, and it is further directed that, after being dried, the bark must be kept for one year before use. It is a hard and woody bark, of a rusty brown or greyish brown colour externally, with a red or reddish-brown inner surface, which is also longitudinally striated. The outer surface of the bark of *Acacia arabica* may be covered with a thick blackish periderm, in the case of older pieces, and it is fissured both longitudinally and transversely; the bark of *Acacia decurrens* is usually in curved or channelled pieces, showing irregular longitudinal ridges and sometimes transverse cracks externally. Both barks have a decided astringent taste, due to the tannin they contain, and the taste may also be slightly mucilaginous, owing to the presence of a small quantity of gum. Tannin is present in largest proportion in the bark of trees from six to ten years old; the bark may contain as much as 22 per cent, together with a certain amount

of gallic acid, which appears to be transformed into tannin on keeping the dried bark, as the result of fermentation. Acacia trees generally are remarkable for producing large quantities of gum, which tends to exude spontaneously from the stem and branches, while the flow may be stimulated by making incisions in the bark of the living trees. This gummy exudation hardens in tears or masses on the bark, whence it is detached by the collectors. After being dried, it is packed in reed mats and conveyed to depots where the gum is sorted and graded prior to exportation in bags or bales. The gum is collected in different parts of Africa, and it is known generally as "Gum Arabic," but "Gum Acacia" for medicinal purposes is usually the product of *Acacia Senegal*, a small tree growing freely in Senegambia, the upper Nile regions, and in Central Africa. The best gum is obtained from trees cultivated near Kordofan, whence it is conveyed to Omdurman or Trieste, for grading and export. It is known as "Hashab gum" and is composed of two varieties—a hard and a soft gum. On exposure to the sun, before being sorted, the hard gum remains glassy and colourless, but the soft kind becomes white and opaque, owing to the formation of innumerable tiny fissures. As a consequence the soft gum appears to be bleached, although this is not really the case. There is a marked difference in the viscosities of the two varieties, and it has also been found that gum from trees which are artificially tapped has a higher viscosity than that which exudes naturally. As used in medicine, gum acacia occurs in rounded or ovoid opaque tears, or in masses of various sizes, or in more or less angular fragments with glistening surfaces. It should be nearly colourless, or have only a slight yellowish tint, any decided yellow, red, or brown colouration

indicating that the gum is of an inferior variety, probably containing tannin. The best gum is nearly without odour, and it has a bland, mucilaginous taste. It is almost entirely soluble in water, and the solution has great adhesive power. The only gum exceeding it in adhesiveness is Ghatti gum, the product of *Anogeissus latifolia*, a large tree which is indigenous to India and Ceylon. Commercial varieties of this gum are usually mixed products, containing the gums of other species, and they are therefore very variable. As used for medicinal purposes, it occurs in vermiform or rounded tears of varying size, colourless or pale yellow, with a dull surface and a vitreous fracture. It has only a slight odour, an insipid and mucilaginous taste, and is entirely soluble in water, yielding a viscous mucilage which possesses about twice the adhesive power of gum acacia. Other gums, more or less soluble in water, are the wattle gums of Australia and South Africa, the products of different species of *Acacia*. They are all very low in viscosity and should not be used for medicinal purposes.

Aconite Root and Leaves. Aconite is the root of *Aconitum Napellus*, a perennial herb which grows abundantly on the lower mountain slopes of Central Europe and is cultivated in England for medicinal use. In addition to reproducing itself by means of flower and seed, the aconite or monkshood plant produces from its tuberous root a daughter root, from a bud at the top of which the next season's stem develops in the ordinary course. As the daughter root increases in size, the parent root shrivels and decays, the maximum development of the daughter root being attained in the autumn, when the part of the plant above ground has perished. It is at this period that the roots are usually collected in this country, so that the English

drug consists mainly of the daughter roots, to which the shrivelled remains of the parent roots are attached. In Germany, where the roots of wild aconite plants are collected, it is necessary to undertake the collection before the plants die down, with the result that the drug consists largely of the parent roots crowned with the base of the stem in each case. It was formerly supposed that the proportion of alkaloid in the drug tended to diminish simultaneously with the exhaustion of the reserve material in the root, but chemical analysis has not confirmed this assumption, and it appears probable therefore that the roots of wild plants are fully as active as those of cultivated specimens. After collection the roots are washed, freed from rootlets, sliced where necessary to facilitate drying, and then dried. They are from 4 to 10 centimetres in length, conical, dark brown externally, solid and starchy internally. Both the fresh leaves and flowering tops of the aconite plant have been used in medicine, but the dried roots alone are official in this country. They owe their virtue to the presence of the exceedingly potent alkaloid aconitine, with which are associated the allied alkaloids picroaconitine and aconine. The total amount of alkaloid present in the dried root varies from 0.5 to 1 per cent, and the greater proportion of this is aconitine, to the presence of which is due the persistent sensation of tingling and numbness experienced on tasting the drug. Other varieties of aconite root than the English and German are the Japanese and the Indian; the former is alleged to be the product of *Aconitum Fischeri* and contains japaconitine, which is rather more powerful than aconitine, while Indian aconite, from *Aconitum laciniatum*, contains pseudaconitine, which is about twice as active as aconitine. Japanese aconite root is easily distinguished by its

dark grey colour, small size, and smooth surface. Indian aconite root is very large, and horny internally as the result of the prolonged application of heat in drying.

Aloes and Aloin. Aloes is the product of *Aloe chinensis*, *Aloe Perryi*, and probably other species of *Aloe*, plants indigenous to East and South Africa, which have been introduced into the West Indies and other tropical countries, different varieties of aloes being obtained from Africa and the West Indies. The plants have large fleshy leaves, from which a thick juice flows when they are detached by means of transverse cuts. This juice is allowed to drain into suitable vessels and then concentrated by evaporation, sometimes spontaneous, but more frequently by boiling. When the liquid has attained the desired consistence it is poured into skins, boxes, or gourds, and allowed to solidify. The colourless juice darkens on evaporation, so that the drug occurs in hard masses varying in colour from yellowish-brown to dark or chocolate-brown. According to the method of concentration employed, the physical characters of the aloes vary, rapid concentration followed by quick cooling resulting in the production of a drug that breaks with a glassy fracture, and small splinters of which appear quite homogeneous and transparent. The product is known as "lucid," "vitreous," or "glassy" aloes. If, however, the process of evaporation is slow, and particularly if it is allowed to take place spontaneously, the aloin contained in solution crystallises and causes the drug to be opaque, owing to the presence of numerous small prismatic crystals in the solidified juice. Opaque aloes are distinguished as "hepatic" or "livery" aloes. All varieties of aloes may occur in either the glassy or the opaque condition, so that this distinction

does not indicate the source of the drug. Aloes has a characteristic odour which differs somewhat in the different commercial varieties, and a nauseous, bitter taste. There are two well-defined varieties of aloes produced in East Africa—Socotrine aloes, which has always been the most highly-esteemed kind, and Zanzibar aloes, which has been regarded as a variety of Socotrine. Both are probably the product of *Aloe Perryi* and other species. Socotrine aloes is imported in kegs or tins, frequently in a pasty or semi-liquid condition, and has a very disagreeable odour when fresh; on evaporation it forms dark brown or nearly black masses which break with a dull, waxy, uneven and somewhat porous fracture, and its decidedly unpleasant odour tends to change on keeping, becoming agreeably fragrant. Zanzibar aloes is imported in skins and is usually solid, though sometimes soft on arrival in this country. It is pale brown in colour, with a dull, waxy and uniform surface, and a strong characteristic odour which is not disagreeable. In addition to the two foregoing varieties of aloes, West Indian aloes, prepared from the juice of *Aloe chinensis* and probably other species, is official in this country for medicinal purposes. It is commonly known as Barbados aloes, but is actually produced in the islands of Aruba, Curaçao and Bonaire, in the Dutch West Indies. It is imported in cases, and occurs both in the opaque and glassy varieties, the latter being distinguished commercially as "Capey Barbados" aloes. Livery Barbados or Curaçao aloes is more highly esteemed. It varies in colour from yellowish-brown to chocolate-brown or even black, breaks with a dull, waxy and uniform fracture, and has a characteristic odour which distinguishes it from Zanzibar aloes, a variety that it closely resembles. Vitreous Barbados

aloes has a garnet-red colour in small splinters. Non-official varieties of aloes include two which are imported from South Africa—Cape aloes, the product of *Aloe ferox*, and Natal aloes, the botanical source of which is unknown. Cape aloes is collected in goat-skins and evaporated in iron pans over an open fire. It occurs in masses of a dark reddish brown or nearly black colour, often with a greenish tinge, and breaks with a clean glassy fracture. It has a distinctive sour odour and yields a very pale yellow powder. A variety of Cape aloes which has been allowed to undergo slight fermentation and concentrated by exposure to the sun, is yellowish brown in colour and opaque; it is known as "Crown" or "Uganda" aloes. Natal aloes is opaque and of a dull greenish-black or dull brown colour, with an odour resembling that of Cape aloes. It differs materially in composition from other aloes, containing nataloin instead of barbaloin. Aloin is the chief constituent and the active principle of aloes. It occurs as a pale yellow, microcrystalline powder, which is almost inodorous, but has an intensely bitter taste. The aloin of Barbados or Curaçao aloes is a mixture of approximately equal quantities of barbaloin and isobarbaloin, but Cape aloes does not contain more than traces of the latter, and it is entirely absent from Socotrine and Zanzibar aloes.

Alstonia Bark. *Alstonia* is the dried bark of *Alstonia scholaris* and *Alstonia constricta*, the former a native of India and the Philippine Islands, while the second is found in New South Wales and Queensland. The bark of *Alstonia scholaris* occurs in irregular fragments, from 3 to 12 mm. thick, with a rough and fissured, brownish-grey external layer, and a bright buff inner surface. It is almost odourless, but has a bitter taste. The bark of *Alstonia constricta* is usually in curved

pieces or quills, about 60 mm. wide and 12 mm. thick, rough and rusty brown externally, with large deeply fissured reticulations, and cinnamon-brown internally. It has a slightly aromatic odour and a very bitter taste. The drug contains various alkaloids. It is rarely seen in England, being mainly used in the countries where it is produced.

Ammoniacum. Ammoniacum is a gum-resin obtained from *Dorema Ammoniacum*, and probably other species. They are perennial plants, the stems of which abound in a milky juice that flows out on the slightest puncture. At the time the fruit is forming the plants are visited by large numbers of beetles which pierce the stems and cause the juice to exude in drops, some of which adhere to the stems, while others fall to the ground. The hardened tear-shaped drops collected from the stems constitute the best "tear ammoniacum," while "lump ammoniacum" is a mixture of gum-resin with stones, dirt and other impurities, collected from the ground near the base of the plants. The drug is collected chiefly in Central Persia, and is imported into this country in cases. As used for medicinal purposes it occurs in small dull white, yellowish-white, or brownish-white tears, or in nodular masses varying from about 5 to 25 mm. in diameter. It is hard and brittle when cold, but softens when warmed. Internally the drug is opaque, varies in colour, and freshly fractured surfaces have a waxy lustre. There is a faint characteristic odour, and a bitter, acrid taste. When triturated with water the gum-resin forms a white, milky emulsion. Besides gum and resin, the drug contains a small quantity of volatile oil, to which its characteristic odour is due.

Anise Fruits and Oil. Anise is the dried ripe fruit of *Pimpinella Anisum*, an annual herb which is indigenous

to Egypt, Greece and Asia Minor, but is cultivated in Southern Russia, Bulgaria, Italy and Spain. The fruits are ovoid in shape, somewhat compressed laterally, and consist of two united greenish or greyish-brown mericarps attached to a short stalk. Short bristly hairs cover the outer surface, which also bears inconspicuous ridges, and numerous vittae or oil glands contain the volatile oil to which the agreeably aromatic odour and taste of the fruit are due. Spanish anise, exported from Alicante, is the finest and largest variety; Russian anise is smaller, and other varieties frequently contain an admixture of hemlock fruit, which may be distinguished by its smooth surface and its lack of odour and taste. Star anise, which yields a similar volatile oil to ordinary anise, is the dried ripe fruit of *Illicium verum*, a small tree which is indigenous to South and South-West China. It is star-shaped, consisting normally of eight one-seeded reddish-brown, boat-shaped carpels, radiating from a central stalk. They have a spicy odour and taste, which distinguish them from the poisonous Japanese star anise, the carpels of which are also more wrinkled and have a more acute beak. Oil of anise is obtained chiefly from the Chinese fruit, this variety differing little from the oil obtained from European anise.

Areca Nuts. Areca Nuts are the dried seeds of *Areca Catechu*, a palm tree which is cultivated in Tropical India, and in the Philippine and East Indian Islands. The seeds are short, rounded cones, about 25 mm. long, with a brownish surface which is marked with a network of paler, depressed lines. They are very hard, exhibit a marbled interior when broken, have but little odour and an astringent, bitter taste. The chief constituent of the seeds is the liquid, volatile alkaloid arecoline, but other alkaloids are also present.

The fruits are collected when ripe, and the fibrous pericarp is removed from the single seed which each contains. It is usual to boil the seeds in water to which lime has been added, and then dry them, prior to packing them in bags for exportation. They are exported largely in bags from Ceylon and India.

Arnica Flowers and Root. Arnica consists usually of the dried flower-heads of *Arnica montana*, a small perennial plant which is indigenous to Central Europe. The flower-head has a nearly flat receptacle, bearing numerous disc and ray florets of a dark yellow colour. As a rule, however, the drug consists mainly of the florets detached from the receptacle, since the entire flower-heads are liable to be attacked by insects. The drug has a slight aromatic odour, due to the presence of traces of volatile oil, and a bitter, acrid taste. Arnica root has also been used in medicine, and consists of the creeping rhizome, with attached roots, collected in the autumn, after the plant has died down, and dried. It is now replaced by the flower-heads, which are imported in bags.

Asafetida. Asafetida is a gum-resin, obtained from the root of *Ferula foetida* and probably allied species. They are gigantic herbaceous plants which grow in Eastern Persia and Western Afghanistan, where they attain to a height of 8 to 10 ft. The roots and stems of the plants contain large ducts filled with a milky juice, which exudes when the stem is cut off close to the crown, and hardens on the cut surface. When hardened it is removed by scraping, a slice of the root is cut off so that more juice exudes, and this in turn is removed when it hardens, the process of cutting off slices of the root being repeated until no more juice can be obtained. The massed scrapings have a certain amount of earthy matter added to facilitate transport of the soft

gum-resin, which is exported to Europe via Bombay. Part of the asafetida imported, however, occurs in the form of rounded or flattened tears, from 12 to 25 mm. in diameter. They vary in colour from greyish white to dull yellow, and darken on keeping; internally they are yellowish and translucent, or milk white and opaque, freshly exposed surfaces tending to become first pink, then red, and finally reddish-brown. Lump asafetida consists of tears mixed with stones and other impurities, all massed together; it has a dark reddish colour and is inferior to tear asafetida. The drug has a strong, disagreeable, onion-like smell, and a bitter, acrid taste. When triturated with water, it forms a white emulsion, the resin and oil it contains being suspended by the aid of the gum also present.

Barberry Bark and Berberis. Barberry bark is obtained from *Berberis vulgaris*, a shrub which grows freely in this country and is found in most parts of Europe and Western Asia. The bark of the stem is that chiefly used, and is collected by shaving, then dried. It occurs in small, thin, nearly flat, dark yellowish-grey pieces, which do not usually exceed 5 cm. in length and 12 mm. in breadth. The outer surface is marked with longitudinal furrows or fissures and frequently bears minute black lichenous spots; the inner surface is yellowish-brown and occasionally has fragments of yellow wood attached. The drug has a bitter taste and colours the saliva yellow when chewed. It contains berberine and other alkaloids. Root bark is greyish instead of yellow and bears no lichenous spots, but appears to contain the same constituents as the stem bark and possesses similar properties. Barberry bark is not official in this country, but there is an official drug known as Berberis, the dried stem of *Berberis aristata*, a shrub indigenous

to India and Ceylon. It occurs in undulating pieces, from 2.5 to 5 cm. in diameter, and has an orange-brown cork. Its constituents are the same as those of ordinary barberry bark, the chief being berberine, which is present in considerable quantity and imparts a bitter taste to the drug. It is used chiefly in India and other eastern countries.

Bearberry Leaves. Bearberry leaves are obtained from *Arctostaphylos Uva-ursi*, a small evergreen shrub which is indigenous to Great Britain and distributed throughout Central and Northern Europe and North America. They are collected during the summer and dried. As they occur in commerce, they are about 2 cm. long and 12 mm. wide, obovate or spoon-shaped, yellowish-green, leathery, with a smooth, shining upper surface and an entire margin. The leaves have only a slight odour, but the taste is very astringent and somewhat bitter. Arbutin and tannin are the chief constituents of the drug.

Belladonna Leaves and Root. Belladonna may consist either of the leaves or the root of *Atropa Belladonna*, a tall perennial plant indigenous to Central and Southern Europe, cultivated for medicinal purposes in England and Germany. The leaves are collected when the plant is in flower, that being the period when it is richest in alkaloid, and dried, carefully dried leaves being of a pale greyish-green colour rather than brownish, also very thin and brittle. They are from 8 to 20 cm. long, broadly ovate in shape, nearly smooth, and have an entire margin together with an acute apex. The root of belladonna is collected in the autumn, dried and packed in bags for the market. It occurs in nearly cylindrical pieces, sometimes split longitudinally, usually from 15 to 30 cm. in length and from 10 to 20 mm. in diameter. Externally it is pale greyish-brown

in colour and finely wrinkled longitudinally; the transverse fracture is short and the interior of the root is whitish and starchy. The odour of the root somewhat resembles that of dried liquorice root, but the taste is slightly bitter. The chief constituent of belladonna is the alkaloid hyoscyamine, which is associated when extracted with its isomer atropine, the latter being present in smaller proportion and possibly produced from hyoscyamine during the process of extraction. Traces of hyoscyne (scopolamine) are stated to have been extracted from the root, and both leaves and root yield belladonnine and apoatropine, which are probably formed from the original alkaloid present during extraction from the drug. The total alkaloid obtainable ranges as a rule from 0.25 to 0.7 per cent. Indian belladonna root is a variety which is collected from both wild and cultivated plants.

Benzoin and Benzoic Acid. Benzoin is a solidified balsam obtained from the stem of *Styrax Benzoin* and allied species, the trees being indigenous to Sumatra and Java. It is a pathological product formed as the result of hacking the stem with an axe. After the tree has thus been injured, the balsam forms and flows over the wounded surfaces, part of it exuding from incisions made in the bark, while the rest accumulates between the bark and the trunk. It is collected when firm, softened by the aid of heat, and then packed in cases for exportation. Sumatra benzoin, the variety used for medicinal purposes, is collected on the west coast of Sumatra and exported to England via Penang or Singapore. It occurs in hard brittle masses, consisting of numerous whitish tears imbedded in a greyish-brown translucent matrix. The odour of the drug is agreeably aromatic, but its taste is slightly acid. It is a resinous substance, consisting chiefly of compounds

of cinnamic acid, associated with free benzoic and cinnamic acids and various aromatic compounds. Varieties of Sumatra benzoin are known as Penang benzoin ; one has an odour resembling that of storax and is sometimes distinguished as storax-benzoin, while another has a glassy fracture and is known as "glassy Penang." A much purer variety is Siam benzoin, which was formerly preferred for medicinal purposes. It is produced in the province of Luang Prabang, Siam, and exported to London via Singapore, or France. It occurs in brownish tears, which have an opaque milky-white fracture, or in masses in which the tears are cemented together by dark reddish-brown, transparent resin. Siam benzoin contains no free cinnamic acid, but yields a much larger percentage of benzoic acid than the Sumatra variety. It has a very fragrant odour, due to the presence of vanillin and an oily aromatic liquid. Palembang benzoin is also produced in Sumatra, but differs markedly from other varieties in appearance, consisting of a translucent, greyish-brown or reddish resinous mass in which only a few scattered tears are embedded. It has an odour resembling that of Sumatra benzoin, contains no free cinnamic acid, and is used chiefly for the preparation of benzoic acid. It is usually imported in tins, several of which are packed in a case. Benzoic acid occurs in light, feathery, crystalline plates and needles, which are nearly colourless and odourless when pure, but possess an agreeable, aromatic odour when obtained from benzoin by sublimation. The purest form of the acid is prepared synthetically.

Buchu Leaves. Buchu consists of the dried leaves of *Barosma betulina* and other species of *Barosma*. erect shrubs several feet in height, which are indigenous to Cape Colony. The leaves are collected when the plants

are in flower and forming fruit, dried, and despatched to Cape Town for exportation. Only the leaves of *Barosma betulina* are official for medicinal use in this country. They are from 12 to 20 mm. long, roundish or rhomboid-obovate in shape, dull yellowish-green in colour, and have a smooth surface; the margin is usually sharply toothed, while the apex of each leaf is blunt and recurved. Oil glands are visible in the leaf, especially near the margin, and the drug has a strong and characteristic aromatic odour and taste, due to the presence of volatile oil. Other important constituents of the drug are diosphenol and mucilage. This variety of buchu is known in commerce as "short" or "round" buchu; "long" buchu consists of the dried leaves of *Barosma serratifolia*, and is distinguished by the greater length of the leaves, their linear lanceolate shape, serrate margin, and truncate apex. A third variety is "crenate" buchu, the product of *Barosma crenulata*; it consists of dried leaves which are broader than those of "long" buchu, varying from lanceolate to oval-oblong in shape, with a minutely serrate margin and a blunt, but not recurved, apex. Leaves of other species of *Barosma* are occasionally imported, but all are readily distinguishable from the official variety.

Butea Seeds and Gum. Butea consists of the seeds of *Butca frondosa*, a tree found in India and Burma, where it is well known under the name of Palas or Dhak. They are flat and kidney-shaped, from 16 to 25 mm. wide, and not more than 2 mm. thick; dark reddish-brown in colour, glossy, veined and wrinkled, with a faint odour and slightly acrid taste. The seeds contain fixed oil and other constituents. Butea gum, also known as "Bengal kino," is obtained from the same tree, being the juice which flows from incisions in the stem, collected after it hardens in small tears.

These are very brittle and, as found in commerce, this variety of kino occurs usually in small, irregular, shining fragments of a dark ruby colour. It should be free from corky or woody particles. When fresh it is almost entirely soluble in water, but it tends to become blackish and insoluble on keeping, as the result of the action of an oxydase or oxidizing enzyme on the soluble tannic acid present, which becomes converted into an insoluble dark colouring matter.

Cade Oil. Cade oil, also known as Juniper Tar Oil, is an empyreumatic, oily liquid obtained by the destructive distillation of the woody portions of *Juniperus Oxycedrus*, a small tree which is indigenous to countries bordering the Mediterranean. The oil is produced mainly in the South of France and occurs in commerce as a dark reddish-brown or nearly black liquid, with a tar-like odour and an aromatic, bitter and acrid taste. It is less viscid than ordinary wood-tar and differs from the latter by its oily consistence. It contains guaiacol and other important constituents.

Cajuput Oil. Cajuput oil is a volatile liquid obtained by distillation from the leaves and twigs of *Melaleuca Leucadendron* and other species of *Melaleuca*. The plants yielding it are indigenous to India, the Malay Archipelago, and Australasia. The oil is distilled chiefly in the Molucca Islands and exported by way of Batavia and Singapore, in bottles which are enclosed in cases. It occurs as a green or bluish-green liquid, with an agreeable, camphoraceous odour and an aromatic, bitter taste. The chief constituent of the oil is cineol, of which it may contain as much as 55 per cent.

Calendula Flowers. Calendula consists of the dried outer or ray florets of *Calendula officinalis*, the common marigold, which is a native of the Levant and Southern

Europe and widely cultivated as a garden plant. When the flower-heads are fully open, the strap-shaped ray florets are collected and dried. They are yellow or orange in colour, from 15 to 25 mm. long and about 3 mm. broad, with a slightly aromatic odour and bitter taste. On exposure to the sun, the dried florets tend to become whitish and their odour becomes less pronounced. The drug contains a yellow colouring substance named calendulin and traces of a sweet-smelling volatile oil.

Calabar Beans. Calabar beans, also known as Ordeal beans, are the ripe seeds of *Physostigma venenosum*, a climbing plant indigenous to the West Coast of Africa, whence they are exported in bags. They are dark chocolate brown in colour, kidney shaped, about 25 mm. long, 18 mm. broad and 12 mm. thick. One side of the seed is arched, with a deep groove extending almost the entire length. The surface is somewhat rough, and there is no marked odour or taste. Various seeds have been offered as Calabar beans, but none of them bears any marked resemblance to the genuine seeds. The chief constituent of Calabar beans is the poisonous alkaloid physostigmine or eserine, the sulphate of which is the most important salt used in medicine.

Calumba Root. Calumba is the root of *Jateorhiza Columba*, a perennial plant which is indigenous to the forests of Eastern Africa, where it climbs over bushes and to the tops of lofty trees. It produces large fleshy roots, which are dug up during the dry season, cut into transverse slices and dried. As imported in bags it is of a dingy brown colour, with particles of earth adhering to it. After being washed and brushed, prior to being graded for the market, the colour of the pieces is somewhat brightened. The slices vary from 2.5 to 5 cm. or more in diameter, and from 3 to 12 mm.

or more in thickness. They are irregularly circular or oval in shape, depressed towards the centre as the result of shrinkage in drying, and break with a short fracture. A thin, dark brown cork encircles the yellowish bark and greyish wood. The drug has a slight, musty odour, and a bitter taste; it contains alkaloids related to berberine and crystalline bitter principles, together with traces of a fluorescent substance.

CHAPTER III

CAMPBOR and camphor oil—Canella bark—Cannabis indica or Indian hemp—Cantharides and cantharidin—Capsicum and Cayenne pepper—Caraway fruit and oil—Cardamom seeds and fruits—Cascara sagrada—Cascarilla—Cassia bark, buds, pods and pulp—Castor seeds and oil—Catechu, pale and black—Chamomile flowers—Chiretta—Cimicifuga—Cinchona bark and quinine—Cinnamon bark and oil—Cloves and clove oil.

Camphor and Camphor Oil. Camphor is a white crystalline substance obtained from *Cinnamomum Camphora*, a large tree which grows abundantly in Formosa, Japan, and China. After the tree has been felled, the wood is reduced to chips which are heated with water in a rude still ; the camphor, being volatile, is carried over with the water vapour and condenses as a crystalline solid in an earthenware dome. This crude camphor may be purified by further sublimation prior to exportation, but much of it is exported to London or Hamburg, in chests or tubs, and there purified by resublimation. Most of it is produced in Formosa and Japan, the crude substance occurring in light brown or pinkish grains. Purified camphor may be in colourless, transparent crystals, or crystalline masses of tough consistence ; but it is more frequently seen in rectangular tablets of varying size, or in pulverulent masses which are known as “flowers of camphor.” At one time it occurred almost exclusively in large bell-shaped masses, corresponding in shape to the vessels used for sublimation. The drug has a penetrating and characteristic odour, with a pungent and somewhat bitter taste, followed by a sensation of cold. It burns readily with a bright, smoky flame. Camphor oil is a

brown or yellowish liquid which drains out of the crude camphor into the tubs in which it is stored ; the oil contains much camphor in solution and is therefore of value for medicinal purposes. It is imported in tins packed in cases, and must not be confused with "Camphorated Oil" which is a simple solution of camphor in olive oil.

Canella Bark. Canella is the bark of the wild cinnamon tree, *Canella alba*, which is indigenous to the West Indian Islands. The trunk bears a thick outer layer of ash-grey cork which is removed by beating, and the remaining bark is then easily stripped off. It is collected chiefly in the Bahama Islands, whence it is exported after drying. The bark occurs in simple quills, or in channelled pieces of very variable size, but commonly from 6 to 25 mm. wide, 5 to 20 cm. long, and not more than 3 mm. thick. It is pale yellow externally, wrinkled, and marked with circular scars ; the inner surface is white and finely striated longitudinally. The drug has an aromatic, cinnamon-like odour, and a pungent, bitter taste. Its chief constituent is a volatile oil, the odour of which resembles that of a mixture of clove and cajuput oils.

Cannabis Indica or Indian Hemp. Cannabis Indica or Indian Hemp consists of the dried flowering or fruiting tops of the female plant of *Cannabis sativa*, grown in India. The hemp plant is an annual herb, indigenous to Central India and Western Asia, and the female plant produces a resinous secretion from glands which are abundant on the upper leaves and bracts, when it is grown in hot climates. When the plants are in flower and fruit is forming, the tops are collected, allowed to wilt, and pressed into masses by treading with the feet, the resinous secretion present causing the masses to remain more or less compacted together.

In this form the drug, known commercially as "guaza," is exported from Bombay to this country. A more active variety, known as "ganjah," or "Bengal gauza," is pressed into rounded instead of flattened masses, and exported from Calcutta to the West Indies, as a rule. *Cannabis indica* is exported from Bombay in cases and bags, and a certain quantity is also produced in South Africa and exported from Cape Town in bags. The drug occurs in compressed, rough, dusky-green masses, matted together by the resinous secretion. It consists of the upper parts of stems, leaves, flowers and fruits. The odour is characteristic and strong, but the taste is slight. As the resinous secretion is the important part of the drug, its presence in the commercial article is essential; hemp tops grown in more temperate climates have been offered in place of Indian hemp, but they contain little resin and may be distinguished by their brighter green colour. Bhang or hashish consists of the larger leaves of the plant, used for preparing a confection or drink; charas or churrus is the resinous secretion collected from fresh flowering tops and used for smoking purposes.

Cantharides and Cantharidin. Cantharides or Spanish Fly consists of the dried beetle, *Cantharis vesicatoria*, which is widely distributed over Southern Europe, where it lives gregariously in ash, elder and other trees. The beetles are collected in Southern Russia, Galicia, Rumania, Italy and Spain, the trees being shaken in the early morning before sunrise, when the beetles are unable to use their wings and fall on to cloths placed beneath. They are killed by exposure to chemical fumes, or by stove heat, and are then packed in small boxes for exportation. The beetles are from 18 to 25 mm. long and about 6 mm. broad, with shining

green or bronze-green wing cases. They have a strong and disagreeable odour when fresh, but this becomes less marked on keeping. The chief constituent of the beetles is cantharidin, which is a powerful blistering agent. Another important source of cantharidin is the Chinese blistering beetle, *Mylabris phalerata*, which has black wing cases with orange-yellow bands. Other species of *Cantharis* and *Mylabris* also yield cantharidin, which occurs when purified in colourless, glistening crystals, soluble in chloroform, acetone, and fixed oils.

Capsicum and Cayenne Pepper. Capsicum is the dried ripe fruit of *Capsicum minimum*, a small shrub which is indigenous to Southern India, where it is also cultivated, as well as in Sierra Leone, Zanzibar, South America, and other tropical countries. The bright scarlet fruits are collected when ripe, and dried, changing to dull orange-red in the process. They are oblong-conical in shape, blunt at the apex, from 12 to 20 mm. in length, and about 6 mm. in diameter. Externally they are smooth, but somewhat shrivelled. The odour is characteristic and the taste intensely pungent. Capsicum imported from Sierra Leone is the most pungent variety and brighter in colour than that produced in Zanzibar. The fruits of *Capsicum frutescens* and other species grown in tropical countries may be mixed with those of *Capsicum minimum*, and the "Chillies" of commerce tend therefore to vary in size, shape and pungency. Cayenne pepper is produced by grinding capsicum fruit to powder, and much of it is probably obtained from the fruit of *Capsicum annuum*, which is considerably larger than that of other varieties.

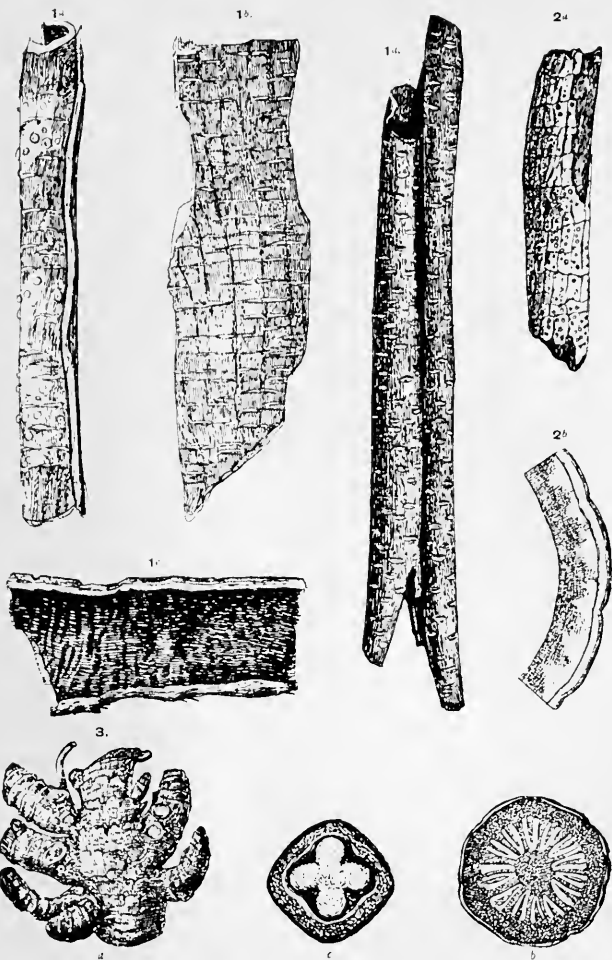
Caraway Fruit and Oil. Caraways are the dried ripe fruit of *Carum Carvi*, a biennial plant indigenous to, and cultivated in, Holland and other parts of

Europe. The plant is collected when the fruit is ripe, and the caraways are separated by threshing. They consist of two mericarps, which are usually separate in the commercial article, from 4 to 6 mm. long and about 1 mm. broad, brown in colour, slightly curved, smooth, and tapering towards each end. The odour and taste are aromatic, owing to the presence of volatile oil contained in several vittae or oil-cells. Holland is the chief country of production, but a small quantity has been grown in England, and supplies have also been produced in Norway, Sweden, Finland, Russia, Germany, and Morocco. Inferior varieties are smaller than the Dutch fruit and are often mixed with dirt, fruit-stalks and other debris. Oil of caraway is imported in tins. It is colourless or pale yellow, with odour and taste resembling those of the fruit.

Cardamom Seeds and Fruits. Cardamoms are the dried ripe seeds of *Elettaria Cardamomum*, a flag-like perennial plant which grows abundantly, both wild and under cultivation, in moist shady mountain forests on the Malabar Coast, and is also cultivated in Ceylon. The seeds are enclosed in three-celled capsular fruits, which are collected before they ripen sufficiently to spring open and scatter the contents. After collection, the fruits are cured by dipping them in water and drying in the sun or in a special drying apparatus; or they may be bleached by the action of sulphurous acid before drying. When cured the fruits are trimmed, freed from impurities, graded, and packed in cases for export. Though it is the seeds alone which are required for use, it is found desirable to keep them in the capsules until they are to be used, as by this means the aromatic properties of the seeds are best retained. Seeds sold without the pericarps may have been collected after being scattered by the ripening fruits and are of less

value for medicinal purposes. The dried fruits are from 1 to 2 cm. long, pale buff in colour, and vary in shape from nearly globular to ovate or oblong. In each of the three cells they contain two rows of small, dark reddish-brown seeds, which are about 3 mm. in length, the same in breadth and thickness, irregularly angular, transversely wrinkled, and enclosed in a thin, colourless, membranous covering which becomes more evident when the seeds are soaked in water. The seeds have an aromatic odour and an agreeable warm, aromatic taste, due to the volatile oil they contain. Of this oil they may yield as much as 8 per cent. and to its presence the seeds owe their marked carminative properties. Wild cardamoms are used for the production of the oil, but only the fruits of cultivated plants are used in medicine. So-called Mysore and Malabar cardamoms are imported from Ceylon; Telli-cherry, Mangalore and Aleppy cardamoms from India. The seeds of these varieties are much the same in appearance, but they differ slightly in flavour.

Cascara or Sacred Bark. Cascara Sagrada is the dried bark of *Rhamnus Purshianus*, a shrub found native in North California, Oregon, Washington, and British Columbia. It is collected in spring and early summer, dried in the shade, and kept for at least a year before it is used. Its action tends to become milder and less emetic by keeping, and matured bark, three years old, is usually preferred for medicinal purposes. The bark occurs in quilled, channelled or nearly flat pieces, from 1 to 2 mm. thick, but varying in length and breadth. Its outer surface is nearly smooth, dark purplish-brown in colour, with transverse lens-shaped markings, and adherent patches of silvery-grey lichen; the inner surface is reddish-brown. The odour of the drug is characteristic but not powerful; its taste



1. (a), (b), (c), CASCARA OR SACRED BARK

1. (d) FRANGULA BARK

2. (a), (b), CASCARILLA 3. (a), (b), (c), CIMICIFUGA AND
* SECTIONS

is nauseous, bitter and persistent. The bark is imported in bags.

Cascarilla. Cascarilla is the dried bark of *Croton Eluteria*, a small tree which is indigenous to the Bahama Islands. The bark is collected from twigs, branches and small stems, dried, and exported in bales and barrels. It occurs in quills from 3 to 10 cm. in length, and from 4 to 12 mm. in diameter, or in small curved pieces. It is covered with greyish-white, easily detachable cork, beneath which the surface is of a dull brown colour. Occasional black dots on the whitish cork are formed by lichens, and the cork itself has a distinctly chalky appearance owing to the presence of numerous crystals of calcium oxalate. The drug has an aromatic odour, which is more pronounced when it is burned; its taste is aromatic and bitter.

Cassia Bark, Buds, Pods and Pulp. Cassia is the dried bark of *Cinnamomum Cassia*, an evergreen tree of medium size, believed to be a native of Cochin China, and cultivated in south-eastern China. The bark is collected from the branches of trees about six years old; it is removed in pieces about 40 cm. long, each piece being half the circumference of the branch. By means of a plane, or knife, the cork and part of the cortex are shaved or scraped off, after which the pieces are tied into bundles each weighing approximately 500 grammes and packed in chests. These are exported chiefly from Canton to London and Hamburg. Cassia occurs usually in channelled pieces or single quills, of a dark earthy-brown colour, from 5 to 40 cm. long, 12 to 18 mm. in diameter, and 1 to 3 mm. in thickness. The bark has a mucilaginous taste and a cinnamon-like odour, due to the presence of a fragrant volatile oil, of which it contains from 1 to 2 per cent. This oil is also present in the leaves and small twigs which are

stripped off the branches before the bark is removed, and large quantities are distilled from these leaves and twigs, and exported in tins packed in cases. Other varieties of cassia bark are obtained from different species of *Cinnamomum* which grow in more northerly parts of China, and are exported from Saigon and Calcutta. They vary considerably in colour, thickness and aroma, and occur often in much broken pieces. Cassia buds are the immature fruits of the trees. They resemble cloves in appearance and have the distinctive cinnamon-like odour of the bark. Cassia pods have no connection with cassia bark, being the ripe fruits of *Cassia fistula*, a tree indigenous to India. They are from 35 to 50 cm. in length, 15 to 25 mm. in diameter, dark chocolate-brown to black in colour, and contain numerous smooth, oval, reddish-brown seeds imbedded in a blackish sweet pulp. Cassia pulp, of which the pods yield about 30 per cent by extraction with water, contains more than half its weight of sugar.

Castor Seeds and Oil. Castor Oil is obtained from the seeds of *Ricinus communis*, a plant which is either a shrub or a small tree, according to the climate in which it grows. It is indigenous to India, but is found growing in tropical and sub-tropical countries generally. The seeds are oblong in outline and somewhat flattened, from 8 to 15 mm. in length, and have an outer coat of a grey or greyish-brown colour, marbled with reddish-brown or black spots and stripes. They yield about 50 per cent of a viscid fixed oil, which is best extracted by cold pressure, without any previous treatment of the seeds. After extraction, the oil is filtered and enclosed in tins or barrels. Much of the oil is expressed from the seeds in this country, but large quantities are imported from Italy, Marseilles and Belgium. The best qualities are nearly colourless, or have a yellowish

tinge which can be removed by exposure of the oil to sun-light, this being the approved method of bleaching it. There is only a slight odour, and the taste is at first bland, but afterwards acrid and unpleasant. Inferior oils are obtained by pressing the seeds between hot plates, or by boiling crushed seeds with water and skimming off the oil as it rises to the surface. Such oils are usually dark in colour, have a disagreeable odour, tend to become rancid more quickly than "cold-drawn" castor oil, and are unsuitable for medicinal use. Castor oil is remarkable among fixed oils, because of its ready solubility in strong alcohol.

Catechu, Pale and Black. Catechu is an extract prepared from the leaves and young shoots of *Uncaria Gambier*, or the wood of *Acacia Catechu*, the product of the first-named being known as pale catechu, gambier, or Terra Japonica, whilst the second variety is known as black catechu or cutch. The plant yielding pale catechu is a climbing shrub which is indigenous to the Malay Archipelago and largely cultivated in many of the islands. A decoction is prepared by boiling the leaves and young shoots with water. After straining, the decoction is evaporated in copper pans to a syrupy consistence and allowed to cool, crystallization being induced in the soft clay-like mass by agitating it with a stick. The crystalline mass is then allowed to drain, placed in shallow square boxes, and cut into cubes, strips, plates, or round discs, which are then allowed to dry. Pale catechu is exported chiefly from Singapore. As used for medicinal purposes, it occurs in cubes measuring about 25 mm.; they are dark reddish-brown externally, pale cinnamon-brown internally, porous, friable and odourless. The taste is at first bitter and very astringent, but afterwards sweetish. Catechutannic acid, of which the drug may contain as much as

50 per cent, is the astringent principle, while the sweetish taste is due to catechin, of which 33 per cent may be present. Black catechu or cutch, which is used more in the dyeing and tanning industries than in medicine, is prepared by boiling chips of the brown or dark red hardwood of the trunk of *Acacia Catechu* with water until all soluble matter has been extracted, straining and evaporating the resulting decoction to a thick syrupy consistence; the extract is then allowed to cool somewhat, spread upon large leaves arranged within wooden frames or moulds, and left to set. The dried cakes or brick-like masses are usually broken into pieces before being packed for exportation from Bengal and Burma. As found in commerce, cutch occurs in irregular, brittle masses, of a dark brown colour, and breaks with a porous, glossy, somewhat conchoidal fracture. It is odourless, astringent and sweetish, may contain as much as 33 per cent of catechu-tannic acid, and up to 10 per cent of catechin. A variety of black catechu, known as "Katha," closely resembles pale catechu in appearance, as the result of being prepared in a similar way so as to induce crystallization. It can, however, be distinguished from pale catechu by the absence of a fluorescent principle which occurs in the latter and can be extracted from an alkaline solution of the extract by agitation with petroleum spirit.

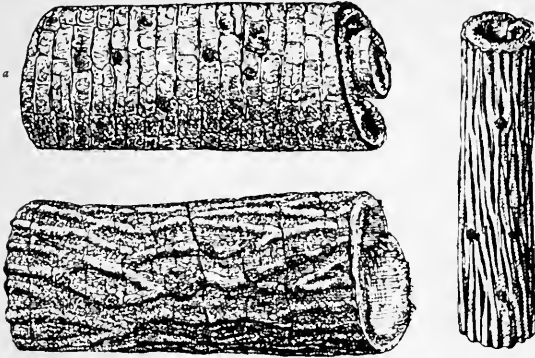
Chamomile Flowers. Chamomiles are the expanded flower-heads of *Anthemis nobilis*, the common or Roman chamomile. It is a small perennial plant which grows wild in the South of England, and is cultivated for medicinal use in Hampshire, Surrey, and other districts, as well as in France, Belgium and Saxony. The dried flower-heads are hemispherical, white or pale buff in colour, and measure from 12 to

20 mm. in diameter. Each flower-head has a solid conical central portion or disc, covered with numerous florets and surrounded by a ring of ligulate or strap-like ray florets. Chamomiles in which all or most of the disc florets are also ligulate are distinguished as "double" or "semi-double" chamomiles, and these are the varieties which are preferred for medicinal use. Scotch chamomiles are the so-called "single" flowers, in which normal yellow disc florets are surrounded by a single row of white ligulate ray florets, as in the case of the common wild daisy. German chamomiles are the dried flower-heads of *Matricaria Chamomilla*; they are "single," have a hollow conical central portion, and are not official in this country. Chamomiles have a strong aromatic odour, due to the presence of a peculiar volatile oil, and a bitter taste. They are usually packed in bales, under pressure. Oil of chamomiles is official. It is a blue or greenish liquid with the odour of the flowers.

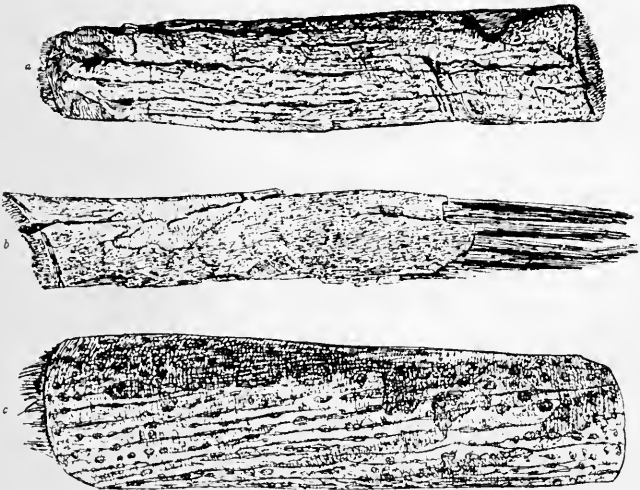
Chiretta. Chiretta is an entire herb, *Swertia Chirata*, collected when in flower and dried. The plant is an annual, indigenous to the mountainous regions of Northern India. It is imported in bales and consists of smooth, brown or purplish-brown stems, about 1 metre long, with attached roots, leaves, flowers and fruits. The drug has no marked odour, but its taste is extremely bitter. It contains two bitter principles, named respectively ophelic acid and chiratin. Various other bitter plants resembling chiretta have been imported under the same name, and some chiretta is imported from Japan.

Cim cifuga. Cimicifuga or Black Snakeroot is the underground portion of *Cimicifuga racemosa*, a native of Canada and the United States. In the autumn, after the plant has died down, the rhizome and roots

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2.



1. (a), (b), (c), RED CINCHONA BARK
2. (a), (b), SOFT COLOMBIAN BARK. 2. (c), HARD CARTAGENA BARK

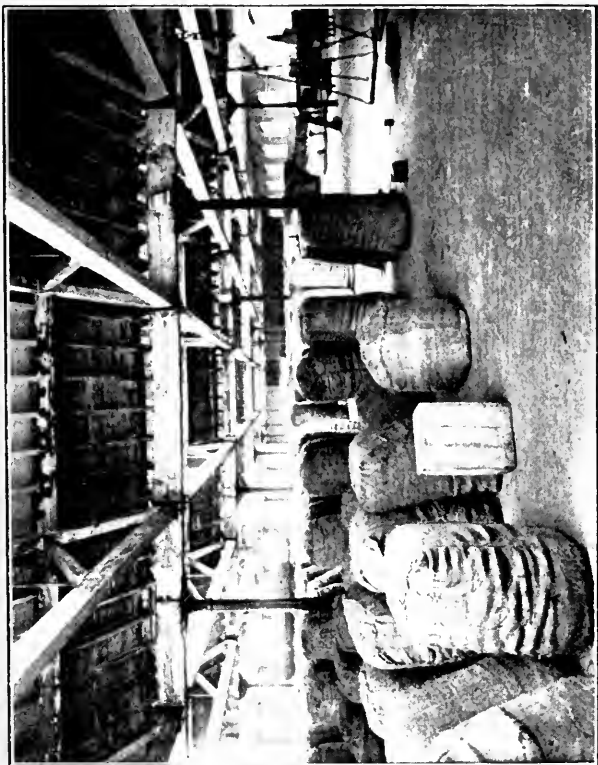
are collected, cut into pieces, and dried. The drug consists of the thick, hard, dark brown rhizome, from which numerous stout branches curve upwards, while straight, stout roots are given off from the under surface. It is without marked odour, but has a bitter, acrid taste, due to the presence of resin. Pieces of the drug vary from 5 to 15 cm. in length, and from 12 to 25 mm. in diameter. Sections of the rhizome show pale wedges of wood arranged in a ring, whereas the wedges in the root are arranged in the form of a Maltese cross. Cimicifugin is a mixture of resinous and other bodies, obtained by precipitating a tincture of the drug with water.

Cinchona Bark and Quinine. *Cinchona* is the bark of the stem and branches of large trees or shrubs belonging to the genus *Cinchona*, some twenty species of which are indigenous to South America, where they occur exclusively on the western side of the continent, in an area which includes portions of Venezuela, New Granada, Ecuador, Peru and Bolivia. The plants are evergreen and are found in the mountain regions in places where the climate is warm and moist. At an early period the Spaniards appear to have become acquainted with the febrifuge properties of the bark, and in course of time the great and increasing demand for the drug prompted serious efforts to cultivate the trees on a large scale both in South America and other countries. They were successfully introduced into British India, Ceylon and Java, with the result that the world became practically independent of South America for its supplies of cinchona bark. Collection of the bark usually takes place during the rainy season, as it then separates readily from the stem and branches. The original method is to strip the bark after felling the trees, and dry it in the sun or over a slow fire, the



CINCHONA FLOOR AT LONDON DOCKS

pale inner surface becoming brown or red as the result of oxidation of the tannin present, which is thus converted into cinchona red. Externally the bark varies in colour from brownish-grey to reddish-brown, and it is frequently more or less covered with greyish lichens ; longitudinal furrows, transverse cracks, and scattered reddish warts also appear on the outer surface, and serve by their frequency and arrangement to distinguish the bark of different species. Large flat pieces of bark are obtained from the trunk and large branches, while quills are obtained from the smaller branches. Where the trees are not uprooted after being cut down, shoots grow from the part of the trunk which remains, and fine quills of bark are obtained from these shoots. If, however, uprooting is effected, a very rich bark can be obtained from the uncovered roots. So-called "renewed" bark is obtained by removing the bark from the living tree in longitudinal strips, protecting the trunk with moss or other suitable material, and allowing the remaining bark to remain covered for some time, while fresh bark is developed. The strips of bark first removed are known as "natural" bark, the strips allowed to remain under cover are removed later and distinguished as "mossed" bark, and the new bark which forms under the protective covering after the "natural" and "mossed" barks have been removed is distinguished in turn as "renewed" bark. Another method of renewing the bark on living trees is to remove a portion of the original bark by a process of shaving and allow new bark to develop without any covering of moss. The particular kind of cinchona bark used for making official galenical preparations is that obtained from *Cinchona succirubra* and imported chiefly from Java in bales. It is known as red cinchona bark and is usually in quills of fairly large size, often



CINCHONA BARK IN BALES

about 25 mm. in diameter, while the bark varies from 2·5 to 6 mm. in thickness. The outer surface is dull brownish-grey or reddish-brown in colour, and more or less wrinkled longitudinally; small transverse cracks are sometimes apparent and older pieces bear reddish warts. The inner surface has a characteristic reddish-brown colour and the bark is spongy in texture, with a distinct bitter and astringent taste, the astringency being due to the tannin present, while the bitterness is caused by the quinine and other alkaloids to which the bark owes its special virtues as a drug. Alkaloids may be present to the extent of 10 per cent or more, but the official standard is 5 to 6 per cent, of which not less than half must be quinine and cinchonidine. Other important alkaloids in the bark are cinchonine, quinidine, quinamine, hydroquinine, hydrocinchonidine, and homocinchonidine. The best known alkaloid is quinine, which is mainly used in the form of quinine sulphate. Flat red cinchona bark comes from South America; Calisaya or yellow bark in quills, or sometimes flat, is the product of *Cinchona Calisaya* cultivated in Bolivia; Ledger bark in quills is another yellow bark, from *Cinchona Ledgeriana* cultivated in Java; pale or crown bark, from *Cinchona officinalis* cultivated in India, occurs in quills only; Colombian and Cartagena barks, from *Cinchona lancifolia*, may be either flat or in quills, and are characterised by patches of silvery cork. The bulk of the bark is imported for the extraction of quinine and other alkaloids.

Cinnamon Bark and Oils. Cinnamon is the dried inner bark of shoots from the truncated stocks of *Cinnamomum zeylanicum*, a small evergreen tree indigenous to Ceylon and specially cultivated there. The trees are pruned as in coppicing, so that stools are formed from which four or five shoots are allowed to

grow. These are cut when $1\frac{1}{2}$ to 2 years old, being then from 2 to 3 metres long and 12 to 50 mm. thick. The bark on the separated shoots is cut through at



CINNAMON-PRESSING MACHINE

distances of about a foot, slit lengthwise, and removed by means of a special form of knife. Pieces of the detached bark are then placed one inside another, so as to form compound sticks which are firmly bound together into bundles. After being left for 24 hours,

the bundles are unfastened and the quills separately scraped so as to remove the outer and middle cortical layers. The smaller quills are then arranged inside the larger ones and small pieces inserted in the cavities, so as to form almost solid sticks about one metre long. These are kept one day in the shade and then placed on wicker trays in the sun to dry, after which they are made into bundles weighing about 1.5 kilo. each. The bark is imported chiefly from Ceylon, but inferior varieties have been obtained from Southern India, Java, Brazil and the West Indies. As found in commerce, cinnamon occurs in closely rolled quills, each about 9 mm. in diameter, and containing numerous smaller quills or channelled pieces. The outer surface is of a dull, pale yellowish-brown colour; the inner surface is darker. The bark has a fragrant odour and a warm, sweet and aromatic taste, both odour and taste being due to the volatile oil present. This is the true oil of cinnamon, of which the yield from the bark is from 0.5 to 1 per cent. It is largely distilled in Ceylon, whence it is exported in bottles packed in cases. Cinnamon leaf oil, which is obtained by distillation of the leaves of the same plant, differs in composition from true oil of cinnamon and is not so valuable.

Cloves and Clove Oil. Cloves are the dried flower-buds of *Eugenia caryophyllata*, an evergreen tree which is indigenous to the Molucca Islands, where it is cultivated, as well as in the Malay Peninsula, Zanzibar, Pemba, Java, Ceylon, etc. The buds are crimson when collected, but become dark brown on drying. They are about 15 mm. long, and consist of the nearly cylindrical calyx tubes crowned with the unexpanded petals, enclosing other parts of the flower. When indented with the finger nail they emit volatile oil which imparts to cloves their strong, fragrant and spicy odour, and

their pungent, aromatic taste. The bulk of the cloves imported comes from Zanzibar, but superior varieties are imported from Penang, Amboyna, Madagascar and Réunion. Penang and Amboyna cloves are larger and brighter coloured than the Zanzibar variety, the Penang product being largest of all. Clove stalks which have been separated from the flower-buds after collection also come into the market and are of value because of the volatile oil they contain. Spent cloves, from which the oil has been removed by distillation, are sometimes used as an adulterant ; they are darker than entire cloves and float on water, whereas entire cloves sink because the volatile oil they contain is heavier than water. Blown cloves are dried expanded flowers from which parts tend to break off, forming clove dust. Mother cloves are the ripe fruits, which contain much less oil than ordinary cloves and have the appearance of ovoid brown berries. Both clove stalks and mother cloves have been used to adulterate ground cloves. Oil of cloves is a heavy, colourless or pale yellow liquid, with odour and taste resembling those of the flower-buds.

CHAPTER IV

Coca leaves and cocaine—Cochineal and carmine—Cod-liver oil—Colchicum corn and seeds—Colocynth fruit and pulp—Copaiba and Gurjun balsam—Coriander fruit and oil—Cotton root bark—Couch grass—Croton seeds and oil—Cubebbs or tailed pepper—Damiana—Datura leaves and seeds—Digitalis or Foxglove leaves—Dill fruit and oil—Elecampane—Elm bark and slippery elm—Ergot of rye—Eucalyptus oil—Euonymus bark and euonymin—Fennel fruit and oil—Fenugreek seeds—Galls and Myrobalans—Gelsemium and gelsemin—Gentian root—Ginger and gingerine.

Coca Leaves and Cocaine. Coca consists of the dried leaves of a cultivated shrub, the different forms of which are believed to be varieties of *Erythroxylum coca*, though the plant yielding one kind of coca has been distinguished as *Erythroxylum truxillense*. The plants have been cultivated from time immemorial in Bolivia and Peru, and are also found in Java and Ceylon. It is customary to pick the leaves at least twice a year, and after being dried they are packed in bales for exportation. There are two important commercial varieties of the drug, known respectively as Bolivian or Huanuco and Peruvian or Truxillo, the latter being the product of *Erythroxylum truxillense*. Java coca is usually exported in the form of coarse powder and differs in its constituents from the better known varieties. Bolivian coca leaves are brownish-green in colour, oval in outline, from 3.5 to 7 cm. long and from 25 to 35 mm. broad. They have a faint but characteristic odour and a slightly bitter taste which is succeeded by a sensation of numbness in the mouth. Peruvian coca leaves are pale green in colour and somewhat smaller as a rule than the Bolivian leaves.

The flowers of a species of *Inga* are occasionally found mixed with them, this addition being supposed to improve the drug. In Bolivia and Peru the freshly dried leaves are found to appease hunger and fatigue when chewed, and the aborigines are said to find them an almost indispensable nerve stimulant. Their peculiar effect is due to the cocaine present in the leaves, and the same alkaloid is the cause of the numbness produced when the leaves are chewed. The proportion of cocaine yielded by commercial coca is very small, the Bolivian leaves being somewhat richer than the Peruvian. Other alkaloids present in the leaves are cinnamyl-cocaine, truxilline and tropacocaine, but the total alkaloidal content is usually less than 1 per cent. It is usual to extract the alkaloidal matter in South America and export it in the crude form to Europe, where it is purified and the cocaine separated from the other constituents of the leaves.

Cochineal and Carmine. Cochineal is the dried fecundated insect, *Coccus cacti*, a native of Central America and Mexico, which is bred in the Canary Islands, where it is reared upon the fleshy branches of cactus plants. After impregnation, the female insects increase rapidly in size, and they are then brushed off the plants, killed and dried. There are two commercial varieties, known respectively as "silver-grain" and "black-grain" cochineal, the former being obtained when the insects are killed by the fumes of burning sulphur or charcoal and dried in the sun, while the second and inferior variety is obtained on killing the insects by hot water or stove heat and subsequently drying. They shrivel up in the process of drying and are then about 5 mm. long; somewhat oval in outline, flat or concave beneath, convex above, transversely wrinkled, and purplish-grey or purplish-black in colour.

The silver-grey appearance is due to the presence of a white waxy secretion which melts when the insects are dried by artificial heat. Cochineal is imported from the Canary Islands in bags. It contains about 10 per cent of carminic acid, a fine red colouring matter which is used, among other purposes, for colouring liquid medicines. Carmine is a powder containing about 50 per cent of carminic acid, and is produced by precipitating infusions of cochineal with such substances as alum and potassium bitartrate, in the presence of lime salts and albumin or gelatin.

Cod-liver Oil. Cod-liver Oil is obtained from the fresh liver of *Gadus morrhua*, the fish being caught for the purpose towards spawning time, on the coasts of Norway, Newfoundland, and other countries bordering the Northern Atlantic Ocean. Only perfectly healthy livers are used, after removal of the gall-bladders, for oil required for medicinal purposes, and it is necessary that the oil should be expressed at a low temperature. It is then cooled to cause separation of solid fat, from which it is separated by filtration under pressure in canvas bags. The resulting "non-freezing" cod-liver oil is pale yellow in colour, with a slight fish-like odour, and a bland fish-like taste. It should remain clear, without separation of particles of solid fat, when exposed to the temperature at which water freezes. Inferior qualities of cod-liver oil are obtained from livers which have been already subjected to pressure, and from unhealthy livers, by heating them, with or without water, to a high temperature, and subsequently straining off the oil which separates. Another method of obtaining oil of low quality is to allow the livers to undergo slow decomposition in barrels, and collect the brownish liquid which rises to the surface of the mass as it escapes from the disintegrating tissues.

Colchicum Corm and Seeds. *Colchicum* consists of the fresh or dried corms, or dried ripe seeds, of *Colchicum autumnale*, the meadow saffron, which occurs abundantly in moist meadows and pastures in various parts of England, and is widely distributed over Central and Southern Europe. The corm is a short, fleshy, bulb-shaped underground stem and should be collected in early summer. It is about 35 mm. long and 25 mm. broad, somewhat conical, but hollowed on one side and rounded on the other. There is an outer, thin brown membranous coat and an inner reddish-yellow one, enclosing a white solid mass which yields a whitish, bitter, malodorous, turbid juice when cut. The dried corm is prepared by removing the outer and inner coats, slicing transversely the portion that remains, and drying the slices at a temperature not exceeding 65 C. Dried slices are 2 or 3 mm. thick, yellowish at their circumference, and somewhat kidney-shaped in outline. They are inodorous, but have a bitter taste, due to the presence of the poisonous alkaloid colchicine. *Colchicum* seeds contain the same active principle; they are dull reddish-brown in colour, nearly round, and larger than black mustard seeds, measuring about 2.5 mm. in diameter. Like the dried corm, they are inodorous, but taste bitter and acid.

Colocynth Fruit and Pulp. *Colocynth* is the dried fruit of *Citrullus Colocynthis*, a slender gourd-bearing plant, found native in the warmer and drier regions of Europe, and also widely distributed throughout Syria, Northern Africa, Persia, and North-Western India. It is cultivated in Spain, Cyprus, India and Syria. The fruit is a gourd about the size and shape of an orange, with a smooth marbled-green surface which changes in colour to yellow as ripening proceeds. It is usually peeled before drying, and occurs in commerce

in the form of more or less broken white balls, which are very light in weight and contain numerous oily seeds. Colocynth pulp for medicinal purposes is prepared by crushing the white balls into light spongy fragments, and removing the seeds. The pulp has no odour, but its taste is intensely bitter, owing to the presence of the glucoside colocynthin. Turkey colocynth is the finest variety ; it is imported from Syria and Cyprus in cases. Spanish colocynth is often discoloured and contains a smaller proportion of pulp, while Persian colocynth is smaller and yields still less pulp. Unpeeled colocynth is occasionally imported from Mogador, but is only a curiosity.

Copaiba and Gurjun Balsam. Copaiba is an oleo-resin obtained by incision from the trunks of various species of *Copaifera*, large trees which are indigenous to Brazil, Venezuela, New Granada, and other parts of Central and South America. The oleo-resin is formed in special secretion ducts and is collected by cutting near the base of each tree a cavity into which the liquid flows. It is thence transferred to barrels, tins, or drums for exportation, and conveyed to seaports on the northern coast of South America for shipment. The commercial varieties of the drug are known in commerce by the names of the seaports—Maranhã, Maracaibo, Para, Bahia, Cartagena—from which they have been exported ; they differ in the relative proportions of volatile oil and resin they contain, and the composition of the resin may also vary. African copaiba is the product of a species of *Hardwickia* and differs essentially from the South American drug. Gurjun balsam is an oleo-resin obtained from species of *Dipterocarpus* indigenous to India and Burma. These two products have been used as substitutes for genuine copaiba, whilst various substances, including

fixed and volatile oils, colophony and paraffin oil, have been employed as adulterants of the drug. Oil of copaiba is the volatile oil separated from the resin by distillation.

Coriander Fruit and Oil. Coriander is the dried fruit of *Coriandrum sativum*, an annual herb indigenous to Southern Europe and cultivated in England, Russia, Thuringia, Hungary, Moravia, Northern Africa, Malta and India. The fruit is collected when ripe by threshing and dried entire, the two mericarps of which it consists remaining firmly attached by their margins. It is nearly globular in shape, about 5 mm. in diameter, brownish-yellow in colour, and smooth. The fruit has an aromatic odour, especially when bruised, and an agreeable taste. The chief constituent, to which the odour and taste are due, is about 1 per cent of volatile oil, which can be obtained from the fruit by distillation. English corianders have the finest flavour, but Russian and German are richer in oil; Bombay and Mogadore fruit yield a much smaller proportion of oil. The fruits are imported in bags. Oil of coriander is a separate article of commerce. It is a colourless or pale yellow liquid, resembling the fruit in odour and taste.

Cotton-Root Bark. Cotton-Root Bark is obtained from the roots of *Gossypium herbaceum* and other cultivated species of *Gossypium*. The plants are herbs, shrubs, or small trees, cultivated in tropical and subtropical countries, mainly as the source of cotton, which consists of the hairs of the seeds. Cotton wool is prepared by removing the natural fat from the hairs and subsequently bleaching them. The dried root-bark is imported in bales from the United States. It occurs in thin, tough, fibrous strips to which long thin tapering rootlets are attached at intervals. The outer

surface of the bark is covered with a rough cinnamon-brown cork which is easily separated, revealing a paler cortex beneath; the inner surface is whitish, silky and finely striated. There is no odour, but a somewhat acrid, astringent taste. The chief constituent of the drug is an acid resin.

Couch Grass. Couch Grass or *Agropyrum*, also known as *Triticum*, is the dried rhizome of *Agropyron repens*, a weed which is abundant in this country and throughout Europe, Northern Asia, Australasia and America. Collection takes place in the spring and the rhizomes are freed from the remains of leaves and rootlets before drying. As met with in commerce, the drug occurs in short, straight, hollow, straw-coloured pieces about 3 to 6 mm. long and 2 to 2.5 mm. broad; they are furrowed longitudinally, without odour, but have a faint, sweetish taste. The drug contains a carbohydrate named tritacin and mucilage.

Croton Seeds and Oil. Croton Oil is obtained from the seeds of *Croton Tiglium*, a shrub or small tree which is indigenous to, and cultivated in, India. The oil is expressed from the seeds, after removal of the outer coating, in India and England. Though the seeds resemble those of the castor-oil plant in shape and size, they differ in being of a dull cinnamon-brown colour. They yield more than 50 per cent of a viscid, brownish-yellow to reddish-brown fixed oil, which has a disagreeable odour and very acrid taste. On account of its powerful action, it is inadvisable to taste it except with extreme caution, as it readily blisters the skin and mucous membrane. Like castor oil, it mixes readily with strong alcohol.

Cubebs or Tailed Pepper. Cubebs are the dried full-grown, half-ripe fruits of *Piper Cubeba*, a climbing plant indigenous to, and cultivated in, Java, Sumatra

and Borneo. They are collected while still green, and dried in the sun, changing colour in the process from green to nearly black. When dry, they are packed in bags and exported—chiefly from Singapore to London, and from Batavia to Amsterdam. As they occur in commerce the fruits are nearly globular, about 4 mm. in diameter, greyish-brown or nearly black in colour, wrinkled externally, and prolonged at the base into a slender rounded stalk. The presence of this stalk distinguishes them from black pepper and has caused cubeb's to be known as tailed pepper. They have a strong aromatic odour and a warm, aromatic taste, due to the presence of volatile oil. Many fruits have been used as substitutes for cubeb's, but the genuine fruit is readily distinguished by imparting, when crushed, a crimson colour to sulphuric acid. Oil of cubeb's is obtained from the fruits by distillation.

Damiana. Damiana consists of the dried leaves of *Turnera diffusa*, variety *aphrodisaica*, and probably other species of *Turnera*. The plants are herbs found in South-Western Texas and Mexico, where the leaves are collected, dried, and packed in bags or bales for exportation. As imported, the drug often contains pieces of stem and a certain proportion of flowers and fruits. The leaves are light green in colour, about 10 to 25 mm. long, and from 5 to 10 mm. broad, with a smooth upper surface, toothed margin, and prominent veins on the under surface. They have an aromatic odour and taste. Their chief constituents are a volatile oil with a chamomile-like odour and a bitter principle.

Datura Leaves and Seeds. Datura consists of the dried leaves or seeds of *Datura fastuosa*, variety *alba*, or the dried leaves of *Datura Metel*. Both plants are annuals and indigenous to India, where the leaves

and seeds are employed instead of stramonium leaves and seeds. As seen in commerce, the leaves are brownish or yellowish-green, about 20 cm. long and 13 cm. broad. They closely resemble stramonium leaves in appearance and have a similar characteristic odour, with a bitter taste. The seeds are yellowish-brown in colour, somewhat wedge-shaped, from 4 to 5 mm. broad and about 1 mm. thick. Their surface is finely pitted and reticulated. They have no odour, but the taste is slightly bitter. Both leaves and seeds contain hyoscine, together with traces of hyoscyamine and atropine.

Digitalis or Foxglove Leaves. *Digitalis purpurea*, the common foxglove, a biennial herb which is found in many parts of England and is widely distributed throughout Europe. It is cultivated in Germany and elsewhere for medicinal use, and the dried leaves are imported in bales. They are collected from plants commencing to flower, dried at a low temperature, and are preferably kept dry in well-filled airtight containers, until required for use. The leaves are from 10 to 30 cm. or more in length, and may be from 12 to 15 cm. broad. They have a somewhat rough, dull green, and slightly hairy upper surface; the under surface is paler and covered with a dense growth of fine hairs. There is no specially distinctive odour, though that of the fresh leaves is markedly unpleasant; the taste of the dried leaves is bitter. Among the constituents of the leaves occur the poisonous glucosides digitoxin and digitalin, to which the action of the drug is chiefly due.

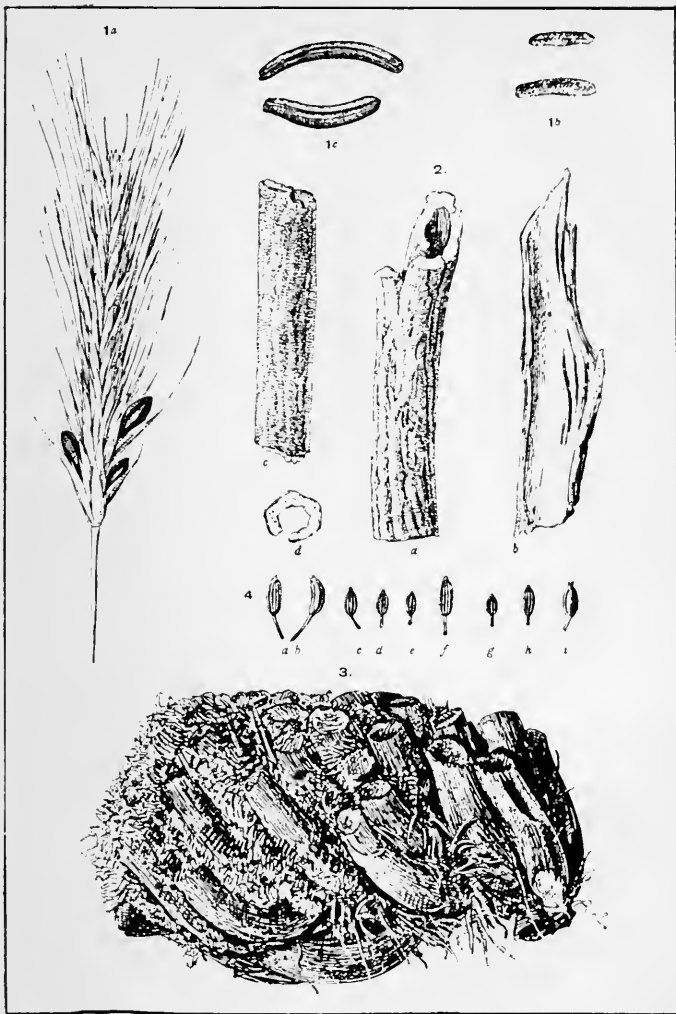
Dill Fruit and Oil. Dill is the dried ripe fruit of *Peucedanum graveolens*, an annual herb which is indigenous to countries bordering the Mediterranean and to Southern Russia, but is cultivated in England,

Germany and Rumania, whilst the fruit of a kindred species, *Peucedanum Sowa*, is collected in India and Japan. The fruits are oblong or oval in shape, and each consists of two separate portions (mericarps) attached to a stalk. After collection and drying, the brown mericarps become detached from the stalks and from each other, so that commercial dill consists usually of the separate mericarps, which are nearly flat, broadly oval in outline, from 2 to 3 mm. in breadth and about 4 mm. in length. They bear inconspicuous ridges on the outer surface and two prominent lateral ridges which are prolonged into pale brown wings. Each mericarp contains six vittae or elongated oil glands, the volatile oil in which imparts an agreeably aromatic odour to the fruit. Indian and Japanese dill yields a volatile oil which differs in its characters from the oil of European dill; as imported, the mericarps are frequently united and attached to the stalks, and they are not considered so suitable for medicinal use as European dill, which alone is official in this country.

Elecampane. Elecampane consists of the dried root and rhizome of *Inula Helenicum*, a perennial plant which is indigenous to Europe and Asia, and is cultivated for medicinal use in Holland, Switzerland and Germany. The plants are dug up in the autumn, when two or three years old, and the roots and rhizomes dried, larger pieces being previously sliced to facilitate drying. When dry, it is packed in bags for exportation. The drug consists chiefly of the long, slightly tapering roots, which vary in thickness from 5 to 20 mm.; they are of a light grey colour and a hard, horny consistence. Pieces of rhizome are usually thin, irregularly rounded, and 4 to 5 cm. in diameter. The drug has an agreeable, aromatic odour and an aromatic, slightly bitter taste. It contains a volatile oil and other principles.

Elm Bark and Slippery Elm. Elm Bark is obtained from the common elm, *Ulmus campestris*, a large tree which is a native of Central and Southern Europe, and is largely grown in England. The bark is collected in the spring and freed from its dark, rough outer portion; the remaining whitish inner portion constitutes the elm bark of commerce. It occurs in thick flattened pieces, usually about 10 to 15 cm. long and from 25 to 50 mm. wide, with a pale yellowish-brown outer surface, marked with patches of the dark brown outer layer. The bark is odourless, but has a slightly mucilaginous and astringent taste. Its chief constituent is tannin. Slippery elm is the dried bark of *Ulmus fulva*, a tree which is indigenous to the United States. Like ordinary elm bark, it is deprived of its dark outer portion after collection, after which it is dried and packed in cases for exportation. It occurs usually in large strips, which are often from 60 to 90 cm. long, 4 or 5 cm. or more in width, and about 3 mm. thick. The outer surface is reddish-yellow, with patches of the brown outer layer; the inner surface is of a tawny yellow colour. There is a strong fenugreek-like odour, and a markedly mucilaginous taste. The chief constituents of the bark are mucilage and tannin.

Ergot of Rye. Ergot is a dense compact mass of slender, threadlike cells, produced from the spores of *Claviceps purpurea*, a fungus which infests the flowers of the rye plant and other cereals. The spores are conveyed by the wind and produce numerous colourless filaments which gradually penetrate the ovaries of the flowers, forming a loose felt. As development proceeds, this becomes hardened into a firm, dark-coloured mass, which entirely replaces the ovary and projects from the ear of rye about the time that the



1. (a), (b), (c), ERGOT 2. (a), (b), (c), (d), EUONYMUS BARK
 3. MALE FERN 4. FENNEL SEEDS

latter is ripe. The dark masses constitute ergot and are separated from the rye by threshing, or the grains may be picked by hand. They are subcylindrical or somewhat triangular in shape, tapering towards the ends, generally curved, from 1.5 to 4 cm. long and dark violet-black in colour. The drug has a characteristic and disagreeable odour, and a very disagreeable taste. It is collected chiefly in Russia, Spain, Austria and Germany, and is imported in bags. The most important commercial varieties are Spanish, which is the largest, and Russian.

Eucalyptus Oil. Eucalyptus oil is obtained by distillation from the fresh leaves of *Eucalyptus globulus*, *Eucalyptus dumosa*, and other species of *Eucalyptus*. The plants yielding it are large trees indigenous to Australia and Tasmania, but they are largely cultivated in the South of Europe, Algeria and the United States. They produce long, leathery leaves which have a strong camphoraceous odour, especially when crushed, and an aromatic, pungent and slightly bitter taste. The oil yielded by different species varies in composition, those which are most preferred containing much cineol or eucalyptol and but little phellandrene. As used for medicinal purposes, it is colourless or of a pale yellow colour, with an aromatic, camphoraceous odour, and a pungent taste which leaves a sensation of cold. It should be readily soluble in 70 per cent alcohol and contain not less than 55 per cent of cineol; oils containing much phellandrene are excluded by the official test. In addition to cineol, eucalyptus oils contain various terpenes, of which phellandrene is the chief constituent in the oils produced by *Eucalyptus amygdalina* and other species. After distillation from the leaves, the oil is rectified by re-distillation and enclosed

in tins which are packed in cases for exportation. It is imported from Australia, Algeria and the United States.

Euonymus Bark and Euonymin. *Euonymus* is the dried root-bark of *Euonymus atropurpureus*, a shrub which is common in shady woods in the United States, whence it is exported in bags. It occurs in quilled or curved pieces, from 2 to 4 mm. thick, covered with a soft, friable cork which is marked with dark patches. The inner surface is of a tawny-white colour and smooth. There is a faint but characteristic odour; the taste is somewhat mucilaginous, afterwards bitter and slightly acrid. The stem-bark is also collected, but is not official for medicinal purposes. It occurs in long, thin and narrow strips, has a dark greenish-grey cork, and is easily distinguished from the root-bark. *Euonymin* is a powdered extract of the bark.

Fennel Fruit and Oil. Fennel is the dried ripe fruit of *Foeniculum vulgare*, an erect herb which is indigenous to countries bordering the Mediterranean, and is cultivated in France, Germany, Russia, Galicia, Rumania, India, Japan, and Persia. For medicinal purposes, the fruit should be collected from cultivated plants, and that grown in Saxony has been found to yield the largest proportion of the volatile oil to which the activity of the fruit is due. It is a small oblong fruit, straight or slightly curved, from 3 to 10 mm. long, 2 to 4 mm. in diameter, and greenish or greenish-brown in colour. Each of the two mericarps of which a fruit consists contains six large vittae or oil cells. The fruit has an aromatic odour and a strong, sweet and camphoraceous taste. Saxon, Russian, Rumanian and Galician fruits yield from 4 to 5 per cent of the volatile oil of fennel, but most other varieties do not yield more than 2 to 3 per cent, and Indian fruit yields less than 1 per cent.

Fenugreek Seeds. Fenugreek consists of the dried seeds of *Trigonella Fænumgræcum*, an annual herb which is largely cultivated in India, Egypt and Morocco, The pods containing the seeds are collected when ripe, threshed, and the separated seeds dried and packed in bales for exportation. They are usually brownish-yellow in colour, rhomboidal in shape, from 3 to 5 mm. long and about 2 mm. thick. The seeds have a characteristic pleasant odour, and a disagreeable taste. They contain much mucilage in their outer coating and also yield 6 per cent of fixed oil.

Galls and Myrobalans. Galls are excrescences formed on young twigs of *Quercus infectoria*, a shrub or small tree found in Greece, Asia Minor, Cyprus and Syria. They result from the development of the larvae of the gall-wasp, *Cynips gallæ tinctoriæ*, which punctures the bark on the twigs and deposits one or more eggs in the cavity formed by its ovipositor. When the larvae emerge from the eggs, they stimulate a rapid development of new tissue which assumes a concentric arrangement around the cavity in which each larva lives until such time as it becomes transformed into a gall-wasp which bores a hole through the gall and escapes. For medicinal purposes, however, it is preferred that the galls should be collected before the insects emerge. They are then heavier, sink in water, and of course exhibit no perforation. Galls are hard, heavy, subglobular in shape, from 12 to 18 mm. or more in diameter, dark bluish-green or olive-green in colour, and have numerous bluntly pointed projections on the surface. They are distinguished as blue or green galls. White galls are those collected after the insects have escaped; they are usually slightly larger, weigh less, and are yellowish in colour. The best galls are those known in commerce as Aleppo or Turkey

galls, being collected in the province of Aleppo. They yield from 50 to 70 per cent of tannic acid, which imparts to them an intensely astringent taste. Chinese and Japanese galls differ in shape, being very irregularly lobed; they are hollow, reddish-brown in colour, and covered with a thick grey, velvety down. English galls, or "oak apples," are smooth, globular, brown, and usually perforated. Myrobalans are largely used in eastern countries instead of galls; they are the dried immature fruits of *Terminalia Chebula*, a tree which is indigenous to India, and are known in commerce as Chebolic myrobalans, to distinguish them from other varieties which are not used in medicine. They are irregularly ovoid or fusiform in shape, from 10 to 30 mm. or more in length, from 5 to 15 mm. wide, strongly shrivelled longitudinally, dark brown or nearly black, without odour, and have a very astringent taste, due to the presence of tannic acid.

Gelsemium and Gelsemin. Gelsemium is the dried rhizome and root of *Gelsemium nitidum*, a climbing plant indigenous to the southern United States, whence it is exported in bales. The drug occurs in nearly cylindrical pieces about 15 cm. or more in length, and usually from 6 to 18 mm. thick. Pieces of rhizome are nearly straight and covered with a brown or dark brownish-violet cork which is often much fissured; the root is yellowish-brown, finely wrinkled, and somewhat tortuous. There is a slightly aromatic odour and the taste is bitter. The chief constituents of the drug are the two alkaloids, gelseminine and gelsemine, the former of which is intensely poisonous. They must both be carefully distinguished from gelsemin, which is a powdered alcoholic extract of the drug.

Gentian Root. Gentian consists of the dried rhizome and roots of *Gentiana lutea*, a perennial herb which is

indigenous to Central Europe, and grows abundantly on the lower slopes of the Jura and Vosges mountains, in the Black Forest, and in the Pyrenees. The underground portions of the plant are collected in the autumn and dried, large pieces being sliced longitudinally to facilitate drying. When fresh the drug is whitish internally, but it darkens gradually during the slow drying process to which it is subjected, and a distinctive odour is developed, apparently as the result of fermentation. When quickly dried the pieces are paler in colour, the odour is less marked, and the drug is apt to be more bitter than usual. After being dried the drug is packed in bales for export. Characteristic pieces of gentian are nearly cylindrical, about 15 to 20 cm. long, and seldom exceed 2.5 cm. in thickness; they are yellowish-brown externally and longitudinally wrinkled, break with a reddish-brown fracture, have a characteristic sweetish odour, and a taste which is at first slightly sweet but afterwards bitter. The bitterness is of an agreeable character, such as renders an infusion of the drug a suitable vehicle for alkaline or acid digestive tonics. It is due to the presence of bitter principles of a glucosidal character. Fresh gentian contains a further bitter principle which disappears as a result of the fermentative changes which take place during the process of slow drying, and the fresh root is largely used in Germany and Switzerland for the production by fermentation of an alcoholic beverage.

Ginger and Gingerine. Ginger is the scraped and dried rhizome or underground stem of *Zingiber officinale*, a reed-like plant which is a native of Asia, but is now largely cultivated in the West Indies, Africa, India, Japan, and other tropical countries. The best ginger is produced in Jamaica, where the plant is propagated by dividing the rhizome into "fingers,"

each of which contains a bud from which a new plant develops. When the stems wither after flowering is over, the rhizomes are dug up, freed from roots, washed, peeled or scraped to remove the corky outer layer, again washed, and dried in the sun. As found in commerce, this unbleached Jamaica ginger occurs in flattish, irregularly-branched pieces, usually from 7 to 10 cm. long, pale yellowish buff in colour, with an agreeable aromatic odour and a pungent taste. Cochin ginger, which is the next best, is smaller, less aromatic, and not always scraped so completely as unbleached Jamaica, the coated or unscraped variety bearing portions of reddish-grey cork on the ventral and dorsal surfaces. African ginger is a coated variety, the ventral and dorsal surfaces bearing patches of earthy-brown, wrinkled cork; it is darker generally than Cochin ginger and deficient in aroma, though very pungent. Japanese ginger is the product of a different plant; it occurs in small, flattened, unscraped pieces. Ratoon ginger is an inferior variety of Jamaica, which has been imperfectly peeled; it is of a dull greyish-brown colour, darker than Cochin ginger, and of inferior aroma and pungency. Ginger contains from 0.25 to 3 per cent. of an aromatic volatile oil, together with resin and an intensely pungent oily body named gingerol. Gingerine is an extract prepared from ginger by treatment with ether, and contains the entire virtues of the drug. Bleached or "limed" gingers consist of inferior qualities which have been treated with sulphurous acid or chlorine, or dusted over with calcium carbonate or sulphate. Limed ginger is less susceptible to the attacks of insects.

CHAPTER V

GRINDELIA—Guaiacum wood and resin—Hamamelis or Witch Hazel, and Hamamelin—Hellebore, Veratrum and veratrine—Hydrastis and hydrastin—Hyoscyamus leaves and seeds—Iceland moss—Ipecacuanha root—Ipomœa or Mexican scammony—Irish moss—Jalap and jalapin—Juniper oil—Kava-kava—Kino and Red Gum—Kola nuts—Koussou flowers—Krameria or Rhatany root—Liquorice and liquorice extract—Lobelia herb—Logwood—Male fern—Manna—Matico leaves—Myrrh and Bdellium.

Grindelia. Grindelia consists of the dried leaves and flowering tops of *Grindelia camporum*, a perennial herb which is indigenous to North America, being common in the plains to the south-west of the Rocky Mountains. The leaves and flowerheads are collected largely near San Francisco in May and June, when the whole plant is resinous; after being dried, they are packed in bales for exportation. As found in commerce, the drug consists of slender, smooth, yellow stems; pale green, rigid, brittle leaves from 3 to 5 cm. long; hard, yellow, flowerheads, and fruits crowned with thick, stiff bristles. All parts of the plant are more or less resinous, with a slightly aromatic odour and aromatic, bitter taste. The chief constituent of the drug is the resin, of which the drug contains a considerable proportion. Other varieties of grindelia have been collected and used, notably the products of *Grindelia robusta* and *Grindelia squarrosa*, which closely resemble *Grindelia camporum*.

Guaiacum Wood and Resin. Guaiacum or Lignum Vitæ is the heart-wood of *Guaiacum officinale*, or of *Guaiacum sanctum*. Both are evergreen trees, the first a native of the West Indian Islands and the north coast of South America, and the second of the Bahamas

and Southern Florida. The wood is largely exported from Cuba and Hayti, where the trees are felled, the trunks stripped of their bark, and cut into logs or billets from 1 to 2 metres long and 10 to 50 cm. in thickness. For medicinal purposes, the wood is prepared in the form of chips, turnings, or raspings. It is dark greenish-brown in colour, dense, hard, and heavier than water. Its taste is slightly acid, and its odour on warming somewhat aromatic. As found in commerce the chips or turnings frequently contain some of the yellowish sapwood and chips of other woods. Guaiacum resin is the chief constituent of the wood ; it exudes spontaneously, or after making incisions, from the stems of the trees and dries in the form of more or less rounded tears, but most of the commercial resin is obtained by heating logs in which incisions or grooves have previously been made, and collecting the melted resin as it runs out. Inferior resin can be obtained by boiling guaiacum chips with brine and skimming off the melted resin as it rises to the surface. The resin is imported in casks, and occurs in dark coloured masses or tears, which are covered with a greenish powder. Thin splinters are transparent and vary in colour from yellowish-green to reddish-brown. The taste and odour on warming are like those of guaiacum wood.

Hamamelis or Witch Hazel, and Hamamelin.

Hamamelis or Witch Hazel consists of the dried bark, or the fresh or dried leaves, of *Hamamelis virginiana*, a shrub which is indigenous to the United States and Canada. The bark is collected in the spring and occurs in curved or channelled pieces about 1.5 mm. thick and from 5 to 20 cm. long ; it has a reddish-brown outer surface, but is sometimes covered with a silvery-grey or dark-grey scaly cork. The inner surface is

pale reddish pink and finely striated longitudinally. There is no marked odour, but the taste is astringent, owing to the presence of tannin. Hamamelis leaves are collected in the autumn. They are broadly oval in outline, dark green or brownish-green in colour, from 7 to 15 cm. long, and have branching hairs on the under surface. The leaves have no marked odour, but their taste is astringent and slightly bitter. As they occur in commerce, they are usually discoloured, broken, and pressed together into more or less compact masses. Their chief constituent is tannin. Hamamelin is a dry extract prepared from the bark or leaves, and occurs usually as a somewhat hygroscopic brownish powder ; but a greenish variety can be obtained from the fresh leaves.

Hellebore, Veratrum and Veratrine. Hellebore occurs in several varieties, the products of distinct plants, but all consisting of the rhizome or underground stem. Black hellebore is the rhizome of *Helleborus niger*, the Christmas rose, a perennial herb found in abundance in the sub-alpine woods of Southern and Eastern Europe, and much cultivated in this country as a garden plant. The rhizomes are collected in the autumn, dried and packed in bales for exportation. Supplies of the drug have come chiefly from Germany. As found in commerce, it consists of the small, black and tortuous rhizomes, with or without long, black, rather stout roots attached ; each rhizome has numerous branches which bear leaf-scars and are terminated by the scars of aerial stems. Trimmed hellebore has had the roots removed, but hellebore "with fibre" has the roots attached. The drug has only a slight odour, but a bitter, acrid taste, and the powdered rhizome has a powerful sternutatory action. It contains poisonous glucosides. The dried rhizome is often confused with

that of *Helleborus viridis*, which closely resembles it, but is much more bitter and acrid. This green hellebore is not a separate article of commerce in this country, and must not be confused with the green hellebore imported from the United States. The latter is the product of *Veratrum viride*, a perennial herb which is common in the Eastern States, where it is collected in the autumn and dried after being cut longitudinally into halves or quarters. It may be offered either trimmed or "with fibre," is of a bright yellowish-brown colour, but otherwise closely resembles white hellebore. The latter is the dried rhizome of *Veratrum album*, a perennial herb which is common in the mountain regions of Central and Southern Europe. The rhizomes are collected in the late summer, freed from the leaves and dried entire, preferably without removal of the roots. Supplies are obtained in bales from Germany, Switzerland and Austria. The dried rhizome is of a dull, blackish colour, about 5 cm. long and 2 cm. in thickness, with a rough and wrinkled surface showing numerous leaf-scars. The roots are dull grey or yellowish in colour, but may be absent from the drug, which is then sold as "trimmed" or "without fibre." Neither green nor white hellebore has any marked odour, but both have a bitter, acrid taste. They contain poisonous alkaloids, and the powdered drugs have a powerful sternutatory action. Veratrine of commerce is a mixture of alkaloids obtained from *sabadilla*, the dried ripe seeds of *Schænocaulon officinale*, a tall herbaceous plant found in Mexico, Guatemala and Venezuela.

Hydrastis and Hydrastin. Hydrastis or Golden Seal consists of the dried rhizome and roots of *Hydrastis canadensis* a small herbaceous plant which is common in Canada and the eastern part of the United States. The plants are dug up in the autumn, after the leaves

have withered, the rhizomes and roots are dried, and the drug is then packed in bags for exportation. As it occurs in commerce, it consists of the twisted, yellowish-brown rhizomes, on the upper surface of which are found short ascending branches terminated by cup-shaped scars, while numerous thin, brittle roots are attached to the under surface and sides. The drug has a faint characteristic odour, and a bitter taste which develops as it is chewed, while the saliva is coloured yellow. It contains the alkaloids berberine, hydrastine and canadine. Hydrastin, which must be distinguished from the alkaloid of similar name, is a brownish powdered extract prepared from the drug by exhaustion with diluted alcohol or water, and subsequent evaporation or precipitation with hydrochloric acid.

Hyoscyamus Leaves and Seeds. *Hyoscyamus* or Henbane consists of the dried leaves of *Hyoscyamus niger*, a coarse erect herb which is found growing wild throughout Europe generally, and is cultivated in England for medicinal use. There are two varieties of the plant, known as annual and biennial respectively, because the former flowers during the first year of its growth, while the second variety does not flower until the second year of the plant's existence. The leaves of either variety may be used for official purposes, provided they are collected from the plants when in flower. Much of the drug is imported in bales from Germany and Egypt. The leaves are pale green in colour, seldom more than 25 cm. long, hairy on both surfaces, and have an irregularly toothed margin. They have a strong, characteristic odour and a bitter, slightly acrid taste. The seeds of the plant are also obtainable in commerce, though seldom used in medicine. They are very small, dark grey in colour, sub-reniform in shape, and have a minutely reticulate

surface. Both leaves and seeds of *hyoscyamus* contain the alkaloid hyoscyamine, accompanied by small proportions of atropine and hyoscine. The total alkaloid in the leaves does not exceed 0·2 per cent; the seeds contain a much smaller proportion.

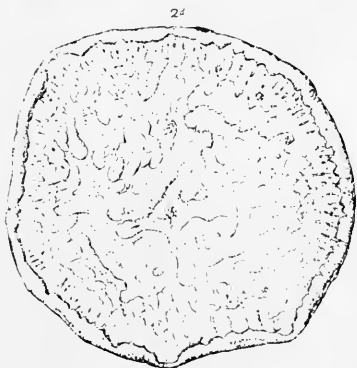
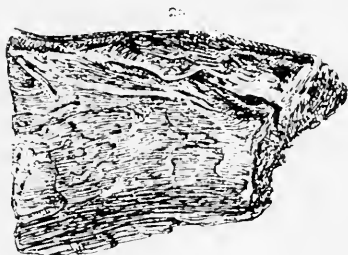
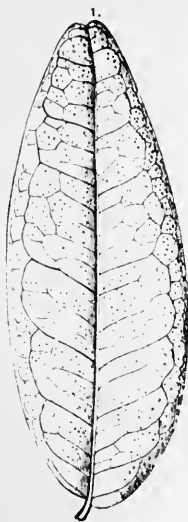
Iceland Moss. Iceland Moss consists of the dried lichen, *Cetraria islandica*, which is indigenous to Britain and widely distributed throughout the Northern Hemisphere. It is collected chiefly in Sweden and Central Europe, and is imported in bales. The drug consists of hard, cartilaginous, leaf-like stems, the branches of which have fringed lobes. It is brownish or greenish-brown on the upper surface, greyish beneath, and marked with small white depressed spots. Though hard when dry, it becomes softer when moist. It has no odour, but its taste is mucilaginous and bitter. The drug contains a starch-like substance named lichenin, which is soluble in hot water, but causes the liquid to thicken on cooling.

Ipecacuanha Root. Ipecacuanha is the dried root of *Psychotria Ipecacuanha*, a small shrub which is indigenous to Brazil and found especially in the province of Matto Grosso; it is also cultivated in the province of Minas Geraes and in the State of Selangor, Straits Settlements, whence ipecacuanha of fine quality has been exported, though much the larger proportion of what arrives in this country is exported from Rio de Janeiro. After collection, the root is freed from other parts of the plant, dried, sifted to remove adherent earth, and packed in canvas bales for exportation. It occurs in somewhat tortuous pieces which are seldom more than 18 cm. long, or 6 mm. thick; they vary in colour from dark brick-red to very dark brown, and are distinguished from drugs of similar appearance by being closely annulated

externally. The chief constituents of the drug are emetine and other alkaloids. Brazilian or Rio ipecacuanha is known in two commercial varieties—Matto Grosso and Minas Geraes, the latter being usually the cleaner of the two. East Indian ipecacuanha is that produced in the Straits Settlements, and tends to be rather larger than the Brazilian drug, which it otherwise closely resembles. Cartagena ipecacuanha is another important variety, which, however, does not meet official requirements in this country. It occurs in thicker and paler coloured pieces than the official drug, and is further distinguished by the annulations taking the form of narrow ridges which partially encircle the root. Much of the Brazilian drug arrives in this country mixed with pieces of stem; these are slender, longitudinally striated, and bear no annulations. Roots of other plants are also offered occasionally as ipecacuanha, but they are all readily distinguished and contain no emetine.

Irish Moss. Irish Moss or Carrageen consists of the dried thallus or stem-like portion of the seaweed, *Chondrus crispus*, which is found on the northern shores of the Atlantic Ocean, growing just below low-water mark upon rocks and stones. It is collected for medicinal purposes in Northern Brittany, bleached, dried, and packed in bales for exportation. The drug occurs in yellow, translucent, horny masses, consisting of pieces varying from 5 to 30 cm. in length. Each of these pieces is a separate thallus and is rounded at the base, while flattened in the upper part and branching into lobes. The chief constituent of the drug is a carbohydrate named carageenin, which forms a jelly when extracted with hot water and allowed to cool.

Jaborandi. Jaborandi consists of the dried leaflets of *Pilocarpus Jaborandi*, a shrub indigenous to Brazil.



1. JABORANDI LEAF 2. (a), (d), JALAP
2. (b), TAMPICO JALAP 2. (c) ORIZABA JALAP

After collection, the leaflets are dried and packed in bales for exportation. It is exported chiefly from Ceara and Pernambuco. The leaflets arrive mixed with stalks and fruits ; they are dull brownish-green in colour, oval-oblong or oblong-lanceolate in shape, leathery in texture, and from 6 to 10 cm. in length. Pilocarpine and other alkaloids are present in the drug, together with a volatile oil which gives it an aromatic odour and taste. Various other kinds of jaborandi leaflets have been imported, including Paraguay, Rio Janeiro, Maranham, Aracati, Ceara, and Guadeloupe. These varieties are all obtained from different plants and contain different proportions of alkaloids. Some of them contain little or no pilocarpine.

Jalap and Jalapin. Jalap consists of the dried tuberous roots of *Ipomœa purga*, a climbing plant which is indigenous to the eastern slopes of the Mexican Andes. When collected, the roots are dried over open fires, the larger ones being previously incised longitudinally to facilitate drying. The plant has been experimentally cultivated in India and Jamaica, and the dried roots obtained have been well spoken of. The drug is exported from the east coast of Mexico in sacks or bales, and is known in commerce as Mexican or Vera Cruz jalap. It occurs in dark brown napiform or fusiform pieces, from 3 to 8 cm. or more in length, the larger pieces being incised as a rule. The pieces are hard, compact and heavy, wrinkled externally and marked with small transverse scars. They have a distinct and characteristic odour, which is partly due to the smoke of the fires over which they are dried, and the taste is at first sweet, but afterwards acrid and disagreeable. The chief constituent of the drug is about 9 to 11 per cent of resin, not more than 15 per cent of which should be soluble in ether. Jalap resin is the mixture of resins obtained

from the drug by extraction with alcohol. Jalapin is the portion of this mixture, which is insoluble in ether ; the soluble portion closely resembles and is probably identical with the ether-soluble portion of scammony resin. Tampico jalap is a variety obtained from *Ipomœa simulans* and exported from Tampico, a town on the Gulf of Mexico ; the roots are distinguished by their irregular shape and remarkable convoluted surface, while the resin they contain is entirely soluble in ether. Orizaba, or male jalap, also known as Mexican scammony, is the product of *Ipomœa orizabensis*. and yields a resin which has the same properties as scammony resin. Brazilian jalap is occasionally found in commerce.

Juniper Oil. Juniper Oil is obtained by distillation from the ripe fruit of *Juniperus communis*, a small evergreen shrub which is indigenous to Great Britain and widely distributed throughout Europe. For the production of oil, fruits collected in Italy and Hungary are most esteemed, and much of the oil is distilled in Germany. The berry-like fruits change from green to a dark purplish colour when they ripen, and they then yield an oil which is much superior to that obtained from the unripe fruits. As met with in commerce, the oil is colourless or pale yellowish-green, with an agreeable, aromatic, turpentine-like odour, and a warm, aromatic and bitter taste. When freshly distilled, it is freely soluble in 95 per cent alcohol, but it becomes less soluble with age. The oil is rectified after distillation and enclosed in tins for exportation.

Kava-Kava. Kava is the rhizome or underground stem of *Piper methysticum*, a shrub which is indigenous to the Sandwich Islands. After being dug up, the rhizome is freed from roots, peeled, sliced and dried. The drug occurs in whitish or light brownish-grey,

irregularly cuboid or roughly wedge-shaped pieces, from 1 to 5 cm. thick. It has a slight, agreeable odour, and a pungent, bitter taste, due to the presence of an acrid resin. In the South Sea Islands, an intoxicating drink is prepared from the fresh rhizome.

Kino and Red Gum. Kino is a generic term, but the name is applied more particularly to the evaporated juice obtained from incisions in the trunk of *Pterocarpus Marsupium*, a tree found in Southern India and Ceylon. Incisions are made in the bark, and the juice that flows from them is collected in cups made of leaves, or in other suitable receptacles. After collection, it is heated to boiling point, and ultimately dried in the sun, forming dark masses which disintegrate readily into small angular grains. These dried fragments are packed in cases for exportation. They are reddish-black, brittle, without odour, and very astringent. Thin laminae of the glistening fragments are transparent and of a ruby-red colour. The drug should be almost entirely soluble in strong alcohol, and not more than 25 per cent should be insoluble in boiling water, but the solubility becomes less with age, especially if the kino juice has not been boiled before drying. Kinotannic acid is the chief constituent of the drug, and this tends to change into insoluble kino-red as the result of oxidation induced by an enzyme, unless this is destroyed by boiling. Commercially, this variety of kino is distinguished as Malabar, Cochin, or East Indian kino. It is distinguished from other varieties by its brilliant and, in the mass, black colour, also by the absence of dust from the fragments. Eucalyptus or Botany Bay kino, also known as Red Gum, is the product of various species of *Eucalyptus*, and is imported from Australasia; it occurs in very dark reddish-brown grains or small masses. Butea gum or Bengal

kino tends to become dull and tough, while it is apt to be mixed with fragments of cork and woody matter. African kino, from *Pterocarpus erinaceus*, closely resembles the official drug, but is not recognized for official purposes.

Kola Nuts. Kola Nuts are the seed-kernels of *Cola vera*, a large tree found in tropical Africa, and cultivated in other tropical countries, such as the West Indies, Brazil and Java. It produces woody capsular fruits, each of which contains from five to fifteen large white or crimson seeds. After collection, the seeds are removed from the fruits and deprived of their outer coats, then dried and packed in bags for exportation. Supplies reach this country from Africa, Brazil and Java. As they occur in commerce, kola nuts are from 2.5 to 5 cm. long, plano-convex in shape, and of a dull reddish-brown colour. They are almost free from odour, and tasteless. The chief constituent of the drug is caffeine, of which it contains from 2 to 2.5 per cent. Other varieties of kola appear in the market from time to time, but they are not so suitable for medicinal purposes as the product of *Cola vera*; the seed-kernels of the latter contain only two cotyledons or seed-leaves, whereas those of other varieties contain four or six cotyledons.

Kousso Flowers. Kousso consists of the dried panicles or clusters of the female flowers of *Brayera anthelmintica*, a tree which is found native in North-Eastern Africa and cultivated in Abyssinia. After fertilization, the inflorescences are collected and dried, then made into cylindrical rolls or "hanks," which are bound round with flexible plant stems. The rolls are from 3 to 6 cm. long and of a decided dull reddish colour. There is no marked odour, but the taste is bitter and acrid. Loose kousso consists of flowers

which have been stripped from the stalks before drying, and occur usually in a more or less fragmentary condition. This variety of the drug is less active and is not recognized officially. The male inflorescences of the plant may also be collected, but they are of no value for medicinal purposes, and are readily distinguished by the absence of young fruits. The activity of kousso is due to kosotoxin, but the drug also contains tannin, an acrid resin, and several inactive crystalline substances.

Krameria or Rhatany Root. *Krameria* or Rhatany is the dried root of *Krameria triandra*, a shrub which grows on the mountain slopes of Bolivia and Peru, or of *Krameria argentea*, a similar plant found in Brazil. The product of the first-named plant is known as Peruvian Rhatany, and that of the second as Para Rhatany. Both are imported in bales. Peruvian rhatany occurs in nearly cylindrical, slightly flexuous, reddish-brown pieces of variable length and not exceeding 15 mm. in thickness. Para rhatany is cylindrical, nearly straight, dark purplish-brown or almost black, and marked with deep transverse cracks. Both varieties are inodorous, but the bark has an astringent taste. This is due to the presence of tannin, which tends to change into insoluble krameria-red by oxidation. Other varieties of rhatany are known, but they seldom come into the market, and they are not suitable for official purposes.

Liquorice and Liquorice Extract. Liquorice consists of the root and underground stem of *Glycyrrhiza glabra* and other species of *Glycyrrhiza*, herbaceous plants which are widely distributed over Southern Europe and parts of Asia, and cultivated in Spain, France, Italy and, to a limited extent, in England. The plants have stout roots, from which are given off numerous

runners or underground stems. In the autumn, the entire underground part of the plant is collected, dried carefully, and peeled. It is then pale yellow in colour, has a faint, characteristic odour and a taste which is sweet and almost free from bitterness. Pieces of peeled liquorice, which alone is official for medicinal purposes, are short and have a smooth fibrous surface. Spanish liquorice is imported in bales of long, straight, unpeeled, cylindrical pieces of a dark reddish-brown colour; they are from 1 to 2 cm. thick and are usually wrinkled longitudinally. Indian liquorice is also imported into this country, in bags, and unpeeled Russian liquorice was formerly common; it shows a close resemblance to Spanish, but it contains a larger proportion of roots and is more bitter than Spanish liquorice. Persian liquorice resembles unpeeled Russian. Large quantities of liquorice are grown in Southern Italy for the purpose of preparing extract, in the form of block or stick liquorice, though the preparation of this extract was originally identified with Spain, where it is still produced. Liquorice extract is prepared by crushing the roots and runners, boiling with water, and concentrating the clear decoction until it is of suitable consistence to be formed into blocks, slabs, or sticks, which are subsequently dried and exported in cases.

Lobelia Herb. *Lobelia* consists of the entire herb, *Lobelia inflata*, a plant which is indigenous to North America and is cultivated for medicinal use in the States of Massachusetts and New York. The plants are collected in August or September, before flowering is over, dried carefully, and exported in bales, or in oblong compressed packets. The drug consists of angular, channelled stems which are often of a purplish tint, together with fragments of leaves, occasional traces of flowers, and numerous characteristic inflated,

capsular fruits. It has a somewhat irritating odour and a burning, acrid taste when chewed. The absence of flowers and seeds from many parcels of the drug is said to be due to the fact that the plants are sometimes allowed to mature their seeds, which are then removed by threshing and sold separately, the remainder of the herb being pressed into packets.

Logwood. Logwood is the heart-wood of *Haematoxylon campechianum*, a tree which is indigenous to Central America, and is found naturalized in the West Indian Islands. The trees are felled when about ten years old, the bark and yellowish sap-wood chipped off, and the stems cut into logs or billets, from 1 to 2 metres in length and from 6 to 15 cm. in diameter. These logs or billets are exported and cut into chips or turnings in this country, but some logwood in chips is imported in bags. It is usual to subject the chips to a process of fermentation, by moistening them in heaps and exposing them to the air for several weeks. When dried, the fermented chips are found to have darkened in colour, and they exhibit patches of a green metallic lustre. For medicinal purposes, only the unfermented chips must be used. They are hard, heavy, dull orange to purplish-red externally and reddish-brown internally, with a slight, agreeable odour and a sweetish astringent taste, due to the presence of hæmatoxylin and tannin. Campeachy logwood, from Yucatan, is the best commercial variety ; those imported from British Honduras and San Domingo rank next in quality, whilst Jamaica logwood is the least esteemed variety.

Male Fern. Male Fern is the rhizome or underground stem of *Dryopteris Filix-mas*, which is indigenous to Britain and very common in all parts of the country. The plants are dug up late in the autumn, roots, leaves and dead portions are removed, the rhizomes are

sliced if of large size, and then carefully dried. As the drug occurs in commerce, the pieces are from 7 to 15 cm. or more in length, the rhizome itself being about 2 cm. in diameter. The pieces are brown in colour and almost entirely covered with the bases of the leaf-stalks, which bear numerous brown membranous scales. There is a feeble but disagreeable odour, and the taste is very disagreeable. The odour and taste are due to the presence of a large proportion of oleo-resin, which can be extracted by ether in the form of an oily extract, which is known as oil of male fern. Since the active constituents of this tend to decompose, with the formation of inert substances, it is not desirable that male-fern should be kept for more than a year before use.

Manna. Manna is obtained from *Fraxinus Ornus* and *Fraxinus rotundifolia*, small trees which are cultivated in Sicily. They yield a saccharine juice which is collected after exuding from incisions made in trees about ten years old. Some of the exuded juice dries upon the stems of the trees and constitutes the flake manna of commerce. This is the finest variety and occurs in yellowish-white, brittle, stalactitic masses, about 10 to 15 cm. long and 20 to 25 mm. wide; the flakes are more or less triangular in section, indistinctly crystalline in structure, with a slight, agreeable odour and a sweet taste. Inferior varieties of manna are obtained by collecting the juice that drops from the stems upon tiles or leaves; this small or broken manna consists of agglutinated fragments and is often darker and more glutinous than flake manna. The chief constituent of manna is about 40 to 60 per cent. of mannitol, which is associated with two sugars. Manna is imported from Italy in cases.

Matico Leaves. Matico consists of the leaves of

Piper angustifolium, a shrub found in Bolivia, Peru, Brazil and Colombia. After collection, the leaves are dried and packed in bales for exportation. They are frequently mixed with portions of stalk and fruits. The leaves are lanceolate in shape and pointed, from 10 to 15 cm. long and from 2 to 4 cm. wide, dark greyish-green or yellowish-green in colour, and tessellated on the upper surface; the under surface exhibits raised veinlets and numerous shaggy hairs. As met with in commerce, the leaves are usually in dusky green, compressed masses, with a slight, aromatic odour and a bitter, camphoraceous taste. The chief constituent of the drug is a volatile oil, from which crystalline matico camphor can be obtained. Much of the matico of commerce, however, yields an oil which does not contain matico camphor; this variety of the drug is probably obtained from some other species of *Piper*.

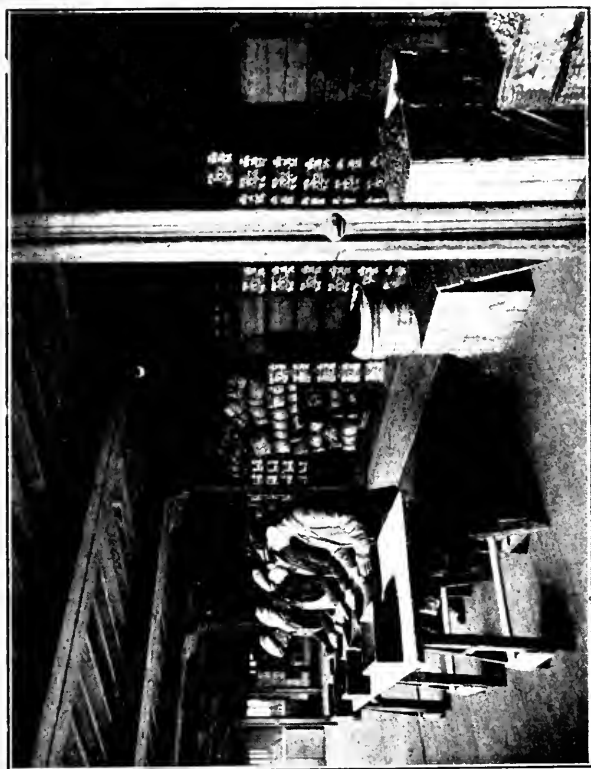
Myrrh and Bdellium. Myrrh is a gum-resin obtained from the stem of *Commiphora Myrrha* and probably other species, the plants being shrubs or small trees indigenous to North-Eastern Africa and Southern Arabia. The gum-resin is secreted in numerous ducts in the bark of the stem, and is discharged as a yellowish-white liquid when the bark is wounded. It hardens in tears or masses and becomes of a reddish-brown colour on exposure. The best myrrh is collected in Somaliland, packed in bags or cases, and conveyed to Aden, whence it is shipped to Europe or Bombay. As found in commerce, this variety occurs in rounded or irregular tears, or masses of agglutinated tears, varying much in size; it is reddish-brown or reddish-yellow externally, dry, more or less covered with a fine powder, and has an agreeable aromatic odour, together with an aromatic, bitter and acrid taste. Its unctuous,

granular fracture and the translucent appearance of thin fragments help to distinguish it from other varieties. Besides gum and resin, myrrh contains volatile oil, and a yellowish emulsion is formed when the drug is powdered and triturated with water. Fadhli or Arabian myrrh occurs in smaller masses of agglutinated tears, which have a less dusty surface than Somali myrrh; the odour is also less fragrant, and the taste less bitter. Yemen myrrh occurs in large dark reddish-brown pieces with a dusty surface, and is less aromatic than Somali myrrh. Varieties of bdellium are occasionally found mixed with myrrh, or offered as substitutes; they are usually markedly different in odour and taste, and of very dissimilar appearance to myrrh.

CHAPTER VI

NUTMEGS and nutmeg oils—Nux vomica seeds—Olibanum or frankincense—Oliver's bark—Opium and morphine—Peppermint oil and menthol—Pepsin—Peru balsam—Picrorhiza rhizome—Pimenta fruit and oil—Podophyllum and podophyllin—Poke root—Prunes—Pyrethrum or Pellitory root—Quassia wood and quassin—Quillaia or soap bark, and saponin—Rhubarb, Chinese and English—Saffron and cake saffron—Sandal wood and oil; Red sanders—Sanguinaria or blood root—Santonica or worm-seed : Santonin—Sappan wood—Sarsaparilla root.

Nutmegs and Nutmeg Oils. Nutmegs are the dried seed-kernels of *Myristica fragrans*, a tree which is indigenous to the Moluccas and neighbouring islands, and is cultivated in numerous hot countries, including Penang, Sumatra, the West Indies, Java and Ceylon. The tree bears a peach-like fruit, which contains a shining brown seed enclosed by a crimson arillus or sheath. When the fruits ripen, they are collected, the seeds are removed, and each seed is freed from the crimson arillus before drying. The arillus is dried separately, and then constitutes the mace of commerce. After drying the kernels, they are sometimes dusted with slaked lime, or washed with milk of lime, in order to protect them from the attacks of insects, and they are packed in cases for exportation. On arrival in this country, the cases are opened, the contents bulked, and the nutmegs graded according to their size and condition, after "garbling" to separate impurities. They are broadly oval or rounded, and rarely more than 25 mm. long; externally they are greyish-brown and marked with reticulated furrows, while internally they are marbled and vary in colour from greyish-red to dark brownish-red. The odour is strongly aromatic,



NUTMEG GARBLING

and the taste is aromatic, warm and somewhat bitter. Volatile and fixed oils are the chief constituents of nutmegs. Other species of *Myristica* yield seeds resembling those of *Myristica fragrans*, but only those of *Myristica argentea* are aromatic; they are longer, narrower and less aromatic than the official nutmegs, and have a distinctly acrid taste. Oil of nutmeg is obtained from nutmegs by distillation.

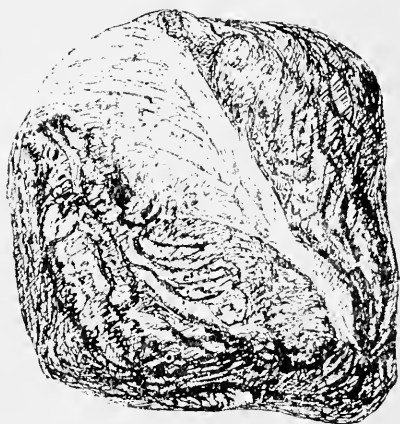
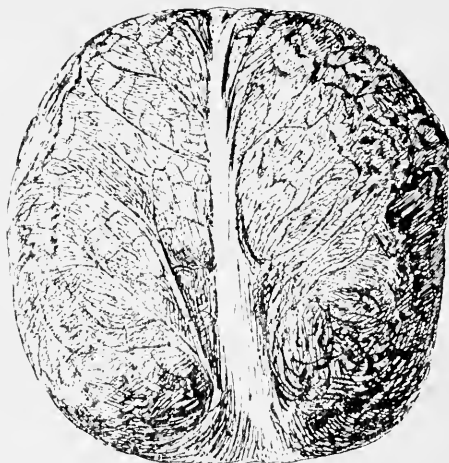
Nux Vomica Seeds. Nux Vomica consists of the dried ripe seeds of *Strychnos Nux-vomica*, a small tree which is indigenous to India, and is also found in Ceylon, Siam and Northern Australia. The orange-like fruit of the tree contains three to five seeds imbedded in a whitish pulp, which is removed by washing after the seeds have been separated from the fruits. After removal of the pulp, the seeds are dried in the sun and sorted before being packed in bags or bales. They are collected largely in India and exported from Madras, Bombay and other ports. The dried seeds are disc-shaped, nearly flat or irregularly bent, rounded or somewhat acute at the margin, from 2 to 2.5 cm. in diameter, and about 6 mm. thick, ash-grey or greenish-grey in colour, and densely covered with short, satiny, radiately-arranged and closely-appressed hairs. They are without odour, but have an extremely bitter taste, due to the presence of the alkaloids strychnine and brucine. These alkaloids are also obtained from ignatius beans, the seeds of *Strychnos Ignatii*, a climbing plant indigenous to the Southern Philippine Islands. These seeds are of irregularly ovoid shape, about 25 mm. long, and destitute of the satiny sheen, which is characteristic of nux vomica seeds.

Olibanum or Frankincense. Olibanum or Frankincense is a gum-resin obtained from *Boswellia Carterii* and other species of *Boswellia*, the plants yielding it being

small trees indigenous to Somaliland and Southern Arabia. The gum-resin is secreted in ducts in the bark of the stem, and exudes on incision. When sufficiently hardened, it is collected, packed in cases, and exported from Aden to Bombay, whence it is conveyed to Europe. It occurs in small ovoid tears, of a pale yellowish, bluish, or greenish colour, and varying in length from 5 to 25 mm. The tears have a dull and dusty surface, a fragrant balsamic odour, and an aromatic, slightly bitter taste. When chewed, they soften to a plastic mass. Besides gum and resin, the drug contains from 3 to 8 per cent of volatile oil.

Oliver's Bark. Oliver's Bark or Black Sassafras is the dried bark of *Cinnamomum Oliveri*, a tree which is indigenous to New South Wales and Queensland. The bark occurs in flat pieces about 20 cm. long, 4 cm. wide and 1 cm. thick. Externally, it is covered with a greyish-brown, warty cork; the inner surface is umber-brown and satiny in appearance. The drug has an aromatic odour and an aromatic, bitter, camphoraceous taste. Its chief constituent is a volatile oil to which the characteristic odour and taste are due.

Opium and Morphine. Opium is the inspissated latex or milky juice of *Papaver somniferum*, obtained by making incisions in the outer coating of the unripe capsules or fruits of the poppy, taking care that the incisions do not penetrate to the interior, and subsequently scraping off the juice which has exuded and become partially dried. The white milky juice darkens as it dries and the scrapings are usually massed together to form cakes. The plant yielding the drug is indigenous to Asia Minor and is cultivated in European and Asiatic Turkey, Egypt, Persia, China and India. Turkey opium is the most important commercial variety, and Persian ranks next in importance; Indian



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A.—CONSTANTINOPLE OPIUM *B.*—SMYRNA OPIUM

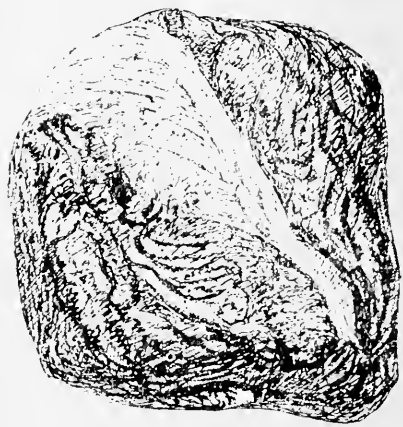
opium is less common, but is likely to be more largely imported into this country. Chinese opium is entirely consumed in the country of origin. Turkey opium occurs in rounded or flattened masses, which are enveloped in poppy leaves and covered with the reddish-brown fruits of a species of *Rumex* to prevent the cakes

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homogeneous in consistence, as the result of being well kneaded before it is divided into bluntly conical cakes weighing about 200 to 400 grammes ; it may also occur in larger, brick-shaped masses which are wrapped in bright red paper, or in sticks or flat cakes which are also wrapped in paper. Indian opium is imported in the form of a stiff extract enclosed in jars or tins. The chief constituent of opium is the alkaloid morphine, of which it may contain as much as 18 per cent. It is accompanied in the drug by many other alkaloids, the most important of which are codeine and papaverine ; narcotine belies its name by having no narcotic action and was formerly more correctly known as anarcotine. The hypnotic and sedative action of opium render it one of the most valuable of drugs. Probably its best known preparation is the tincture, more familiarly termed laudanum ; but opium is also an ingredient of paregoric, Dover's powder, and many other preparations in common use, while morphine and its salts are employed in a variety of ways. Opium-eating is believed to have originated in Persia, and



B

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opium is less common, but is likely to be more largely imported into this country. Chinese opium is entirely consumed in the country of origin. Turkey opium occurs in rounded or flattened masses, which are enveloped in poppy leaves and covered with the reddish-brown fruits of a species of *Rumex* to prevent the cakes from adhering to one another. These masses are exported from Smyrna or Constantinople in tin-lined cases. The cakes vary in weight from 250 to 1,000 kilos or more, and they are apt to be of irregular shape, as the result of pressure when soft. Internally, fresh opium appears granular and of a light brown or reddish-brown colour. The drug has a strong characteristic odour and a bitter taste. Persian opium is more homogeneous in consistence, as the result of being well kneaded before it is divided into bluntly conical cakes weighing about 200 to 400 grammes ; it may also occur in larger, brick-shaped masses which are wrapped in bright red paper, or in sticks or flat cakes which are also wrapped in paper. Indian opium is imported in the form of a stiff extract enclosed in jars or tins. The chief constituent of opium is the alkaloid morphine, of which it may contain as much as 18 per cent. It is accompanied in the drug by many other alkaloids, the most important of which are codeine and papaverine ; narcotine belies its name by having no narcotic action and was formerly more correctly known as anarcotine. The hypnotic and sedative action of opium render it one of the most valuable of drugs. Probably its best known preparation is the tincture, more familiarly termed laudanum ; but opium is also an ingredient of paregoric, Dover's powder, and many other preparations in common use, while morphine and its salts are employed in a variety of ways. Opium-eating is believed to have originated in Persia, and

opium-smoking is a distinctly Chinese habit. For smoking purposes, it is necessary to prepare the drug specially and to use a peculiar form of pipe.

Peppermint Oil and Menthol. Peppermint Oil is obtained by distillation from fresh flowering peppermint, *Mentha piperita*, a plant which is distributed throughout Europe and is cultivated in England, and various other countries for the production of the oil. Only small quantities are produced in this country, the greater proportion of what is used being imported from the United States, in bottles and tins. German and Japanese oils of peppermint oils are also met with in commerce, and a certain amount has been produced in China, Russia and Italy. The oil is usually colourless, pale yellow, or greenish-yellow, with a peppermint odour and a pungent, aromatic taste which is followed by a sensation of cold on the tongue. It should be freely soluble in 70 per cent alcohol. The chief constituent of the oil is menthol, but it also contains various esters to which the characteristic flavours of different varieties of the oil are due. Menthol is obtained in largest quantity from a variety of the oil produced in Japan and China from *Mentha arvensis*. It is separated by submitting the oil to fractional distillation, or by cooling it to a very low temperature, when the menthol crystallizes out in a dense mass from which adhering oil can be separated by pressure. Dementholized peppermint oil, imported in tins from Japan, is the residue left after removal of the bulk of the menthol originally present.

Pepsin. Pepsin is obtained from the fresh and healthy stomach of the pig, sheep, or calf, but chiefly from that of the pig. One method of preparation is to scrape the mucous membrane lining the stomach, and dry and powder the viscid pulp so obtained ; but

a preferable method is to remove the mucous membrane from the underlying muscular coats, mince it finely, and dissolve out the pepsin by maceration in water acidified with hydrochloric acid, or mixed with glycerine. The pepsin is recovered from the liquid by precipitation and subsequently purified. It then occurs as a light yellowish-brown powder, or in the form of pale yellowish scales. The powder or scales should have only a faint odour and be almost entirely soluble in water. Pepsin is imported chiefly from the United States, in glass bottles.

Peru Balsam. Peru Balsam is a viscid liquid obtained from the trunk of *Myroxylon Pereiræ*, a tree found in forests in San Salvador and other parts of Central America near the Pacific Ocean, the district where the balsam is collected being known as the Balsam Coast. The balsam is not a normal secretion product, but a pathological product formed after the bark of the trunk has been beaten with stones or axe handles, and the cork has been removed. After exudation of the balsam commences, the wounded parts of the trunk are scorched by means of torches and the increased irritation causes a more abundant flow. The balsam is absorbed by rags, from which the liquid is subsequently recovered by pressure, after which it is boiled with water to remove impurities. Further quantities of the balsam are obtained by detaching the scorched bark from the trunk, after exudation has ceased, and boiling the bark with water. As the balsam is heavier than water, it settles down after boiling, and the water can be poured off, carrying with it all the impurities. The balsam obtained by boiling the bark is mixed with the rag balsam, and the mixture is poured into large tins or drums, which are shipped from Acajutla and Belize to New York and

Europe. It acquired its name "Balsam of Peru" because it was formerly conveyed to Callao in Peru, and thence exported to Spain. The balsam is a nearly black treacly liquid, but thin layers are transparent and of a deep orange-brown or reddish-brown colour. The odour of the drug is fragrant and agreeable, but the taste is acrid and there is a burning sensation in the throat when it is swallowed. From 56 to 66 per cent. of the balsam consists of cinnamein, an oily mixture of the aromatic substances benzyl benzoate and benzyl cinnamate; the remainder of the drug is resinous and contains compounds of benzoic and cinnamic acids together with peruvial and vanillin. Adulteration of the balsam with alcohol, turpentine, fixed oils, etc., lowers its specific gravity, which varies normally from 1.137 to 1.158; such adulteration can also be detected by the action of different solvents.

Podophyllum and Podophyllin. Podophyllum consists of the dried rhizome and roots of *Podophyllum peltatum*, a small herb which is indigenous to Canada and the north-eastern part of the United States. The plant grows in moist shady situations and produces a long creeping rhizome, or underground stem, which is collected late in the summer, dried with the roots attached, and exported in bags. It appears to have been long known to the North American Indians as an active anthelmintic and emetic. Another variety of the drug is obtained from *Podophyllum Emodi*, a plant indigenous to Northern India, and used in India and other eastern countries as an equivalent of American podophyllum. The American drug is dark reddish-brown in colour and occurs in nearly cylindrical pieces, from 6 to 18 cm. long and from 5 to 8 mm. thick. Depressed scars indicate where the leaves and flowering stems have been, while traces of roots occur on the

opposite surface. The odour of the drug is characteristic and the taste is bitter and acrid. Indian podophyllum occurs in brown, more or less contorted pieces, from 6 to 8 mm. thick, with an abundance of stout roots on the under surface. By treatment with strong alcohol, podophyllum yields a bitter resinous substance, which can be obtained in the form of a yellowish or brown powder, known as podophyllin, and containing the active principles of the drug, together with a certain amount of inert material. The active constituents are podophyllotoxin, podophylloresin and picropodophyllin. Indian podophyllum yields the higher proportion of resin.

Poke Root. Poke Root is the product of *Phytolacca decandra*, a large herb which is widely distributed in Eastern and Central North America. It is collected in the autumn, dried, and packed in bags for exportation. The drug occurs in transverse, oblique, or longitudinal slices of nearly cylindrical roots, rarely exceeding 7 cm. in diameter. It is yellowish or reddish-brown externally, longitudinally wrinkled, and marked with narrow transverse bars of cork. There is no odour, but a sweetish and acrid taste. The root has been mistaken for belladonna, and contains a saponin which causes the powdered drug to have a powerful sternutatory action.

Pyrethrum or Pellitory Root. Pyrethrum or Pellitory is the dried root of *Anacyclus Pyrethrum*, a small perennial plant which is indigenous to Algeria. It is dug up in the autumn, dried, and packed for export. The dried root occurs in pieces from 5 to 10 cm. long, and from 10 to 15 mm. thick; the pieces are nearly cylindrical, or taper towards both ends, and the crown of the root often bears a tuft of nearly colourless hairs. Externally, the drug is brown and longitudinally

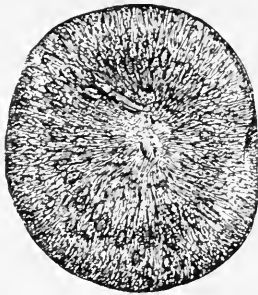
wrinkled. The root is tough and breaks with a short fracture, it has a characteristic odour, and its taste is pungent, exciting a copious flow of saliva. This is due to the presence of the alkaloid pyrethrine, which possesses an intensely pungent taste.

Quassia Wood and Quassin. Quassia is the wood of the trunk and branches of *Picraena excelsa*, a lofty tree which is found in Jamaica. The wood is imported from Jamaica in logs and billets about 1.5 to 2 metres long and 20 to 30 cm. in diameter. After removal of the attached bark, the wood is prepared in chips or raspings, which are yellowish-white in colour, without odour, but have an intensely bitter taste. This is due to the presence of picrasmin, a mixture of two crystalline bitter principles. Surinam quassia, obtained from *Quassia amara*, was formerly used in this country for medicinal purposes, but it has now been replaced by Jamaica quassia. Quassin, the bitter principle of Surinam quassia, is also a mixture of homologous substances, but they are quite distinct from those found in Jamaica quassia.

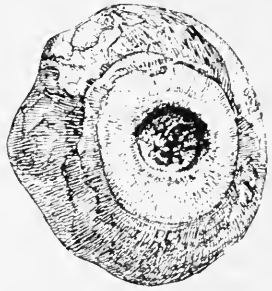
Quillaia or Soap Bark, and Saponin. Quillaia is the dried inner part of the bark of *Quillaja Saponaria*, a large tree indigenous to Chili and Peru, whence the bark is exported in bales. It is also imported into this country in bags containing the crushed bark, or in barrels containing the drug in the form of powder. Soap bark, as it is commonly known, had long been used by the natives of Chili and Peru for washing silk and wool, before it was introduced into Europe, its peculiar property in this respect being due to the saponins it contains. After the bark is stripped from the trees in large pieces, the dark brown outer portion is removed and the brownish-white inner portion is then dried. The pieces break with a splintery, laminated fracture,

and the freshly fractured surfaces reveal minute glistening prismatic crystals of calcium oxalate, such as may also be seen on the yellowish-white inner surface of the bark. There is no marked odour, but particles of dust from the bark give rise to prolonged fits of sneezing, due to the saponins present. The taste is astringent and acrid. Saponins are toxic glucosides which produce frothing when shaken with water, in this respect resembling soap, and the detergent action of soap bark is due to their presence. Commercial saponin is a mixture of substances obtained from quillaia by boiling the powdered bark with water until exhausted, evaporating the decoction to dryness, and extracting the residue with alcohol. The saponin separates as the alcoholic solution cools and is obtainable as a white powder. This is used largely as a frothing agent for liquids, and is also suitable for emulsifying fixed oils, liquid tars, etc., but for this purpose a tincture of the bark is preferable.

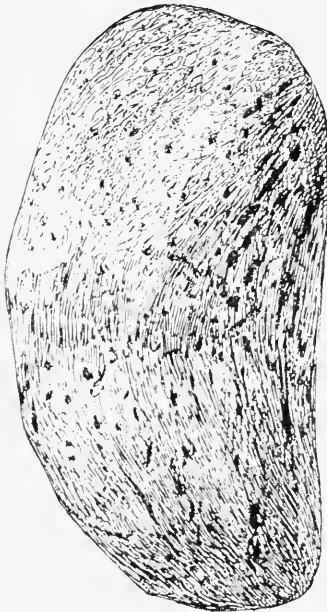
Rhubarb, Chinese and English. Rhubarb is the rhizome of *Rheum officinale* and other species of *Rheum*, large perennial plants which occur abundantly in Central and Western China, and Thibet. Though commonly known as "Turkey Rhubarb," it is not produced in Turkey. It is officially directed that the rhizome must be collected in China and Thibet, deprived of most of the cortex, and dried. The plants are dug up towards the end of September, the roots cut off, the rhizomes cleaned, and the crown and cortex removed from each. Larger rhizomes are divided longitudinally or transversely, but smaller ones are dried entire. The trimmed pieces are then strung on cords and hung under the eaves of houses to dry in the sun, or they may be partly dried by the sun and partly on heated stones, or in stoves. Inferior varieties are dried by



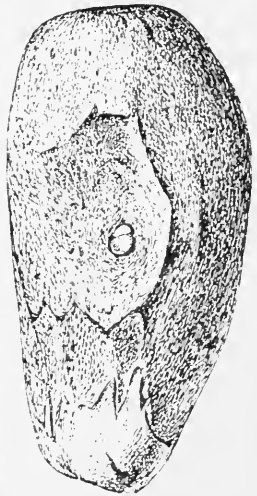
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RHUBARB : (a) SUN-DRIED ROOT ; (b) KILN-DRIED ROOT ;
(c) FLAT ; (d) ROUND

artificial heat only, and may bear the marks of scorching by fire. The best Chinese rhubarb consists of rhizome only and is exported from Shanghai in cases. It occurs in compact, firm, cylindrical, barrel-shaped, conical, or plano-convex pieces, which are often perforated, the perforations sometimes containing fragments of cords by which the pieces have been suspended during the process of drying. The surface of the drug is rounded or slightly angular, but not shrunken, and is marked with reddish-brown lines embedded in a whitish ground substance. Pieces of the drug are usually covered with a bright brownish-yellow powder, but this is sometimes applied after they have arrived in this country. There is a characteristic, somewhat aromatic odour, and a bitter, slightly astringent taste. Rhubarb contains a variety of tannoid and purgative principles. There are three varieties of Chinese rhubarb in commerce—Shensi, Canton, and high-dried, the latter resembling either Shensi or Canton in character. Each variety may occur in "rounds" or "flats," i.e. in entire rhizomes, or transversely cut pieces, or in longitudinal slices of large rhizomes. Shensi rhubarb occurs in very compact pieces of a bright yellow colour, showing a distinct network of whitish lines and breaking with an uneven fracture; the fractured surface has a somewhat similar appearance to that of a broken nutmeg, this being due to an alternation of white and pink or reddish-brown lines which are readily distinguished by the aid of a lens. Canton rhubarb is less compact, not so bright coloured, and the network of whitish lines is less marked; it also has a granular fracture, without any marked marbling, and is of a less agreeable and more distinctly empyreumatic odour and taste than Shensi rhubarb. High-dried rhubarb, which may be of either Shensi or Canton character, has a

dull and rough surface, is often much shrunken as the result of more rapid drying, and has a more empyreumatic odour and taste than Canton rhubarb ; high-dried " flats " are of better quality than the " rounds," as a rule. English rhubarb consists of the dried rhizomes of *Rheum officinale* and *Rheum rhaponticum*, cultivated in the country near Oxford and Bedford, It is much shrunken, less compact and lighter than the Chinese drug, and shows no whitish network on the surface. Rhapontic rhubarb is usually pinkish in colour and does not contain the same constituents as the product of *Rheum officinale*, the English variety of which does not differ markedly from the Chinese in respect of its constituents.

Saffron and Cake Saffron. Saffron consists of the dried stigmas and tops of the styles from the flowers of *Crocus sativus*, a small plant with a fleshy, bulb-like corm and grassy leaves, which blooms in the autumn, producing a purple flower similar in appearance to that of the ordinary garden crocus. It is probably indigenous to Greece, Asia Minor and Persia ; but has long been cultivated in Spain, and to a less extent in France, Austria and Italy. After the flowers have been collected in the autumn, the large orange-red stigmas and the upper parts of the styles are separated and dried. The product is known as " hay saffron " and is mostly imported from Spain, in tin-lined cases. It occurs in commerce in loosely matted, dark reddish-brown masses, in which can be distinguished single stigmas and short portions of the yellow styles to which three stigmas are attached. The stigmas are about 25 mm. long, tubular in shape, and irregularly notched at the top. Saffron is flexible and unctuous to the touch when fresh, but it becomes dull and brittle when quite dry. There is a characteristic sweetish

odour and a bitter taste. The odour is due to the presence of volatile oil, but the chief constituent of the drug is an orange-red colouring matter which imparts a rich yellow colour to water or alcohol. Valencia and Alicante saffron are the two most important varieties, the former being much superior to the other. Inferior varieties tend to consist of smaller stigmas, and may contain stamens and other useless parts of the flowers, while inorganic substances and artificial colouring matters may be present as adulterants, as well as the florets of safflower and other plants. Cake saffron was formerly prepared by pressing saffron into cakes, but now consists of safflower florets made into a paste with sugar and mucilage.

Sandal Wood and Oil : Red Sanders. Sandal Wood is the product of *Santalum album*, a small tree found in the mountainous parts of Southern India, but more especially in Mysore and Madras. After the trees are uprooted, the branches are removed, the trunks roughly trimmed by removing the bark and part of the sapwood, and the wood is then sawn into logs about 1 metre long and from 15 to 20 cm. in diameter. These logs are exported to London, or used locally for distillation of the volatile oil, of which the wood yields from 3 to 5 per cent. As found in commerce, yellow sandal wood occurs in logs or fine raspings, and should consist entirely of heartwood. Apart from its use as a wood, it is employed chiefly for the production of oil of sandal wood. This is a pale yellow or nearly colourless, somewhat viscid liquid, with a strong aromatic odour and an unpleasant, bitter taste. Other woods are sometimes imported as sandal wood, from West Australia and the West Indies, but the oils obtained from them differ in important respects from East Indian sandal wood oil. Red Sandal Wood, more

commonly known as Red Sanders, is the heart-wood of *Pterocarpus santalinus*, a small tree which is indigenous to Southern India and the Philippine Islands. It is obtained by felling the trees, removing the bark and pale sapwood from the trunks, and cutting the latter into irregular logs or billets about 1 metre long and from 7 to 15 cm. thick. These are exported to Europe, where the wood is mostly used as a dye-stuff. As employed for medicinal purposes, it is usually in the form of small, hard, splintery raspings of a dull purplish-red colour. The logs or billets are reddish-brown or blackish-brown externally, and deep blood-red internally. Though practically odourless, the wood is faintly aromatic when warmed, and it has a very slightly astringent taste. The chief constituent of the wood is red colouring matter, which is insoluble in water, but readily soluble in strong alcohol.

Sanguinaria or Blood-Root. Sanguinaria is the rhizome of *Sanguinaria canadensis*, a perennial herbaceous plant which is widely distributed throughout the United States and Canada, where it grows freely on rich soils in shady places. The rhizome is dug up during the autumn, dried and packed in bags for export. It occurs in pieces varying from 2 to 5 cm. in length, and from 5 to 10 mm. in thickness, dark grey to reddish-brown in colour, and nearly cylindrical or somewhat flattened in shape. The pieces break with a short fracture and the fractured surface varies in colour from nearly white, with minute red spots, to deep blood-red, or nearly black. This variation in colour depends upon the extent to which a deep red resinous secretion has escaped from the cells in which it was originally contained into the surrounding tissue. The secretion contains several alkaloids, in addition to a red resin, the presence of which in the sap of the freshly

cut rhizome accounts for the common name "blood-root" which is applied to it. As the plant from which the drug is obtained is closely allied to the opium poppy, it is not surprising to find that the alkaloids it contains resemble certain opium alkaloids in their action.

Santonica or Worm-Seed: Santonin. Santonica or Worm-Seed consists of the dried, unexpanded flower-heads of *Artemisia maritima*, variety *a Stechmanniana*, a small plant which is widely distributed throughout Europe and Asia. The plant grows freely in the deserts of the Kirghiz in Turkestan, where the flower-heads are collected and conveyed to Chimkent and used for the production of santonin. When dried they are from 2 to 3 mm. long, brown, ovoid, and smooth or slightly hairy. They have an agreeable, aromatic odour due to the presence of volatile oil, and a bitter, camphoraceous taste. But little of the crude drug is imported into this country, the santonin being extracted near the area of collection.

Sappan Wood. Sappan is the heart-wood of *Caesalpinia Sappan*, a tree which is indigenous to India and cultivated in Madras. It yields a brownish-red heart-wood, which is used for similar purposes to logwood. This wood occurs in commerce in the form of hard, heavy pieces of variable size, or in orange-red chips. It is without odour, but has a slightly astringent taste and imparts to water or alcohol a red colour which changes to carmine-red upon the addition of sodium hydroxide solution.

Sarsaparilla Root. Sarsaparilla is the dried root of *Smilax ornata*, a climbing plant indigenous to Costa Rica, and other species of *Smilax* found in Central America. It is commonly known as "Jamaica" sarsaparilla because it was formerly exported by way of Jamaica to this country. The plants have stout,

knotty rhizomes, from which proceed long, slender, cylindrical roots. After collection, the roots are separated from the rhizomes, cleaned, dried, made into bundles, and packed in bales for exportation. These were formerly sent to New York, whence the English supplies were obtained, but "grey Jamaica" sarsaparilla is now exported direct to London from Bocas del Toro. The bundles are about 45 cm. long and 10 to 12 cm. wide, consisting of the folded roots loosely bound by a long root of the same plant. Costa Rica sarsaparilla roots are greyish-brown or reddish-brown in colour, longitudinally furrowed, and bear numerous fibrous rootlets. There is no odour, and only a slightly bitter taste. The drug contains saponins, but is of no particular medicinal value. Lima sarsaparilla, imported from Panama, closely resembles the "red" and "grey" Costa Rica varieties which are most esteemed. Native Jamaica sarsaparilla is actually produced in Jamaica, from *Smilax officinalis*, and reaches this country packed loose in bales. Honduras sarsaparilla is imported from British Honduras in longer and narrower bundles than the Costa Rica varieties, and is distinguished by having but few rootlets attached. Mexican or Vera Cruz sarsaparilla is the product of *Smilax medica* and consists of both rhizome and roots, the latter being much shrunken and of a dull greyish-brown colour. Guayaquil sarsaparilla consists of rhizomes and portions of stem, as well as roots, and is of a mahogany brown colour.

CHAPTER VII

SASSAFRAS root, bark, oil and pith—Scammony root and resin—Senega root—Senna leaves and pods—Serpentary or Snake-root—Spermaceti—Squill and Urginea—Stavesacre seeds—Storax and prepared storax—Stramonium leaves and seeds—Strophanthus seeds—Sumbul root—Taraxacum or Dandelion root—Tolu balsam—Tragacanth—Turpentine oil, Resin and Terebene—Valerian root—Viburnum or Black Haw—Wild Cherry bark—Wintergreen oil—Wool-fat and Lanolin.

Sassafras Root, Bark, Oil and Pith. Sassafras is the dried root or root-bark of *Sassafras officinale*, a tree which is widely distributed over the eastern parts of the United States. In the autumn, the roots are raised from the ground, partly barked, and conveyed to Baltimore, where they are cut into logs or chips for exportation, or for distillation on the spot. The separated root-bark is a distinct article of commerce, and is imported into this country in bags. As it occurs in commerce, the dried root is in large branched pieces, more or less covered with dark reddish-brown or greyish-brown spongy bark, or in the form of chips or raspings of a greyish-yellow or greyish-red colour. The bark consists of channelled, flattish, or curled, irregular rusty-brown fragments, which seldom exceed 10 cm. in length and 7.5 cm. in breadth, and are usually much smaller; the fragments vary in thickness from 1.5 to 6 mm., and have a finely striated inner surface. Both wood and bark, but especially the latter, have an agreeable, fragrant odour and an aromatic, slightly astringent taste. The odour and taste are due to the presence of volatile oil, of which the bark yields a much larger proportion than the wood. Sassafras pith is also used for medicinal purposes. It is obtained from the young stems and branches, and occurs in light, whitish, more

or less cylindrical, often curved or coiled, pieces of variable length and about 5 mm. in diameter. The pith has a faint odour of sassafras oil, and a mucilaginous taste.

Scammony Root and Resin. Scammony is the dried root of *Convolvulus Scammonia*, a climbing plant which is indigenous to countries in the Eastern Mediterranean region. The living root yields a milky juice which, when collected and dried, is known in commerce as "virgin scammony," and was formerly largely used for medicinal purposes, but is now usually replaced by the resin extracted from the dried root. Scammony root and the dried milky juice are collected in Asia Minor, near Smyrna and Aleppo. The dried root occurs in brownish-grey or yellowish-grey pieces, which are tapering or nearly cylindrical, and vary usually from 2 to 8 cm. or more in diameter. It has a characteristic odour and a taste which is sweet at first but afterwards slightly acrid. The odour and taste are due to the presence of resin. Scammony resin is extracted from the root by means of strong alcohol, and occurs in brownish, translucent, brittle fragments, or as a pale brown powder; the resin is also obtained from *Ipomœa* or *Orizaba jalap*. Virgin scammony consists of the resin mixed with gum, and occurs in large, flat, dark grey or blackish pieces, or in irregular, flattened lumps. It has a cheesy odour and a slightly acrid taste.

Senega Root. Senega is the dried root of *Polygala Senega*, a small plant which is widely distributed throughout the United States and adjoining parts of Canada. It is collected largely in Minnesota and Manitoba, and after being cleaned and dried is packed in bales for exportation. The dried root is greyish or brownish-yellow, slender, usually from 5 to 10 cm. long, with a knotty crown which bears the bases of

numerous slender aerial stems. It is frequently curved or contorted, sparingly branched, keeled, and sometimes transversely wrinkled. The odour of the drug recalls that of wintergreen, while the taste is at first sweetish and afterwards acrid. This is known as Western senega and is the variety chiefly imported into this country; it contains saponins and a small quantity of methyl salicylate. Northern senega, obtained from *Polygala Senega*, variety *latifolia*, is collected in the north-western parts of the United States and seldom reaches the European market; it is considerably larger than Western senega, darker in colour, less contorted, and less markedly keeled, but has a very acrid taste. Southern or white senega is the product of *Polygala alba*, and is collected in the southern parts of the United States; it is smaller and more slender than Western senega, paler in colour, and much less acrid. Western senega alone is official in this country.

Senna Leaves and Pods. Senna consists of the dried leaflets or dried fruits of *Cassia acutifolia*, or *Cassia angustifolia*. The first-named plant is a small shrub which is indigenous to the Middle and Upper Nile territories, while the second is a native of Southern Arabia, and largely cultivated in Southern India. Alexandrian senna is the product of wild plants of *Cassia acutifolia*, and is collected chiefly between Suakin and Kassala. After the leaflets have been separated from the dried shrubs, they are conveyed to Cairo or the Red Sea ports and there sorted, packed loosely in bales or cases, and sent to Alexandria for exportation. Tinnevelly or East Indian senna is collected from cultivated plants in the district of Tinnevelly, dried, pressed into bales, and exported from Tuticorin. Senna pods or fruits are sometimes

found mixed with the leaflets, especially in the case of Alexandrian senna, but they are also exported separately in bales from Egypt and India. The dried leaflets of Alexandrian senna are pale greyish-green, thin, brittle, and from 2 to 4 cm. long, while those of Tinnevely senna are pale yellowish-green and from 2.5 to 5 cm. long. They are also usually free from foreign leaves and from the senna stalks and fruits which are frequently present in the Alexandrian variety. As a rule, Tinnevely senna leaflets are larger, more nearly equal in size, less broken, and more free from admixtures than Alexandrian senna leaflets. The pods differ only slightly and are practically indistinguishable; those from *Cassia angustifolia* are, however, somewhat narrower than those from *Cassia acutifolia*. Both leaves and pods of the two varieties contain emodin, chrysophanic acid, and allied substances, to which their activity is due. Arabian or Mecca senna, collected in Southern Arabia from wild plants of *Cassia angustifolia*, has been offered as Alexandrian; it is usually discoloured and mixed with stalks, while the leaflets differ in shape, being narrower. Bombay senna is the same wild variety, shipped via Bombay to London.

Serpentary or Snake-root. Serpentary or Snake-root consists of the dried rhizome and roots of *Aristolochia Serpentaria*, or of *Aristolochia reticulata*. Both are small herbaceous plants indigenous to the United States. They are dug up in the autumn, dried, and packed in bales, casks, or bags for exportation. Virginian snakeroot is the product of *Aristolochia Serpentaria*, collected east of the Mississippi; it was formerly exported from New York and Boston, but is now seldom imported into this country. Texan or Red River serpentary, obtained from *Serpentaria reticulata* grown in the south-western part of the United

States, is the drug at present found in the English market. After collection in the autumn, the underground portions of the plants are dried and packed in bales for exportation. The drug occurs in tortuous and slender, dull yellowish-brown pieces about 2 cm. long and 3 mm. thick, with the remains of slender aerial stems on the upper surface, and numerous wiry, interlacing roots, often about 7 cm. long, on the under surface; the product of *Aristolochia reticulata* is somewhat longer and thicker than that of *Aristolochia Serpentaria*, with straighter roots. There is a characteristic camphoraceous odour and a strong, disagreeably bitter and acrid taste. The chief constituents of the drug are volatile oil and a bitter alkaloid.

Spermaceti. Spermaceti is obtained from the sperm whale, *Physeter macrocephalus*, and possibly from other species. It is found chiefly in the head cavities and blubber of the whale, mixed with sperm oil, from which it is separated by filtration and subsequently purified by treatment with caustic alkali. The purified product occurs in translucent, pearly-white, glistening masses, which are slightly unctuous to the touch and have a leafy, crystalline structure. It is almost inodorous, and has but little taste. It is imported from the United States in cases containing the refined product in blocks and cakes, and from Japan, in bags.

Squill and Urginea. Squill is the dried bulb of *Urginea Scilla*, a perennial plant found generally in countries bordering the Mediterranean. The bulbs often weigh several pounds. They are collected during August, freed from their dry outer scales, and cut into transverse slices which are dried in the sun. There are two varieties, white and red squill. The former has whitish or yellowish outer scales, and is collected largely in Sicily and Malta; the red squill has dull

red outer scales, and is collected in Algeria. There are also intermediate varieties, but the white squill is the kind mostly seen in this country. The drug is imported in bags and occurs usually in the form of curved, yellowish-white, somewhat translucent strips, from 2·5 to 5 cm. long, and frequently tapering towards both ends; the strips are tough and slightly flexible while moist, but brittle and easily powdered when dry. There is only a slight odour, but the taste is disagreeably bitter and acid. The chief constituents of the drug are bitter glucosides. Urginea or Indian squill is the product of *Urginea Indica*, the bulbs of which are much smaller than those of ordinary squill, but contain similar constituents. It is used chiefly in India.

Stavesacre Seeds. Stavesacre consists of the dried ripe seeds of *Delphinium Staphisagria*, a stout erect herb which is indigenous to Italy, Greece and Asia Minor, and is cultivated in France and Italy. The fruits are collected when ripe, the seeds removed and dried, and exported from Trieste and Nismes. They are irregularly triangular or obscurely quadrangular in shape, about 6 mm. long and somewhat less in breadth, blackish-brown to dull greyish-brown in colour, with a wrinkled and deeply pitted surface. The seeds have no marked odour, but the taste is nauseous, bitter and acid. They contain from 30 to 35 per cent of fixed oil, together with poisonous alkaloids which render the seeds and their preparations of value as parasiticides.

Storax and Prepared Storax. Storax is a liquid balsam obtained from the trunk of *Liquidambar orientalis*, a tree found in the extreme south-western part of Asia Minor. The balsam is a pathological product, formed when the bark on the trunk is wounded by beating it, or incised; it gradually saturates the wounded bark, which is stripped off in the autumn and

subjected to pressure, the residual balsam being extracted by boiling the bark with water and again pressing it. Crude storax thus obtained is exported in barrels to Smyrna, Constantinople and Trieste, whence it is shipped to this and other countries. It is a greyish, semi-fluid, viscid liquid, with an agreeable aromatic odour and a sharp, pungent taste. It separates on long standing into a dark brown layer of oleo-resin, and a lighter aqueous layer. For medicinal purposes, the separated oleo-resin is treated with alcohol, the solution filtered, and the alcohol removed by evaporation. The purified product is known as Prepared Storax, and consists of resinous matter mixed with an oily liquid ; it may contain as much as 47 per cent of free and combined cinnamic acid.

Stramonium Leaves and Seeds. Stramonium consists of the dried leaves of *Datura Stramonium*, a bushy annual which is found throughout Europe and is cultivated for medicinal use in England, France, Germany and Hungary. The leaves are collected when the plant is in flower, and dried. They are usually from 10 to 15 cm. long, ovate with an acuminate apex and a sinuate-dentate margin. The upper surface is dark greyish-green, the under surface paler and minutely wrinkled. There is a disagreeable and characteristic odour and an unpleasant, bitter taste. The drug contains the alkaloids hyoscyamine and atropine, in somewhat smaller proportion than belladonna leaves, together with hyoscyne. Stramonium seeds are also used for medicinal purposes, being collected when the fruits are ripe and dried. They are dark brown or nearly black in colour, flattened, kidney-shaped, and averaging about 4 mm in length. Their surface is reticulated and minutely pitted. The seeds have a scarcely perceptible odour and a bitter, oily taste.

They contain the same alkaloids as the leaves, together with 15 to 30 per cent of fixed oil.

Strophanthus Seeds. *Strophanthus* consists of the dried ripe seeds of *Strophanthus Kombé*, a large climbing plant which is indigenous to eastern tropical Africa, especially near the Shiré river and the Nyanza and Tanganyika lakes. The fruits are pods about 30 cm. long and 25 mm. in breadth. They are collected when ripe, freed from their outer coatings, dried, and occasionally exported entire; but more frequently the seeds are separated from the fruits, deprived of their awns or long feathery plumes of white silky hairs, and packed in bags for exportation. As found in commerce, the dried fruits are smooth and tawny-coloured; on opening the leathery endocarps, the seeds appear closely packed together. They are exported chiefly from Somba, Quilimane and other East African ports. The seeds freed from the awns are about 15 mm. long and 4 mm. broad, oval, pointed, flattened, and narrowed towards the obtuse base. They are covered with silky hairs, under which they are of a greenish-fawn colour. If fairly strong sulphuric acid is applied to a transversely-cut section of a seed, the surface is coloured dark green. This test indicates the presence of the poisonous glucoside strophanthin, and affords a ready means of distinguishing the seeds of *Strophanthus Kombé* from those of other species of *Strophanthus*, with which they are often mixed, or which may be offered for sale in place of them. Other varieties of strophanthus seed either give a red colouration with sulphuric acid, or they differ in colour and other characters.

Sumbul Root. Sumbul consists of the dried transverse-sliced root of *Ferula Sumbul*, a plant of considerable size which grows in Turkestan, or of some

other species of *Ferula*. It occurs in more or less cylindrical or tapering pieces, from 25 to 75 mm. in diameter and 15 to 25 mm. thick, very light, and bearing numerous short bristly fibres arranged in encircling lines. The pieces exhibit regular transverse wrinkles and a thin but tough dusky brown cork which can easily be stripped off. Internally the drug is spongy, whitish or yellowish, and fibrous. There is an agreeable musky odour and a bitter, slightly aromatic taste. The odour and taste are due to the presence of an aromatic resin with a musk-like odour, but the drug also contains a small proportion of volatile oil.

Taraxacum or Dandelion Root. *Taraxacum* is the root of *Taraxacum officinale*, the common dandelion, which is widely distributed throughout Europe, Asia, and North America. Only the fresh root is now official, but the dried root has also been used largely. The root is collected from wild plants in the autumn, washed, and dried if not required for use in the fresh state. Much of the drug was formerly imported from Germany. The fresh root is frequently 30 cm. or more in length, and 12 mm. or more in diameter. It is smooth and yellowish-brown externally, whitish within, odourless, but has a bitter taste, due to the presence of the milky juice which exudes from cut surfaces. Pieces of dried root are dark brown or nearly black, more or less shrivelled, and deeply wrinkled longitudinally. The bitter principle in the milky juice is taraxacin, which remains in the dried root and imparts to it a taste somewhat less bitter than that of the fresh root. *Taraxacum* juice is prepared by expression from the fresh root and preserved by the addition of alcohol.

Tolu Balsam. Tolu Balsam is a solid substance obtained from the trunk of *Myroxylon toluiferum*, a

tree which is found in the forests of Colombia. It appears to be a pathological product formed as the result of irritation set up by making V-shaped incisions in the bark. These incisions are made at varying heights and the exuding balsam is collected in gourds, which are subsequently emptied into skin bags; when full, these are conveyed to the coast, where the balsam is poured into tins which are exported to New York, mainly from Savanilla and Cartagena. The name of the balsam is derived from the town of Tolu, a small place near Cartagena, on the northern coast of Colombia. Freshly imported balsam of Tolu is a soft, tenacious, yellowish-brown resinous mass, but it hardens on keeping and finally becomes brittle. The hardened balsam is transparent and yellowish-brown in thin films, softens readily on warming, and exhibits crystals of cinnamic acid when a small piece is pressed between pieces of glass after warming. When chewed, the balsam adheres to the teeth; its odour is fragrant and its taste aromatic and slightly acid. The balsam yields about 7.5 per cent of an oily liquid similar to the cinnamein obtained from balsam of Peru; it also contains about 80 per cent of resinous matter and 12 or more per cent of cinnamic acid. On boiling with water, the cinnamic acid and aromatic constituents of the balsam pass into solution, and balsam so exhausted has been used to adulterate the entire drug, while colophony resin has also been employed as an adulterant. Sophistications of this nature are detected by the action of specific solvents.

Tragacanth. Tragacanth is a dried gummy exudation obtained from *Astragalus gummifer* and other species of *Astragalus*. The plants producing it are small thorny shrubs which are indigenous to Southern and Eastern Europe, and found more especially in Asiatic

Turkey and Persia. When incisions or punctures are made in the stems, the gum exudes and dries in flat, ribbon-like pieces or vermiform tears, the form of the pieces depending upon the shape of the incisions or punctures. It shows distinct evidence of metamorphosed or swollen vegetable tissue, and differs from gum arabic in that it is almost always the product of incisions. The tragacanth collected in Asiatic Turkey is shipped from Smyrna, whilst the Persian product is conveyed to Bombay, and thence to Europe. It is imported in bags or cases. Persian or Syrian tragacanth occurs in thin, flattened, white or pale yellowish flakes, which are irregularly oblong or more or less curved, marked on the surface with concentric ridges, frequently 25 mm. long and 12 mm. wide, somewhat translucent, and horny. The gum is odourless and almost tasteless, only sparingly soluble in water, but swells into a gelatinous mass when immersed in water. Smyrna tragacanth occurs in similar pieces, but they are less ribbon-like and more opaque. In addition to flake tragacanth, inferior varieties in dark tears or irregular vermiform pieces are imported and offered as "hog" gum or Caramania gum. It is stated to be obtained from a species of *Prunus*.

Turpentine Oil, Resin and Terebene. Turpentine oil is obtained by distillation from the crude oleo-resin which exudes from various species of *Pinus*, found growing in the United States, France, Germany, Sweden and Russia. Crude turpentine is collected from incisions or cavities cut in the trunks of the trees, during the period from March to October, mixed with water, and distilled in copper stills. The distillate consists of a mixture of water and volatile oil, while the residue constitutes the ordinary resin, rosin, or colophony of commerce. After separation of the oil from the water,

it is rectified by re-distillation with a solution of caustic potash, and still further rectified if required for medicinal purposes. The highly rectified product is a colourless, limpid liquid, with a characteristic odour and a pungent, somewhat bitter taste. Most of the oil of turpentine in commerce is imported in barrels from the United States, but French, Russian and other European oils are sometimes met with. The latter are not so highly esteemed, and often differ in both physical and chemical characters. Resin is imported from America in casks and varies in colour from light amber to nearly black. For medicinal purposes, it should be translucent, of a light amber colour, and readily soluble in strong alcohol ; the odour and taste of the resin are faintly terebinthinate. Venice turpentine is the crude oleo-resin collected from larch trees in France and Southern Tyrol, but what is commonly sold as such is a mixture of resin and oil of turpentine. White resin is an opaque variety prepared by mixing water with melted resin and stirring the mixture until it sets. Terebene is a mixture of dipentene and other hydrocarbons, obtained by shaking oil of turpentine with successive quantities of sulphuric acid until it is optically inactive, and then distilling the liquid in a current of steam. The product is a colourless liquid with an agreeable odour and an aromatic, terebinthinate taste.

Valerian Root. Valerian consists of the dried rhizome and roots of *Valeriana officinalis*, a plant which is widely distributed throughout Europe and Northern Asia, and is cultivated in England, Holland and Germany. It is collected in the autumn, freed from lateral shoots, sliced longitudinally, when the rhizomes are large, and dried. As found in commerce, the drug consists of entire or sliced rhizomes not more than 25 mm. long and 12 mm. thick, dark yellowish-brown

externally and whitish internally, with numerous slender, brittle roots attached. It has a strong, characteristic, disagreeable odour and an unpleasant, camphoraceous, slightly bitter taste. The odour increases markedly during the process of drying, as the result of enzyme action which can be prevented by boiling the rhizome before drying it. A volatile oil is the chief constituent of the drug and contains bornyl isovalerianate, from which free isovalerianic acid is gradually formed by enzyme action as the process of drying proceeds. Oil of valerian usually contains much of this acid, to which its action must probably be ascribed. Indian valerian is the product of *Valeriana Wallichii*, a plant found in the temperate Himalayas. It consists of curved pieces of rhizome, about 5 cm. long and from 5 to 10 mm. thick, dull brown in colour, and bearing a few thick roots, together with numerous prominent root-scars and some raised transverse leaf-scars. The odour and taste of the drug resemble those of ordinary valerian.

Viburnum or Black Haw. Viburnum or Black Haw is the dried bark of *Viburnum prunifolium*, a shrub or small tree which is indigenous to the United States. It occurs in dull brown or reddish-brown quills or curved pieces, from 1 to 4 mm. thick, with longitudinal wrinkles or shallow fissures externally, and longitudinal striations internally. The external appearance depends upon the age of the bark, younger bark being wrinkled, while older bark exhibits fissures and has a scaly appearance. There is only a slight odour, but the taste is bitter and astringent. The odorous principle of the bark is isovalerianic acid; other constituents of the drug are a bitter glucoside, tannin and resin.

Wild Cherry Bark. Wild Cherry Bark is obtained

from *Prunus serotina*, a tree which is widely distributed throughout the United States and other parts of North America. The bark is collected in the autumn, from all parts of the tree, dried, and packed in bags and bales for exportation. Bark from young stems and branches is said to be most active, and it should preferably be used when recently dried, as it deteriorates on keeping. The drug occurs in curved pieces or irregular fragments not more than 3 mm. thick, frequently covered with a smooth, thin, reddish-brown, papery cork. If the cork has been removed, there is exhibited a greenish-brown cortex marked with transversely elongated lenticels. The inner surface of the bark is reddish-brown and striated or reticulately fissured. The drug has a slight odour recalling that of bitter almonds, which is much more apparent when the bark is moistened; the astringent, aromatic and bitter taste also recalls that of bitter almonds. This resemblance in odour and taste is due to the formation of benzaldehyde and hydrocyanic acid in the presence of water.

Wintergreen Oil. Wintergreen oil, also known as Gaultheria oil, is obtained by distillation from the leaves of *Gaultheria procumbens*, and a product which is almost identical in composition is similarly obtained from the bark of *Betula lenta*, the sweet birch. The first-named is a small plant indigenous to Canada and the northern part of the United States, while the sweet birch is also a native of North America. During the process of distillation, the oil is formed by hydrolysis of a glucoside contained in the leaves and bark. The oil produced is enclosed in bottles for exportation from America. It is colourless, or nearly so, with a strong odour of methyl salicylate and a pungent taste. The oil should be readily soluble in 70 per cent alcohol and contain not less than 99 per cent of methyl

salicylate. Other constituents are an alcohol and an ester, the presence of which serve to distinguish natural oils of wintergreen and sweet birch from synthetically produced methyl salicylate.

Wool-fat and Lanolin. Wool-fat is the purified fat or wax of sheep's wool, where it is deposited from the perspiration. It can be extracted by kneading the wool with water, an emulsion being thus formed, from which the fat separates on heating and floats to the surface of the liquid. Other methods of extraction are by washing the fleece with soap, or by the use of appropriate solvents. Purification of the fat is subsequently effected by distillation with superheated steam, or by repeated treatment with water in a centrifugal machine. The purified product is a yellowish, tenacious, unctuous substance, which is almost inodorous and mixes readily with water, of which it can take up as much as 50 per cent. Lanolin or hydrous wool-fat is a mixture of wool-fat with about 30 per cent of water. Wool-fat is largely produced in this country, but it is also imported from Germany and elsewhere, in tins and kegs.

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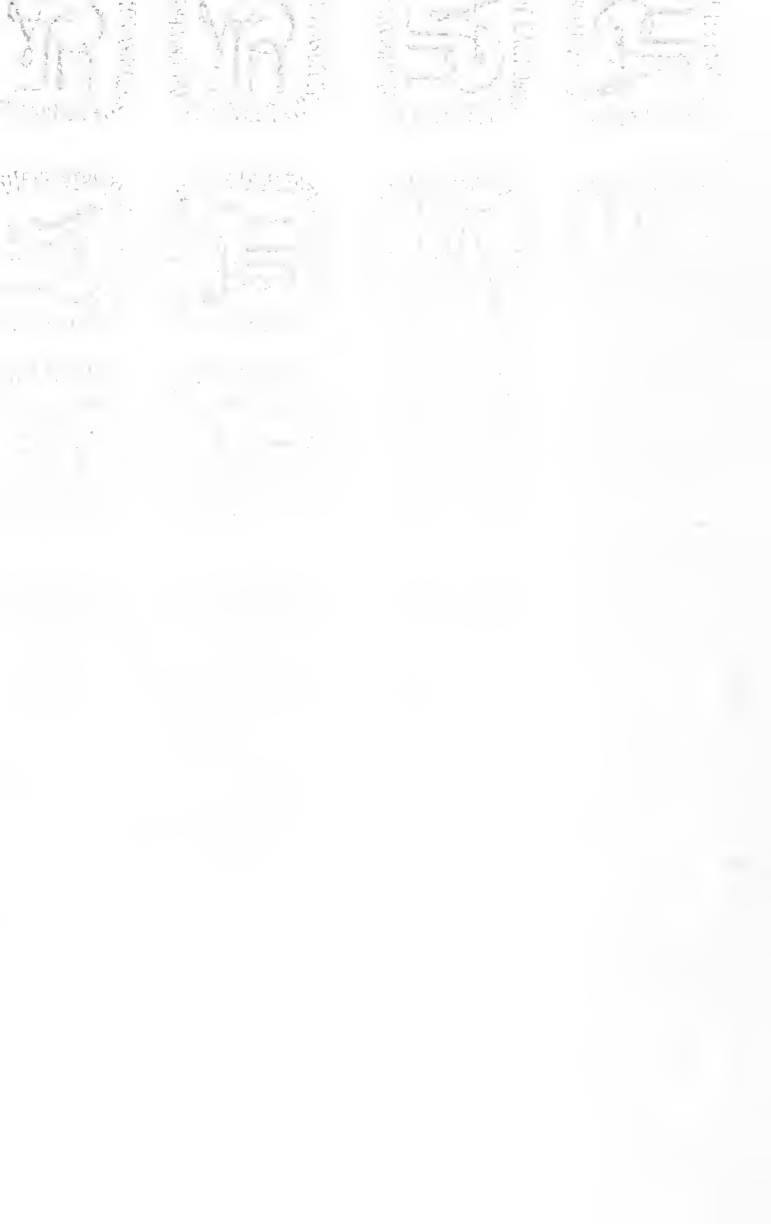
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