preparation, the *Decoctum pyrolæ*, D. or *chimaphilæ*, L. This decoction becomes deep-green with sesquichloride of iron. An extract is also in use. The leaves contain a little tannin, resin, gum, and various salts, with much lignin and eighteen per cent. of bitter extractive matter, in which its virtues are concentrated.

Actions and Uses.—The fresh plant is irritant, and acts as a rubefacient. It was introduced into medicine as a tonic and diuretic in scrofula and dropsy. It increases the flow of urine, and was therefore strongly recommended by Dr. Somerville in dropsies connected with debility. As it has been said also to lessen the lithic acid in the urine, it has been proposed and employed as an antilithic in gravel. It has likewise some diaphoretic action. It has been supposed, like uva-ursi, to have a soothing astringent effect on the urinary organs in catarrh of the bladder, chronic gonorrhœa, and chronic diseases of the kidneys. Its alleged virtues in scrofula are doubtful. It has not come much into use in this country.

The dose of the *Decoctum pyrolæ* is fl. unc. i. ad fl. unc. iv.

QUASSIA. *U.S. E. L. D. Wood of Quassia excelsa (U.S. Lond. Dub.), Wood chiefly of Picræna excelsa, Lind. Fl. Med., and seldom of Quassia amara, L. Suppl. W. DC. Spr. (Edin.). Quassia.*

EXTRACTUM QUASSIÆ, U.S. E. *Extract of Quassia.*

PROCESS, *U.S. Edin.* To be prepared from Quassia in the same way with extract of Liquorice-root (Gentian, *U.S.*).

INFUSUM QUASSIÆ, U.S. E. L. D. *Infusion of Quassia.*

[PROCESS, *U.S.* Take of
Quassia rasped two drachms;
Cold water a pint.
Macerate for twelve hours, and strain.]

PROCESS, *Edin. Lond. Dub.* Take of
Quassia-chips a scruple, *D.*; two scruples, *L.*; three, *E.*
Boiling (distilled, *L.*) water a pint, *E. L.*; half a pint, old wine-measure, *D.*
Infuse for two hours in a covered vessel, and strain.

TINCTURA QUASSIÆ, U.S. E. D. *Tincture of Quassia.*

[PROCESS, *U.S.* Take of
Quassia rasped two ounces;
Diluted alcohol two pints.
Macerate for fourteen days, express and filter.]

PROCESS, *Edin. Dub.* Take of
Quassia chips ten drachms (saw-dust, *D.* an ounce);
Proof spirit two pints (old wine-measure, *D.*).
Macerate for seven days, and then strain.

TINCTURA QUASSIÆ COMPOSITA, E. *Compound Tincture of Quassia.*

PROCESS, *Edin.* Take of
Cardamom-seeds bruised, and
Cochineal bruised, of each half an ounce;
Cinnamon in moderately fine powder, and
Quassia-chips, of each six drachms;
Raisins seven ounces;
Proof spirit two pints
Digest for seven days, strain the liquor, express strongly the residuum, and filter. This tincture may be also made by percolation, as directed for compound tincture of cardamom, provided the quassia be rasped or in powder.

FOR. NAMES.—*Fr.* Bois de quassi; Bois de Surinam.—*Ital.* Quassin.—*Ger.* Bitterholz; Quassienholz.—*Dan.* Vestindisk bittertræe; Quassietræe.—*Russ.* Kvassia visocaia.

FIGURES of Quassia amara in Hayne, ix. 4.—Nees von E. 383.—Steph. and Ch. iii. 172.—Carson, Illust. 21.—Picræna excelsa as Simaruba excelsa in Hayne, ix. 16.—Nees von E. 381.—As Quassia excelsa in Steph. and Ch. iii. 173.—Carson, Illust. 22.

ALTHOUGH met with in Europe somewhat earlier, QUASSIA-WOOD was first made distinctly known about the middle of last century by Linnæus, through information communicated to him in 1760, by an officer at Surinam of the name of Dahlberg. Linnæus named it after a negro called Quassi, who informed Dahlberg of its virtues, and used it at Surinam as a febrifuge. It came quickly into general use in Europe; and a drug termed Quassia has been ever since in great request. The wood, however, now in commerce under this

designation, is not the same with that first employed; but is obtained from a different plant, inhabiting Jamaica.

Natural History.—The original quassia is the wood of a tall shrub, never above fifteen feet in height, and whose trunk seldom exceeds the thickness of a man's arm. This is the *Quassia amara* of Linnæus, a species of the Natural family *Simarubaceæ*, and belonging to the class and order *Decandria Monogynia*. It inhabits Surinam, Guiana and Colombia, and is cultivated as an ornamental plant, but not for commercial purposes, in Brazil and various West Indian islands. It has elegant pinnated leaves, whose common leaf-stalk is winged; and it bears beautiful spikes of red flowers. Its wood is light, yet close and tough, pale yellowish-white, without odour, and of a pure intense bitter taste. The bark varies; being in one specimen, sent to me from St. Thomas's, extremely thin, dense, brittle, wrinkled, and yellowish-green; while in others, which I have from Jamaica, Trinidad and St. Vincent, it is fully a line thick, more spongy and tough, smooth and light-gray. Its infusion is not altered by sesquichloride of iron. I have often tried to obtain this wood from wholesale dealers in London; but none of the billets sent to me correspond with true Surinam quassia. Professor Lindley mentions, on the authority of a friend who resided long at Surinam, that for thirty years past it has ceased to be exported from that place. In all probability, therefore, Surinam quassia never occurs now in English trade.

Fig. 167.

P. excelsa.

1. Male flower. 2. Flower expanded. 3 Fertile flower. 4. Drupe.

The quassia of the shops at present, is the wood of a very different species of the same Natural family, the *Quassia excelsa* of Linnæus, *Simaruba excelsa* of Decandolle, Hayne and Nees von Esenbeck, or *Picræna excelsa* of Lindley.—This is a magnificent forest tree, towards a hundred feet in height, inhabiting the plains, but more especially the hills, of Jamaica, and other West Indian islands; where it is called Bitter-ash, from its resemblance to the ash of Europe, and the intense bitterness of its whole organization. Its leaves are pinnated, but without the winged petioles

of the Surinam quassia;—and its flowers are small and yellowish. Its wood is very tough, close in texture, yellower than Surinam quassia,—and equally bitter. Its bark, which is occasionally imported, is sometimes rather thin, dark-brown, smooth, and traversed by reticulating lines, more commonly thick, grayish-brown, wrinkled and similarly reticulated. The wood is imported from Jamaica in billets, often as thick as a man's thigh, sometimes thicker than his body, and then sometimes split into quarters.—The larger wood is cut up in Jamaica into floor-planks, for which purpose it is of great value, on account of its tough close grain, and its complete immunity from the attacks of insects.

Chemical History.—Its bitterness is intense and pure, unattended either with astringency, acridity, or aroma. This property is removed by boiling water and by spirit; which are accordingly used for making the officinal *Infusum* and *Tinctura quassiæ*. Rectified spirit is said to make a better tincture than the proof-spirit enjoined by the Pharmacopœias. A watery infusion made by percolation without heat, yields, when evaporated, an excellent *Extractum quassiæ*, which has been lately adopted as a pharmaceutic form by the Edinburgh College. The infusion yields gray flocks with sesquichloride of iron. Quassia owes its bitterness to a crystalline principle discovered in 1837, by Wiggers. It is obtained by concentrating a decoction of the wood, agitating it when cold with lime occasionally for four-and-twenty hours, evaporating the filtered liquor to dryness, acting on the residuum with boiling rectified spirit, and obtaining impure crystals by concentration and cooling, which may be afterwards purified by repeatedly crystallizing them from absolute alcohol, mixed with a little ether. Quassin, called by some Quassite, is intensely bitter, soluble in 200 parts of water, sparingly soluble in ether, freely soluble in alcohol, fusible and neutral. Its constitution is probably $C^{20}H^{12}O^{6}$ (Liebig). The discoverer does not state distinctly in which of the quassia-woods he obtained it. I have not succeeded with the true quassia.

Adulterations.—Quassia is sometimes adulterated with other woods. I have met with billets which were entirely free of bitterness, and resembled branches of the black poplar. The taste will easily detect such substitutions before the billets are cut into chips or rasped, but the detection is difficult afterwards.

Actions and Uses.—In action, quassia is a tonic, febrifuge, stomachic, anthelmintic, and probably in some degree narcotic. It acts as a powerful narcotic poison on flies and other insects; the alcoholic extract kills small animals with obscure narcotic symptoms, when it is introduced into the cellular tissue; and the infusion is thought by some to possess calmative effects on the nervous system in man. As a bitter tonic, it sometimes arrests intermittent and remittent fevers. In Brazil, indeed, it is in such estimation on this account, as to be called Cayenne cinchona. It is also a useful tonic in debility during convalescense from prolonged acute or chronic diseases. Its most important application, however, is as a stomachic in dyspepsia connected with loss of tone in the stomach; in which it is given either singly or with antacids, such as bicarbonate of potash dissolved in its infusion to the extent of a scruple in two ounces. Its infusion is a good anthelmintic for ascarides, if administered in the way of injection. It preserves animal matters from decay, a property possessed more or less by all simple bitters. It is often used by brewers as a substitute for hops, although prohibited by severe statutes in this and other countries.

The doses of its preparations are *Pulvis quassiæ*, gr. xxx.—*Infusum quassiæ*, fl.unc. i. ad fl.unc. iii.—*Extractum quassiæ*, U.S. E. gr. v. ad gr. xv.—*Tinctura quassiæ*, U.S. E. D. fluidr. i. ad fluidr. iv.—*Tinctura quassiæ composita*, E. fluidr. i. ad fluidr. iv.

QUASSIA SIMARUBA, *D.*—See *Simaruba.*

QUERCUS, *L.* QUERCUS CORTEX, *E. D. Bark of Quercus pedunculata, W. Spr. (Edin. Lond.)—of Quercus Robur, L. (Dub.)*

DECOCTUM QUERCUS, E. L. D. *Decoction of Oak Bark.*

PROCESS. *Edin. Lond. Dub.* Take of Oak-bark ten (eight, *D.*) drachms; Water two pints (old wine measure, *D.*) Boil down to one pint, and then strain.

EXTRACTUM QUERCUS, D. *Extract of Oak Bark.*

PROCESS, *Dub.* To be prepared from oak-bark in the same manner as extract of gentian.

FOR. NAMES.—*Fr.* Chêne.—*Ital.* Quercia.—*Span.* Roble.—*Port.* Carvalho.—*Ger.* Eiche; Steineiche.—*Dut.* Eikenboom.—*Swed.* Ek.—*Dan.* Egetræe.—*Russ.* Dub obiknovennoi.

FIGURES of Quercus Robur in Hayne, vi. 35.—Nees von E. 92.—Quercus pedunculata in Hayne, vi. 36.—Nees von E. 93;—as Q. Robur in Steph. and Ch. iii. 151.—Engl. Bot. 1342.

OAK-BARK has been used as an astringent in medicine since the days of the Greek physicians. The tree is the Δρυς of Dioscorides.

Natural and Chemical History.—The bark is obtained from two species in this country, the *Quercus Robur* & *Q. pedunculata*; which differ from one another chiefly in the fruit being in the former sessile, and in the latter supported, several together, on a long peduncle. The genus belongs to the Linnæan class and order *Monœcia Polyandria*, and to the Natural family *Amentaceæ* of Decandolle and *Corylaceæ* of Lindley. The pedunculated species is that from which oak-bark is most commonly obtained in Britain. It is peeled in the spring from small branches. It has a grayish, shining epidermis, and is somewhat cinnamon-coloured on its inner surface. It is brittle, fibrous, without odour, and of a strongly astringent taste. It gives out its astringency readily to water or rectified spirit; and its watery decoction yields an astringent extract, which is officinal in the Dublin Pharmacopœia. Its solutions yield a dark bluish-black precipitate with the salts of sesquioxide of iron. According to Sir H. Davy it contains 15 or 16 per cent. of tannin; and it is said to contain nearly thrice and a half as much in winter as in spring (Biggins in Pfaff). The acorns of

Fig. 168.

Q. pedunculata.

a. Male catkins. *b.* Stamens *c.* Female involucre and stigmas. *d.* Young fruit. *e.* The same magnified. *f.* A cotyledon with the radicle.

the oak contain 38 per cent. of starch, 9 tannin, 6.4 gum, 5.2 resin, 5.2 bitter extractive, and 4.3 concrete oil, besides various salts and ligneous fibre (Löwig).

Actions and Uses.—Oak-bark is a powerful astringent, and may be used for all the purposes to which vegetable astringents in general are applied. Its decoction is an excellent gargle for relaxed uvula and sore-throat, a good stimulating astringent lotion for ulcers with spongy granulations, and an astringent injection for leucorrhœa. Internally it may be employed in dysentery and chronic diarrhœa, in hæmorrhagies, and in chronic mucous discharges. Of late, however, it has been in a great measure abandoned, probably without reason, for astringents of foreign origin; and its applications are now almost confined to relaxed sore-throat and fluor albus, in which it is used topically. When employed as a gargle, a little sugar should be dissolved in the decoction; and sometimes one or two drachms of alum are added to every five ounces of the mixture.

The doses of its preparations are *Decoctum quercus*, fluidunc. i. ad fluidunc. iv.—*Extractum quercus*, D. gr. x. ad gr. xl.

QUERCUS INFECTORIA, *D.* See *Galla.*

[QUERCUS ALBA, *U.S.* *The bark of Quercus alba, W. Pursh. White Oak Bark.*

Decoctum Quercus Alba, U.S.	*Decoction of White Oak Bark.*
Process, *U.S.* Take of	Water a pint and a-half.
White oak bark bruised an ounce;	Boil down to a pint, and strain.

Figured in Michaux, Arb. Forest. ii. t. 1.

Natural History.—The White Oak is a large tree, found in most parts of the United States, but most common in the more temperate portions; it is much esteemed for its wood, which is extensively employed in ship-building. It has a grayish-white bark, by which it may be readily distinguished from any other species of American oak. The leaves are pale and pubescent beneath, oblong, and pinnatifidly sinuate, with the lobes oblong, obtuse, and mostly entire. The acorn is ovate in a deep, tuberculated cup. The bark is officinal, and when prepared for use, is deprived of its epidermis; it then presents a coarse fibrous texture, and separates into short filaments when attempted to be pulverised. It is of a yellowish-brown colour, has a peculiar but not strong odour, and an austere, bitterish taste. It closely resembles that of the English oak in its properties, and is used for the same purposes. (See *Quercus.*)]

[QUERCUS TINCTORIA, *U.S.* *The bark of Quercus Tinctoria, W. Pursh. Black Oak Bark.*

The Black Oak is one of the largest of the American species, and is of much importance, from its bark forming an article much employed for tinctorial purposes, and largely exported under the name of Quercitron. Under this name, however, are included the ground barks of several other species, as *Q. falcata* and *Q. rubra.* This tree has a deeply fissured and rugose bark, of a dark-brown or black colour. The leaves are oblong-ovate, pubescent beneath, somewhat lobed, the lobes being oblong, obtuse and mucronate; the acorn is depressed-globose, with a flattened cup. This bark is also officinal in the U.S. Pharmacopœia, but is not as much employed as an internal remedy as that of the white oak, being apt to cause irritation of the bowels. It has a much more astringent and bitter taste, and tinges the saliva of a yellow colour on being chewed. When an external astringent is required,

it is more efficient than the white oak, from containing a larger proportion of tannin.

QUINA. QUINIA, *U.S. L. Alkali obtained from the bark of Cinchona cordifolia. Quina. Quinia.*

Tests, *Lond.* Soluble very easily in alcohol, but not in water unless an acid be added. It alters the colour of turmeric, tastes bitter, and is entirely destroyed by heat.

Quina (Quinina; Quinia; Quinine) is one of the alkaloidal proximate principles to which cinchona-bark owes its virtues as a tonic and febrifuge. It was discovered in 1820 by Pelletier and Caventou. Its chief source is Yellow Bark (see *Cinchona*).

Chemical History.—It is most easily obtained by decomposing a solution of the commercial sulphate of quina with ammonia. A sulphate of ammonia is formed, while the alkaloid, being little soluble in water, is precipitated in the form of a snow-white powder. It may also be prepared more directly from cinchona-bark by a variety of processes; but the easiest way to obtain it in a state of purity is to make a pure sulphate in the first instance.

In its ordinary state quina is a snow-white amorphous powder, but it may be got in needle-shaped crystals by slowly cooling a saturated solution in alcohol or water. It is without odour, but of an intense pure bitter taste, which, on account of its insolubility, is slowly developed. It fuses at about 300°, and if suddenly cooled puts on the appearance of a resin. It is very sparingly soluble in cold water, and dissolves in 200 parts at 212°. Ether dissolves it more readily, and rectified-spirit still more so. As precipitated from water, it is a hydrate; it parts with its combined water at a temperature below its melting point; and when afterwards thrown into water, it swells a little and returns to its hydrated condition. It is dissolved by most acids in their diluted state, neutralizes them, and forms either neutral salts or subsalts, which are for the most part crystallizable in delicate needles, and moderately soluble in water. They all possess the pure intense bitter taste of their base; and their solutions in water are precipitated by ammonia owing to the separation of quina, and are also precipitated by tincture of galls, from the formation of the insoluble tannate of quina. Quina has been often analyzed, and with various results, of which those obtained by Liebig are most confided in. He found it to consist of 74.4 per cent of carbon, 7.61 hydrogen, 9.88 oxygen, and 8.11 azote; which numbers correspond with 20 equivalents of carbon, 12 hydrogen, 2 oxygen, and 1 azote, or $C^{20}H^{12}O^{2}N$.

Quina is easily distinguished from cinchonia, the other alkaloid of cinchona-bark, by its form and taste. It is intensely bitter; and it is very rarely seen except in the form of amorphous powder, because it is crystallized with difficulty. Cinchonia, on the other hand, crystallizes from rectified-spirit with great facility in rhombic prisms of moderate size; and it is free of bitterness.

Actions.—The actions of quina are identical with those of its sulphate. I am not aware that it is ever used in medicine instead of that salt, or why the London College has introduced it into the list of the Materia Medica.

QUINÆ SULPHAS, *E.* QUINÆ DISULPHAS, *L.* QUININÆ SULPHAS, *D.* QUINIÆ SULPHAS, *U.S. Sulphate or Disulphate of Quina.*

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

Tests, *Lond.* Entirely soluble in water, especially acidulated. Ammonia throws down quina; and the residue, on evaporating the liquid, ought not to taste of sugar. It loses 8

or 10 per cent. of moisture when heated, is entirely destroyed by a red heat, and is turned green by the addition first of chlorine and then of ammonia.

[Process, *U.S.* Take of
Yellow bark, in coarse powder, four pounds;
Muriatic acid three fluidounces;
Lime, in powder, five ounces;
Water five gallons;
Sulphuric acid,
Alcohol, and
Animal charcoal, each a sufficient quantity.
Boil the bark in one-third of the water, mixed with one-third of the muriatic acid, and strain through linen. Boil the residue twice successively with the same quantity of water and acid as before, and strain. Mix the decoctions, and while the liquor is hot, gradually add the lime, previously mixed with two pints of water, stirring constantly until the quinia is completely precipitated. Wash the precipitate with distilled water, and having pressed and dried it, digest it in boiling alcohol. Pour off the liquor, and repeat the digestion, several times, until the alcohol is no longer rendered bitter. Mix the liquors and distil off the alcohol, until a brown viscid mass remains. Upon this, removed from the vessel, pour about half a gallon of distilled water, and having heated the mixture to the boiling point, add as much sulphuric acid as may be necessary to dissolve the impure alkali. Then add an ounce and a-half of animal charcoal, boil for two minutes, filter the liquor while hot, and set aside to crystallize. Should the liquor, before filtration, be entirely neutral, acidulate it very slightly with sulphuric acid. Should it, on the contrary, change the colour of litmus paper to a bright red, add more animal charcoal. Separate the crystals from the liquor, dissolve them in boiling water slightly acidulated with sulphuric acid, add a little animal charcoal, filter and set aside to crystallize. Wrap the crystals in bibulous paper and dry them with a gentle heat. The mother-waters may be made to yield an additional quantity of sulphate of quinia, by precipitating the quinia with solution of ammonia and treating the precipitated alkali with water, sulphuric acid and animal charcoal as before.]

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

Process, *Lond.* Take of
Cinchona cordifolia bruised seven pounds;
Sulphuric acid nine ounces;
Purified animal charcoal two ounces;
Hydrated oxide of lead,
Solution of ammonia, and
Distilled water a sufficiency.
Mix four ounces and two drachms of sulphuric acid with six gallons of distilled water, add the cinchona, boil for an hour, and strain. Boil the residue again in the same quantity of water and acid for an hour, and strain. Then boil the cinchona for three hours in eight gallons of distilled water, and strain. Wash the residue frequently with boiling distilled water. Mix the liquors and add to saturation the oxide of lead in the moist state. Pour off the supernatant fluid, and wash the precipitate with distilled water. Boil the liquors for fifteen minutes, strain, and add the solution of ammonia to precipitate the quina. Wash this till the water ceases to be alkaline. Saturate what remains with the sulphuric acid previously diluted, digest the solution with the animal charcoal, and strain. Finally, having washed the charcoal, cautiously concentrate the solution, to obtain crystals.

Process, *Dub.* Take of
Yellow cinchona-bark, in coarse powder, four pounds;
Distilled water eight (old wine) pints;

Diluted sulphuric acid two ounces.
Digest them in a proper vessel, with a moderate heat and frequent stirring for four hours, and strain. Digest the bark again with an equal quantity of water, and do this thrice. Add to the united liquors enough of fresh burnt and slaked lime to saturate the acid. Dry on blotting-paper the precipitate which subsides. Digest this for six hours with three pints of rectified-spirit, and filter. Repeat this thrice, with an equal quantity of spirit. Distil the spirituous liquors to dryness with a vapour-bath heat. Add diluted sulphuric acid gradually to the residuum, till there is a very faint excess of acid, and obtain crystals by concentration and cooling.

[PILULÆ QUINIÆ SULPHATIS, U.S. *Pills of Sulphate of Quinia.*

PROCESS, *U.S.* Take of
Sulphate of quinia an ounce;
Gum Arabic, in powder, two drachms;
Syrup a sufficient quantity.
Mix together the sulphate of quinia and the gum, then beat them with the syrup so as to form a mass, to be divided into four hundred and eighty pills.]

FOR. NAMES.—*Fr.* Sulphate de quinine.—*Ital.* Solfato de quinina.—*Ger.* Schwefelsaures quinin.—*Russ.* Sernokisloi chinin.

SULPHATE OF QUINA was discovered at the same time with its base in 1820, by MM. Pelletier and Caventou. It came quickly into notice as a substitute for the drug from which it is obtained; and at present in this country, as well as in many parts of the continent, sulphate of quina has almost completely displaced cinchona-bark in regular practice.

Chemical History.—All the processes for preparing it consist substantially in exhausting yellow-bark of its bitterness by water acidulated with sulphuric or muriatic acid, decomposing the solution with some inorganic base, and combining the precipitate, which is impure quina, with sulphuric acid. The details of the various known methods differ exceedingly; but the main objects aimed at by all of them are to exhaust the bark readily, to avoid as much as possible the use of the expensive menstruum rectified spirit, and to simplify the steps for purifying the quina or its sulphate. It is not decided by manufacturers which process answers best on the large scale, but from such trials as I have made, it appears to me that the best on the small scale,—inasmuch as it dispenses with the use of spirit altogether, and very readily yields a pure salt,—is that given in the new Edinburgh Pharmacopœia.

This process consists in first removing a great part of the colouring principles and resin of the bark, together with its proper acid, the cinchonic or kinic acid, by a boiling solution of carbonate of soda, then exhausting the residuum with very weak sulphuric acid, next decomposing the concentrated acid liquors with carbonate of soda, and lastly uniting the precipitated quina with sulphuric acid largely diluted with boiling water, and purifying the crystals obtained on cooling, by a second crystallization from water after digestion with animal charcoal. If the minutiæ carefully stated in the Edinburgh formula be attentively followed, the acid liquor, when ready for decomposition by carbonate of soda, is not high-coloured, and two crystallizations of the sulphate are sufficient to render it a snow-white salt.——The London method,—in which the bark is exhausted at once by weak sulphuric acid, the acid liquors neutralized and decolourized by hydrated oxide of lead, and the impure quina separated by ammonia,—appears ingenious and simple in theory; but I have not found it to yield either so abundant or so pure a product as the mode recommended by the Edinburgh College. Much of the quina is lost unless the lead precipitate is washed much more perseveringly than the very loose directions of the College formula indicate.——The process of M. Henry, long followed in France and in this country, and substantially adopted in the last Dublin (and U.S.) Pharmacopœia,—but which labours under the disadvantage of requiring the use of rectified-spirit,—is to exhaust the bark by water containing sulphuric acid or muriatic acid, to decompose the acid liquors with milk of lime in slight excess, to collect the precipitate and dry it, to take up the quina from it with

boiling rectified-spirit, to distil off the spirit, to neutralize the residuum with diluted sulphuric acid, and finally to purify the crystals by animal charcoal. The lime here used as a precipitant, not only throws down quina, but likewise forms with the colouring principles of cinchona a compound, insoluble either in water or in spirit. In Britain the necessity of employing rectified spirit is an obstacle to this otherwise convenient and productive process.——Caustic soda, which has been recommended as a precipitant, on the ground that it does not when in excess redissolve any of the quina, as the other precipitants are alleged to do (Calvert), was found by Dr. Maclagan not to yield so abundant a product by the Edinburgh process as the carbonate of soda.——The mother liquors of all these processes yield chinoidine (vide Appendix).

The quantity of sulphate of quina obtained from yellow-bark, varies greatly with its quality. Some specimens yield scarcely one per cent. Pfaff obtained at the rate of 34 ounces from 100 pounds; which, if the *civil pfund* is meant, will amount to a trifle above two per cent. A gentleman in London who manufactures it largely informed me a few years ago, that the extremes he obtained were 25 and 50 ounces from 100 pounds avoirdupois, that is, between $1\frac{1}{2}$ and 3 per cent. Wittstein indicates from 1 to 3 per cent. as the average product. A table showing the productiveness of different barks in the hands of various experimentalists will be found under the head of *Cinchona*. All other varieties of cinchona-bark, yield greatly less than yellow-bark, and some of them render the process complex in consequence of also containing more or less cinchonia.

The commercial sulphate of quina, disulphate of chemists, is usually sold in the form of a loose mass of interlaced, filiform, silky crystals, of a snow-white colour, without odour, and of a pure, most intense, bitter taste. The crystals, when exposed to the air, lose three-fourths of their water of crystallization by efflorescence. They melt at about 240°, become red at a higher temperature, and at a red heat are charred and by degrees altogether dispersed. They dissolve in about 740 parts of temperate water, and in 30 parts at 212°; and the latter solution deposits numerous crystals on cooling. They are much more soluble when the water is acidulated with sulphuric acid. They dissolve in sixty parts of temperate rectified-spirit. The watery solution has a peculiar blue tint by reflected light, yields a white precipitate of quina with the alkalis or their carbonates, and a white precipitate of tannate of quina, with infusion of galls. When treated first with chlorine and then with ammonia, it acquires an emerald-green colour, and slowly deposits a copious green precipitate. The salt, when it retains its full amount of water of crystallization, consists of two equivalents of quina, one of sulphuric acid, and eight of water ($2C^{20}H^{12}O^2N+SO^3+8Aq$), that is, 74.3 per cent. of base, 9.2 of acid, and 16.5 of water. Under this view of its composition, it is evidently the disulphate of quina.

A neutral sulphate, sometimes incorrectly called bisulphate of quina, is obtained by adding to a concentrated boiling solution of the disulphate, as much sulphuric acid as enters into its constitution. On concentrating the solution, rhombic prisms are formed, consisting of one equivalent of base, one of acid, and eight of water, and which are soluble in their own water of crystallization at 212°, and in ten parts of water at 60°.

The commercial disulphate of quina being in great demand and of high price, it is much subject to adulteration. That manufactured in England is commonly purer than what is imported from France. The adulterations hitherto noticed are sulphate of lime, mannite or sugar, starch, margaric acid, or some other crystalline fatty matter, sulphate of cinchonia, salicin, and caffein, the active principle of coffee. The London formula of tests will detect some, but not all of these impurities. Sulphate of lime is indicated by the salt not being entirely destructible by heat; fatty matters by its not being

wholly soluble in acidulated water; and sugar or mannite, by the sweet taste of the residuum left on evaporating the watery solution, after removing the quina by precipitation with ammonia and filtration. The other tests in the formula are rather for ascertaining the nature of the salt, than for detecting impurities; and no account is taken of starch, cinchonia, salicin, or caffein, as occasional adulterations.—The Edinburgh formula, instead of providing against any particular impurities, is intended to determine generally, whether or not the salt is pure. The process consists in dissolving the salt in water acidulated with sulphuric acid, detaching the quina by an excess of carbonate of soda, and then weighing it; and for the last purpose the quina is collected by heating it in the solution from which it has been precipitated, till it contracts into a fused mass, so that it is obtained in a concrete cake when it cools. After being weighed, it is subjected to the action of solution of oxalic acid, which dissolves it entirely if pure, but not if sulphate of lime were present in the salt. I have found that ten grains of pure sulphate of quina, give steadily 7.4 grains of quina, when treated according to this formula. Though sufficient for most impurities, it will not detect adulteration, where the foreign ingredient is caffein or sulphate of cinchonia.——Another convenient formula for testing sulphate of quina is the following. Twenty parts of boiling water acidulated with sulphuric acid dissolve it entirely and without any floating oily globules appearing, if there be no fatty matter present: The solution when cold, does not become blue with tincture of iodine, if free of starch: It does not precipitate with oxalic acid, if free of lime: And when treated with solution of baryta so long as a precipitate forms, which precipitate is a mixture of quina and sulphate of baryta, the liquid has not a sweet taste, if free of sugar or mannite. Salicin is discovered by cold concentrated sulphuric acid forming with the suspected salt, a red, instead of a colourless solution. If this acid solution is brown, or black, it indicates starch, sugar, fatty matters, or other organic substances (Wittstein). Caffein is difficult to detect; but it is too dear in this country to be used for adulterating sulphate of quina, when that salt bears an average price. Sulphate of cinchonia is also troublesome to detect. Yet the adulteration is of importance; for it is supposed to be common, when, as at present, the pale barks are cheaper than yellow-bark. Probably the best method of discovering it is to dissolve the salt in forty parts of boiling water, which on cooling will deposit most of the sulphate of quina, but retain most of the salt of cinchonia; and by concentrating the residual solution, the latter is obtained in short rhombic prisms or pearly scales,—forms which are never assumed by sulphate of quina.

Actions and Uses.—Quina was one of the first substances in which the activity of a crude drug was clearly traced to an alkaloidal crystalline principle. It possesses, in a concentrated form, the most important actions of cinchona-bark. It is seldom given except in the form of disulphate; so that it is unnecessary to treat under the present head of any other preparation except this salt.

The disulphate of quina is a tonic, and as such stands at the head of all vegetable remedies. By some, all its other physiological actions, as well as all its therapeutic effects, are held to depend on its tonic properties. But the most important of its therapeutic actions, its power of arresting certain periodic diseases, cannot be rationally referred to this head, and is, therefore, considered by many to be a specific effect, that is, a result incapable at present of being satisfactorily explained. Single small doses, not exceeding a few grains, have no particular obvious effect in the generality of people, except that each produces increase of appetite and improved digestion. But when frequently repeated in these doses, it strengthens the pulse, increases the muscular force, and invigorates the tone of the nervous system. These results are best ob-

served in a state of debility, and are obscure in a healthy state of the body. In many, after a time, and in some even from the first, small doses tend to induce headache, or sickness, or irregular action of the bowels; and these effects are almost certain to follow when gastro-enteric irritation pre-exists. Large doses, such as a scruple or half a drachm, have been observed to occasion sickness and pain in the stomach, giddiness, flushed countenance, palpitation, a sense of distension in the head, intense weighty headache, ringing in the ears, and sometimes vomiting, numbness in the feet, deafness, blindness, and delirium. Alarming symptoms, and even death, have been caused by its injudicious administration in larger quantities. The slighter nervous symptoms, such as giddiness and ringing in the ears, have been described under the name of Cinchonism, and their production has been thought, but on doubtful grounds, to be necessary for the full development of its therapeutic action (Blair). It is absorbed in the course of its action, and may be detected in the urine and sweat (Landerer). It possesses antiseptic properties over dead animal matter.

Some have thought that quina itself is less apt to disorder the stomach than its disulphate: some ascribe the same superiority to its phosphate or cinchonate; and others imagine that its activity as a therapeutic agent is increased in the form of neutral sulphate. There is no sound reason for any of these propositions. The disulphate, in relation to cinchona-bark, is a more powerful tonic, but is destitute of its astringent properties. It is much less apt to excite sickness and vomiting when given in large doses during periodic diseases, especially where the stomach is irritable. It possesses the same advantage, likewise, in most cases where it is given in small tonic doses; nevertheless some, on the contrary, maintain that it is more apt, especially than infusions of cinchona, to excite, in small doses, nausea, pain in the stomach, and febrile symptoms.

The special diseases in which it is chiefly employed are the following:—In Intermittent fevers it is the most efficacious of all remedies. It is best given during the apyretic intermissions in divided doses, to the extent of between twelve and forty grains in all, according to the urgency of the particular case, and the violence of the disease in the particular locality or climate. If incidental irritation in the stomach be first removed by leeches, blisters, and opium, or by opium alone, acute local inflammation by general blood-letting, crudities in the alimentary canal by emetics and purgatives, and diarrhœa or dysentery by opium and laxatives or otherwise,—sulphate of quina very seldom fails to arrest intermittent fever before the second or third succeeding paroxysm; and not unfrequently it puts a sudden stop to the disease at its first administration. Violence of fever during the fit, or congestive enlargement of the liver or spleen, is not a contraindicant as some imagine. According to practitioners in hot climates, the greatest obstacle to its efficacy is unusual tendency to vomiting, or dysentery. General experience warrants the conclusion that sulphate of quina is superior as a febrifuge to cinchona-bark, inasmuch as it is more commonly retained by the stomach,—admits of being given in much larger quantity at once, so that a sufficiency may be administered in short apyretic intermissions,—cures a considerably larger proportion of cases,—and arrests the disease in general much more quickly. Nevertheless it is said that opposite results have been observed in some endemics (Hancock).——It is often not less useful in Remittent fever, provided the treatment be commenced in time, so long as the remissions are distinct. Dr. Allan, now of Forres, has informed me, that a few years ago he found it effectual even in the dreadful remittents of Madagascar and the eastern coast of Africa, if it was given at once in large doses of thirty or forty grains at the first remission, more especially when the remission was well marked.——In

Continued fever its utility is more circumscribed. The virtues once almost universally assigned to cinchona-bark as a tonic, antiseptic, and febrifuge, in the typhoid stage and form of continued fever, are now no longer confided in, and have never been transferred to sulphate of quina. But it is serviceable in certain circumstances. When distinct remissions occur, particularly in the fevers of childhood, and no obstacle exists from the presence of irritation in the stomach or intestines, sulphate of quina often proves almost as perfect a febrifuge as in ague. It is also of service in the typhus of adults when attended with exhausting non-critical sweats, which it sometimes arrests. It promotes convalescence when this is retarded by general nervous debility, and still more by defective appetite and feebleness of digestion. I have repeatedly seen it arrest relapse in inflammatory fever, when the relapse put on the intermittent character.——It is contraindicated in most acute local inflammations. In subacute Rheumatism, however, it is sometimes an effectual remedy; and Haygarth's treatment even of acute rheumatism with cinchona-bark has been practised also with sulphate of quina, apparently not without advantage.—The allied affection Neuralgia, when periodic and regular in its recurrence, may be generally treated with as much success by this remedy as ague itself, especially, however, that variety of it which affects the head. It is a most valuable stomachic tonic in dyspepsia depending upon enfeebled or depraved digestion; in which disorder it is usually given half an hour before meals, and has often extraordinary power in augmenting the appetite and promoting healthy chymification. In that form of dyspepsia, however, which is connected rather with unusual irritability of the stomach, it seems, on the contrary, to be hurtful by increasing irritation. Dyspepsia is one of the diseases in which it appears often disadvantageous to use this remedy long and continuously, on account of its tendency to occasion, in fourteen days or three weeks, headache and ineffective diarrhœa; and therefore an interval of a few days may be usefully interposed from time to time.—Lastly, in diseases at large connected with an enfeebled state of the system, and especially in debility attending convalescence from most acute and chronic diseases, it is the best of tonics, with the single exception, perhaps, of iron. Dr. Pereira thinks it least useful as a tonic where debility occurs in connection with chlorosis or impoverishment of the colouring globules of the blood, and that chalybeates are more appropriate in such circumstances,—an observation which is probably well founded.—Its utility in gangrene, or in the atonic form of erysipelas and some other inflammations in which cinchona-bark was once held to be an essential remedy, is greatly doubted by most practitioners of the present day.

Sulphate of quina is supposed to have the effect of promoting the action of certain other remedies. From the concurrent testimony of various physicians it seems to accelerate, in a remarkable manner, the constitutional action of mercurials. It has also been supposed by some to increase the activity of aloes as a purgative, and to lessen its griping tendency; but I have not been able to verify this observation. Its action as an adjuvant to other remedies deserves to be more studied.

The forms in which it is usually administered are that of pill and that of solution. The pill is best made with a little conserve of roses and bread-crumb. The solution is commonly made with the aid of a drop or two of sulphuric acid, to increase the solubility of the salt; and sometimes a little syrup is added to cover the bitter taste, which, however, is not unpleasant. The dose for dyspepsia, or, as a general tonic, is one or two grains twice or thrice a-day. From twelve to eighteen grains divided into four or six doses will be generally sufficient for the ordinary intermittents of Europe; but the severe forms which occur in the south of Europe, and, still more, those of the

tropics, require thirty-six or forty grains on an average; and in Madagascar Dr. Allan informs me he had not unfrequently to use ninety grains divided into three doses. Some think the solution acidulated with sulphuric acid the most efficacious form in tropical intermittents; others maintain that the efficacy of the salt is injured in this way, and is greatest in the form of pill (Madras Reports, 1831); whence it may be inferred to be very effectual in either mode. The doses in periodic neuralgia, which I have found sufficient for checking the disease abruptly, are twelve or fifteen grains divided into several doses.

Sulphate of quina is one of the remedies which may be administered for its constitutional action according to the Endermic method, that is, by applying it to the skin recently stripped of its cuticle by means of a blister. In this way so small a dose as six grains has cured violent ague,—even where the remedy had failed when given by the mouth (Cristin). It is said, however, to excite severe pain where it is applied, and sometimes violent inflammation and even sloughing.

Other salts of quina have been proposed as improvements upon the disulphate, such as the nitrate, muriate, phosphate, ferrocyanate, citrate, acetate, cinchonate, valerianate, and tannate. But there is no good reason for supposing that any one of them is superior in efficacy to the disulphate, or that it signifies much with what acid the alkaloid is united.

Its doses are, gr. i. to gr. ii. repeatedly as a tonic, and gr. iii. to scr. i. repeatedly as a febrifuge. [The *Pilulæ Quiniæ Sulphatis, U.S.*, each contain one grain, and are to be given like the powder.]

RESINA, *L.* See *Terebinthina.*

RANUNCULUS. *U.S.* Secondary. *The cormus and herb of Ranunculus bulbosus* (*L. W. DC.*). *Crowfoot.*

RANUNCULUS ACRIS, *D. Leaves of Ranunculus acris* (*L. W. DC. Spr.*).

RANUNCULUS FLAMMULA, *D. Leaves of Ranunculus Flammula* (*L. W. DC. Spr.*).

For. Names.—*Fr.* Rénoncule.—*Ital.* Ranunculo.—*Span.* Ranunculo.—*Ger.* Hahnenfuss.

Figures of Ranunculus acris in Roque, 118.—Engl. Bot. 562.—Ranunculus Flammula in Roque, 118.—Engl. Bot. 387.

Natural and Chemical History.—The genus Ranunculus (Butter-cup), which belongs to the Linnæan class and order Polyandria Polygynia, and gives its name to the Natural family in which it is arranged, comprises a great number of species, the common ornaments of our fields, moors, and ditches. They are distinguished from other similar genera by the inside of the base of each petal presenting a minute concave scale. Of the species admitted by the Dublin Pharmacopœia, the *R. acris* is very common in meadows, especially where somewhat moist, and near ditches. It is distinguished from *R. bulbosus* and *R. repens*, which considerably resemble it, by not presenting a bulbous root like the former, and by being smooth upon the flowering stem, not hairy, as is the case with the latter. The *R. flammula* is equally common on moist hilly pastures and moorlands, and is easily known from all other species in the same localities by its smooth, elongated, ovato-lanceolate leaves. The leaves and unripe germens of both species are acrid, occasioning when chewed, a singular intense cutting sensation in the point of the tongue, which quickly ceases when the plant is spit out. The acridity of these and all other species of Ranunculus which I have yet examined, is entirely lost by drying them, however carefully the process be managed; and it also disappears in the germens as the seeds, which are themselves bland, ripen. It, how-