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VIBURNUM PRUNIFOLIUM AND VIBURNUM OPULUS.

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The two barks. *Viburnum prunifolium* and *Viburnum opulus*, have been for some time almost equally popular among practitioners. Wherein lies the advantage of one over the other, therapeutically, is, perhaps, difficult for one to say without more data than is at present at our command; but, as far as my investigations have gone, it appears that the prunifolium is more frequently depended upon in neuralgia of the ovaries, that the opulus is most useful in uterine and ovarian pain, in dysmenorrhoea and pains of that class, and that it is more often depended upon for prevention of abortion whether accidental or habitual. But it is not so much a question of therapeutical merits of the one or the other of these barks which so much engages the attention of the pharmacist, as it is the physical characteristics which will enable one to assure himself of their purity.

The Pharmacopoeia describes these two barks as follows:

VIBURNUM OPULUS.

"In flatfish or curved bands, or occasionally in quills, sometimes 30 centimetres long, and from 1 to 1.5 millimetres thick; outer surface ash-gray, marked with scattered, somewhat transversely elongated warts of a brownish color, due to abrasion, and more or less marked with blackish dots, and chiefly in a longitudinal direction, with black, irregular lines or thin ridges; underneath the easily-removed corky layer of a pale brownish or somewhat reddish-brown color; the inner surface dingy white or brownish; fracture tough, the tissue separating in layers; inodorous; taste somewhat astringent and bitter."

VIBURNUM PRUNIFOLIUM.

"In thin pieces or quills, glossy purplish-brown, with scattered warts and minute black dots ; when collected from old wood, grayish-brown; the thin, corky layer easily removed from the green layer; inner surface whitish, smooth; fracture short; inodorous; somewhat astringent and bitter."

Among the problems presented to Research Committee C by its chairman, Dr. H. H. Rusby, is one which relates to the question of discrimination of these two barks, particularly in the crushed or powdered condition, and one relating to the distinction between the bark of the root and bark of the stem of *Viburnum prunifolium*. Entering upon the investigation, I have formulated the problem as follows:

- (1) What are the distinguishing characteristics which will identify the bark of the stem and the bark of the root of *Viburnum prunifolium*?
- (2) How can one distinguish between the bark of *Viburnum prunifolium* and *V. opulus*?
- (3) What are the differential characteristics of these barks which will enable one to distinguish between them in the crushed condition or in the state of powder ?

Before seriously taking up the third question, it is necessary to have clearly before one the gross characteristics of these barks, and to understand the relation between them structurally as well. At the same time, it is essential that such a knowledge of the constituents be had as shall enable one to compare them pharmaceutically.

It is the object of this paper to lay before those who desire to contribute to the work a statement of what has been done thus far in answering the first and second questions. I am gratified to state that there are those, even outside of the committee, who have interested themselves in the work, and who desire such a statement. It is this that has suggested this paper.

For authentic specimens for the investigation I am indebted to Dr. H. H. Rusby. These were as follows :

NAME OF SPECIMEN AND PHYSICAL CHARACTERISTICS.

I. *Viburnum opulus*.— trunk bark, commercial specimen from Parke, Davis & Co. Curved pieces from 6 to 10 inches (150 to 250 mm.) in length, and about 1/12 inch (2 mm.) in thickness, the inner surface usually with strips of the white wood adhering. The bark consists of three layers, the periderm, a green chlorophyll layer, and a yellowish or brownish-yellow inner bark. The periderm is nearly smooth, especially on the younger bark, greenish or greenish-gray, marked with greenish and whitish patches, and with brown, corky warts. Fracture short through the outer layer; the inner layer tears in long, fibrous strips

II. *Viburnum prunifolium*.—Trunk-bark collected by Dr. H. H. Rusby, at Franklin, N. J., May, 1894. Curved pieces and fragments about 1/6 inch (4 mm.) thick; outer surface very rough, greenish or grayish, covered here and there with gray lichens; inner surface yellowish-white, about half as thick as the corky layer, free from adhering wood; the cork is thick, reddish, and shows, on a cross-section, small white spots dotted throughout its tissue. Fracture short.

III. *Viburnum prunifolium*.—Bark collected from small branches. Small curved pieces, very thin; periderm brownish-gray, smooth, overlaying a green chlorophyll layer; inner layer whitish, its inner surface yellowish-brown from exposure to air. Fracture short. It seems to possess the bitter principle to a greater extent than any of the preceding.

IV. *Viburnum prunifolium*.—Bark of root collected at Franklin, N. J., May, 1894, by Dr. H. H. Rusby. Quills or fragments, sometimes with strips of the yellowish-white wood adhering to the inner surface, which is brownish by exposure to air. The corky layer is grayish-brown, somewhat ridged so as to form more or less distinct meshes. The inner layer is thick, breaking with a short, or sometimes waxy, white fracture, easily cut or scraped with the fingernail.

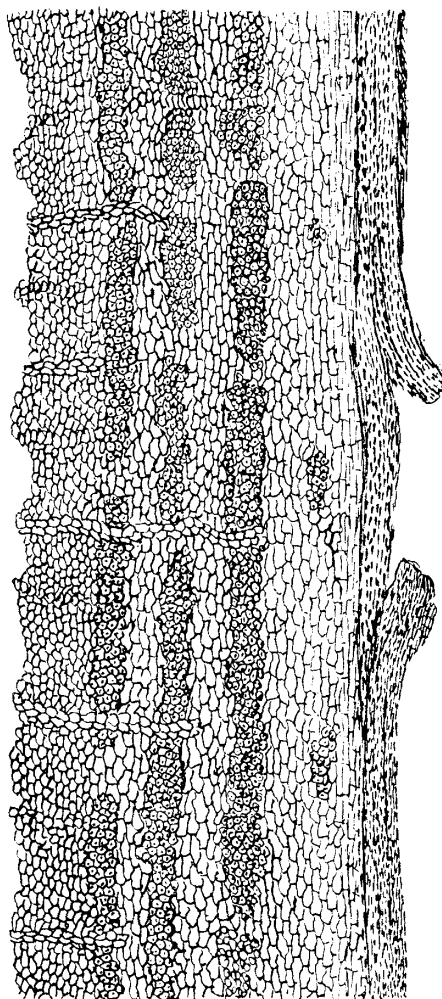
V. *Bark of root (source unknown)*.—Flattish or curved pieces, from 1/8 to 1/6 inch (3 to 4 mm.) in thickness, covered by (or sometimes deprived of) a reddish or grayish-red cork. Inner layer of about equal thickness to the outer, breaking with a short, brownish-white or white fracture.

All of these specimens have a pronounced, peculiar odor, difficult to

describe, differing quite considerably among themselves in this respect. The root-bark of *Viburnum prunifolium* has a somewhat disagreeable odor. All contain a bitter principle, this bitterness being particularly prominent in the root-bark and bark of small branches of *V. prunifolium*. In the trunk-bark the bitterness is noticeably less. In *Viburnum opulus* there is not much bitterness, but there is quite an astringent taste.

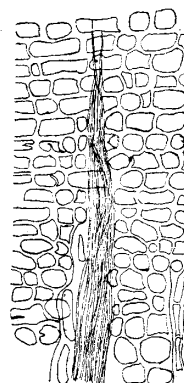
STRUCTURAL CHARACTERISTICS.

FIG. 1.



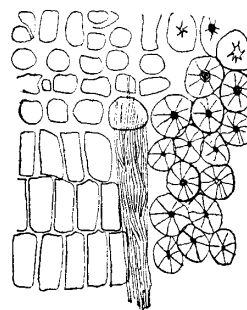
Viburnum opulus—Bark of stem.
Cross-section.

FIG. 2.



Viburnum opulus.
Bark of trunk.
Longitudinal section.

FIG. 3.

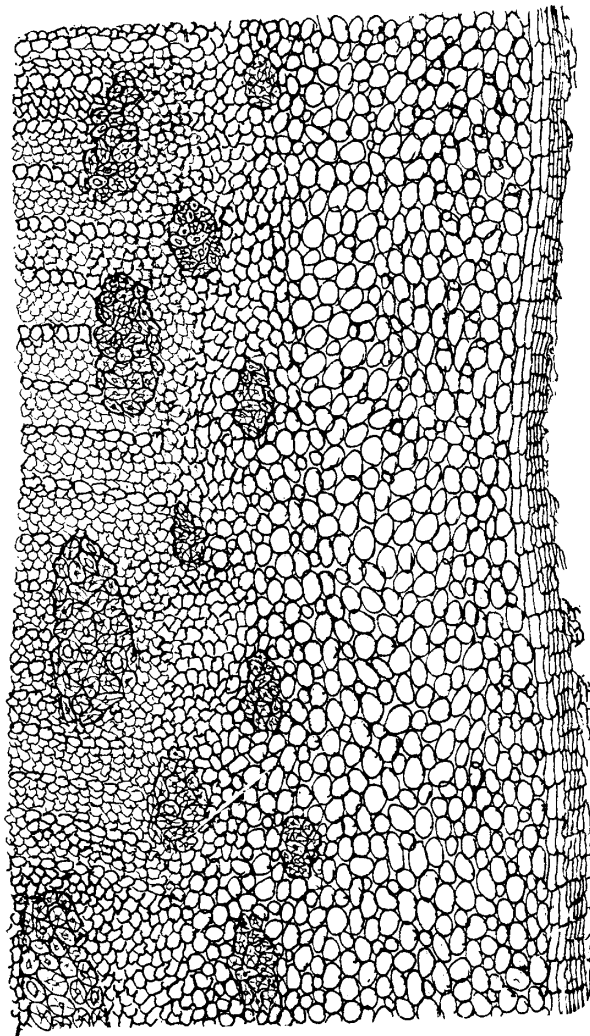


Viburnum prunifolium.
Bark of trunk.
Longitudinal section.

A cross-section of the stem bark of Viburnum opulus under the microscope shows the following structure: Immediately interior to the periderm are numerous irregular clusters of stone cells. These are

succeeded in the inner or bast layer by large clusters of bast fibres associated with a few stone cells. These clusters are arranged in bands parallel to the surface of the bark, and are separated from each other radially by narrow, one or two-rowed, straight medullary rays. The clusters are also partly or wholly encased in thin-walled crystal cells, each usually containing a single crystal of calcium oxalate. These interrupted bands of bast fibres and stone cells are separated from each other by rather broader bands of soft bast, in which also a few scattered stone cells and bast fibers occur.

FIG. 4.



Viburnum prunifolium—Bark of root.
Cross-section.

Tests by means of ferric solutions show the presence of considerable quantities of tannic matters in the middle bark, in the soft bast and in the medullary rays.

A cross-section of the stem bark of V. prunifolium shows groups of stone cells somewhat irregularly disposed, but no bast fibres. These groups appear in this section rounded or somewhat elongated in a tangential direction, or sometimes irregular in outline, but in longitudinal view they appear mostly fusiform, and sometimes five or ten times as long as thick. The component cells are also of large size.

The clusters of stone cells occur both in the middle and in the inner layers of the bark, but are larger in the latter.

The medullary rays, which in this species are also straight and composed of one or two rows of cells, are much less easily traceable than in the former species, because the cells differ little in size and shape from adjacent parenchymatous elements. They are best recognized by means of iodine solution, their cells containing more starch than those of adjacent tissues.

Freely sprinkled through the parenchymatous regions of this bark are cells containing stellate crystalline masses of calcium oxalate, but cells containing single crystals are rare or wanting, and there is no crystal sheath about the masses of stone cells.

Tannin is also present in this bark, but apparently somewhat less abundant than in the former species.

The bark of the young stems or branches differs from that of older ones, in the fact that the stone cells are in smaller groups. This is because in the old bark the earlier formed masses of stone cells have been cut off by the secondary cork formations, and the later formed groups of stone cells in the inner layers of the bark are of larger size than the older ones farther exterior.

The bark of the root of *V. prunifolium* differs from that of the stem chiefly in the fact that its groups of stone cells are farther apart and average somewhat larger in size. The outer bark is also thicker and

more spongy in its texture.¹

PHARMACEUTICAL EXAMINATION.

Five grammes of each of the powdered drugs were taken, and, by means of the continuous extracting apparatus, chloroformic extracts were obtained. The amount of the extractive obtained from the two official drugs by this means was quite different, that of the prunifolium being nearly twice that of the opulus. The physical characteristics of these chloroformic extracts were similar, resin-like, yellow to green in color, sticky to the touch, and having a very bitter taste. The extractives were then allowed to evaporate down and their solubility in water was taken. Of the *Viburnum opulus* 0.00459 gramme was dissolved, and of the *Viburnum prunifolium* 0.005 gramme, showing both to contain about the same amount of the principles soluble in water. This extractive was of a clear, greenish color and very bitter, that of the opulus being the more bitter of the two.

The residues remaining after treating the chloroformic extracts with water were next treated with a small quantity of petroleum spirit and filtered, the total extractive of the *Viburnum opulus* being 0.0834 gramme, and that of the *V. prunifolium* 0.3915 gramme. These figures show a marked difference in the amounts of the fixed oil (?) contained in the two barks. The physical properties of this fatty material from the different barks were similar in most respects. Both were of a pale green to yellow color, rather sticky, showing the presence of a small quantity of resinous matter; hard to saponify, darkened with sulphuric acid, and, in case of the opulus, a slight reaction was obtained with hydrochloric acid.

The chloroformic residues which remained, after extracting with water and petroleum spirit, were macerated for two days in 80 per cent. alcohol. The quantity of extractives obtained thereby was, of *Viburnum opulus*, 0.122 gramme, and of the *V. prunifolium*, 0.0375 gramme, showing the extractive of the opulus to be considerably larger than that of the prunifolium. The physical characteristics were similar. Evaporated to small bulk and poured into acidulated water gave a large precipitate

¹ It appears possible to distinguish between the two species, *V. opulus* and *V. prunifolium*, by the presence or absence of stone cells. A further report will be made on this point when some experience has been obtained in practically distinguishing the powders of the two species.

of resin from the solution of *Viburnum opulus*, but scarcely any with the *prunifolium*.

The powdered drugs which had been treated with chloroform were dried and subjected to the action of alcohol for fourteen hours. The quantity of extractive from each was as follows : *Viburnum opulus*, 1.515 gramme, and *V. prunifolium*, 0.969. The only distinguishable point of difference in these extracts was the very astringent taste in that of the *opulus*, which was almost entirely lacking in the extractive of the *prunifolium*. Evaporating to small bulk, and pouring into a large volume of water, a precipitate of resin came down from both solutions, but much larger from the *prunifolium* than from the *opulus*.

The analysis was continued through an alcoholic and aqueous solution of the dregs in turn, and an examination was also made of all the barks in order to compare them; but as this part of the examination did not yield results which appear of special significance now, they need not be here recorded. The examination of the chloroformic extract proves the most interesting, and is worthy of mention at this time.

TABULATION OF RESULTS.

	V. opulus. Per cent.	V. prun. Per cent.
Chloroformic extract	5'98	9'46
	V. op. Per cent.	V. prun. Per cent.
(a) Soluble in water	'0918	'100
(b) Soluble in petroleum spirit	1'66	7'83
(c) Resinous matter	2'44	'75
(d) Residue	1'7882	'78

For this comparison of constituents I am indebted to the assistance of Mr. E. E. Cowman, who performed the work under my direction. The figures are his. Work on the proximate analysis of the different specimens is still in progress, and what is here pre-ented must be regarded as preliminary.

These preliminary results seem to justify the hope that a means may soon be discovered by which the different barks may be distinguished even in the state of powder. The practical details for this discrimination are not yet worked out. It is hoped this preliminary report will be a help to those who may desire to offer assistance in perfecting these details.

NOTES ON SOME SAPS AND SECRETIONS USED IN PHARMACY.

BY P. L. SIMMONDS, F.L.S.

[Concluded from June.]

Pinus species. Very many species of *Pinus* yield volatile oils used in pharmacy. Among others, *P. palustris*, Ait, or *P. pinaster*, *P. Taeda*, *Pinus sylvestris*, Lin., *P. Pumilio*, Hank., the *P. Mugus*, Scop., and others.

Pinus Abies, Lin., *P. Picea*, Du Roi, *P. vulgaris*, *Abies excelsa*, Dec., the silver fir.—This species furnishes the oleo-resin known as Strasburg turpentine, which resembles common turpentine, but has a more agreeable odor.

P. balsamea, Lin., *Abies balsamea*, Marshall, *A. balsamifera*, Michx.—The balsam fir yields the well-known oleo-resin, Canada turpentine, which is exported from Quebec in kegs or large barrels. Canada balsam is used for medicinal and manufacturing purposes. It is an ingredient in blistering paper and flexible collodion. It is highly valued and much employed as a menstruum for mounting microscopic objects, and makes a fine, transparent varnish for water-color drawings, which does not become darker with time.

P. Australis, Michx., *P. palustris*, Mill.—This is the most valuable of all the American pines. From it are obtained the American "Turpentine," the concrete turpentine, the volatile oil from turpentine, and the resin. There are three principal descriptions of turpentine known in commerce, American, Bordeaux and Russian. Bordeaux, from *P. pinaster*, Ait.; Russian, from *P. sylvestris*, Lin.; Chian, from *Pistacia Terebinthus*, Lin.

P. Canadensis, Lin., *Abies Canadensis*, Michx. and DeC.—The hemlock spruce furnishes the concrete turpentine known as Canada pitch, which is official in the United States. It is slightly stimulant, like Burgundy pitch, and employed for similar purposes. A volatile oil is obtained from the leaves, which produces dangerous effects. The inner bark, being a powerful astringent, is used medicinally in America, but its chief application is for tanning. The young shoots are used in making spruce

beer.

Turpentine is the general name for the oleo-resinous exudations of coniferous trees, which flows in the crude state from incisions made in the stems. The turpentines, as a rule, are yellowish-white, very viscid, transparent or translucent masses, of honey consistence and of acid reaction; of a peculiar, strong, mostly unpleasant odor, and generally of a burning, aromatic, bitter, disagreeable taste; they consist chiefly of resin and volatile oil. When distilled, this oleo-resin yields the volatile oil or "spirit of turpentine." England imports from 420,000 to 520,000 cwt of oil of turpentine, in barrels of 2 to 3 cwt., chiefly from the Southern States. Its medicinal properties are stimulant, diuretic, occasionally diaphoretic and anthelmintic. In large doses, purgative, sometimes causing nausea, vomiting and intoxication. Previous to 1846, the tariff of Great Britain was such as to exclude imports of spirits of turpentine and resin.

Turpentine especially affects the kidneys and the mucus of the genito-urinary organs. Externally rubifacient, employed as a liniment in chronic affections. The yellow, translucent resin, the residue of the distillation of the turpentines, is important as an ingredient of plasters and ointments, which are employed as stimulant applications to indolent and ill-conditioned ulcers.

Picea vulgaris, Link., in the north of Europe, furnishes a quantity of resin, from which different products are obtained, among others, pitch. From *Larix Europaea* is obtained the resinous extract known as Briancon, or Venice turpentine, employed in consumption.

From *P. pinaster*, Ait., *P. maritima*, Poir. and Dec. (the cluster pine), Galipot is obtained, also known as "Barras." It is employed, like American "Thus," in the preparation of certain plasters. The annual production from a tree ranges from 5 to 8 pounds.

P. religiosa, H. B. K.—The turpentine produced by this tree is similar in properties to the Venice turpentine. The local name of this tree in Mexico is Oyatmetl.

P. sylvestris, C. Bauhin.—Tar is procured by the destructive distillation of the fir in Northern Europe and America. That used in North America is chiefly obtained from *P. palustris*, Mill. (*P. Australis*, Michx.). The tar

obtained in Europe is generally considered superior to that of America. The imports of tar into the United Kingdom were, in 1892, 132,000 barrels, and in 1893, 102,216 barrels. of about 30 gallons each. Tar acts as a stimulant, diuretic and diaphoretic, but is not much employed in medicine. It may be used internally in chronic catarrhal affections, and complaints of the urinary passages, also for some chronic skin diseases. Tar water used to be popular in England as a medicinal drink, and in France in most of the Duval and other cheap restaurants, gallons of "Eau de Goudron" are drunk daily.

A kind of barrillin is prepared from the cambium sap of this pine. An oily substance, called "fir-wool spirit," has been introduced from Germany, recommended for external use in rheumatism, neuralgia, etc.

P. Larix, Lin., *Abies Larix*, Lamarck., *Larix Europaea*. Dec.—Larch bark is considered to be stimulant, astringent and diuretic. This tree furnishes Venice turpentine, the properties and uses of which are the same as those of the other turpentine.

P. nigra, Ait., when tapped, yields the essence of spruce, an infusion of which, with the leaves and branches, in water, sweetened with molasses, makes the chowder, or black beer, used by the fishermen of Newfoundland as an antiscorbutic.

P. Picea, Du Roi, *P. Abies*, Lin.—The resinous exudation from the spruce fir, commonly known as Burgundy pitch, is obtained chiefly in Finland and the Black Forest. It is a useful application as a plaster to the chest in chronic coughs and other pulmonary affections, to the loins in lumbago, and to the joints in rheumatism.

P. Taeda, Linn.—The oldfield, or frankincense, a fine American pine, furnishes similar products to *P. sylvestris* and *P. Australis*. It yields turpentine in good quantity, though of inferior quality, and exudes much resin.

P. Teocot, Schlecht.—The Brea turpentine produced resembles that of Bordeaux. It yields 17 per cent. of essential oil. The tree abounds in the mountains that surround the valley of Mexico, and in some other localities in that country. Its local name is Ocoto.

Pistacia Lentiscus, Lin.—This and *P. Atlantica* furnish the gum resin of

commerce known as mastic. The largest consumption is in the east of Europe, where it is universally chewed like chicle gum in America, and thence derives its popular name. The women of Scio, Smyrna and Constantinople have almost always a piece of mastic in their mouths. It is asserted to be effectual in whitening the teeth, strengthening the gums, and sweetening the breath. Hence it is used by dentists, and also the inferior kinds for making varnishes, and is one of the ingredients in fumigation. It is obtained in the Greek archipelago, by making incisions in the bark of the tree. When good it occurs in pale yellow, brittle, transparent drops, of an astringent taste, slight agreeable odor, especially when heated. Such as inclines to black, green, or is dirty, should be avoided. The principal revenue of Chios, or Scio, is derived from this gum resin, of which some 4,000 to 5,000 cwt. are obtained. The picked first quality is sent to Constantinople, France and Austria, in small cases. Very little comes to England, only a few cases. The second and third qualities are used in the manufacture of mastic raki, a liqueur made with spirit, mixed with pulverized mastic, which is boiled and cooled. About 200,000 gallons of this are exported annually from Scio.

Pistacia Terebinthus, Linn.—The Chian turpentine of commerce was obtained from this tree in Scio. The produce was under 1,000 lbs. a year. As a medicine it is now obsolete. It is chiefly used in Greece and other parts of the Levant, for preserving wine, and flavoring the spirituous cordial called Raki.

A resinous gum called Alk or Lik (whence the word Lac), flows so abundantly from the trees, even without incision, in Algeria, that it is often dangerous to sleep under them. It is supposed that this tree would yield good terebinthine.

The resins of Algeria are those from the teribinth cedar, juniper, *Pinus halepensis*, Mill. (of which there are large forests), *Thuya articulata*, Vahl., sandarac and mastic.

Pluchea balsamifera, Less. *Blumea balsamifera*, Dec. *Conyza balsamifera*, Lin.—This Eastern shrub has diaphoretic and expectorant properties, in lung diseases. It is the source of a kind of camphor known as Ngai, exported from the Chinese port of Hoihow, in the island of Hainan, to the extent of about 15,000 lbs. annually. The crude camphor is refined at Canton, and is then known as Ngai-pun, and about 10,000 lbs. are exported yearly from Canton.

Plumeria phagadaemia, Mart.—The milky juice is used in the Amazon valley of Brazil as a vermifuge, administered in coffee, with castor oil. It is also applied externally in rheumatism, and for the cure of ulcers, boils, dislocations, etc.

Populus balsamifera, Linn.—The leaf buds of this species, and of *P. nigra*, Lin., are gathered for medicinal purposes. Their resinous secretion is said to be diuretic and antiscorbutic. It is used to prevent rancidity in ointments, but paraffin is equally effectual.

Mimusops globosa Gaertner, Chicle gum, exudes from this and another species in Mexico, and is largely collected, being used in the United States for chewing. The exports from Mexico in 1892 were to the value of over \$476,000.

Prosopis dulcis, H. B.—Mezquite is used in the preparation of mucilage, gum-drops, jujube-paste, etc. The gum, which exudes from the trunk and branches, is very soluble in water, and forms, when dissolved, a demulcent of a sweet, creamy and agreeable taste, but souring more readily, and probably containing a larger proportion of tannic and gallic acid than gum arable.

There are vast forests of the mezquite trees, embracing millions of acres, in the southwestern part of Texas. The process of gathering the gum is simple. The outside bark of the tree is scraped off, and the gum begins to exude and form in icicle-shaped masses, and, after one day's exposure in the autumn, is dry and hard enough to collect. Its color, however, unfits it for pharmaceutical purposes.

Prunus spinosa, Lin.—The acid, astringent juice of the fruit (the sloe), inspissated over a slow fire, has been used in France as a substitute for catechu. The leaves have that peculiar flavor which exists in *Spiraea ulmaria*, the American *Gaultheria*, and some other plants, which resembles the more delicate perfume of green tea, and hence they were said to be used as adulterants of tea. A water distilled from the blossoms is used as a medicinal vehicle in some parts of the continent.

Pterocarpus marsupium, Roxb. The reddish gum resin which exudes from the bark of this tree forms one of the best kinds of commerce, containing about 75 per cent. of tannic acid, and has been known in

Europe for upwards of a century. It is the dried sap which exudes copiously, on the stem being artificially wounded. It becomes brittle on hardening, and is very astringent. It is exported in considerable quantities from Malabar. Another kind of kino is from *Butea frondosa*. Nearly all the Australian *Eucalypti* exude astringent gum resins in considerable quantity, resembling Kino in appearance and property. Kino is commonly used in medicine for its astringent properties, especially in diarrhoea, chronic dysentery and other such cases.

P. Santalinus, Lin.—The essential oil of nosandus wood, or "sandal wood," as it is sometimes called, is prescribed for gonorrhoea. This tree also yields a kind of dragon's blood.

Rhus Metopium, Lin.—This tree is known in the West Indies as the false hog gum tree. From the bark, when wounded, a transparent juice exudes, which is used on plasters as a substitute for Burgundy pitch, also in medicine as a substitute for balsam of copaiba. The milky juice of some other species of *Rhus*, especially of *R. radicans*, Lin., a variety of *R. Toxicodendron*, Michx, is exceedingly poisonous.

Saccharum officinarum, Lin.—One-half of the sugar now made in the world is produced from beet root, which, however well prepared, is inferior to that obtained from the sap of the sugar cane. The latter alone is prescribed in the Pharmacopoeias; it is demulcent. given in catarrhal affections, in this form of candy, syrup, etc. It is also employed in pharmacy to render oils miscible with water, and enters into the composition of several mixtures and pills, and all the confections, syrups and lozenges.

Molasses is the drainage from raw or muscovado sugar. It is sometimes sold as "golden syrup." Treacle, which is darker and thicker, is that which drains from refined sugar in the moulds. Treacle is slightly laxative, and is used in pharmacy to give cohesiveness to pill masses. To persons disposed to dyspepsia and bilious habits, sugar in excess becomes more hurtful than otherwise. Sugar, when concentrated, is highly antiseptic, and, from a knowledge of its possessing this principle, it is frequently employed in the preservation of vegetable, animal and medicinal substances. In cases of poisoning by copper, arsenic, or corrosive sublimate, sugar has been successfully employed as an antidote; and white sugar finely pulverized is occasionally sprinkled upon ulcers with unhealthy granulations.

Salix tetrasperma, Roxb.—At the commencement of the hot season in India, the upper surface of the leaves of this tree are occasionally covered with a sugary exudation, which dries up in thin white flakes to a sugar or manna. The same trees often yield this exudation several years in succession, but it appears to be confined to a few trees and is not common. Two or three other species of *Salix* have also been observed to yield a saccharine exudation— *S. fragilis*, in Persia; *S. Chilensis*, in Chili, and a species in the Punjab.

Styrax benzoin, Dryand.; *Benzoin officinalis*, Hayne; *Lithocarpus Benzoin*, Blume.—Benzoin, known in commerce as "Gum Benjamin" is an odoriferous or balsamic gum resin, an exudation from the stem of trees in Siam and Sumatra, and imported in small chests of 2 1/2 cwts. These two qualities are chiefly used in medicine; the one in tears from Siam, and the other, in agglutinated masses from the far East. The former is the purest and has the strongest odor. Its medicinal properties are stimulant, expectorant and styptic. It is used also in perfumery, for incense, and in making aromatic pastilles, coating court-plaster and for healing wounds.

The imports into London were, in 1891: 3,464 chests; 1892, 2,655 chests; and in 1893, 3,163 chests. Benzoin was formerly employed in chronic bronchitis and dysentery, but is now chiefly used in the tincture known as "friar's balsam," as a styptic and stimulant to wounds and old ulcers. Benzoic acid is stimulant and diuretic, and also a valuable antiseptic.

Tabashur, a word of Sanscrit origin; Tavakshiri meaning cow's milk. This secretion is procured from the joints, or internodes, of the female bamboo, *Bambusa arundinacea*, W. It so far resembles silex as to form a kind of glass when fused with alkalies. It is also unaffected by fire and acids. It is called "bamboo salt," and is employed medicinally in the East as a tonic and astringent in the cure of all sorts of paralytic complaints, flatulencies and poisons. This hydrate of alumina is often found in the soil where a plantation of bamboos has been burnt. P. Smith gives the following analysis of its composition:

Silica	90'50
Potash	1'10
Peroxide of iron	0'90
Alumina	0'40
Water	4'87
Sap	2'23
	<hr/>
	100'00

Beesha Rhudii, Kunth. (*Melocanna bambusoides*, Tim.), yields more or less of the Tabashur; sometimes, it is said, the cavity is nearly filled with this silicious crystallization.

Toluifera balsamum, Lin.; *Myroxylon Toluifera*, H. B. K.; *Myrospermum toluiferum*, A. Rech.—There are many other synonyms of this tree.

There is great confusion yet as to the origin of the two balsams, Peru and Tolu. The exudation known as "balsam of Tolu " is obtained by incisions in the trunk. When in the first state it is thickish, yellow, becomes slowly darker and solid, and has a very pleasant odor and an agreeable taste. It is chiefly obtained in New Granada, and exudes only from the tree during the heat of the day. The tree inhabits the mountains and banks of the River Magdalena. The balsam, which contains cinnamic acid, is used as a stimulant expectorant, and for flavoring by confectioners and perfumers. It is largely imported into the United States, the imports averaging 42,000 pounds in the three years ending 1890. In the form of lozenges it is a popular and agreeable remedy for appeasing troublesome coughs, and gives a pleasant odor to lip salve.

Toluifera Pereirae (Roxb.) Baillon; *Myroxylon peruiferum*, Lin. fil.; *Myrospermum Salvatoriense*.—This balsam tree, like Tolu, has received many synonyms from different authors. The balsam is a beautiful tree, averaging 100 feet in height and 20 inches in diameter. It grows almost exclusively on the coast of Salvador, comprised by the southern shores of the departments of Sonsonate and Libertad. It is known locally as quinquino, or white balsam, when first obtained, but this name is also given to a balsam from the pressed fruit. It is a transparent deep reddish brown, or black liquid, similar in color and consistence to dark molasses, smells vanilla-like, but somewhat empyreumatic, tastes a little bitter, sharp and burning.

There are two methods of extracting the liquid. The first consists in scraping the skin of the bark to the depth of one-tenth of an inch with a

sharp machete in small spaces some twelve to fifteen inches square, all along the trunk and stout branches of the trees. Immediately after this operation, the portions scraped are heated with burning torches made out of the dried branches of a tree, and after this pieces of old cotton cloth are spread on the warmed and half-charred bark. By punching the edges of the cloth against the tree with the point of the machete, they are made to adhere. In this condition they are left for twenty-four and even forty-eight hours, when the rags are gathered and submitted to a decoction in large iron pots. After this the rags are subjected, while still hot, to great pressure in an Indian machine made of strong ropes and wooden levers worked by hand. The balsam oozes out and falls into a receptacle, where it is allowed to cool. This is called raw balsam. To refine it they boil it again and drain it, after which they pack it in iron cans ready for market. The other method of extracting balsam consists in entirely barking the trunk and heavy branches of the tree, a process which, as a rule, kills it outright, and at best renders it useless for several years. The bark is finely ground, boiled and submitted to pressure in order to extract the oil, which is considered of an inferior quality to that obtained by the system first described. Both methods are defective, but the latter is ruinous, and is forbidden by the authorities. The name of " Peruvian balsam " was given to this article because it was first sent from Salvador to Peru, in the time of the Spaniards, and from Callao reshipped to England.

About 6,000 pounds of the balsam go to the United States annually. Thirty years ago, many thousand pounds of it were received in England, but the imports there rarely exceed now 2,000 pounds. It is a warm and stimulating tonic and expectorant, useful in chronic catarrh, asthma and other pectoral complaints and rheumatism. Externally it is much used in Europe, in the treatment of scabies, as being equally effective, and more agreeable than sulphur in its application.

The balsams of Tolu and Peru are employed occasionally medicinally in the state of syrup or tincture, particularly in cough mixtures; their fragrance also renders them pleasant adjuncts to chocolate, liqueurs and other articles.

Balsam of Peru is seldom met with in commerce unadulterated. The best test is its specific gravity, which ought to be between 1.14 and 1.16. The difficulty of taking the specific gravity is best overcome by making a solution of one part of chloride of sodium in five parts of water, the

specific gravity of which is 1.125. In this liquor a drop of Peru balsam, if pure, ought to sink down. (Other tests were given in Vol. 66, p 100.)

Uncaria Gambir, Roxb. *Nauclea Gambir*, Hunter.—This plant yields the extract known as pale catechu in pharmacy, which is largely imported into Europe from Singapore, under the commercial name of Gambler, and frequently under the old erroneous designation of "Terra japonica." It is like cutch, a powerful astringent, useful chiefly in diarrhoea. Lozenges are said to be the best medium of administering it in relaxed condition of the throat, uvula and tonsils, in sponginess of the gums, salivation, etc. They may be employed in pyrosis and other cases in which astringents are indicated. This extract contains only about half the astringent matter of that obtained from the trunk of *Acacia Catechu*. (Tests to determine the two are given. Vol. 66, p. 105.)

The exports from Singapore average over 40,000 tons, of which more than half comes to England, to be chiefly used by tanners and dyers, and about 13,000 tons to the United States.

Unona Narum, Dun.; *Uvaria Narum*, Bl; *U. Zeylanica*, Lam.— A greenish, sweet-smelling oil; is obtained in Malabar by distilling the roots of this evergreen climber, which is used medicinally as a stimulant in rheumatism. The seeds are carminative.

Valeria indica, Lin.; *Elaeocarptis copallinus*, Retz.—The resin from this tree is the white dammar, or Indian copal, known also as "piney varnish." Under the influence of gentle heat, it combines with wax and oil, and forms an excellent resinous ointment.

Xanthorrhoea Tatei, Mueller.—This, one of the largest of the so-called "Australian grape trees," furnishes the "black-boy gum," a balsamic resin of a bright yellow color and pleasant fragrant odor, when burned as incense. It is used for the manufacture of sealing wax, and picric acid (which it yields in large percentages), and for varnishes. It is also known as "gum acroides." It tastes slightly astringent and aromatic, like storax or benzoin, containing benzoic and cinnamic acids. This resin is also commercially obtained from *X. resinosa*, Persoon; *X. quadrangulata*, Mueller, of South Australia; *X. Preissic*, Endlicher, of West Australia, and *X. hastilis*, and *X. Australis*, R. Brown, of New South Wales.