others it is said to diminish the scars of small-pox, when smeared over the pustules before and during encrustation.

It is said to facilitate the extinction of mercury by trituration.

[PANAX, *U.S.* Secondary. *The root of Panax quinquefolium, L. W. T. & G. Ginseng.*

For. Names.—*Fr.* Ginseng.—*Ger.* Ginzeng; Kraftwurzel.—*Port.* Ginsao.

Figured in Bigelow, Med. Bot. 29.—Barton, Veg. Mat. Med. 45.—Bot. Mag. 1333.

Natural History.—Ginseng is a native of most parts of the middle and northern states, and extends on the mountains far south. It grows in rich soil in shaded situations. It belongs to *Pentandria Digynia* of Linnæus, and to *Araliaceæ* of the Natural orders. It has a perennial, fusiform root, often branched, succulent, with many transverse wrinkles. The stem is erect, one or two feet high, divided at top into three petioles, having a central peduncle at their base. The petioles are long, and commonly have five, but sometimes only three leaflets; these are ovate, acuminate, doubly serrate, dark-green above, paler beneath. The flowers are small, collected in a globose umbel, yellowish-green, supported on a central erect peduncle, and succeeded by bright scarlet berries, each having two reniform seeds.

Ginseng has become very celebrated from the astonishing virtues attributed to it by the Chinese, who consider it as a perfect panacea. It has been a subject of discussion, whether the Chinese plant is the same as the American. At one time they were generally considered as identical, but it is now admitted by the best authorities that they are distinct, though very closely allied. N. v. Esenbeck calls the Asiatic species *P. schinseng*, and admits three varieties, one of which is the *P. pseudo-ginseng* of Wallich; this, as is observed by Torrey and Gray, exceedingly resembles the American plant. The mistake originally arose from the Jesuits, some of whom, especially Farther Jartorux, becoming acquainted with the plant in Tartary, thought they recognized it in the American species. In consequence of the information derived from them of the estimation in which the root was held in China, large quantities were exported to that country, and at first with great profit; it is now, however, considered as an inferior quality, though it often meets with a ready sale, but the demand for it fluctuates much, for from a fancied de-

Fig. 152.

P. quinquefolium.

terioration of the article or from other causes, it has at times not paid freight and charges.

The Asiatic kind is principally found in Chinese Tartary, between 39° and 47° N. latitude. The collection of it is said to be a monopoly of the government, who guard the districts in which it grows, with extreme vigilance. Those who are employed to collect it are obliged to deliver about two pounds of the best roots to the proper authorities, gratuitously, for all above this weight they are paid its weight in silver.

Ginseng has a peculiar and rather pleasant smell, and a sweet, somewhat pungent aromatic taste. No analysis has been made of it.

Actions and Uses.—According to the Chinese, this root nourishes and strengthens the body, checks vomiting, removes hypochondriasis, and all other nervous affections, and in short is capable of giving a vigorous tone to the system, even in old age, and is a panacea for all corporeal ills. It is administered in a variety of forms, and the only ill result arising from over-doses, they state to be a tendency to hemorrhage. Several of the Jesuits, who have used the Chinese root, are of opinion that many of the properties attributed to it are real, and that it is a truly valuable remedy. On the other hand, the trials made in the United States and in Europe, with the American kind, prove that it is merely a gentle stimulant with some slight antispasmodic qualities. No extended observations, however, have been made on it, and as regards the Chinese variety, it is difficult to come to any just conclusion, for it can scarcely be possible that an article so long in use, and so highly prized, can be wholly worthless, and yet there is every reason to believe that its beneficial effects should be attributed rather to the effects of imagination, than to any extraordinary powers in the root.]

PAPAVER, *U.S. E. L.* PAPAVERIS SOMNIFERI CAPSULÆ, *D.* *Ripe (not quite ripe, E.) capsules of Papaver somniferum, L. W. DC. Spr. Poppy-heads.*

Decoctum Papaveris, E. L. D. *Decoction of Poppy.*

Process, *Edin. Lond. Dub.* Take of
Poppy-heads sliced four ounces;
Water three pints (four, *L.*, two old wine pints, *D.*).
Boil for fifteen minutes, and strain.

Extractum Papaveris, L. E. *Extract of Poppy.*

Process, *Edin. Lond.* Take of
Poppy-heads without seeds (bruised, *L.*) fifteen ounces;
Boiling water (distilled, *L*) a gallon.
Macerate for twenty-four hours; boil down to four pints; filter the liquor hot; and evaporate (in the vapour-bath, *E.*) to the due consistence.

Syrupus Papaveris, E. L. D. *Syrup of Poppy.*

Process, *Edin. Lond.* Take of
Poppy-heads, without seeds, a pound and a half (three pounds, *L.*);
Boiling water fifteen pints (five gallons, *L.*);
Sugar three pounds (five, *L.*);
(Slice the poppy-heads and infuse them for twelve hours in the water, *E.*)
Boil down to five pints (two gallons, *L.*).
Strain and express strongly through calico.
Boil again to two and a-half (four, *L.*) pints.
(Strain again; let the impurities settle for twelve hours, and boil down the liquor to two pints, *L.*) Then add the sugar, and dissolve it with the aid of heat.

Process, *Dub.* Take of
Dried poppy-heads, without seeds and bruised, seventeen ounces;
Boiling water two gallons.
Macerate for twenty-four hours, evaporate in the vapour-bath to one gallon, and express strongly. Concentrate the strained liquor to two pounds, and strain it again while hot. Let the impurities settle for twelve hours. Boil down the liquor to a pound, and make it into a syrup.

For. Names.—*Fr.* Pavot.—*Ital.* Papavero.—*Span.* Adormidera blanca.—*Port.* Dormiderias.—*Ger.* Weisser mohn.—*Dut.* Maankop.—*Swed.* Wallmo.—*Dan.* Hoid Valmue.—*Russ.* Mak usipitelnoi.—*Arab.* Khushkhash.—*Pers.* Kooknar.—*Tam.* Casa casa.—*Hind.* Post.

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FIGURES of Papaver somniferum in Nees von E. 405.—Hayne, vi. 40.—Steph. and Ch. i. 31.—Roque, 136.

Natural History.—THE history of the *Papaver somniferum* has been already given in a great measure under the head of Opium. It is the common cultivated poppy, of which there are at least three varieties, the white, red, and purple poppy. Its capsules, commonly called Poppy-heads,—the only officinal part besides opium,—are obtained for the most part from the white variety, because these are the largest. They ought to be gathered, as the Edinburgh Pharmacopœia directs, before they are entirely ripe. They abound at that period with the milky juice of which opium is made; but, if allowed to ripen before being plucked, as the two other Colleges have directed, this juice is in a great measure exhausted. The seeds, which are very numerous, ripen well enough although the capsules be cut while greenish and juicy.

The seeds of the poppy are oleaginous and emulsive, and yield by expression a large quantity of a yellowish fixed oil, which dries up into a varnish on being exposed for a length of time to the air. Both the seeds and the oil are quite bland and without narcotic properties; and consequently they may be taken as food with impunity. But the capsules possess the peculiar bitterness and narcotic qualities of opium. The yield their virtues readily to water; with whose agency are obtained the *Decoctum*, *Extractum*, and *Syrupus papaveris* of the Pharmacopœias. These preparations probably all contain a little morphia. Winckler got 20 grains of pure morphia from 32 ounces of the capsules; and Petit detected it in the extract. All the preparations of the capsules, however, are very irregular in strength; which may depend partly on differences in the variety of plant used, partly on the period at which the capsules are plucked, and partly, too, on deviations from the correct pharmaceutic processes.

Actions and Uses.—Poppy-heads, with their preparations, possess all the properties of opium. The syrup and extract, which are used internally, have been thought by some to be less liable than opium to the disadvantage of causing headache and sickness after their hypnotic action, or restlessness, fever, and anxiety instead of it. But this superiority is far from being well established. The extract, the Μηχωνειον of the ancient Greeks, is now little employed, except perhaps for adulterating opium. But the syrup is still frequently given to children. Owing, however, to its irregular strength, it has sometimes occasioned dangerous accidents; so that, if a syrup is necessary at all, it would be better that the Colleges substituted a syrup of opium, which would have the advantage of greater uniformity. Decoction of poppy-heads is much in use as an emollient and anodyne for fomentations. It is probable that it does not possess greater virtues than other mucilaginous decoctions.

The doses of the preparations of poppy-heads are: *Extractum papaveris*, gr. i. ad gr. x.—*Syrupus papaveris*, unc. ss. ad unc. ii.—*Decoctum papaveris*, for external use.

PAPAVER RHŒAS, *D.* See *Rhœas*.

PAREIRA, *U.S. E. L. Root of Cissampelos Pareira, L. W. DC. Spr. Pareira.*

EXTRACTUM PAREIRÆ, E. L. *Extract of Pareira.*

PROCESS, *Edin. Lond.* This extract is to be prepared from Pareira-root in the same way as extract of gentian.

INFUSUM PAREIRÆ, E. L. *Infusion of Pareira.*

PROCESS, *Edin. Lond.* Take of
Pareira six drachms;
Boiling water one pint.

Infuse for two hours in a covered vessel, and then strain through linen or calico.

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For. Names.—*Fr.* and *Ital.* Pareira brava.—*Port.* Abutua; Pareira brava.—*Ger.* Griewurzel.

Figure of Cissampelos Pareira in Woodville, Med. Bot. t. 82.—Carson, Illust. 8.

This root, which was admitted for the first time into the last editions of the London and Edinburgh Pharmacopœias, has, nevertheless, been an article of the European Materia Medica for urinary complaints since the close of the seventeenth century, when it was made known by Marcgrav and Piso in their Natural History of Brazil.

Natural History.—Though referred by the Colleges to *Cissampelos Pareira*, doubts have arisen as to the exact species which produces it. The root of this species, which is a native of the South American main, as well as of the West Indian Islands, and is known on the Continent by the name of Parreyra-brava (Wild vine, *Portug.*), and on the Islands, by that of Velvet-leaf,—has been long used in both situations as a bitter tonic and diuretic. But according to Auguste St. Hilaire, a different species, the *C. glaberrima*, furnishes the true root, or Red Pareira of Brazil,—the country whence the remedy was first introduced into Europe. And Aublet, referring a variety of the drug, distinguished by the name of White Pareira, to the *Abuta subrufescens*, another plant of the same family, adds that the Red Pareira is obtained from a variety of this species. All these plants are climbers, belonging to the Natural family *Menispermaceæ*, and to Linnæus's class and order *Diœcia Monadelphia*.

Fig. 153.

C. pareira.
1. Separate flowers. 2. Embryo. 3. Calyx.

Chemical History.—The root is imported in roundish pieces, from half an inch to four inches in diameter, from four inches to four feet in length, and often slit longitudinally. These consist of a thin, grayish-brown, firmly-adhering epidermis, somewhat wrinkled, covered transversely by annular elevations, and spotted, especially the larger pieces, with knotty excrescences—and of a reddish, woody interior, composed of concentric rings, very porous, and easily split. It is without odour, but has an intensely bitter, somewhat aromatic taste, preceded by sweetness. It readily imparts its taste and active properties to water; and through means of this menstruum are obtained the officinal *Infusum* and *Extractum pareiræ*. The decoction, preferred by some, has no real advantage over the infusion. A better preparation than either would be a solution obtained with cold water by percolation, as in the Edinburgh formula for obtaining the extract; because the product, as it does not contain the starch of the root, is less apt to decay. The chemical composition of the root has been successfully examined by Wiggers, who ascertained that the active part is an alkaloidal uncrystallizable principle, insoluble in water, soluble in ether, alcohol and acids, and of an intense, sweetish bitterness. It has been named Cissampelina or Pelosa.

Actions and Uses.—Pareira-root is considered to be a tonic, diuretic and aperient, and likewise to possess specific virtues over various disorders of the urinary organs, more especially chronic inflammation of the bladder. A care-

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ful inquiry into its physiological actions is much wanted; for some have failed to observe the diuretic and aperient properties ascribed to it by others; and they are disposed to think, as would be anticipated alike from its sensible qualities and its place in the natural arrangement of vegetables, that it is nothing else than an excellent tonic bitter, akin to calumba. The authority of Sir B. Brodie, who recommended it in chronic urinary diseases, and especially in chronic inflammation of the urinary bladder, brought it into general employment. The information communicated to me on this point by various surgeons here who have made trial of it, is not in its favour. When first used currently in Europe at the close of the seventeenth century, it was thought capable of curing stone in the bladder.

The doses of its preparations are: *Infusum pareiræ*, E. L., fl. unc. i. ad fl. unc. iv. *Extractum pareiræ*, E. L., gr. x. ad scr. i.

PASTINACA OPOPONAX. See *Opoponax*.

PETROLEUM, *E.* PETROLEUM BARBADENSE, *L. D.* *Petroleum; Rock-oil; Barbados-tar, L. D.*

For. Names.—*Fr.* Pétrole.—*Ital.* Petrolio.—*Span.* Petroleo; Aceyte mineral.—*Port.* Petroleo.—*Ger.* Steinöl; Bergöl.—*Swed.* Bergolja.—*Dan.* Steenolie; Peterolie.—*Arab.* Neft.—*Tam.* Mun tylum.—*Beng.* Muttie ka tel.

Although this old remedy is retained in the British Pharmacopœias, it is all but abandoned in practice. Indeed, I question whether it is used by a single practitioner in this part of the kingdom; and scarcely any druggist keeps it. It is a natural production, being met with as a mineral in various parts of the world. Several forms of bitumen occur in the mineral kingdom, such as asphalt, which is always hard and brittle,—mineral pitch, which is brittle in cold weather, but soft and pliant at a moderate heat,—mineral tar, which is viscid at all ordinary temperatures,—petroleum, which is a thick fluid at ordinary temperatures,—and naphtha, a yellowish, ethereal, very mobile, and very light liquid.

Natural History.—Petroleum, the only officinal species, is found floating on the water of some springs in this country. In Barbados it is produced in the same way in considerable quantities. At Trinidad it forms great beds or lakes. Near Rangoon it may be obtained to an indefinite extent, on digging into the soil in the warm season. The London and Dublin Colleges have restricted the source of supply unnecessarily to Barbados. Whatever properties petroleum may possess, they will be found, probably, in greater force in that of Rangoon than in any other sort.

Chemical History.—It differs much in characters and composition as produced in different places. That of Barbados and Trinidad has a dusky greenish-brown colour, a peculiar, not agreeable, bituminous odour, and the consistence of very thick cream or treacle. Under exposure to the air it gradually hardens to the consistence of pitch. Heat increases its liquidity, but does not render it a thoroughly mobile fluid; and a higher heat expels a naphthous liquid, whose properties have not been carefully examined. Acids, alkalis, and rectified-spirit have little effect on it. Ether becomes green when shaken with it; and the oils, fixed, as well as volatile, dissolve it. It consists chiefly of carbon and hydrogen, with a little oxygen and nitrogen. The petroleum of Rangoon has also a dark greenish-brown colour, a strong, rather fragrant odour, and the consistence of lard in warm weather. When heated to 90° it becomes a very mobile liquid. Acids, alkalis, and rectified-spirit, ether, fixed oils and the volatile oils, act as upon the other variety. Heat expels a naphthous fluid in great quantity and afterwards a crystalline principle. The latter I discovered to be paraffin; and, indeed, the properties of this principle, as derived from Rangoon petroleum, were ascertained before

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the discovery of it in tar by Reichenbach was known in this country. In the naphthous fluid, which closely resembles native Persian naphtha, Dr. Gregory afterwards discovered eupion, another of Reichenbach's products of destructive distillation. It appears, then, that Rangoon petroleum is the product of the destructive distillation of vegetable matters; while in all probability most other varieties have not been subjected to this process.

Actions and Uses.—Petroleum has at different times been recommended as a remedy for various diseases, especially as a vermifuge, as an application for diseases of the skin, and as a liniment for rheumatism. So recently as 1808, Lucas, a German physician, recommended it both inwardly in the form of emulsion, and externally in the way of friction over the abdomen, as an effectual means of curing tapeworm (Mérat). It is probably as good an application for lepra, psoriasis and other scaly diseases as tar; whose virtues are undeniable. In the East-Indies the Rangoon petroleum, for some time after the Burmese war, came into considerable repute as a liniment for all forms of neuralgia. Those varieties which, like the Rangoon petroleum, abound in naphtha, are probably narcotic poisons in large doses.

[PETROSELINUM, *U.S.* SECONDARY. *The root of Apium petroselinum, L. W. Parsley Root.*

FOR. NAMES.—*Fr.* Persil.—*Ger.* Petersilie.—*Ital.* Prezzemolo.—*Span.* Perexil.

FIGURED as Apium petroselinum in Woodville, Med. Bot. 45;—as Petroselinum sativum in Nees and Ebernmair, Pl. Med. 283.

Natural History.—Parsley is a native of shady rocks in the south of Europe and the Levant, and is generally cultivated in gardens in Europe and the United States. It belongs to the Linnæan class and order *Pentandria Digynia*, and to the Natural order *Umbelliferæ*, DC., or *Apiaceæ* of Lindley. It has a biennial, or if not allowed to flower, a perennial root, which gives rise to a striated round stem from eighteen inches to two feet in height, which is much branched in somewhat a corymbose manner. The radical leaves are biternate, on long channelled petioles, with rhomboidal ovate leaflets. The upper leaves are mostly three parted, with linear segments. The flowers are in terminal and axillary, pedunculate umbels, of five to eight rays. The general involucre is wanting, or is of a single leaf or sometimes two. The involucre is of five or six short, subulate leaves. The petals are greenish-white. The fruit is ovate, of a pale greenish-brown.

Parsley flowers in June, and is well known on account of its leaves, which are much used for culinary purposes. A variety is often met with, having the radical leaves of a larger size and much curled at the edges. The whole herb possesses a peculiar aromatic odour. The root, which is the officinal part, is fusiform and fleshy; both it and the other parts of the plant contain an essential oil on which the properties depend. M. Braconnot obtained from the root a peculiar gelatinous substance, somewhat similar in appearance to pectic acid, which he calls Apiin. The root becomes quite bland by boiling or by long keeping, and should always be used in a fresh state.

Actions and Uses.—The root has attained some celebrity as a diuretic, in dropsy and affections of the kidneys and bladder. Dr. Chapman speaks of it in high terms in dropsical complaints, and it has been found advantageous in suppression of urine and strangury, especially in children. It is best given for these purposes in a strong infusion, The seeds have been used as carminative and also as diuretic. The leaves have been considered beneficial as an application to contusions, and to swelled breasts, and enlarged glands; and Lallemand states that the oil in doses of three or four drops a-day gradually increased, is very efficacious in acute gonorrhea.]

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[PHYTOLACCÆ BACCÆ, *U.S.* SECONDARY. *The berries of Phytolaccæ decandra, L. W. Big. Poke Berries.*

PHYTOLACCÆ RADIX, *U.S.* SECONDARY. *The root of Phytolaccæ decandra. Poke-root.*

FIGURED in Bigelow, Med. Bot. 3.—Barton, Veg. Mat. Med. 48.

Natural History.—The Poke is a native of, and abundant in almost every portion of the United States, growing in new cleared spots, along fence-rows, and on the borders of thickets and woods. It belongs to *Decandria Decagynia* of the sexual arrangement of plants, and to *Phytolaccaceæ* in the Natural orders. The root is perennial, very large and fleshy; the stems are annual, from six to eight feet high, round, smooth, much branched, green when young, but purplish as they become old. The leaves are scattered, petiolate, ovate-oblong, smooth on both sides, entire and acute at each end. The flowers are in long pedunculated racemes, opposite to the leaves; they are greenish-white and are succeeded by dark purple berries, marked with ten furrows on the sides, and flattened above and below. It flowers in July, and ripens its fruit in the autumn. The young shoots, when they first emerge from the ground, are used as a substitute for Asparagus, but when they attain any size, are apt to cause catharsis. The ashes of the stem and leaves contain a large proportion of potash, in union, in the plant, with an acid resembling the malic.

Fig. 154.

P. decandra.

The root, berries and root are used in medicine, the first two being officinal. The berries abound in a rich purple juice; they have a sweetish, unpleasant, somewhat acrid taste, and a peculiar feeble odour. The colouring matter is extremely fugitive, and much cannot be applied for tinctorial purposes. The root is dried in transverse slices, when it is of a light brown externally, somewhat wrinkled, and presenting on the cut surface, numerous concentric rings; in a fresh condition, these rings are alternately light brown and yellowish-white, but change to a uniform shade of brown, when the root has been kept for some time. The taste is somewhat sweetish, followed by a sensation of acrimony. In a fresh state the odour is not unlike that of Ginseng, but this disappears by keeping. It should be collected for medicinal purposes late in the fall; and the berries when they have attained their full maturity. From an analysis by Mr. Donnelly (*Amer. Jour. Pharm.*, ix. 165), it is shown

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that the root contains gum-resin 2.62, starch 20, potash 2, a small portion of a fixed oil, &c. with 66.5 of lignin.

Actions and Uses.—The root is actively emeto-cathartic, and also displays some cathartic powers, and in over doses it causes most of the symptoms of the acro-narcotics. Mr. Donnelly (loc. cit.) states that he has known the dust arising during the process of powdering it, to produce all the symptoms of a severe coryza, accompanied with headache, purging, and prostration of strength. It has been proposed as a substitute for Ipecacuanha, but its tendency to act on the bowels, and its tardiness of operation, militate against its use. Drs. Jones, and Kollock, of Savannah, state that it is an effectual remedy for syphilis in its various stages, and that it is very beneficial in rheumatism and chronic eruptions (Coxe). The extract of the root, or of the whole plant, according to Dr. Shultz, is efficacious in the treatment of scabies and herpes, and in syphilitic rheumatism allays pain more speedily than opium. The extract is also employed in domestic practice, as an application to indolent ulcers.

The berries in the form of extract or tincture, have obtained some celebrity in rheumatism, and the fruit is stated to be beneficial in scrofula, and as a dressing to cancerous sores. An ointment made with a drachm of the powdered leaves or root, to the ounce of lard has been successfully employed in obstinate cutaneous affections. It has also been asserted that a strong infusion of the leaves is an excellent remedy in painful hemorrhoids, given internally, and used as a wash. These leaves are somewhat purgative, but are principally employed as external applications. Martius states that a cataplasm of the whole plant has much reputation in Brazil as a dressing to ill-conditioned ulcers.

The dose of the powdered root as an emetic, is from ten to thirty grains; as an alterative from one to five grains, and of the tincture about a fluidrachm, three or four times a-day.]

PIMENTA, *U.S. E. L. D. Unripe berries of Eugenia Pimenta. DC. (Edin.) of Myrtus Pimenta, L. W. (Lond. Dub.) Pimento.*

AQUA PIMENTÆ, L. E. D. *Pimento Water.*

PROCESS, *Edin. Lond.* Take of
Pimento bruised a pound (or pimento-oil two drachms, *L.*);
Water two gallons;
Rectified spirit three (proof spirit seven, *L.*) fluidounces.
Mix them and distil off one gallon.

PROCESS, *Dub.* Take of
Pimento half a pound;
Water enough to prevent empyreuma.
Macerate for twenty four hours and distil off a gallon.

OLEUM PIMENTÆ, U.S. L. E. D. *Oil of Pimento.*

PROCESS. To be prepared according to the general directions for distilling volatile oils. See *Introduction.*

SPIRITUS PIMENTÆ, U.S. L. E. D. *Spirit of Pimento.*

[PROCESS, *U.S.* Take of
Pimento bruised two ounces;
Diluted alcohol a gallon;
Water a pint.
Macerate the pimento in the diluted alcohol for twenty-four hours, add the water, and with a slow fire, distil a gallon.]

PROCESS, *Edin.* Take of
Pimento bruised half a pound.
Proceed as for *Spiritus carui.*

PROCESS, *Lond.* To be prepared like *Spiritus Myristicæ.*

PROCESS, *Dub.* Take of
Pimento bruised three ounces;
Proof spirit one gallon;
Water enough for preventing empyreuma.
Macerate for twenty-four hours, and distil off a gallon.

FOR. NAMES—*Fr.* Piment; Poivre de la Jamaïque.—*Ital.* Pepe d'India.—*Port.* Pimenta da Jamaica.—*Ger.* Nelken-pfeffer; Englisch gewurz.—*Dut.* Jamaica-peper.—*Swed.* Krydd-peppar.

FIGURES of Eugenia Pimenta, Carson, Illust. 36;—as Myrtus Pimenta in Nees von E. 298.—Hayne, x. 37.—Sloane's Jamaica, ii. t. 191.—Engl. Bot. 1236.—Steph. and Ch. ii. 124.

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PIMENTO, ALL-SPICE, or JAMAICA-PEPPER, has been known in Europe for at least two centuries.

Natural History.—It is produced by the *Eugenia Pimenta* of Decandolle and Lindley, or *Myrtus Pimenta* of other botanists, a native of the West-Indies and of Mexico. It belongs to the Linnæan class and order *Icosandria Monogynia*, and to the Natural family *Myrtaceæ* of Lindley, or *Myrtineæ* of Decandolle. It is a beautiful tree towards thirty feet in height. It flowers from June to August, and bears berries about the size of a small pea. These when ripe are viscous on the outside, and possess little aroma; but if gathered while green and not quite ripe, they are, like most parts of the tree, powerfully aromatic. When dried, they are brownish-black, round, rough, and crowned with the teeth of the calyx. They consist of a rind, which is yellowish internally, enveloping two dark-brown seeds. They have a strong aromatic odour, and a hot aromatic taste, combining that of cinnamon, nutmeg, and cloves,—whence is derived one of their vernacular names, All-spice. The taste and odour are stronger in the rind of the berry than in the seed.

Chemical History.—The aroma is readily communicated to water, alcohol, or proof-spirit, and passes over in distillation with any of these fluids, constituting the *Aqua* and *Spiritus pimentæ*. This aroma depends on an acrid volatile oil, which may be obtained from the berries by distillation with water in a proportion varying from a fiftieth (Braconnot) to a sixteenth (Hagen). The oil, the *Oleum pimentæ* of the Pharmacopœias, somewhat resembles oil of cloves, which is derived from a different plant of the same Natural family. It is reddened by nitric acid. It consists of two oily principles,—one lighter than water, a pure, neutral hydro-carbon,—and the other heavier than water, and capable of uniting with alkalis (Pereira). Hence they may be separated by distilling the oil with solution of potash. The light oil passes over; while the other, which remains behind, may be detached from the potash by sulphuric acid. Bonastre found the rind of pimento-berries to consist of 10 per cent. of volatile oil, 8 green fixed oil, 1.2 resin, 11.4 astringent extract, and 50 lignin, with some gum, sugar, colouring matter, and various salts; and the seeds are similarly composed, but contain only half the proportion of volatile oil, and three times as much astringent extract. Very different results, however, have been obtained by Braconnot; who says the entire fruit consists of 2 per cent. of volatile oil, 1 reddish wax, 6 gum, 9 starch, 5 azotized matter, 6 citrate of potash, 3.4 calcareous salts, and 67.8 lignin.

Adulterations.—Pimento is said by some German authors to be occasionally adulterated with the berries of Cocculus-indicus, to which it bears some distant resemblance. The adulteration is known by the abscence of the persistent calyx, and the intense bitterness of the seed, without any aroma.

Actions and Uses.—Pimento is a good deal used as a hot aromatic in cookery, but very little in medicine. It possesses the stimulant, stomachic, and carminative properties of the hot aromatics generally. It enters into the composition of the London and Dublin *Syrupus rhamni*, the griping tendency of which is diminished by this addition.

The doses of its preparations are: *Pulvis pimentæ*, gr. x. ad gr. xxx. *Aqua pimentæ*, fl. unc. i. ad fl. unc. iv. *Spiritus pimentæ*, fl. dr. i. ad fl. dr. ii. *Oleum pimentæ*, min. ii. ad min. v.

PIMPINELLA ANISUM, *D.* See *Anisum.*

PINUS ABIES, &c., *D.* See *Terebinthina.*

PIPER CUBEBA, *L. D.* See *Cubeba.*

PIPER LONGUM, *E. D.* *Dried spikes* (*Seeds, D.*) *of Piper longum, L. W. Spr. Long Pepper.*

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For. Names.—*Fr.* Poivre long.—*Ital.* Pepe lungo.—*Span.* Pimienta lunga.—*Port.* Pimenta longa.—*Ger.* Langer pfeffer.—*Dut.* Lange peper.—*Swed.* Lang peppar.—*Russ.* Perets dlinnoi.—*Arab.* Dar filfil.—*Pers.* Filfili daraz.—*Tam.* Tipilie.—*Beng.* Pipili.—*Hind.* Pipel.

Figures of Piper longum in Nees von E. 23.—Van Reede, vii. 14.—Steph. and Ch. iv. 174.

Long-pepper has been usually referred to the *Piper longum*, a creeper belonging to the Linnæan class and order *Diandria Trigynia*, and to the Natural family *Piperaceæ*, which grows naturally in bushy places in the Circars on the Indian continent, and is also extensively cultivated in Bengal. But Miquel, subdividing the extensive genus *Piper*, refers it to three species of his new genus *Chavica*, the *C. officinarum*, which yields the long-pepper of the Philippines, and *C. pepuloides* and *C. Roxburghii*, the sources of the article from the Indian continent. Long-pepper consists of long, somewhat cylindrical bodies, from an inch to an inch and a-half in length, and about two lines in thickness, grayish-brown in colour, and covered with little eminences in spiral rows, containing each a seed of the size of a small pin's head. These cylinders are composed of numerous little berries closely united to one another. They have an aromatic odour, and an intense fiery taste like that of black-pepper. Their chemical composition, according to the analysis of Dulong, is nearly the same with that of black-pepper, as described under that article.

Long-pepper possesses the properties of the hot aromatics, and in this respect is identical with black-pepper, for which it is sometimes used both in cookery and in medicine. It is, however, a needless addition to the Pharmacopœias.

PIPER NIGRUM, *E. L. D.* PIPER, *U.S.* *Dried (unripe, E.) berries (seeds, D.) of Piper nigrum, L. W. Spr.* *Black-pepper.*

Confectio Piperis, E. L. D. *Confection of Black Pepper.*

Process, *Edin. Lond. Dub.* Take of
Black-pepper and
Elecampane (liquorice-root, *E.*), of each one pound;
Fennel three pounds;
Honey and
White sugar, of each two pounds.
Triturate the solids together into a very fine powder, and heat the whole into a uniform mass.

Unguentum Piperis, D. *Ointment of Black Pepper.*

Process, *Dub.* Take of
Prepared axunge a pound;
Black-pepper, in powder, four pounds.
Make them into an ointment.

For. Names.—*Fr.* Poivre; Poivre noir.—*Ital.* Pepe.—*Span.* Pimienta nera.—*Port.* Pimenta negra.—*Ger.* Schwarzer pfeffer.—*Dut.* Gemeene peper.—*Swed.* Swarteller starkpeppar.—*Dan.* Sort peber.—*Russ.* Perets tschernoi.—*Arab.* Tilfil uswud.—*Pers.* Tilfil seeah.—*Tam.* Mellaghoo.—*Hind.* Meerch.—*Beng.* Kali mirchaï.

Figures of Piper nigrum in Nees von E. 21.—Bot. Mag. 3139.—Roque, 176.—Hort. Mal. vii. 12.—Steph. and Ch. iv. 174.—Carson, Illust. 83.

Black-pepper is the Πεπερι of Dioscorides and other Greek physicians, who probably derived their knowledge of its properties from India, its native country.

Natural History.—It is produced by the *Piper nigrum*, a plant of Linnæus's class and order *Diandria Trigynia*, and of the Natural family *Piperaceæ*. It is a native of the East-Indian continent, as well as of many islands in the Indian Ocean; and it is extensively cultivated in various parts of the East and West-Indies. The plant is a climber or trailer, which, like the ivy, strikes root as it spreads, and clings to adjoining objects. The fruit is produced in the form of sessile berries closely set on slender spikes from three to six inches long. These ripen in irregular succession throughout the whole year, becoming first green, then red, and finally black. Black-pepper is the entire berry collected and dried in its red state, when not quite ripe; and it

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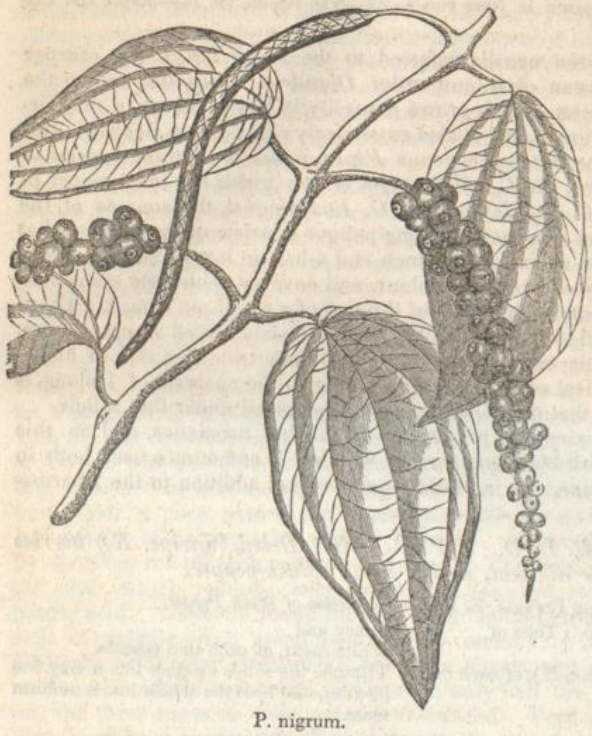
consists of a shrivelled pulp enveloping a single seed. When allowed to ripen, and then divested of its husk, it constitutes the White-pepper of the shops. Black-pepper is imported chiefly from the East Indian islands, and especially from Sumatra. The imports amount to over 2 millions of pounds annually (Pereira).

Fig. 155.



P. nigrum.

Chemical History.—It is of the size of a small pea, roundish, but somewhat wrinkled, dark brownish-black externally, and composed of a dark tegument covering a grayish-yellow globular seed. It has a peculiar aromatic odour, and a fiery, bitterish taste. It imparts its acrimony readily to water, but still more readily to alcohol or proof-spirit. White-pepper has the same taste and odour but in a milder degree. These peppers have been analyzed by Oersted, by Pelletier, and by Lucae. They consist of an acrid resin, a little bland volatile oil, and a neutral crystalline principle called Piperin, together with some starch, bassorin, arabin, extractive matter, malic and tartaric acids, various salts and lignin. Their active properties reside chiefly in the resin and piperin. The resin is soft, most intensely acrid, soluble in alcohol and ether, and much more abundant in black than in white pepper. Piperin, when quite pure, which it is rendered with difficulty, forms colourless, rhombic prisms, insoluble in water, soluble in alcohol, ether, or acetic acid, fusible at 212°, neutral, and capable of producing red solutions with nitric and sulphuric acids. It is said to be bland when quite pure; but the whitest crystals I have been able to obtain were as acrid as those which were brownish, and they emitted an intensely irritating vapour when thrown on a heated iron plate. It exists both in black and white pepper; but most abundantly in the latter. It is best obtained by exhausting ground white-pepper with cold rectified spirit, by percolation, distilling off most of the spirit, and purifying the crystals which slowly form in the residuum by repeatedly crystallizing them from rectified spirit or pyroligneous acid. It is said to consist of thirty-four equivalents of carbon, nineteen of hydrogen, six of oxygen and one of nitrogen,—$C^{34}H^{19}O^{6}N$ (Liebig).

Actions and Uses.—Black pepper is the most familiar of the hot aromatic

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condiments. It is a tonic, stimulant, carminative, and febrifuge. It is in universal use as a stomachic. It is not much employed in medicine except for correcting the tendency of other drugs to excite nausea. It forms an important part of the *Confectio piperis*, an imitation of Ward's paste, which has been for some time an approved nostrum in hæmorrhoids. Black pepper is one of the many hot aromatics which have been held to possess the property of arresting ague. In very large doses it is probably an irritant poison.

The doses of its officinal preparations are: *Confectio piperis*, dr. ss. ad dr. i.—*Pulvis piperis*, gr. v. ad gr. x.

PISTACIA LENTISCUS, *D.* See *Mastiche.*

PISTACIA TEREBINTHUS, *D.* See *Terebinthina Chia.*

PIX. See *Terebinthina.*

PLUMBUM. *Lead.*

For. Names—*Fr.* Plomb.—*Ital.* Piombo.—*Span.* Plomo.—*Port.* Chumbo.—*Ger.* Bley.—*Dut.* Lood.—*Swed.* Bly.—*Dan.* Blye.—*Russ.* Svinets.—*Arab.* Anuk.—*Pers.* Surb.—*Tam.* Eeum.—*Hind.* Sisa.—*Beng.* Sheesh.

Although lead in the state of metal is not now employed in any of the British Pharmacopœias, its chemical, medicinal, and toxicological relations are so important, that a few observations on the subject will not be out of place here.

Natural History.—Lead appears to have been known from a very early period. It occurs rarely native, but abundantly throughout most parts of the globe in the form of sulphuret, carbonate, sulphate, and phosphate. It is chiefly obtained from the sulphuret, or galena, and from the carbonate, or white lead,—from the latter, by reduction with carbonaceous matter, to which lime is often added,—from the former, by roasting it in a reverberatory furnace, with certain additions and precautions which it is unnecessary to detail.

Chemical History.—Lead has a bluish-gray colour, with great brilliancy on a fresh surface. It is so soft as to take the impression of the nail, and to be easily cut with a knife. It bends easily, and is moderately malleable, but not so ductile. Its density is 11.38. It fuses about 612°, and may be crystallized from a state of fusion in octaedres. It has not yet been sublimed. It is soon tarnished under exposure to the air, and a thin whitish crust gradually forms over its surface. The same change takes place much more quickly when the lead is placed under distilled water; and at the same time minute foliaceous crystals of a white colour, and brilliant pearly lustre are abundantly formed. The chemical action here consists in the lead combining with oxygen and water to form hydrated oxide of lead, and then with the carbonic acid of the atmosphere to form a carbonate of lead, which consists of two equivalents of neutral carbonate and one of hydrated oxide. The action is impeded by the coexistence of any neutral salts in the water; and some salts whose acids form very insoluble compounds with oxide of lead prevent the action entirely in very minute proportion. Lead unites with oxygen in no less than four proportions, forming a gray or dinoxide, a yellow or protoxide, a brown binoxide which has acid properties, and a red oxide which is a compound of the protoxide with the binoxide. The second and fourth of these are officinal. It also unites with sulphur to constitute the ore galena or lead-glance, from which most of the lead of this country is obtained. It unites likewise with chlorine to form a crystalline chloride. Its protoxide combines readily with the acids, forming salts which are generally colourless and crystallizable, and which differ greatly in solubility. All its compounds, which are somewhat soluble, present the singular combination of astringency

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and sweetness; and some of them, such as the acidulous citrate, possess the latter property in considerable purity. Of its saline compounds the acetate, diacetate, carbonate, nitrate, chloride, and iodide, together with a mixture of various fatty salts, constituting litharge-plaster, are more or less used in medicine or pharmacy.

Adulterations.—The lead of commerce always contains a trifling admixture of other metals, especially iron and copper. Iron and copper may be detected by dissolving the lead in diluted nitric acid, precipitating the lead with a slight excess of sulphuric acid, and then adding ammonia to the filtered solution; upon which the fluid becomes violet if copper be present, and yields a yellow precipitate if iron also co-exist.

Actions and Uses.—The Medicinal Actions of lead will be most conveniently treated of under the head of its principal preparation, the acetate. In the present place it may be well to notice its peculiar properties as a poison. Few substances possess so singular an action as lead upon the body. When it is introduced into the animal system in small but often repeated doses for a series of months, it produces a constitutional state so peculiar as to be aptly called Plumbism, in the same manner as iodism and mercurialism are spoken of among the effects of iodine and of mercury. It thus induces in the first instance severe dyspepsia, with obstinate constipation and gloominess of mind; and if these warnings be neglected, there ensues a peculiar variety of colic, distinguished by the violence of the fits, their duration, and their obstinate tendency to recur. From this state some recover under proper treatment without any farther symptoms. But others are seized sooner or later either with symptoms like those of apoplexy, which prove fatal, or with a singular sort of palsy affecting all the muscles more or less, but especially those of the arms, and above all the balls of the thumbs and extensors of the fingers. The paralytic affection is commonly incomplete, always very obstinate, yet for the most part curable under tonic treatment, graduated exercise, attention to the bowels, and avoidance of fresh exposure to the cause of the disease. It is usually accompanied with dyspepsia, tendency to constipation and colic, great lassitude, restlessness, anxiety and gloominess of spirits. A peculiar symptom said to attend almost invariably the constitutional action of lead, is a blue line upon the gums, where they touch the teeth (Burton). Lead-colic or Colica pictonum, and lead palsy, may be occasioned by handling any of the preparations of lead or breathing their dust. An attempt has been made by Dr. A. T. Thomson to show, that no preparation possesses this property except the carbonate; but doubts may be entertained of the accuracy of that conclusion. The risks which workmen encounter, who are constantly in contact with lead and its compounds, may be in a great measure averted by scrupulous attention to cleanliness, and by proper contrivances to prevent dust and maintain ventilation in their workshops. When a tendency to lead-colic or palsy has once shown itself, the only effectual corrective is abandonment of the occupation which is the source of exposure.

Lead is chiefly used in Pharmacy for making the nitrate, and also for fabricating various pharmaceutic utensils. In regard to the latter application of it, care should be taken not to preserve distilled-water, rain, snow-water, or the distilled waters of plants in contact with lead, otherwise carbonate of lead forms in abundance, and the water also contains a trace of lead in solution. Neither ought ordinary terrestrial waters to be kept very long in leaden vessels, because the same changes, though not appreciable in a few days or weeks, are nevertheless accomplished in the course of time. Acidulous fluids also, such as fluids containing the vegetable acids, ought not to be kept in contact with lead, since the lead gradually becomes oxidated at the expense of the oxygen in the atmosphere, and is then dissolved.——Sheet-lead has

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been employed as an application for indolent ulcers. Its alleged good effects are probably owing to the protection and support which it supplies; but may also depend, as some imagine, upon the astringent action of the carbonate of lead formed on its surface.

PLUMBI ACETAS, *U.S. E. L. D.* *Acetate of Lead.*

TESTS, *Edin.* Entirely soluble in distilled water acidulated with acetic acid: Forty-eight grains thus dissolved are not entirely precipitated by a solution of thirty grains of phosphate of soda.

TESTS, *Lond.* Soluble in distilled water. In this solution carbonate of soda occasions a white, iodide of potassium a yellow, and sulphuretted-hydrogen a black, precipitate. Sulphuric acid evolves acetous vapours; and heat first fuses and then reduces it.

PROCESS, *Edin. Lond.* Take of
Pyroligneous acid, of the density 1034, two pints (acetic acid four pints, *L.*);
Distilled water one pint (four, *L.*);
Litharge fourteen ounces (four pounds and two ounces, in powder, *L.*).
Mix the acid and water, add the litharge, dissolve it with the aid of a gentle heat, filter, and concentrate the solution sufficiently for crystallization on cooling.

PROCESS, *Dub.* Take any quantity of carbonate of lead, and ten times its weight of distilled vinegar. Digest them in a glass vessel till the vinegar becomes sweet. Pour off the liquor, add more vinegar, and proceed as before. Filter the liquors and crystallize the salt by alternate slow evaporation and cooling. Dry the crystals in the shade.

PILULÆ PLUMBI OPIATÆ, E. *Opiate Pills of Lead.*

PROCESS, *Edin.* Take of
Acetate of lead six parts;
Opium one part;
Conserve of red-roses about one part.
Beat them into a proper mass, which is to be divided into four-grain pills.—This pill may be made also with twice the quantity of opium.

UNGUENTUM (CERATUM, L.) PLUMBI ACETATIS, E. L. D. *Ointment of Acetate of Lead.*

PROCESS, *Lond.* Take of
Powder of acetate of lead two drachms;
White-wax two ounces;
Olive-oil eight fluidounces.
Dissolve the wax in seven fluidounces of the oil, add gradually the acetate previously triturated with the rest of the oil, and stir the mixture as it concretes.

PROCESS, *Edin.* Take of
Simple ointment twenty ounces (see *Olivæ Oleum*);
Acetate of lead, in fine powder, one ounce.
Mix them thoroughly.

PROCESS, *Dub.* Take of
Ointment of white-wax a pound and a-half;
Acetate of lead an ounce.
Make an ointment.

FOR. NAMES.—*Fr.* Acetate de plomb; Extrait de Saturne.—*Ital.* Acetato di piombo; Zucchero di Saturno.—*Ger.* Einfach essigsaures bleioxyd; Bleizucker.—*Russ.* Uksusnokisloi svinets.

ACETATE OF LEAD (Sugar of lead; Superacetate of lead; *Saccharum saturni*) has been known at all events so early as in the time of Basil Valentine in the fifteenth century. It is an artificial production, and is prepared on the great scale by the manufacturing chemist for a variety of purposes in the arts, in many of which it is extensively used. On this account, and because it may be readily obtained of good quality, the Colleges might dispense with a process for making it.

Chemical History.—The process of the Dublin College is unnecessarily costly, in so far as it requires an expensive preparation both of acetate acid and of lead; white-lead, besides, is much subject to adulteration; and the weakness of the acid involves much trouble in concentrating the solution. The process of the two other Colleges, which consists in simply dissolving the protoxide of lead in diluted pyroligneous acid, is considered to be one of the methods followed by British manufacturers. For the success of the process it is desirable that the pyroligneous acid be colourless. Should the acid be faulty in that respect, and the crystallized salt be consequently also discoloured, it may be purified by fusing it quickly but cautiously, dissolving it with a slight excess of acetic acid, and crystallizing it anew (Geiger). Another

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but more tedious process a good deal practised on the large scale, consists in hanging lead-plates in distilled vinegar or diluted pyroligneous acid, so that one-half of the plates shall be immersed while the other is exposed to the air, and turning them from time to time, as the upper halves become covered with oxide. A saturated solution is at length obtained, which is crystallized by evaporation and cooling. This result is obtained more speedily by sprinkling weak acetic acid over coarsely granulated lead, contained in covered vessels, upon which oxide of lead is immediately formed, with the disengagement of heat,—then dissolving out the oxide by means of more diluted acid, which is saturated by passing it through several vessels in succession,—and repeating the sprinkling and solution alternately till the lead is consumed (Geiger). Whatever method be followed, it is always necessary that a slight excess of acid be present, in order to obtain a perfect and easy crystallization.

The acetate of lead of the shops has usually the appearance of a confused white mass of interlaced needly crystals, possessing an acetous odour, and a powerful sweet astringent taste. It crystallizes in transparent, colourless right-rhombic prisms,—terminated at each extremity by two converging planes placed upon the acute angled edges,—or truncated on two edges so as to form six-sided prisms. It effloresces slightly in the air, parting at the same time with a little of its acid. In the air-pump vacuum, and with the acid of sulphuric acid or quicklime to absorb water as it escapes, the acetate of lead falls into a white powder, which is completely anhydrous. The crystallized acetic when heated, fuses in its water of crystallization: at a heat of 320° its whole water, with a small proportion of its acid, is speedily discharged, and a heavy white opaque mass remains: a higher heat fuses it again, decomposes it, and disengages acetate acid and acetone or pyro-acetate spirit: and as the temperature rises farther a brownish-black mass is formed, which when urged with a stronger heat, yields globules of metallic lead. It is soluble both in water and in rectified spirit. Temperate water dissolves from a fourth to three-fifths of its weight, according to different authorities. There is always some muddiness produced when it is dissolved, because the carbonic acid in the water unites with a little excess of oxide of lead, commonly contained in the acetate; or combination takes place between the oxide and a trace of organic matter, which almost all waters present more or less in solution. The muddiness is removed by a few drops of acetic acid. The solution faintly reddens litmus, but rather turns syrup of violets green. It is precipitated black by sulphuretted hydrogen, yellow by iodide of potassium, yellow by bichromate of potash, white by the alkalis, white by their carbonates and sulphates,—the respective precipitates being sulphuret, iodide, chromate, hydrated oxide, carbonate, and sulphate of lead. A plate of zinc slowly separates the lead in the form of beautiful arborescent foliaceous crystals, and the zinc takes the place of the lead in the solution. The best mode of detecting lead in a state of complex mixture in organic substances is to heat the substance with water containing some nitric acid, to treat the filtered solution with sulphuretted-hydrogen, and to reduce the sulphuret on charcoal with the blowpipe. If no dark precipitate be occasioned by sulphuretted hydrogen, lead may still be sought for in the residue left on the filter by drying and incinerating it, heating the ashes with nitric acid, neutralizing the nitric acid, and testing the solution with any of the liquid tests mentioned above. Acetate of lead consists of one equivalent of protoxide of lead, one equivalent of acetic acid, and three equivalents of water of crystallization, ($C^4H^3O^3+PbO+3HO$

Fig. 156.

Royle.

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or $\bar{A}+PbO+3Aq$), and consequently of 51.48 parts of acid, 111.6 of base, and 27 of water.

Adulterations.—Acetate of lead is little subject to contain impurities. Copper is said to occur occasionally; but this would be too palpable an adulteration, in consequence of the bluish colour which is caused by even a slight admixture of that metal. The tests given by the London College are not of a kind to detect adulterations, but will merely determine the nature of the salt. The reactions of the tests must be obvious from what has been stated above of the properties of the dissolved acetate. The characters given by the Edinburgh College are entire solubility, and the property of decomposing a certain proportion of crystallized phosphate of soda. Complete solubility is a test which no specimen will absolutely withstand, for reasons already given; but if the salt and water be pure, a mere haze only is produced. Thirty grains of phosphate of soda and 47.66 of acetate of lead exactly decompose one another. Hence, if 48 grains, or a 140th part more of the latter salt be used, the solution will be affected after filtration by a farther addition of phosphate, provided the acetate be tolerably pure. The ordinary impurities contained in the acetate, either do not decompose phosphate of soda at all, or decompose so much less a proportion than acetate of lead, that it is plain their presence in any material quantity would leave in the solution a large excess, not of the salt of lead, but of the phosphate of soda; and consequently the farther addition of the test to the filtered fluid will have no effect. A hundredth part of impurity may easily be thus detected.

Actions and Uses.—The medicinal actions and uses of acetate of lead have within a few years become exceedingly important. It is in large doses an irritant, in medicinal doses an astringent and sedative; and in long-continued small doses it may induce the peculiar constitutional action of the preparations of lead. At one time it was thought to be a powerful irritant poison; but it is far from being energetic as such,—several drachms having been at times swallowed without occasioning more than severe sickness, some pain in the stomach, vomiting and violent griping,—and no fatal case having yet been recorded. Its best antidote is sulphate of soda, sulphate of magnesia or phosphate of soda, which should be followed by emetics if necessary, and then by alternate purgatives and opium. It has been doubted by some whether acetate of lead possesses the property, belonging to other preparations of the metal, of exciting colic and palsy when long administered in small quantities at a time. On the whole it seems to be established that both when given internally, and when used outwardly, it may have these effects; but that they are exceedingly rare when the salt is given for medicinal purposes under the observation of a medical man.

In medicinal doses acetate of lead is a powerful astringent both of dead and of living animal fibre. This property is exerted directly on the part to which it is applied, and indirectly on parts at a distance. Acetate of lead differs from most other astringents in producing at the same time a remarkable sedative effect upon the nervous system where it is applied. This action is well exemplified in the immediate arrestment of the vermicular movement of the intestines when its solution is brought in contact with them, and likewise by its marked effect in allaying pain in local inflammation. It is doubtful whether acetate of lead is generally absorbed in the course of its constitutional action as a poison, or its indirect astringent action. In animals killed by the constitutional action of the acetate I have seldom been able to detect lead anywhere throughout the body; but Wibmer says he could generally detect traces of it in the liver, lumbar muscles, and spinal chord.

The important concurrence of sedative and astringent virtues renders the acetate of lead a useful remedy for many special therapeutic purposes.

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Externally it is employed in most forms of superficial inflammation, in the early stage of which it is often singularly serviceable. Some would restrict its use to phlegmonous inflammation. But it may also be resorted to with safety, and often with great advantage, especially if united with opium, in erythema, spreading inflammation of the subcutaneous cellular tissue, and erysipelas. It is also beneficial in many cutaneous eruptions, attended with surrounding inflammation, or accompanied by itching or heat. It is usually applied in the form of solution by means of soft cloths, which ought never to be allowed to dry; or it may be applied on the surface of a poultice; and the solution commonly made use of consists of a drachm of the salt to five or eight ounces of distilled water or some aromatic water, with a scruple of distilled vinegar to maintain the oxide from being thrown down. For erythema and erysipelas, its best form and one of the best of applications, is a lotion consisting of four grains each of acetate of lead and of opium to every ounce of water. Decomposition takes place when these substances are mixed,—acetate of morphia remaining in solution and meconate of lead falling down insoluble; but the proportions here given leave an excess of acetate of lead in the lotion. In the case of cutaneous eruptions the form of ointment is usually preferred; for which the Pharmacopœias have a formula. This salt is now much used internally as a sedative astringent for diarrhœa and dysentery, pulmonary catarrh, and hæmorrhagies. It first came into general use as a remedy for the different kinds of hæmorrhagy. In hæmoptysis, hæmatemesis, hæmorrhois, hæmaturia and menorrhagia it is often serviceable; in all of which diseases it must obviously act as a constitutional, not as a topical, astringent. It is chiefly used in the passive, yet is not contraindicated in the active, forms of hæmorrhagy. In pulmonary catarrh it has been employed both in the acute and chronic forms; and it is undoubtedly sometimes beneficial in lessening and inspissating the expectoration. In dysentery and diarrhœa, its employment has of late been greatly extended. It has been chiefly employed in chronic cases, whether idiopathic, or secondary to other diseases, such as phthisis pulmonalis. For these affections there is no remedy yet known which equals in efficacy the *Pilulæ plumbi opiatæ* of the Edinburgh Pharmacopœia, each of which contains three grains of acetate of lead and half a grain of opium, and of which from two to six may be given in the course of the day, according to the urgency of the symptoms. There is no danger of constitutional effects from the long-continued use even of the largest of these doses, so long as the evacuations from the bowels are not materially diminished. I have given acetate of lead to the extent of six grains on an average daily for several months in phthisis, without any palsy, colic or dyspepsia being induced, and with good effect in retarding the progress of the affection of the bowels. In severe cases of obstinate dysentery advantage is also found in the occasional administration of an injection of ten or fifteen grains of acetate of lead in four fluidounces of water.

The doses of acetate of lead and its preparations are as follows; *Acetas plumbi*, U.S. E. L. D. gr. ii. ad gr. vi. bis terve indies. *Pilulæ plumbi opiatæ*, E. i. ad ii. bis vel ter indies. *Unguentum acetatis plumbi*, E. D. *Ceratum acetatis plumbi*, L. externally.

PLUMBI CARBONAS, *U.S. E. L. D.* *Carbonate of lead.* *Carbonate of protoxide of lead.*

Tests, *Edin.* It does not lose weight at a temperature of 212°; sixty-eight grains are entirely dissolved in 150 minims of acetic acid diluted with a fluidounce of distilled water; and the solution is not entirely precipitated by a solution of 60 grains of phosphate of soda.

Tests, *Lond.* Diluted nitric acid dissolves it with effervescence: potash causes in this solution a white precipitate, and in excess redissolves it: hydrosulphuric acid blackens it. Heat alone renders it yellow; but, along with charcoal, reduces it to the metallic state.

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UNGUENTUM PLUMBI CARBONATIS, U.S. E. D. *Ointment of Carbonate of Lead.*

[PROCESS, *U.S.* Take of
Carbonate of lead, in very fine powder, two ounces;
Simple ointment a pound.
Add the carbonate of lead to the ointment previously softened over a gentle fire, and mix them.]

PROCESS, *Edin.* Take of
Simple ointment five ounces;
Carbonate of lead one ounce.
Mix them thoroughly together.

PROCESS, *Dub.* Take of
Carbonate of lead, in very fine powder, two ounces;
Ointment of white wax a pound.
Make an ointment.

FOR. NAMES.—*Fr.* Carbonate de plomb; Cérusse.—*Ital.* Carbonato di piombo; Cerussa; Biacca.—*Span.* Albayale fino.—*Ger.* Kohlensaures bleioxyd; Bleiweiss.—*Dut.* Loodwit; Ceruis.—*Swed.* Blyhwiit.—*Dan.* Bleghvidt—*Russ.* Uglikisloi svinets; Svintsovya belila.—*Arab.* Asfidaj.—*Pers.* Suffiah.—*Tam.* Vullay.

CARBONATE OF LEAD (Cerusse, white-lead) was known to the Greeks under the name of Ψιμυθιον, and to the Romans by that of *Cerussa*, as obtained both by the exposure of lead to the air, and by one of the artificial processes still followed in modern times. It occurs in nature, and frequently crystallized in white, brilliant, prisms; but that which is used in medicine and the arts is all obtained from the chemical manufacturer.

Chemical History.—As it is prepared by the manufacturer on the large scale the colleges have not given a process for it. Various methods are followed. The most recent process consists in mixing litharge with a hundredth part of acetate of lead, making this into a paste with water and transmitting carbonic acid gas. A fine amorphous and opaque white lead is thus obtained. An old way, still sometimes practised, consists in subjecting sheet-lead to the fumes of pyroligneous acid. The acid is placed in the bottom of earthen vessels, and the lead rolled spirally is fixed a little above the acid. The vessels thus prepared are surrounded with a mixture of dung and tanner's refuse, by the heat of which the acetic acid is slowly volatilized. As its vapours rise the lead is gradually attacked, and a considerable thickness of it converted into carbonate, which after some weeks is detached, partly by beating the sheets of lead, partly by rolling them between cylinders under water. The acetic acid is not decomposed in this process so as to yield both oxygen and carbonic acid to the lead, as has been supposed, but merely acts by forming some acetate which serves as a medium for absorbing carbonic acid (Pelouse Hochstetter). Another method proposed by Thenard, and now adopted in France and Sweden, is to transmit carbonic acid through the solution of diacetate of lead,—by which means the excess of oxide is detached as carbonate, and neutral acetate is left in solution; and the same solution is used over and over again, by boiling it with litharge to restore the lead to the state of diacetate. In this way a very fine and pure carbonate is easily prepared either on the great or small scale. Lastly carbonate of lead may be got slowly by exposing lead to the action of air and distilled water (see *Plumbum*); and it may be made at once, though not economically, by double decomposition from the acetate in solution, by means of carbonate of soda.

When carbonate of lead is well prepared, it is a pure white, earthy-like, friable mass, heavy, and without taste or odour. The density of its crystals in the native state is 6.25. A moderate heat drives off the carbonic acid, and the yellow protoxide is left. It is insoluble in water, but readily soluble, with effervescence, in diluted nitric and acetic acids. The solutions present the characters mentioned above under the head of the acetate of lead. The composition of carbonate of lead varies. That obtained by the action of distilled water on lead is a compound of two equivalents of neutral carbonate and one of hydrated oxide of lead ($2\ CO^2PbO + PbOAq$). The commercial carbonate of Germany contains three equivalents of the neutral carbonate; and the composition of that of British commerce is four equivalents of carbonate and

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one of hydrate ($4\ CO^2PbO+PbOAq$). A neutral carbonate is obtained by passing carbonic acid through the last kind suspended in water. The larger the proportion of hydrate in this substance, the more does its colour incline to gray.

Adulterations.—This preparation is very often adulterated; and the usual impurities are chalk and sulphate of baryta. The latter is left undissolved by diluted acetic acid. The former may be discovered by throwing down the lead from the acetic solution by sulphuretted-hydrogen, and then testing the filtered liquor for lime. The Edinburgh formula is a convenient one for ascertaining whether the article be pure or not, but without indicating the nature of the impurity. Sixty-two grains of crystallized phosphate of soda almost exactly decompose 68 grains of pure commercial carbonate of lead (62.06 to 68). Hence with 60 grains of phosphate, as in the formula, some lead must remain in solution, and will be shown on adding more phosphate to the filtered liquor, but not if any material adulteration be present. The London formula, as usual, indicates chiefly the properties by which carbonate of lead may be known. Nitric acid, however, will leave sulphate of baryta undissolved; and potash in excess, which redissolves the hydrated oxide of lead thrown down in the nitric solution by the first portions of the alkali, will leave an insoluble white powder of lime should chalk be present.

Actions and Uses.—Carbonate of lead possesses the constitutional action proper to the compounds of that metal, as explained under the article *Plumbum.* Little is known of its medicinal effects when given inwardly, because it is never employed as an internal remedy. Externally, in the form of ointment, the only shape in which it is now used, it is an efficacious astringent for ulcers and eruptions attended with irritation.

Its only officinal preparation is the *Unguentum plumbi carbonatis*, U.S. E. D.

PLUMBI CHLORIDUM, *L.* *Chloride of Lead.*

Tests, *Lond.* Boiling water dissolves it altogether, and on cooling deposits it almost entirely in crystals. Heat renders it yellow, sulphuretted-hydrogen black.

Process, *Lond.* Take of
Acetate of lead nineteen ounces;
Boiling distilled water three pints;
Chloride of sodium six ounces.

Dissolve the acetate in the boiling water, and the chloride in a pint of distilled water; mix the solutions, and when the mixture has cooled, wash the precipitate and dry it.

For. Names.—*Fr.* Chlorure de plomb.—*Ital.* Chloruro di piombo.—*Ger.* Chlor-blei.

Chloride of Lead is met with in nature in the form of dense, transparent or opaque, white, prismatic crystals, and in opaque horny masses, called Horn-lead by mineralogists. It is also obtained artificially by double decomposition, as directed by the London College. A loss of nearly two-thirds of the chloride formed is said to be sustained in this process unless the fluid is evaporated down (Anthon). It is thus got in the form of a white, tasteless, crystalline, heavy powder, easily fused, and forming on cooling a translucent, horny-like mass,—whence its trite name of horn-lead. It is soluble in twenty-two parts of water at 212°, and in thirty parts at 60°; and from the former it separates in a great measure on cooling in the form of small, brilliant, tabular or acicular crystals. It is composed of one equivalent of chlorine and one of lead ($Cl+Pb$), and, therefore, of 35.42 parts of the former, and 103.6 of the latter.

Chloride of lead is too little used to be exposed to adulteration. The characters given in the London Pharmacopœia are intended merely for determining its nature.

This is an unnecessary preparation, contained only in the London Pharmacopœia. It possesses in all probability the constitutional action and local

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astringent effects of other compounds of lead. In large doses it is an irritant poison (Taylor). But it is never used in medicine; and the only object in introducing it is for making muriate of morphia; for which object, from its sparing solubility, it is objectionable.

PLUMBI DIACETATIS SOLUTIO, *E.* PLUMBI DIACETATIS LIQUOR, *L.* PLUMBI SUBACETATIS LIQUOR, *U.S. D.* *Solution of Diacetate of Lead. Solution of Subacetate of Lead. Goulard's Extract.*

TESTS, *Lond.* Density 1260. Its other properties are like those of acetate of lead.
TESTS, *Edin.* A copious precipitate is gradually formed, when the breath is propelled through it by means of a tube.

[PROCESS, *U.S.* Take of
Acetate of lead sixteen ounces;
Semi-vitrified oxide of lead, in fine powder, nine ounces and a-half;
Distilled water four pints.
Boil them together in a glass or porcelain vessel for half an hour, occasionally adding distilled water, so as to preserve the measure, and filter through paper. Keep the solution in closely stopped bottles. The sp. gr. should be 1.267.]

PROCESS, *Edin Lond.* Take of
Acetate of lead six ounces and six drachms (two pounds three ounces, *L.*);
Litharge, in fine powder, four ounces (one pound four ounces, *L.*);
Water a pint and a-half (six pints, *L.*).
Boil the salt and litharge with the water for half an hour, stirring occasionally. When the solution is cold, add water, if necessary, to make up a pint and a half; and then filter. Preserve the solution in well-closed bottles.

PROCESS, *Dub.* Take of
Semi-vitrified oxide of lead one part;
Distilled vinegar twelve parts.
Boil down to eleven parts in a glass vessel; leave the solution at rest till the impurities subside, and filter it.

PLUMBI DIACET. (SUBACETATIS, U.S.) LIQUOR DILUTUS, L. PLUMBI SUBACET. LIQUOR COMPOSITUS, D. *Diluted Solution of Subacetate of Lead.*

[PROCESS, *U.S.* Take of
Solution of subacetate of lead two fluidrachms;
Distilled water a pint.
Mix them.]

PROCESS, *Lond.* Take of
Solution of diacetate of lead one fluidrachm and a half;
Distilled water a pint;
Proof spirit two fluidrachms.
Mix them.

PROCESS, *Dub.* Take of
Solution of subacetate of lead one drachm;
Distilled water a pint;
Proof spirit a drachm.
Mix them.

CERATUM PLUMBI SUBACETATIS, U.S. CERATUM PLUMBI COMPOSITUM, L. *Cerate of Subacetate of Lead. Goulard's Cerate.*

[PROCESS, *U.S.* Take of
Solution of subacetate of lead two fluidounces and a half;
White-wax four ounces;
Olive oil nine fluidounces;
Camphor half a drachm.
Mix the wax previously melted with eight fluidounces of the oil, remove the mixture from the fire, and when it begins to thicken, gradually pour in the solution of subacetate of lead, stirring constantly with a wooden spatula, till it becomes cool. Lastly, add the camphor dissolved in the remainder of the oil, and mix]

PROCESS, *Lond.* Take of
Solution of diacetate of lead three fluidounces;
Wax four ounces;
Olive oil half a pint;
Camphor half a drachm.
Melt the wax, mix with it eight fluidounces of the oil, remove the mixture from the fire, and as it begins to concrete, add gradually the solution of diacetate of lead, and stir constantly till the mixture cools. Lastly, add the camphor dissolved in the remainder of the oil, and mix them.

FOR. NAMES.—*Fr.* Sous-acetate de plomb liquide; Extraît de Saturne.—*Ital.* Sotto-acetato di piombo; Aceto di Saturno.—*Ger.* Halb-essigsaures bleioxyd; Blei essig; Blei-extract.

Chemical History.—Acetic acid unites with oxide of lead in several proportions besides those constituting neutral acetate of lead. One only of these compounds is officinal. It is a soluble salt, which was probably known to Basil Valentine in the fifteenth century, but was first accurately distinguished

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from the acetate in 1802 by Thenard. This may be obtained by evaporating the solution of the formulas in the Pharmacopœias in such a way as to prevent the free access of atmospheric air, upon which white foliaceous crystals sometimes form, but more generally an opaque, white, gummy-like, uncrystallizable mass. The officinal preparations, which are the subject of the present article, are solutions of the salt now referred to,—the DIACETATE OF LEAD. This name, which has been adopted by the Edinburgh and London Colleges, implies the constitution of one equivalent of acid and two of base; but the existence of a salt of this definite composition is doubted by some. The solution of the shops is sometimes a solution of the trisacetate, more commonly a mixture of several acetates of lead.

These solutions are all varieties of the celebrated Goulard's-extract, or *Extractum Saturni;* which was first made with crude vinegar and litharge,—then with distilled vinegar, as still recommended by the Dublin College,—and now more generally, as directed in the two other Pharmacopœias, by boiling a solution of the neutral acetate with finely powdered litharge. The solution of the Pharmacopœias has an alkaline reaction upon vegetable colours. It deposits a white carbonate of lead under exposure to the air, and much more quickly when a stream of carbonic acid is transmitted into it, as by propelling the breath through a tube; and if the gas be transmitted in sufficient quantity, the water at length contains only the neutral acetate, the additional equivalent of oxide of lead being all thrown down in the shape of carbonate. Carbonate of lead is sometimes manufactured in this way (p. 733). The other properties of the solution of diacetate of lead are much the same with those of the acetate. The *Liquor dilutus* of the London, Dublin (and U.S.) Pharmacopœias is a convenient form for extempore use.

Actions and Uses.—The solution of diacetate of lead possesses all the actions proper to the soluble salts of this metal; but they have not yet been fully investigated. The diacetate is never used internally. It is probably the most energetic poison among the compounds of lead, and has actually proved fatal to man. It even seems to have some corrosive action, owing to an affinity existing between the animal principles and the excess of oxide it contains. It is a familiar and excellent external application in all circumstances where solutions of the acetate are used, and is preferred by some because it is not so apt to dry up and crystallize. The stronger solution of the Pharmacopœias must always be considerably diluted before being put to use.

PLUMBI EMPLASTRUM, *U.S. L.* EMPLASTRUM LITHARGYRI, *E. L. Litharge Plaster. Oleo-margarate of lead.*

[PROCESS, *U.S.* Take of
Semi-vitrified oxide of lead, in very fine powder, five pounds;
Olive oil a gallon;
Water two pints.
Boil them together over a gentle fire, stirring constantly, until the oil and the oxide of lead unite into a plaster. It will be proper to add a little boiling water, if that employed in the commencement be nearly consumed before the end of the process.]

PROCESS, *Edin. Lond. Dub.* Take of
Litharge, in very fine powder, five ounces (six pounds, *L.*—five pounds, *D.*);
Olive oil twelve fluidounces (one gallon, *L. D.*);
Water three fluidounces (two pints, *L. D.*).
Mix them; boil (heat between 200° and 212°, *D.*) and stir constantly till the oil and litharge unite, replacing the water if it evaporate too far.

EMPLASTRUM LITHARGYRI CUM RESINA, D. See *Terebinthina.*

LITHARGE-PLASTER is treated of in the present place, and not as a preparation of litharge, because it is now well known to be, not a mechanical mixture, as was once thought, but a product of chemical combination, analogous in constitution to soap.

Chemical History.—Litharge-plaster (Diachylon-plaster, Common plaster, Lead plaster) is obtained by heating together olive-oil, water, and finely pow-

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dered litharge. Other oils and fatty matters will answer; but none has yet been found to yield so good a plaster as olive-oil. Union does not take place except about the temperature of 212°, which may be maintained by a slow naked fire, but is probably best secured on the large scale by steam under pressure. The water used in the process was formerly thought to serve no other purpose than to keep down the temperature and prevent charring, but it would appear that its presence is indispensable to induce the action of the litharge on the oil. The litharge ought to be very finely powdered. The water which is driven off in vapour must be replaced from time to time; and what is added must be hot, otherwise the process is retarded by refrigeration of the mixture, besides that the sudden addition of cold water may occasion spurting or explosions.—For a long time the formation of litharge-plaster was thought to depend merely on mechanical mixture of its ingredients. But since the researches of Chevreul on the composition of the oils and their saponification, it is known that the process consists of a complex set of chemical changes, by virtue of which the neutral fatty principles of the oil, being converted into fatty acids, unite with the oxide of lead, while a neutral sweet principle, glycerine, is disengaged and remains in the water. Litharge-plaster, then, is a mixture of various fatty salts, of which protoxide of lead is the base, and the oleic and margaric acids the chief oleaginous acids.

Litharge-plaster has a grayish-yellow colour, is very brittle, and, when softened by gentle heat, adheres to the skin. It is blackened by exposure to sulphuretted-hydrogen gas. When agitated with hot pyroligneous or diluted nitric acid, it is decomposed, the oxide of lead is dissolved, and the fatty acids, on the mixture being left at rest, rise to the surface like an oil, and concrete on cooling into an opaque, fibro-foliaceous mass.

Attention has not been paid to its adulterations; but it is often of inferior quality, because it will not make good resin-plaster.

Litharge-plaster has long been held to be a sovereign detersive and desiccative for indolent ulcers of various kinds. It is now little used by itself for this or any other purpose. But it is the basis of a large proportion of officinal plasters. There is no other metal whose oxides saponify olive-oil so completely as the protoxide of lead; and no oxide of lead but the protoxide will answer the purpose (Henry).

PLUMBI IODIDUM, *E. L.* *Iodide of Lead.*

Tests, *Edin.* Bright yellow: five grains are entirely soluble with the aid of ebullition in one fluidrachm of pyroligneous acid diluted with a fluidounce and a-half of water; and golden crystals are abundantly deposited on cooling.

Tests, *Lond.* Boiling water dissolves it, and on cooling deposits it in shining scales. Heat melts it, and afterwards dissipates it in a great measure in vapours, which are at first yellow and then violet.

Process, *Edin.* Take of
Iodide of potassium, and
Nitrate of lead, of each half an ounce;
Water a pint and a-half.
Dissolve the salts separately, each in one-half of the water; add the solutions; collect the precipitate on a filter of linen or calico, and wash it with water. Boil the powder in three gallons of water acidulated with three fluidounces of pyroligneous acid. Let any undissolved matter subside, maintaining the temperature near the boiling point; and pour off the clear liquor, from which the iodide of lead will crystallize on cooling.

Process, *Lond.* Take of
Acetate of lead nine ounces;
Iodide of potassium seven ounces;
Distilled water a gallon.
Dissolve the acetate in six pints of the water and filter; add to this the iodide dissolved in two pints of water; wash the precipitate and dry it.

Unguentum Iodidi Plumbi, L. *Ointment of Iodide of Lead.*

Process, *Lond.* Take of
Iodide of lead an ounce;
Lard eight ounces.
Mix them well together.

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For. Names.—*Fr.* Iodure de plomb.—*Ital.* Ioduro di piombo.—*Ger.* Iodblei.

The Iodide of Lead has been known only since the recent discovery of iodine itself. It was introduced into the Materia Medica but a few years ago chiefly through the recommendations of Lugol.

Chemical History.—It is always obtained by double decomposition of the acetate or nitrate of lead with iodide of potassium. The nitrate is on the whole the preferable salt, as being more uniform in composition, and free of any excess of oxide of lead; for an excess interferes with the purity of the product. The London College is satisfied with directing to be preserved for use the precipitate obtained by the simple process of mutual decomposition of the two salts. But in this way a pure iodide will seldom be obtained. The reason is that the iodide is prone to form compounds with the oxide of lead. The circumstances in which this action occurs have not been all settled: but it is always apt to take place when the metal in the salt of lead is in excess to the iodine of the iodide of potassium. Hence when the acetate of lead contains an excess of oxide, which happens not unfrequently, or when the iodide of potassium is impure, which is a more common occurrence, or when the solution of the iodide is poured into the solution of the acetate, instead of conversely,—a compound is formed of oxide and iodide of lead. If the iodide of potassium contain any of its common adulteration, carbonate of potash, carbonate of lead will also be formed in the precipitate. As it is probable that the presence of oxide or carbonate of lead may affect its medicinal actions, the process for iodide of lead should be so contrived as to avoid such impurities; and this object is attained, as in the Edinburgh process, by the additional step of crystallization from a solution in weak acetic acid, by which all the oxide and carbonate of lead are removed and retained in solution.

Iodide of lead when pure is in the form of a fine powder of an intense gamboge-yellow hue, or constitutes a loose congeries of very delicate crystalline scales of a splendid golden colour and brilliancy. It is heavy, tasteless, and inodorous. It is very sparingly soluble in water, requiring 1235 parts of cold, and 194 of boiling water. From a boiling solution it crystallizes on cooling in the form of delicate gold-like scales. It is blackened by sulphuretted hydrogen, owing to the formation of sulphuret of lead; and the iodine is disengaged in the form of hydriodic acid. Heat fuses it; and on being increased, decomposes it, and drives off iodine. It is composed of one equivalent of metal and one of iodine (Pb+I), and therefore of 103.6 parts of the former, and 126.3 of the latter.

Adulterations.—Its adulterations have not been particularly attended to. When it contains intermixed carbonate or combined oxide, it presents a lemon-yellow, instead of a gamboge-yellow, tint; and if boiled in successive portions of distilled water till all trace of yellow tint is removed, a grayish powder remains behind.

Actions and Uses.—Doubts are entertained as to its medicinal actions. It was introduced into practice by M. Lugol of Paris, as a powerful local remedy in the form of ointment for chronic scrofulous tumours and ulcers; and it has been conceived to owe its virtues to its constitution as a compound of iodine. I have seen it repeatedly useful to appearance in obstinate ulcers, especially consecutive to mercurio-syphilitic eruptions in strumous habits. So much has been said in France of its effects as a compound of iodine in reducing strumous enlargement of glands when used in the way of friction, that the British Colleges could not but introduce it into their Pharmacopœias. Its physiological actions, however, do not correspond with its alleged therapeutic effects; for it has been shown, that in continued small doses it

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produces the constitutional action of lead, and not at all that of iodine (Cogswell, Paton). It is used only in the form of the *Unguentum plumbi iodidi.*

PLUMBI NITRAS, *E.* *Nitrate of lead.*

PROCESS, *Edin.* Take of
Litharge four ounces and a-half;
Diluted nitric acid a pint.
Dissolve the acid to saturation with the aid of a gentle heat. Filter and set the liquid aside to crystallize. Concentrate the residual liquor to obtain more crystals.

Chemical History.—NITRATE OF LEAD is obtained according to the process of the Edinburgh College by dissolving litharge with the aid of heat in diluted nitric acid, and crystallizing the solution by evaporation and cooling.

This salt forms beautiful tetraëdral and octaëdral crystals, nearly opaque, white, and of adamantine lustre. They are permanent in the air. They are soluble in somewhat more than four parts of water. Heat fuses the nitrate, and when increased, decomposes it, driving off various gaseous compounds of nitrogen, and leaving pure oxide of lead. When thrown upon burning fuel, it enlivens the combustion, and metallic lead is left. Its solution is affected by sulphuretted hydrogen, iodide of potassium, chromate of potash, the alkaline carbonates and sulphates, and metallic zinc, exactly in the same way as solutions of the acetate. The caustic fixed alkalis also act as upon the acetate. Ammonia tends to form white basic nitrates which are sparingly soluble. It is composed of one equivalent of each constituent ($PbO+NO^5$), and hence of 111.6 parts of protoxide of lead, and 54 parts of acid. It does not contain any water of crystallization.

Actions.—I have found nitrate of lead to be in large doses an irritant poison, somewhat resembling nitrate of potash in its action. It probably possesses the constitutional operation of the other compounds of lead. It has not been used in medical practice. And it is introduced into the Edinburgh Pharmacopœia merely as the best salt of lead from which to prepare the iodide.

PLUMBI OXYDUM, *L.* PLUMBI OXYDUM (OXIDUM) SEMIVITREUM, *U.S. D.* LITHARGYRUM, *E.* *Protoxide of lead, fused. Litharge. Semivitrified oxide of lead.*

TESTS, *Edin.* Fifty grains dissolve entirely, without effervescence, in a fluidounce and a-half of pyroligneous acid; and the solution precipitated by 53 grains of phosphate of soda, remains precipitable by more of the test.

TESTS, *Lond.* Almost entirely soluble in diluted nitric acid; its other properties are the same with those of carbonate of lead.

FOR. NAMES.—*Fr.* Protoxide de plomb; Litharge.—*Ital.* Protossido di piombo; Litargiro.—*Span.* Litargirio.—*Ger.* Blei-oxyd; Bleiglatte.—*Dut.* Zilverschuim.—*Swed.* Silfwerglitt.—*Dan.* Sölverglöd.—*Russ.* Glem.—*Pers.* Moordar sang.—*Tam.* Marudar singhie.

Chemical History.—WHEN lead is exposed in the melted state to a gentle current of air, and stirred, it is speedily converted into yellow, semicrystalline scales of protoxide, known in commerce by the name of Massicot. When this oxide is urged with a red heat, it undergoes incomplete fusion, puts on the appearance of an oil, and on cooling, concretes into a loosely-aggregated mass of shining scales of a grayish-red tint. This is Litharge. A stronger heat fuses it completely, and the product on cooling is a translucent glass. Besides these different forms of oxide of lead there is a fourth in which it is united with water. This will be the subject of a separate article.

LITHARGE (oxide of lead, semivitrified oxide of lead, *chrysitis, argyritis, spuma argenti*) was known in ancient times. It is sometimes prepared expressly, sometimes obtained as a secondary product in the refining of gold and silver by means of lead. It has considerable weight,—a foliaceous structure when in mass, and a scaly appearance as usually sold,—a grayish-red

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colour, which is reddest in the specimens obtained in refining gold, and most gray as produced in refining silver,—considerable brilliancy, and neither taste nor smell. A strong heat fuses it into a glass; but if carbonaceous matter be present, it is reduced to the metallic state. It is said slowly to attract carbonic acid from the air. It is insoluble in water or spirit. It dissolves readily in diluted acetic or nitric acid, and without effervescence if pure; but there is commonly a slight effervescence from the presence of a little carbonate of lead. Other acids also unite with it to form neutral and basic or acidulous salts. It possesses the property of decolorizing many vegetable fluids. Wines for example, even port, are promptly rendered perfectly colourless by agitation with litharge. When heated with oils and fats along with water, it saponifies them, as in the preparation of the *Emplastrum lithargyri* (*plumbi, L.*). It consists of one equivalent of metal and one of oxygen (PbO), consequently 103.6 parts of lead, and 8 of oxygen.

Litharge is subject to adulteration with copper, carbonate of lead, and various express additions of inert earthy substances. These may be all guarded against by the formula of tests given in the Edinburgh Pharmacopœia. It ought to dissolve altogether, or at least very nearly so in diluted acetic acid, and with scarcely any effervescence; by the first of which characters the absence of such articles as sulphate of baryta is ascertained, and by the second the absence of carbonate of lead. The subsequent process of precipitation with phosphate of soda, applied by the Edinburgh College, to ascertain the purity of this and other compounds of lead, will detect all ordinary impurities exceeding one per cent. Good litharge never contains quite so much. The principles of the test have been explained under the head of the acetate and carbonate. The formula of the London College is also a good one. It requires almost absolute purity from all earthy matters soluble in nitric acid. Diluted nitric acid should dissolve litharge with faint effervescence only, and with but a scanty residuum; and the solution when decomposed by caustic potash deposits a precipitate which ought to be entirely soluble in an excess of the reagent. The other characters given by the same College are not intended for discovering adulterations. The litharge made in this country is generally very pure; but that prepared on the continent often contains copper.

Actions and Uses.—Litharge may be presumed to possess the constitutional action of the preparations of lead; but it has not been particularly examined in this respect, and is not itself put to any use in medical practice. It is extensively used in the arts for making the other compounds of lead; and in pharmacy is employed for preparing the acetate, solution of diacetate, and lead-plaster.

PLUMBI OXYDUM HYDRATUM, *L.* *Hydrated oxide of lead.*

Tests, *Lond.* This preparation, when used for making disulphate of quina, should dissolve entirely in diluted nitric acid, and present the characters of oxide of lead in other respects.

Process, *Lond.* Take of
Solution of diacetate of lead six pints;
Distilled water three gallons;
Solution of potash six pints, or enough to throw down all the oxide.

Mix them; and wash the precipitate till the water which passes off ceases to be alkaline.

Chemical History.—The preparation of the Hydrated Oxide of Lead from the diacetate is an instance of single decomposition. The potash must be added cautiously towards the close, so that a faint excess only may be present, otherwise some of the oxide is re-dissolved. The hydrate is also formed from the action of distilled water upon lead under exposure to the air.

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But unless the air be deprived of carbonic acid, the hydrate is converted partly into the carbonate of lead.

The hydrated oxide, as obtained by the College process, is a pure white, tasteless, heavy powder, which by heat is converted into the yellow protoxide, with the escape of water. It is very sparingly soluble in distilled water, and gradually separates from it in the form of carbonate when the water is left exposed to the air. It is very soluble in nitric and acetic acids, and is likewise dissolved by solution of potash. Sulphuretted-hydrogen renders it black, owing to the formation of sulphuret of lead. Like litharge, and in a greater degree than that substance, it possesses the property of decolorizing many coloured vegetable fluids. It is composed of three equivalents of oxide of lead, and one equivalent of water ($3\ PbO + HO$), as thrown down from the acetate of lead by potash,—that is 334.8 parts of oxide, and 9 of water.

Actions.—Its actions on the animal body have not been examined. But there can be little doubt that it possesses the properties of the lead compounds generally. The London College has introduced it merely as a pharmaceutic agent, required for the process for making sulphate of quina. As that process appears to be far from a convenient one, the present addition to the Pharmacopœia might be dispensed with.

PLUMBI OXYDUM RUBRUM, *U.S. E. Red Oxide of lead. Red-lead. Minium.*

Tests, *Edin.* Entirely soluble in highly fuming nitrous acid: partially soluble in diluted nitric acid, a brown powder being left.

For. Names.—*Fr.* Oxide rouge de plomb; Minium.—*Ital.* Minio.—*Span.* Minio.—*Ger.* Mennig; Rothes bleioxyd; Blei-hyperoxydul.—*Dut.* Mennie.—*Swed.* Mönja; Mönnie.—*Arab.* Isrenj—*Tam.* Segapoo sendooerum; Eeum sindoorum.—*Beng.* Sendoor.

It is not ascertained at what time Red Oxide of Lead was discovered. The *Minium* of the Romans appears to have been vermilion, and not this substance. The alchemists in the thirteenth century knew how to prepare it.

Chemical History.—It is obtained from the protoxide of lead by exposing this preparation, under the access of air, to a temperature just short of what is required to cause fusion, stirring it occasionally for a day and a half or upwards, and allowing the product to cool slowly. It is a heavy, tasteless powder, of a bright scarlet colour. Heat renders it darker, and when raised, fuses it, with the disengagement of oxygen, and its re-conversion into protoxide. It is insoluble in water. Nitrous acid, as stated in the Edinburgh formula of tests, dissolves it entirely, forming nitrate of protoxide of lead; because the excess of oxygen in red-lead converts the nitrous into nitric acid. Diluted nitric acid instantly renders it dark-brown, resolving it into two oxides, one of them the protoxide, which is dissolved, and the other the peroxide or binoxide, which remains. Chemists differ as to the constitution of red lead. But it is now most commonly considered to consist of three equivalents of lead, and four of oxygen, so united as to constitute it a compound of two equivalents of protoxide, and one of peroxide or plumbic acid ($2\ PbO + PbO^2$), that is 223.2 parts of the former oxide, and 119.6 of the latter.

It is little subject to adulteration. Brick-dust is sometimes mixed with it. This is best detected by the solvent action of nitrous acid, which leaves the impurity.

Actions.—Its actions have not been examined. It is sometimes used as a desiccative sprinkled upon sores. It is admitted into the Edinburgh Pharmacopœia for purifying concentrated acetic acid, and for preparing chlorine-water.

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PLUMBI SUBACETATIS LIQUOR, *U.S. D.* See *Plumbi diacetatis liquor.*

[PODOPHYLLUM, *U.S.* *The Rhizoma of Podophyllum peltatum, L. & W. Big. May Apple.*

EXTRACTUM PODOPHYLLI, U.S. *Extract of May Apple.*

PROCESS, *U.S.* This is prepared from the root of Podophyllum peltatum, in coarse powder, in the mode directed for extract of Peruvian bark. (See *Extract. Cinchonæ.*)

Podophyllum peltatum is figured in Bigelow, Med. Bot. 23.—Barton, Veg. Mat. Med. 25. —Carson, Illust. 11.

The root of the Podophyllum was in common use among the Indians before the settlement of the country by the whites, and was considered by them as one of their most efficient purgatives. The first writers on the Materia Medica who noticed it, as Schœpf and Puihn, speak of it as an emetic, but except in too fresh a state, or in large quantities, it has no peculiar action on the stomach.

Natural History.—THE MAY APPLE is found in abundance in almost all parts of the United States, in damp and shady woods; but sometimes in dry and exposed situations. It belongs to the Linnæan class and order *Polyandria Monogynia*, and the Natural order *Berberidaceæ*. The root or rhizoma is long, and creeping, of a brown colour externally and yellowish within; the stem is single, upright and smooth, about a foot in height, two leaved, and bearing a solitary flower at the insertion of the petioles. The leaves are large, peltate, and divided into five or six lobes, of a yellowish-green above and somewhat glaucous beneath. The flower is nodding, large, white and a little fragrant, succeeded by an oval fruit of a lemon-yellow colour, containing a thick, mucilaginous pulp, in which numerous seeds are immersed. It flowers in May and June, and ripens its fruit in September, at which time the leaves wither. This fruit is very palatable to some persons, but is distasteful to most. It is slightly aperient, and may be eaten freely. The Indians are said to be very fond of it, and to consider it medicinal. The leaves have been stated to be narcotic and poisonous, but there is a want of definite information on the subject.

Fig. 157.

P. peltatum.

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The root, which is the officinal portion, when collected and dried for use, which should be done after the ripening of the fruit, is in pieces of various lengths, about as thick as a quill, of a blackish-brown colour externally and somewhat corrugated with occasional knots; internally it is of a dirty white. It has a faint unpleasant odour, not unlike that of ipecacuanha, and a bitterish and at the same time sweetish taste.

Chemical History—This root has been chemically examined several times, Dr. Staples detected in it, besides the usual constituents, a peculiar substance, which crystallized in silky tufts; this was not found by Mr. Hodgson, who made a subsequent analysis of it, and was probably a salt of lime. The latter observer obtained a peculiar principle, which he has called *Podophylline*, evidently belonging to the same group as Salicine and Populine. When dry it is in pale brown scales of considerable lustre, is unalterable in the air, and has a permanent bitter taste. The peculiar properties of the root are most likely due to this principle and a resin.

Actions and Uses.—This root is an officinal purgative, much resembling Jalap in its action on the bowels, but more apt to cause pain, though in general operates without producing any unpleasant effects. It induces watery stools, especially when given in combination with the bitartrate of potassa. The testimony of those practitioners who have given it a fair trial is unanimous in its favour as the best substitute for jalap, among the North American vegetable cathartics. It is much given in some parts of the country in conjunction with calomel in bilious fever, or in hepatic derangement. It is stated by Dr. Porcher that it is employed by the southern Indians as an anthelmintic, but this quality is merely to be attributed to its purgative power and not to any peculiar action on the worms.

The dose of the powdered root is from ten grains to a scruple; of the *Extractum Podophylli*, five to fifteen grains.]

POLYGALA, *D.* See *Senega.*

[POLYGALA RUBELLA, *U.S.* Secondary. *The root and herb of Polygala rubella, W. DC. Big. Bitter Polygala.*

Figured in Hooker, Flor. Am. Bot. 29—as P. polygamum; and in Big. Med. Bot. 54—as P. rubella.

Natural History.—The Bitter Polygala is a native of many parts of the United States, usually growing in arid, sandy or gravelly soils, flowering in July and August. It belongs to *Diadelphia Octandria* of the sexual system, and to *Polygalaceæ* of the Natural arrangement. The root is perennial, somewhat fusiform and branched. The stems are six to twelve inches in height, numerous and erect, with oblong and oblong-linear leaves. The flowers are in terminal or lateral racemes; the first are spiciform, loose, and the flowers are winged, which is not the case with those in the lateral racemes, which are leafless, prostrate, and often subterranean. The whole plant is officinal. It has no odour, but a permanent and powerfully bitter taste, imparting this quality to water and alcohol. No chemical examination has been made of it.

Actions and Uses.—This article in small doses is tonic, and in larger quantities, laxative and diaphoretic, and is very closely allied in its properties to the Polygala vulgaris of Europe. Dr. Bigelow states that an infusion has been found beneficial as a tonic in debility of the digestive organs. It is one of those articles, however, that might with advantage be expunged from the officinal lists.]

POLYGONUM BISTORTA, *D.* *Root of Polygonum Bistorta, L. W. Spr. Bistort.*

For. Names.—*Fr.* Bistorte.—*Ital. Span.* and *Port.* Bistorta.—*Ger.* Natterknöterig;

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Schlangenkraut.—*Dut.* Naterwortel.—*Dan.* Stangeurt.—*Swed.* Ormrot.—*Russ.* Serteschnaia trava.

FIGURES of Polygonum Bistorta in Nees von E. 105.—Hayne, v. 13.—Engl. Bot. 509.—Steph. and Ch. i. 47.

BISTORT has been long used in European medicine; but it cannot be clearly referred to either of the plants known to Dioscorides by the name of Πολυγονον, which were probably other species of the same genus.

The *Polygonum Bistorta* is a common native of this country, inhabiting moist meadows. It belongs to the Linnæan class and order *Octandria Trigynia*, and to the Natural family *Polygonaceæ*, to which it has given its generic name. It has a perennial root, and an annual herbaceous stem, towards three feet in height, and terminating in a dense spike of rose-coloured flowers which blow in June. The root has a double twist, whence is derived the specific name of the plant. This is its only officinal part. It is dark-brown externally, without odour, and of a strong pure astringent taste. It must contain a large quantity of tannin; but it has not been carefully analyzed.

It is one of the most powerful of indigenous astringents, and has been used as a constitutional astringent in chronic hæmorrhagies and mucous discharges, and also locally in relaxed sore-throat and in leucorrhœa. At present it is very seldom prescribed.

Its dose in powder is from 30 to 40 grains.

PORRUM, *L.* *Root of Allium Porrum, L. W. Spr.* *The Leek.*

FOR. NAMES.—*Fr.* Poireau.—*Ital.* Porro.—*Span.* Puerro.—*Ger.* Lauch.—*Dut.* Look.

ALTHOUGH the LEEK, the Πρασον κηπαιον of the Greek physicians, was considered by them a diuretic, laxative, expectorant, and emmenagogue, and appears to have been in their eyes an important remedy, I do not know why it is still retained in the London Pharmacopœia; for it is now never used medicinally; and as an article of diet, it is apt to excite flatulence with many, so that it cannot well be employed as an alimentary substance in the dietetic treatment of diseases. In its characters, properties and composition, it closely resembles the onion.

POTASSA, *U.S. E.* POTASSÆ HYDRAS, *L.* POTASSA CAUSTICA, *D.* *Potash. Hydrate of Potash. Protoxide of potassium. Caustic potassa.*

TESTS, *Edin.* Boiling water commonly leaves oxide of iron undissolved, which should not exceed 1.25 per cent. The solution, supersaturated with nitric acid, gives a faint precipitate (only) with solution of nitrate of baryta, and more with solution of nitrate of silver,—owing to the presence of impurities.

TESTS, *Lond.* It soon deliquesces if exposed to the air: soluble entirely in alcohol: other properties the same as those of *Potassæ Aqua.*

[PROCESS, *U.S.* Take of solution of potassa a gallon. Evaporate the water rapidly in a clean iron vessel, over the fire, till ebullition ceases, and the potassa melts. Pour this into suitable moulds, and keep it when cold in well-stopped bottles.]

PROCESS, *Edin.* Take any convenient quantity of aqua potassæ; evaporate it in a clean and covered iron vessel, increasing gradually the heat, till there remains an oily-looking fluid, a drop of which, when removed on a glass-rod, becomes hard on cooling. Then pour out the liquid upon a bright iron plate; and as soon as it solidifies, break it quickly, and put it into glass bottles, secured with glass stoppers.

PROCESS, *Lond.* Take of solution of potash, one gallon. Evaporate it over the fire in a clean iron vessel till all ebullition ceases, and the fused hydrate of potash is left; which is to be poured into proper moulds.

PROCESS, *Dub.* Take any quantity of solution of caustic potash. Evaporate it in a clean iron or silver vessel till the saline matter, on increasing the heat, remains at rest. Pour this upon an iron or silver plate, and while it congeals, cut it into pieces, and put them into a well-closed phial. Avoid the drops spurted up during the evaporation.

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For. Names.—*Fr.* Potasse; Potasse caustique.—*Ital.* Potassa.—*Ger.* Kali; Kaliumoxyd. *Russ.* Litoe vodnoe kali.

Potash (Potassa; Pure potash; Caustic potash; Pure kali; Pure lixivium; *Lapis infernalis, Cauterium potentiale*) seems to have been known in the pure and solid form so early as the thirteenth century, and in solution much earlier. It has been known by many other pharmaceutic names besides those just mentioned. The newest and most refined is that of the London College; which might with equal propriety have added the term Hydrate to every hydrated salt in the Pharmacopœia.

Chemical History.—Two varieties must be carefully distinguished—the Caustic potash of commerce, which is alone used in medical practice, as well as in the shop of the druggist, and Pure potash, prepared expressly for the use of the scientific chemist. It is for the former of these that the College processes are designed. The directions they contain are sufficiently precise to require little explanation. The solution of potash should be recently prepared. So long as the temperature is maintained at the point of ebullition, carbonic acid is not absorbed from the atmosphere; but if the evaporation be interrupted, and the liquid allowed to cool, the alkali becomes quickly carbonated. It is unnecessary to use a silver vessel, this being required only when a very pure potash is to be made. An iron vessel, indeed, however clean it may be, always imparts some oxide of iron to the potash; but not in such quantity as to interfere with any of its medicinal or common pharmaceutic applications. The contact of all organic substances, and of all the common metals except iron or silver, must be carefully avoided. The fused potash is sometimes poured upon a clean iron plate to cool and congeal; but for all purposes it is more conveniently run into cylindrical moulds, such as are employed for making rods of nitrate of silver. In order to obtain pure potash for scientific purposes, a very pure carbonate of potash must be used for preparing *Aqua potassæ:* this solution is then to be evaporated in a vessel of silver or platinum to the consistence of syrup, and the cooled liquor agitated with a third of its weight of alcohol; and when the mixture has remained at rest for a little, the clear fluid is to be decanted and immediately evaporated till an oily-like matter is obtained.

The potash of pharmacy is sold in the form of fragments of plates or of cylindrical pencils, of a gray colour, fibrous fracture, and intense corrosive alkaline taste. When handled in the moist state it feels soapy. It is exceedingly deliquescent, and in thus dissolving, attracts at the same time carbonic acid powerfully from the atmosphere. Acids combine with it, causing the evolution of much heat; and crystallizable salts are formed. It is very soluble in water and alcohol. It generally effervesces when dissolving in water, as it contains generally some peroxide of potassium, which is resolved by the water into oxygen and potassa. The aqueous solution presents the characters described under the article *Aqua potassæ*. It powerfully corrodes the soft animal textures; and when it has thus acted on them, extensive inflammation ensues around, preparatory to the separation of a deep slough. It is composed of one equivalent of potassium, one of oxygen, and one of water ($KO+Aq.$), and, therefore, of 39.15 parts of metal, 8 of oxygen and 9 of water.

Adulterations.—The common potash of the shops being necessarily always impure, it is not easy to lay down characters for detecting adulterations. It contains alkaline sulphates and muriates, oxide of iron, silica, and often alumina. The Edinburgh College indicates one grain and a quarter per cent. of oxide of iron as the greatest amount of that impurity which should be left on dissolving it in water; and, pointing out muriates and sulphates as farther admixtures, seldom altogether absent, and easily discovered by the action of

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nitrate of baryta and nitrate of silver on the potash solution supersaturated by nitric acid,—the operator is left to judge of the degree of impurity by his own experience. Carbonate of potash, which may be often present also, is detected by the solution of potash effervescing with nitric acid. There is no sample of the ordinary potash of the shops which will answer to the London character of purity,—complete solubility in alcohol.

Actions and Uses.—Potash is a very powerful corrosive, probably indeed the most powerful of all pure corrosive poisons. It dissolves the textures to which it is applied, first attracting their water and then disorganizing them entirely. Its special effects on the human body are not so thoroughly known as those of the carbonate, but are probably the same in kind, and greater in degree. It has no action as a poison except what depends directly on the local injury occasioned: it exerts no indirect influence through the medium of absorption. Its poisonous properties are neutralized in a great measure or entirely, when it is united with those acids which, like itself, are pure corrosives or irritants. Vinegar and lemon-juice, or the fixed oils, are its antidotes. In medicine, potash is never employed internally, except in the form of solution; but, like its solution, it must be antacid, antilithic, and probably diuretic. Its compounds with the acids are generally purgative and diuretic, unless where other properties are imparted through means of the peculiar actions of the acids combined with it. Potash in its solid state is only used externally in medical practice; and its chief application is for making caustic issues. For this purpose the integuments around the part to be acted on are protected by two or three layers of cloth, spread with adhesive plaster, and perforated with a circular hole an inch or more in diameter; and then a rod of potash, slightly moistened at the end, is gently rubbed over the circular portion of the skin till the surface be destroyed. After the slough separates, the retraction of the surrounding skin always makes the surface of the issue much larger than the circle originally cauterized; the extent of which must be regulated accordingly. It may be used in like manner for the destruction of tumours, and of the surfaces of unhealthy or malignant ulcers; but the potential cautery is little employed now-a-days for these purposes.

POTASSÆ ACETAS, *U.S. E. L. D.* *Acetate of Potash.*

Tests, *Edin.* Not subject to adulteration.

Tests, *Lond.* Entirely soluble in water and alcohol: it does not affect litmus or turmeric, and is not affected in solution by chloride of barium or nitrate of silver, unless the solution be strong, in which case any precipitate formed by the silver test is redissolved by water or nitric acid. A red heat converts it into carbonate of potash. Sulphuric acid disengages acetic vapours.

[Process, *U.S.* Take of
Acetic acid a pint;
Carbonate of potassa a sufficiency.
Add the carbonate of potassa gradually to the acetic acid, till it is saturated, then filter and evaporate cautiously by means of a sand-bath, until a dry salt remains. Keep in closely-stopped bottles.]

Process, *Edin.* Take of
Pyroligneous acid a pint and a-half;
Carbonate of potash (dry) seven ounces or a sufficiency.
Add the carbonate gradually to the acid till complete neutralization be accomplished. Evaporate the solution over the vapour-bath till it is so concentrated as to form a concrete mass when cold. Allow it to cool and crystallize in a solid cake; which must be broken up and immediately put into well-closed bottles.

Process, *Lond.* Take of
Carbonate of potash a pound;
Acetic acid twenty-six fluidounces;
Distilled water twelve fluidounces.
Add the carbonate of potash to the acid and water till saturation take place; and filter. Evaporate the liquid in a sand-bath till the salt be dried, applying the heat cautiously.

Process, *Dub.* Take of carbonate of potash from tartar, any quantity. Add gradually about five times its weight of distilled vinegar moderately heated. Evaporate the solution, and then add more distilled vinegar till effervescence ceases. Then evaporate to dryness, and liquefy the salt by cautiously

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raising the heat. Dissolve the salt in water, filter the solution, and evaporate it till it becomes on being cooled a white crystalline mass. Put this immediately into well-closed vessels.

For. Names.—*Fr.* Acetate de Potasse.—*Ital.* Acetato di potassa.—*Ger.* Essigsaures kali.—*Russ.* Uksusnokisloe kali.

Acetate of Potash was described by Raimund Lully in the thirteenth century. It exists, according to Berzelius, in many plants; but what is used in medicine is all obtained by artificial processes.

Chemical History.—The method long practised was to neutralize distilled vinegar with carbonate of potash, and obtain the salt by evaporation, as still directed by the Irish College. The employment of distilled vinegar, however, always involves great nicety of manipulation. For as the solution becomes concentrated, it also acquires a brown colour; and the only convenient way to get rid of the colour is, by raising the heat slightly after all the moisture is driven off except the water of crystallization, maintaining the salt for some time in a state of fusion, and then dissolving it and evaporating again to dryness. This process, besides being troublesome, is attended with the risk of decomposition of the salt, if the fusing heat should accidentally rise too high. If, instead of distilled vinegar, a colourless pyroligneous acid be used, and the carbonate be also of good quality, a salt is obtained at once by evaporation, presenting the necessary whiteness and purity for medicinal use. The chief precautions to be attended to are, that there shall be no excess of alkali, but rather the reverse, otherwise the free alkali reacts on the acid of the salt when the solution is much concentrated, and discoloration ensues,—and that the drying heat shall be carefully regulated, not by the vapour-bath (E. P.) the temperature of which is too low for thorough desiccation, nor by the sand-bath (L. P.) which may easily raise the temperature too high, but on the small scale by the muriate of lime-bath, and on the large scale by steam under pressure.

Acetate of potash may be crystallized, but with difficulty, in transparent colourless needles. As sold in the shops, it always forms white, foliaceous, satiny masses, not unlike spermaceti, soapy to the touch, without odour, but of a strong saline, warm, and rather acrid taste. It is exceedingly deliquescent, and must, therefore, be carefully excluded from the air. Heat fuses it, and then decomposes it, partly driving off and partly disorganizing its acid; so that at length carbonate of potash is left. It is soluble in half its weight of temperate water (Phillips), and in four parts of rectified spirit (Powell). The solution is known by giving off an acetous odour on the addition of sulphuric acid, and yielding a yellow precipitate with chloride of platinum. It is decomposed by the stronger acids and by some metallic salts; and, therefore, it should be prescribed without any such additions. It is composed of one equivalent of acid, one of base, and two of water ($\bar{A}+KO+2Aq$), and consequently of 51.48 parts of acetic acid, 47.15 potash, and 18 water.

Adulterations.—The London College has given characters partly for recognizing it, partly for ascertaining its purity. But in point of fact it is scarcely ever adulterated, and never to such a degree as to be of any consequence in respect of its medicinal applications. The characters laid down by the College are too simple to require explanation.

Actions and Uses.—Acetate of potash is chiefly known as a cathartic and diuretic. It acts with considerable certainty in both ways, and is accordingly used with advantage as a purgative diuretic in dropsy. In small repeated doses its diuretic effect is most generally the principal action developed. Its purgative action is best produced by doses of a drachm and a-half or two drachms. This salt is probably not so much in use as it ought to be. As a diuretic particularly, it is often most energetic. Among others, my prede-

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cessor Dr. Duncan used it extensively with favourable results in dropsy; and Alibert thought it the best of diuretics in hydrothorax. Its applications to the treatment of jaundice and other visceral obstructions are not well supported by facts. It should be given simply in a state of diluted solution, to which a little sugar may be added, if thought necessary.

Its doses are gr. x. ad gr. xx. as a diuretic, and dr. iss. ad dr. ii. as a laxative.

POTASSÆ AQUA, *E.* POTASSÆ LIQUOR, *U.S. L.* POTASSÆ CAUSTICÆ AQUA, *D.* *Solution of Potash.*

Tests, *Edin.* Density, 1072.—*Dub.* 1080.

Tests, *Lond.* Its density is 1063. It turns turmeric brown. It effervesces very little, if at all, when neutralized with diluted nitric acid; and the solution should scarcely precipitate with carbonate of soda, chloride of barium, or nitrate of silver; but it yields an abundant yellow precipitate with chloride of platinum.

[Process, *U.S.* Take of
Carbonate of potassa a pound;
Lime half a pound;
Boiling distilled water a gallon.
Dissolve the carbonate of potassa in half a gallon of the water; pour a little of the water on the lime, and when it is slaked, add the remainder. Mix the hot liquors and boil for ten minutes, stirring constantly, then set the mixture aside in a covered vessel, until it becomes clear. Lastly, pour off the supernatant fluid, and keep in well-stopped bottles of green glass.]

Process, *Edin.* Take of
Carbonate of potash (dry) four ounces;
Lime, recently burnt, two ounces;
Water forty-five fluidounces.
Let the lime be slaked and converted into milk of lime with seven fluidounces of the water. Dissolve the carbonate in the rest of the water; boil the solution, and add the milk of lime in successive portions, about an eighth at a time,—boiling briskly for a few minutes after each addition. Pour the whole into a deep, narrow glass vessel for twenty-four hours; and then withdraw with a syphon the clear liquid, which ought to amount to at least thirty-five fluidounces, and should have a density of 1072.

Process, *Lond.* Take of
Carbonate of potash fifteen ounces;
Lime eight ounces;
Boiling distilled water a gallon.
Dissolve the carbonate in half of the water. Let the lime be slaked with a little of the water in an earthen vessel: add the rest of the water; mix the liquors immediately in a close vessel, and agitate frequently till they are cold. Set it aside, that the carbonate of lime may settle; pour off the supernatant liquor; and keep it in a well-closed green glass bottle.

Process, *Dub.* Take of
Carbonate of potash, and
Lime, fresh burnt, of each two parts;
Water fifteen parts.
Let the lime be slaked in an earthen dish with a little of the water; then immediately mix the salt, and add the rest of the water. When the mixture has cooled, put it into a well-closed bottle, and agitate frequently for three days. When the carbonate of lime has subsided, decant the clear liquor and keep it in well-closed green glass bottles. Its density is 1080.

Caustic Potash in a state of solution in water (Caustic Lixivium, Kali-water, Soap-maker's-ley, Potash-water) seems to have been known to the ancients; and Paulus Ægineta, as well as Geber in the eighth century, showed how it may be obtained by lixiviating a mixture of carbonate of potash and lime fused together. Dr. Black was the first to methodize the liquid process which is still followed; but the manipulations have of late been much improved as regards facility and dispatch.

Chemical History.—A tolerably pure carbonate of potash must in the first place be used; and if the object is to have a pure solution for delicate chemical purposes, the carbonate ought to be prepared by incinerating bitartrate of potash, previously once or twice crystallized, and the lime to be made use of should be obtained from a pure marble or calcareous spar. Good spring-water is sufficient for a pharmaceutic solution; but for a pure one distilled water must be taken, as the London College directs. The minutiæ of the process are by no means unimportant. Filtration, which was enjoined by the previous editions of the Pharmacopœias, is advantageously dispensed with,

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both as being tedious, and, therefore, exposing the potash to become carbonated, and because it is sometimes apt to introduce organic matter into the solution. By the process of subsidence, it is true, a portion is left with the carbonate of lime at the bottom of the vessel; but this does not exceed a seventh of the whole solution when the process is well conducted; and it may be recovered on the great scale by the affusion of boiling water and a second subsidence, and used in this state instead of water for making the strong solution. The proportions of the salt, the lime and the water, are of material consequence. Formerly, too much lime was used. Half as much lime as there is of carbonate has been found sufficient; but the proportion cannot be farther reduced. Water must be used in the proportion of about ten parts (by weight) to one of carbonate, otherwise a portion of the salt escapes decomposition; and no increase in the proportion of lime will prevent that result. The decomposition of the carbonate is greatly accelerated by ebullition, which has likewise the advantage of increasing the density of the particles of carbonate of lime that is formed, and so rendering their subsidence more complete. The last-mentioned object is farther secured by adding the milk of lime in successive portions, and renewing the ebullition after each (Berzelius). Having verified these statements by careful trials, I have no doubt that the details of the Edinburgh formula are superior to those of the two other Pharmacopœias in facility, dispatch, economy, and perfection. The Dublin process is faulty as enjoining twice the necessary lime, and too little water,—so little indeed that, unless with the common watery carbonate of potash of the shops, a perfect caustic potash-solution cannot be obtained. The London formula is better; but by omitting ebullition after the ingredients are mixed, and continuing the agitation till the liquor is cold, much time is lost, and the subsidence is not so complete.

The solution of the Pharmacopœias is a colourless, transparent fluid, which feels soapy, is without odour, and has an intense, alkaline, caustic taste. It turns turmeric brown, renders litmus purple, and infusion of violets, red cabbage, and most blue vegetable colours green. It rapidly absorbs carbonic acid from the air; which must therefore be carefully excluded from the bottles in which it is kept. Heat alters it no farther than by concentrating it, until at length pure caustic potash is obtained. If the evaporation be stopped when the density reaches 1600, crystals may be formed by slow refrigeration, which are four-sided prisms, four-sided tables, or octaedres (Geiger). Solution of potash is an energetic agent in chemistry and pharmacy, by reason of the powerful affinity of its alkali for the acids. It decomposes the salts of ammonia and disengages that alkali,—also the earthy salts, throwing down oxides of the earthy metalloids,—likewise most metallic salts, separating metallic oxides, but redissolving some of them when added in excess,—and lastly, many vegetable infusions containing alkaloids or neutral crystallizable principles, which it detaches more or less pure, in the free state and insoluble. It saponifies most oils and fats, converting the neutral principles of which they are composed into fatty acids, which unite with the potash to form soaps, or fatty salts of definite composition. It acts with great intensity on the soft animal textures, as well as on many vegetable tissues; which it disorganizes, corrodes, or altogether dissolves.

Adulterations.—As solution of potash is scarcely ever purchased by the druggist on the large scale, but is made by retailers themselves, it is not necessary to be minute as to its impurities. It is never expressly adulterated: but may be faulty from errors in preparing it. It ought to have a density of 1072 when prepared by the Edinburgh formula, and of 1063 when made by that of London. Its effects on turmeric and on chloride of platinum, specified by the latter College, are intended merely for distinguishing it. The other cha-

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racters relate to impurities. If it should effervesce on being neutralized by diluted nitric acid, it is not altogether caustic. Should the neutral solution undergo precipitation with carbonate of soda, there is lime present; if with muriate of baryta, there is sulphuric acid; and if with nitrate of silver, there is muriatic acid. None of the potash-waters of the shops, however, will entirely resist the last two tests; nor is it necessary for their pharmaceutic or therapeutic uses that they should do so absolutely. In order to prevent an impregnation of silica, the solution of potash ought to be kept, not in crown-glass, but in green-glass bottles.

Actions and Uses.—The actions of this preparation correspond in a great measure with those of the carbonate, and likewise of potash itself. It is a powerful corrosive; and as such, an energetic poison in large doses, and undiluted. In smaller quantity it is an irritant. It is a pure irritant and corrosive; it does not exert any constitutional action except what depends on the local injury it occasions. In medicinal doses it possesses antacid and antilithic properties, and in these respects it is undistinguishable from the carbonate or bicarbonate of potash. As an antacid it has been used in dyspepsia, as well for correcting acidity generally, as for preventing gastrodynia more especially; and of late, in the practice of not a few physicians, it has been preferred to all other alkaline remedies in these affections, whether idiopathic, or connected with such chronic eruptive diseases as lepra and psoriasis. It is extraordinary how it should be considered in any way preferable to the carbonate of potash in dyspeptic complaints; because the small doses which are, and may alone be, administered, must be instantly converted into carbonate on coming in contact with the carbonic acid largely contained in the gases, secretions, and other contents of the stomach. As an antilithic and lithontriptic, it has been thought superior to other forms of the alkalis, on the inconclusive ground, that it surpasses them in solvent power over the matter of certain urinary concretions out of the body. Within the body it can only exist as a carbonate. When administered inwardly it is commonly given along with some aromatic distilled water, to cover its taste,—always much diluted, to remove its acrimony,—and sometimes along with simple bitter infusions, to unite a tonic with an antacid action, in dyspepsia and cutaneous diseases.

The dose of *Aqua potassæ* is m. x. ad fl. dr. ss.

[LIQUOR POTASSÆ CITRATIS, *U.S.* *Solution of Citrate of Potassa. Neutral Mixture.*

PROCESS, *U.S.* Take of
Fresh lemon juice half a pint;
Carbonate of potassa a sufficient quantity.
Add the carbonate gradually to the lemon juice till it is perfectly saturated, then filter.
Or take of
Citric acid half an ounce;
Oil of lemons two minims;
Water half a pint;
Carbonate of potassa a sufficiency.
Rub the citric acid with the oil of lemons, and then with the water till dissolved; then add the carbonate of potassa gradually till the acid is fully saturated; lastly, filter.

THE United States Pharmacopœia has given two preparations for Neutral mixture; they, however, are nearly identical, each being a solution of citrate of potassa: one being made by a union of the fresh juice of the lemon to carbonate of potassa, and the other a substitution of citric acid for this juice, the solution being flavoured with a little oil of lemon. They are equivalent as regards their action on the system, but the first forms the most agreeable mixture to the taste, and is more apt to sit well on the stomach; the latter is, however, the most precise compound, from the great difference that exists in the strength and purity of the juice of the lemon. Wood and Bache state that it requires about thirty-three grains of perfectly dry and pure carbonate of potassa to saturate a fluidounce of good lemon juice, or forty-eight grains of

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the hydrated carbonate usually kept in the shops. In all cases the mixture should be neutral, the point of saturation being determined either by the cessation of effervescence, or, more accurately, by the litmus test, which should not be reddened by the solution, nor restored to its true colour if previously reddened by an acid. In both preparations a precipitate is apt to form, which is most marked in the first; hence it should be filtered. Sometimes this compound is made with the bicarbonate of potassa, in which case little or no precipitate ensues, but no advantage is gained by the substitution in a remedial point of view. It requires about one-third more of the bicarbonate to saturate the acid, than if the dry carbonate be used.

Sometimes it is advantageous to administer the citrate of potassa, in a state of effervescence, or during the escape of the carbonic acid disengaged from the carbonate; this is known under the name of EFFERVESCING DRAUGHT. It is usually made by adding an equal quantity of water to the lemon juice, and pouring a fluidounce of this on half a fluidounce of water holding fifteen grains of carbonate or twenty grains of bicarbonate of potassa in solution. This is to be administered during its effervescence. Citric acid in solution of the strength indicated in the formula, may be substituted when the lemon juice cannot be obtained, but the preparation is not so pleasant.

The citrate of potassa is now to be found ready made in the shops, and has been prepared as a substitute for the neutral mixture, when dissolved in the proper proportion in water. According to Mr. Scattergood fifty grains are about equivalent to a fluidounce of lemon juice fully saturated with the alkali. It is not much employed, and is far less agreeable to the taste than the officinal mixtures.

Actions and Uses.—The neutral mixture is a good cooling diaphoretic, much employed in febrile conditions of the system, where the skin is hot and dry, and in most cases tends to allay the accompanying thirst; this is particularly the case when given in a state of effervescence, in which form also it will in most instances relieve irritability and sickness of stomach. Sometimes this preparation acts on the bowels, but this tendency is checked by combination with an opiate. It also but rarely operates as a diuretic instead of a diaphoretic. Where it is wished to increase its action on the skin, it will be found advantageous to combine a small portion of tartar emetic with it, or a little sweet spirit of nitre, according to circumstances.

The dose of the neutral mixture is about half a fluidounce, diluted with water. The effervescing draught is to be taken in the quantity noticed above. The dose is to be repeated every hour to three hours, as may be required.]

POTASSÆ AQUA EFFERVESCENS, *E.* LIQUOR POTASSÆ EFFERVESCENS, *L.* *Kali-water. Solution of bicarbonate of potash, surcharged with carbonic acid. Effervescing solution of potassæ.*

PROCESS, *Edin. Lond.* Take of
Bicarbonate of potass one drachm;
Distilled water a pint.
Dissolve the salt in the water, and transmit through the solution carbonic acid gas under strong pressure (till more has passed than suffices for saturation; and preserve the solution in well-closed vessels, *L.*).

WHEN a weak solution of bicarbonate of potash is strongly charged with carbonic acid under high pressure, there is produced the Kali-water of the shops, now frequently used instead of soda-water. Its preparation, action and uses are identical with those of the familiar soda-water, or *Sodæ aqua effervescens;* to which the reader is accordingly referred. It has the advantage over soda-water, that when used as drink, the after-taste is more purely saline, and without any alkalinity. It is distinguished by being highly effervescent, and by the solution, which remains after the escape of the excess of gas, yielding a yellow precipitate when treated with the chloride of platinum.

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The latter character distinguishes it from the similar preparation of soda. Like soda-water, it is sometimes made with too little salt.

POTASSÆ BICARBONAS, *U.S. E. L. D.* *Bicarbonate of potash.*

Tests, *Edin.* A solution in forty parts of water does not give a brick-red precipitate with solution of corrosive sublimate; and when supersaturated with nitric acid, is not affected by solution of nitrate of baryta or nitrate of silver.

Tests, *Lond.* Entirely soluble in water. The solution affects turmeric faintly, and is not affected by sulphate of magnesia unless heated. One hundred parts lose 30.7 at a red heat. When supersaturated by nitric acid, chloride of barium does not affect it, and nitrate of silver causes very little, if any, precipitate.

[Process, *U.S.* Take of
Carbonate of potassa four pounds;
Distilled water ten pints.
Dissolve the carbonate in the water, and pass carbonic acid through the solution till it is fully saturated. Then filter and evaporate, that crystals may form, taking care that the heat does not exceed 160°. Pour off the supernatant liquid and dry the crystals upon bibulous paper. Carbonic acid is obtained from marble by the addition of dilute sulphuric acid.]

Process, *Edin.* Take of
Carbonate of potash six ounces;
Carbonate of ammonia three and a-half ounces.
Triturate the carbonate of ammonia to a fine powder; mix with it the carbonate of potash; triturate them thoroughly together, adding by degrees a very little water, till a smooth and uniform pulp be formed. Dry this gradually at a temperature not exceeding 140°, triturating occasionally towards the close; and continue the desiccation till a fine powder be obtained, entirely free of ammoniacal odour.

Process, *Lond.* Take of
Carbonate of potash six pounds;
Distilled water one gallon.
Dissolve the carbonate in the water; pass carbonic acid through it to saturation; apply a gentle heat to redissolve any crystals that may have formed; and then set the solution aside to crystallize. Pour off the liquor and dry the crystals.—Carbonic acid is obtained from chalk rubbed with water to the consistence of syrup, upon which is poured a mixture of equal weights of sulphuric acid and water.

Process, *Dub.* Take of
Carbonate of potash, prepared from pearl-ash, one part;
Distilled water two parts.
Dissolve the salt in the water; transmit carbonic acid gas, from the action of diluted muriatic acid on marble till the solution becomes turbid; filter; transmit the gas again to saturation; leave the solution in a cool place till crystals form, which are to be dried without heat and kept in a well-closed bottle.

For. Names.—*Fr.* Bicarbonate de potasse.—*Ital.* Bicarbonato di potassa.—*Ger.* Doppelt kohlensaures kali.—*Russ.* Dvuch-uglekisloe kali.

Bicarbonate of Potash, known in former editions of the Pharmacopœias under the name of Carbonate, was first prepared by Cartheuser, in 1757. It exists in small quantity in some mineral waters. The salt used in medicine is all prepared from the carbonate by the manufacturing chemist.

Chemical History.—It may be obtained in various ways. But the process generally followed, consists in charging a solution of the carbonate with carbonic acid, by means of a stream of the gas, or in deriving the additional carbonic acid from the decomposition of the sesquicarbonate of ammonia, in contact with the carbonate of potash. The former method is that of the present London, Dublin (and U.S.) Pharmacopœias. For this process it is desirable that a pure carbonate of potash be used; for in that case the gas may be transmitted to saturation without interrupting the process. But if an impure salt containing silica be employed, as the Dublin College directs, it is necessary to interrupt the transmission of the gas at a certain stage, in order to filter the solution, which becomes muddy from the deposition of siliceous impurities. The method by transmission of gas is not convenient upon the small scale, because the gas is very slowly absorbed except under pressure,—a fact which neither the London nor Dublin College has taken notice of. Hence manufacturers either employ considerable pressure to facilitate absorption, or adopt the plan of simply exposing the alkaline solution for a long time to an atmosphere of

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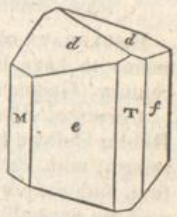
carbonic acid, as in a brewer's vat during the progress of fermentation. The process by decomposition of the sesquicarbonate of ammonia, is superior to the former in point of economy, despatch, and certainty in small operations. This process may be followed either in the moist or dry way. The usual practice is to heat a solution of carbonate of potash in its own weight of water, with about half its weight of sesquicarbonate of ammonia to about 130°, and to stir occasionally until in the course of evaporation small crystals begin to form. Ammonia is given off in great quantity, and the carbonic acid of the ammoniacal carbonate is appropriated by the carbonate of potash; so that, under slow cooling, crystals of bicarbonate of potash are formed. The first crop of crystals is very pure; but if an attempt be made to concentrate the solution farther, to obtain more, carbonic acid is given off, and the subsequent crystals contain a little carbonate. It is better, therefore, to use the residual solution for a fresh operation, adding to it the requisite carbonate of potash and sesquicarbonate of ammonia. I have found that the same process may be conducted very well on the small scale in the dry way. The carbonate of potash being intimately mixed with somewhat more than half its weight of finely-powdered sesquicarbonate of ammonia, the mixture, with the addition of a very little water, is to be subjected to brisk trituration until a perfectly smooth, thick pulp is formed. Ammonia is given off largely; and by subsequently drying the pulp in a hot air-press, and triturating occasionally, more ammonia is discharged, together with the excess of sesquicarbonate. A pure bicarbonate of potash is thus easily obtained in the state of powder. The minutiæ requisite for success, are fine trituration of the ammoniacal salt before it is added to the carbonate of potash, thorough intermixture of the salts, a temperature not much exceeding 130° or 140°, and exposure to that degree of heat until an ammoniacal odour ceases to be given off. This is the process of the Edinburgh Pharmacopœia.—Wöhler says the bicarbonate of potash may be speedily and cheaply prepared in the following manner. Crude tartar is charred in an earthenware crucible, moistened with water, packed in a glass vessel, and subjected to a stream of carbonic acid gas. The gas is absorbed so fast, that the heat produced must be kept down by cooling the vessel. When the absorption of gas ceases, the mass is lixiviated with water at 100° F.; and crystals of pure bicarbonate form as the solution cools.

Bicarbonate of potash readily crystallizes in transparent, colourless, right-rhombic prisms, usually truncated on the acute edges. Their primitive form is the rectangular octaedre. This salt is without odour, and of a mild saline taste, with scarcely any alkalinity. Heat expels carbonic acid from it, and reduces it to the state of carbonate,—a change which takes place partially even below the temperature of 212°. It is soluble in four parts of temperate water, and in rather less than its own weight at 212°. Protracted ebullition converts its solution into the sesquicarbonate. Its reactions on the earthy and metallic salts are in general widely different from those of the carbonate. Sulphate of magnesia and corrosive sublimate, in a moderately diluted solution, do not yield any precipitate with bicarbonate of potash. It is composed of two equivalents of acid, one of base, and one of water ($2CO^2+KO+Aq$), and, therefore, of 44.24 parts of carbonic acid, 47.15 of potash, and 9 of water. It has no power of dissolving or disorganizing the animal textures.

Fig. 158.



Modified Prism of Carbonate of Potash.

Adulterations.—The usual adulterations of bicarbonate of potash are with sulphate and muriate of potash, in consequence of an impure carbonate of potash having been used to make it, and with carbonate of potash from defect-

ive preparation. Sulphate and muriate of potash are detected by nitrate of baryta and nitrate of silver occasioning a white precipitate in its solution when supersaturated by nitric acid. Carbonate of potash is best detected, as the Edinburgh College directs, by a solution of corrosive sublimate; which, with a solution of pure bicarbonate in forty parts of water, has either no effect at all, or causes a white haze merely, but immediately produces a brick-red precipitate if the salt contains even so little as a hundredth part of carbonate. Sulphate of magnesia, which has been recommended for the same purpose by the London College, is altogether useless; even where fifty per cent. of carbonate of potash is present with the bicarbonate, a precipitate is not occasioned.

Actions and Uses.—The bicarbonate closely resembles the carbonate of potash in most of its actions. It is not, like it, a corrosive or powerful irritant, and therefore can scarcely be considered a poison. But it is equally powerful as an antacid and antilithic; it possesses the same diuretic properties and it has the advantage of being less unpleasant to the taste, and so little irritating that it may be administered in much larger doses. As an antilithic, it is preferable to the carbonate, for reasons which will be found explained under the head of carbonate of soda. It is commonly given in the state of simple solution, which, however, may be sweetened with sugar, and aromatized with any distilled water, if the patient prefer it so.—It is sometimes used for making effervescing powders; but the bicarbonate of soda, which answers equally well, is commonly preferred, because much cheaper.

Its dose is gr. x. ad gr. xx. as an antacid or antilithic, and dr. i. ad dr. ii. as a diuretic.

POTASSÆ BISULPHAS, *E. L. D.* *Bisulphate of potash.*

Tests, *Edin.* A solution in eight waters effervesces briskly with alkaline carbonates.

Process, *Edin. Lond.* Take of
The residuum, in the preparation of pure nitric acid, two pounds;
Commercial sulphuric acid seven fluidounces and one fluidrachm (one pound, *L.*);
Boiling water six (four, *L.*) pints.
Dissolve the salt in the water, add the acid, concentrate the solution, and set it aside to cool and form crystals.

Process, *Dub.* Take of
Sulphuric acid two parts;
Carbonate of potash from pearl-ash a sufficiency;
Water six parts.
Neutralize with the carbonate one part of the acid diluted with the water, add the rest of the acid, and evaporate the solution sufficiently for it to crystallize on cooling.

For. Names.—*Fr.* Bisulphate de potasse.—*Ital.* Deuto-solfato di potassa.—*Ger.* Doppelt schwefelsaures kali.—*Russ.* Dvuch-sernokisloe kali.

Bisulphate of Potash (supersulphate of potash; *Sal auri philosophicum*) seems to have been first prepared by Lowitz towards the close of the last century (Geiger).

Chemical History.—It may be obtained according to the process of the Dublin College by moderately diluting the commercial sulphuric acid, neutralizing it with carbonate of potash, then adding as much acid as was used at first, and evaporating the solution so far, that on cooling it concretes into a uniform crystalline mass. Crystals, however, cannot be obtained with these proportions; because, if no more acid be present than is required to form a bisulphate, and the evaporation be stopped at an earlier stage than that indicated in the formula, the crystals which separate on cooling are chiefly neutral sulphate. In order to obtain crystals of bisulphate, a large excess of sulphuric acid must be used. This measure constitutes part of the process of the London and Edinburgh Colleges; which, however, also deviates from the Dublin formula, by directing the operator to make use of the bisulphate obtained as refuse in the making of nitric acid.

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Bisulphate of potash forms small oblique four-sided prisms when crystallized; and when obtained by extreme concentration and cooling, it has the appearance of a firm, fibrous, white mass. Both forms have a strong acid taste. The crystals are permanent in dry air; but the concreted fibrous mass effloresces. A strong heat fuses it, without occasioning any other change. It is exceedingly soluble in water. It is composed of two equivalents of acid, one of base and two of water, when crystallized, and consequently of 80.2 parts of sulphuric acid, 47.15 of potash, and 18 of water ($2\ SO^3 + KO + 2\ Aq$). It may be distinguished from other salts by its strong acid taste, by the brisk effervescence occasioned on projecting an alkaline carbonate into its solution, and by the solution, neutralized in that way, presenting the characters of the neutral sulphate.

Fig. 159.

Actions.—The properties of this salt have not yet been fully investigated. It is a laxative. It supplies a cheap substitute for tartaric acid in making effervescing powders (Barker). A drachm of bisulphate and as much carbonate make a good effervescing powder, which might be used with advantage in hospitals instead of the more expensive tartaric acid.

Its dose is from one to two drachms.

POTASSÆ BITARTRAS, *U.S. E. L. D.* *Bitartrate of potash.*

Tests, *Edin.* Entirely soluble in forty parts of boiling water. Forty grains in solution are neutralized with thirty grains of crystallized carbonate of soda; and when then precipitated with seventy grains of nitrate of lead, the liquid remains precipitable by more of the tests.

Tests, *Lond.* It is sparingly dissolved by water. It reddens litmus. At a red heat it is converted into carbonate of potash.

TARTARUM, *D.* *Impure Bitartrate of potash. Crude Tartar.*

For. Names.—*Fr.* Bitartrate de potasse; Crême de tartre.—*Ital.* Bitartrato di potassa.—*Ger.* Doppelt weinsaures kali; Weinstein.—*Russ.* Dvuvinnokisloe kali.

Bitartrate of Potash (Cream of tartar, Supertartrate of potash, Purified tartar) must have been known in the impure state since the discovery of wine; but the pure salt was first prepared during the last century, and its constitution was unknown until the investigations of Scheele in 1769 (Geiger).

Chemical History.—This salt is all obtained from the crude tartar, argol, or winestone of commerce. This is a grayish or brownish obscurely crystalline substance, which concretes upon the inside of casks in which new wine has been kept. It is formed in largest quantity from the tart wines. This impure tartar (Crude tartar—Argol) consists of bitartrate of potash, tartrate of lime, colouring matter and other accidental impurities. It is freed in a great measure of these impregnations by dissolving and crystallizing it anew. The purest salt is obtained by dissolving what has been thus purified, evaporating gradually the solution, and removing the crust as fast as it forms upon the surface. Hence the vernacular name of Cream of tartar given to the pure salt. The crystals are best freed from lime by placing them in contact with diluted muriatic acid, afterwards draining and washing them (Duflos).

Bitartrate of potash is usually sold in the form of fine powder, but sometimes in fragments of white cakes with obscure crystallization on one of the surfaces. It has a sharp, agreeable, acid taste. It crystallizes in oblique rhombic prisms of very small size. Heat chars and decomposes it, leaving carbonate of potash, and disengaging empyreumatic oil, pyrotartaric acid, and various gases. When heated with half its weight of nitre, a mixture of

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carbon and carbonate of potash is obtained, which constitutes the black flux of chemists. But if the proportion of nitre be doubled, nothing remains behind except carbonate of potash. It is soluble in ninety parts of temperate, and in fifteen of boiling, water. The solution, like the dry salt itself, has a strong, agreeable acid taste. If heated, it effervesces briskly with carbonate of potash. It is not easily decomposed by acids; on the contrary, its acid will decompose many of the neutral potash salts, uniting with their base, and falling down in the form of crystalline or pulverulent bitartrate of potash. The solution of the bitartrate is decomposed by the salts of lime, and tartrate of lime falls in the form of a white powder. It is composed of two equivalents of acid, one of base and one of water (2 T + KO + Aq); and consequently 132.96 parts of tartaric acid, 47.15 of potash, and 9 of water.

Fig. 160.

Adulterations.—It is often adulterated with various white mineral and organic powders. The proofs of its freedom from these are its complete solubility in boiling water, and its decomposing power over nitrate of lead, as laid down in the formula of the Edinburgh College.

Actions and Uses.—Bitartrate of potash is an excellent laxative and a valuable diuretic. In the dose of half an ounce singly, or in that of two drachms along with other mild laxatives, it forms a brisk yet gentle purgative, which may be used for a variety of familiar purposes. In doses somewhat larger, it sometimes gives rise to severe and long-continued purging of watery stools; yet it seldom causes griping at the time, or debility and prostration afterwards. In doses somewhat less, its cathartic qualities disappear, and give place to a powerful diuretic action; on account of which it has lately been much employed in medical practice, especially in dropsies of all sorts. Few diuretics are more generally serviceable in dropsy than ninety grains or two drachms of bitartrate of potash, administered thrice a day with a little water. It is often used as a laxative with sulphur. Some employ it in the form of electuary; but it is better given simply with water.—A solution, with or without sugar, makes an excellent drink for febrile disorders.

Its doses are, for a cathartic effect, dr. iv. ad dr. vi.; for its diuretic action, dr. ss. ad dr. iii. ter in dies.

POTASSA CUM CALCE, *E. L.* POTASSA CAUSTICA CUM CALCE, *D.* *A mixture of potash and lime.*

Tests, *Lond.* Miscible with water; an acid then added causes no effervescence; not altogether soluble in alcohol.

Process, *Edin. Dub.* Take any convenient quantity of Aqua Potassæ; evaporate it in a clean, covered, iron vessel to one-third (one-fourth, *D.*) its volume; add slaked lime till the fluid has the consistence of firm pulp. Preserve the product in well-closed vessels.

Process, *Lond.* Take of
Hydrate of potash, and of
Lime, one ounce of each.
Rub them together, and keep the mixture in a well-closed vessel.

This preparation, the Common Caustic of last century (Vienna paste), is intended for a milder caustic than pure potash, which in other respects it closely resembles in action on the body. It is little used, and may be excluded from the Pharmacopœias.

It is intensely caustic and alkaline to the taste, not wholly soluble in water, unless the water be in very large proportion, and only in part soluble in rectified-spirit. When long or carelessly kept, it becomes partially carbonated;

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and then it effervesces more or less with acids,—which is not the case when it is well made and recent. It is used in the same way and for the same purposes with the solid pure potash; but owing to its pulpiness, it is less convenient. I do not know what advantage there is in the dry, pulverulent preparation of the London College.

POTASSÆ CARBONAS, *U.S. E. L.* POTASSÆ CARBONAS E LIXIVO CINERE, *D.* *Carbonate of potash not quite pure, obtained by lixiviating, evaporating, and granulating, by fusion and refrigeration, the potashes of commerce.*

Tests, *Edin.* One hundred grains lose not more than twenty on exposure to a red heat; and when dissolved and supersaturated by pure nitric acid, the solution gives a faint haze only with solution of nitrate of baryta, and is entirely precipitated by 100 minims of solution of nitrate of silver. (See *Tests* in *Introduction.*)

Tests, *Lond.* Deliquescent; almost entirely soluble in water; it renders turmeric brown: when supersaturated with nitric acid, carbonate of soda and chloride of barium do not cause any precipitate, and nitrate of silver little. One hundred parts lose sixteen of water by a strong heat, and twenty-six of carbonic acid when treated with diluted sulphuric acid.

[Process, *U.S.* Take of
Impure carbonate of potassa three pounds;
Water two pints and a-half.
Dissolve the impure carbonate in the water, and filter the solution, then pour it into a clean iron vessel, and evaporate the water over a gentle fire till the solution thickens; lastly, remove it from the fire, and stir it constantly with an iron spatula till the salt granulates.]

Process, *Lond.* Take of
Impure carbonate of potash two pounds;
Distilled water a pint and a-half.
Dissolve the salt in the water, and filter; pour the solution into a proper vessel, and evaporate it till it becomes thick; then stir it constantly with a spatula while it concretes.
Carbonate of potash may be obtained more pure from crystals of bicarbonate of potash heated to redness.

Process, *Dub.* Take of
Potashes in coarse powder, and of
Cold water, equal parts.
Triturate them together; macerate for a week, stirring occasionally; filter, and evaporate in a clean silver or iron vessel, stirring constantly towards the end with an iron spatula. Put the coarse powder thus obtained into close vessels. Should the potashes be very impure, roast them in a crucible till they are white, before they are dissolved in the water.

POTASSÆ CARBONAS IMPURA (IMPURUS, *U.S.*) *L.* LIXIVUS CINIS, *D.* *Impure Carbonate of potash: Potashes: Pearlash.*

POTASSÆ CARBONAS PURUM (PURUS, *U.S.*) *E.* POTASSÆ CARBONAS, *L.* POTASSÆ CARBONAS E TARTARI CRYSTALLIS, *D.* *Carbonate of potash.*

Tests, *Edin.* It does not lose weight at a low red heat: and a solution supersaturated with pure nitric acid is precipitated, either faintly or not at all, by solution of nitrate of baryta or nitrate of silver.

Tests, *Lond.* The same as given under Potassæ Carbonas.

[Process, *U.S.* Take of
Bitartrate of potassa two pounds;
Nitrate of potassa a pound.
Rub them separately into powder, then mix and throw them into a brass vessel heated nearly to redness, that they may undergo combustion. From the residue prepare the pure carbonate in the manner directed for the carbonate.]

Process, *Edin.* Pure Carbonate of Potash may be most readily obtained by heating crystallized bicarbonate of potash to redness in a crucible; but more cheaply by dissolving bitartrate of potash in thirty parts of boiling water, separating and washing the crystals which form on cooling, heating these in a loosely-covered crucible to redness so long as fumes are discharged, breaking down the mass and roasting it in an open crucible for two hours, with occasional stirring, lixiviating the product with distilled water, filtering the solution thus obtained, evaporating the solution to dryness, granulating the salt towards the close by brisk agitation, and heating the granular salt nearly to redness. The product of either process must be kept in well-closed vessels.

Process, *Dub.* This process is essentially the same with the second of those in the Edinburgh formula, except that the preliminary crystallization of the bitartrate is dispensed with.

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POTASSÆ CARBONATIS LIQUOR, U.S. L. POT. CARB. AQUA, D. *Solution of Carbonate of Potassa.*

[PROCESS, *U.S.* Take of
Carbonate of potassa a pound;
Distilled water twelve fluidounces.
Dissolve the carbonate of potassa in the water, and filter.]

PROCESS, *Lond. Dub.* Take of
Carbonate of potash twenty ounces, *L.* (one part, *D.*);
Distilled water a pint, *L.* (two parts, *D.*).
Dissolve and filter. (Density 1320, *D.*).

FOR. NAMES.—*Potassæ Carbonas impurum* sive *Lixivum Cinis.*—*Fr.* Potasse de commerce.—*Ital.* Potassa; Potassa di cenere; Potassa di peccia.—*Span.* Potasa.—*Ger.* Rohe Potasche.—*Dut.* Potasch.—*Swed.* Pottaska.—*Dan.* Potaske.—*Russ.* Potash.—*Tam.* Marra ooppoo.—*Beng.* Jhar ke nemuk.

Potassæ Carbonas purum.—*Fr.* Carbonate de potasse.—*Ital.* Carbonato di potassa.—*Ger.* Kohlensaures kali.—*Russ.* Uglekisloe kali.

CARBONATE OF POTASH has been known from a period anterior to any scientific records.

There is considerable confusion as to the nomenclature of the several forms recognized by the Pharmacopœias. The London and Dublin Colleges recognize,—the former under the name of Impure Carbonate of potash, the latter under the classical name of *Lixivus cinis*,—the very impure carbonate obtained by simple lixiviation of vegetable ashes, and called in commerce Potashes. This article is excluded by the new Edinburgh Pharmacopœia, because it is not put to any medicinal use, and for pharmaceutic purposes is purified on the large scale by the manufacturing chemist, so that it is rarely seen in the crude state in the shops of retailing druggists. The generic term, Carbonate of Potash, is attached by the Edinburgh College to this purified article; and the Dublin College defines it more minutely, by indicating its source in its title,—*e lixivo cinere.* The London College applies the simple term, Carbonate of potash, both to purified potashes and likewise to a much purer salt obtained by heating the bicarbonate. Finally, for this last variety, as obtained both from the bicarbonate and the bitartrate of Potash,—and which is required only for certain pharmaceutic operations, and not for medicinal use,—the Edinburgh College affixes the supplementary term, Pure, and the Dublin College the explanatory term, *e tartari crystallis.* These differences are obviously immaterial as regards prescriptions; but they must be attended to in using the several carbonates in pharmacy or in chemical researches. Great care must be taken not to confound the Carbonate of the present Edinburgh Pharmacopœia with the Carbonate of the last Latin edition, the former salt being a corrosive poison, and the latter the bicarbonate, which is not poisonous.

Chemical History.—Carbonate of potash in an impure state is obtained in large quantity from land plants by drying them, burning them so as to consume their carbonaceous matter, lixiviating the ashes with water till they are exhausted, and evaporating the solution to dryness in iron vessels. The residuum is a deliquescent porous mass, presenting various tints of gray, blue, and green, known by the name of Potashes, and containing, besides carbonate of potash, a large proportion of sulphates, muriates, and other impurities. The quantity of potashes obtained from different plants varies exceedingly. Kirwan found that herbaceous plants yield more than woody plants, and that the barks of woody plants yield more than their woods; that the quantity of saline matter produced by lixiviating their ashes varies from 6 per cent. to 75 per cent.; and that wormwood and fumitory among herbaceous plants, and beech among trees, yield the largest quantity observed in the course of his experiments. The following table, compiled from various sources, shows the quantity of pure potassa produced from one thousand parts of various plants.

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Pine,	0.45	Barley-straw,	5.8
Poplar,	0.75	Beech-bark,	6.0
Trefoil,	0.75	Fern,	6.26
Beech,	1.45	Rushes, large,	7.22
Oak,	1.53	Maize-stalks,	17.5
Box,	2.26	Anthemis cotula,	19.6
Willow,	2.85	Bean-stalks,	20.0
Elm,	3 9	Sunflower-stalks,	20.0
Maple,	3.9	Common nettle,	25.03
Wheat straw,	3.9	Vetch,	27.5
Oak-twig bark,	4.2	Thistles, full grown,	35.37
Thistles,	5.0	Wheat-stalks, young,	47.0
Flax,	5.0	Wormwood,	73.0
Rushes,	5.08	Fumitory,	79.0
Vine shoots,	5.5		

Different varieties of potashes are imported into this country chiefly from North America and Russia. When potashes are exposed to heat and air in a reverberatory furnace, a part of their impurities undergoes oxidation, some water is given off, and a purer substance is produced which is called Pearl-ash in commerce. When the process of lixiviation is combined with the use of quick-lime, and the application of a strong fusing heat, a substance is obtained of stony hardness, and much more caustic than either pot-ashes or pearl-ash. This is called American ash or American pot-ashes; and it is distinguished by a considerable part of its potash being in the caustic state. Vauquelin made a careful analysis of various specimens of the different articles here described, and found that the pure hydrated potash existing in the free state, or combined with carbonic acid, amounted in American-ash to 74 per cent., in Russian potashes to 67.0, in American pearl-ash to 66.5, and in various other European specimens to between 38.5 and 62 per cent.

From the potashes or pearl-ash of commerce is obtained by solution and evaporation the Carbonate of potash of the Edinburgh and London Pharmacopœias, the *Carbonas potassæ e lixivo cinere* of that of Dublin. The London and Dublin processes consist essentially in dissolving the impure salt in as small a quantity of water as possible, by which many of the impurities are left behind,—then evaporating the solution in very clean iron-vessels, till it is so concentrated as to become solid on cooling,—and stirring it briskly while it concretes, so that the salt is eventually obtained in small, roundish grains, rather larger than millet-seed. In this state it is often sold under the name of Purified Pearl-ash.

When thus far purified, carbonate of potash is white, opaque, caustic and alkaline to the taste, very deliquescent, and possessed substantially of all the properties to be described presently under the head of the pure carbonate. But in addition to these, it loses weight by a heat somewhat short of redness, owing to the presence of water, generally to the amount of 20 per cent. This impurity arises from the process of concentration being stopped before complete dryness. Farther, when saturated with nitric acid, its solution yields a precipitate both to nitrate of baryta and nitrate of silver, especially the latter, on account of the presence of some sulphate and muriate of potash.

Pure carbonate of potash is sometimes obtained, as the London College directs, by subjecting the bicarbonate to heat; which drives off an equivalent of water and an equivalent of carbonic acid. If the bicarbonate be used in the crystalline form, more especially if it have been crystallized more than once, an extremely pure carbonate is thus readily prepared. Considering how little use is made in Pharmacy of a carbonate chemically pure, this process might perhaps have been sufficient for the Colleges. As it is comparatively expensive, however, the Dublin and Edinburgh Colleges have introduced the older process, which consists in first charring and then incinerating the bitartrate of

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potash, previously purified by solution and crystallization if necessary,—next lixiviating the residuum, which consists of carbonate of potash with a little charcoal,—and finally obtaining the salt by evaporation, granulation, and subsequent thorough drying.

Pure carbonate of potash is in small roundish grains, white, opaque, caustic and alkaline to the taste, and soapy to the touch, if moist. It quickly deliquesces in the air and soon becomes liquid; but in consequence of the slow absorption of carbonic acid from the atmosphere, and its passage to the state of bicarbonate, it again very gradually dries up. A red heat fuses it; but no elevation of temperature, however great, causes any farther change. It dissolves in its own weight of water, occasioning heat in the act of solution. From a very strong solution of the density 1600 it may be crystallized, though with difficulty, by slow cooling, in opaque, rhombic octaedres and tables, which contain two equivalents of water of crystallization. It is insoluble in alcohol. Its watery solution, which is admitted into the Pharmacopœias of London and Dublin, is a very powerful and extensively useful agent in Pharmacy as well as in chemical analysis; but for the former of these purposes the purified pearl-ash answers in general equally well. It decomposes, with the phenomena of double decomposition, the salts of lime, baryta, magnesia, and strontia,—throwing down insoluble white carbonates. It acts similarly on most of the salts of the ordinary metals; the precipitates from which, however, are commonly coloured. In the case of the salts of alumina and of the sesquioxide of iron, the precipitate is the hydrated oxide and not the carbonate; for these oxides do not unite with carbonic acid. It corrodes and dissolves the soft animal solids and many vegetable tissues, but not so energetically as the solution of pure potash.——Carbonate of potash is distinguished from the bicarbonate, in the solid state by deliquescing in the air, and in solution by yielding a white precipitate with sulphate of magnesia, and a brownish red one with corrosive sublimate; for neither of these reagents will affect the bicarbonate if in a state of diluted solution. From carbonate of soda it is known by its deliquescent property in the solid state, the soda salt being efflorescent,—and in solution by giving a yellow precipitate with chloride of platinum, and a granular or crystalline precipitate with an excess of tartaric or perchloric acid. Carbonate of soda in solution is not affected by any of these tests. It is composed of one equivalent of acid and one of base (CO^2+KO), and therefore of 22.12 parts carbonic acid, and 47.15 of potash.

Adulterations.—The adulterations of the common carbonate of potash are indicated by the Edinburgh College as being an excess of moisture, and too much sulphate or muriate of potash. If the specimen be of good quality, a red heat ought not to diminish its weight more than twenty per cent., and when its solution is supersaturated by pure nitric acid, solution of nitrate of baryta should occasion little more than a haze; while solution of nitrate of silver of the strength of one part in forty, when added in the quantity of 100 minims for every hundred grains of carbonate, should leave no muriate in the fluid, so that an additional quantity of the silver test added after filtration has no farther effect. I have found that most samples of purified pearl-ash answer to these characters. The silver test indicates that there is not more than one grain per cent. of muriate of potash present in the carbonate. The characters given by the London College are partly intended to indicate its nature, partly to detect its adulterations. The latter characters are inferior in precision to those of the Edinburgh Pharmacopœia. The quantity of pure salt in commercial carbonate may be conveniently estimated by its power of neutralizing tartaric acid. Five parts of real carbonate saturate 5.44 parts of acid gently dried, so as not to expel any of its water of crystallization (Wittstein).——The great quantity of moisture in the common carbonate of the shops, which

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is not generally adverted to in chemical or pharmaceutic works, must be carefully remembered and made allowance for in all operations in pharmacy.

The adulterations of the pure carbonate are with water, sulphate of potash, muriate of potash, and silica. Few specimens sold as pure carbonate are without some water. It is detected by the loss of weight at a red heat. The foreign salts occur in consequence of purified pearl-ash being substituted for the pure carbonate. They are detected by the solution, when supersaturated with nitric acid, giving a white precipitate with nitrate of baryta in the case of the sulphate of potash, and with nitrate of silver in the case of the muriate. These are the adulterations referred to by the tests of the Edinburgh College. Silica,—also sometimes present, owing to original admixture, or accidental impregnation from the salt having been long kept in the moist or dissolved state in crown-glass bottles,—may be discovered by a cloudless or fleecy precipitate forming, on nitric acid being added to neutralization. The tests of the London College for this salt are vague, in consequence of the College having confounded under the same name, both that which is perfectly pure, and that which is obtained by purifying the potashes of commerce.

Actions and Uses.—All the forms of carbonate of potash here treated of are identical in their actions. Like caustic potash, they are corrosive; and though less powerful than it, they are sufficiently so to be very energetic poisons. They occasion destruction of the mucous membrane of the fauces, gullet, stomach, and sometimes of the intestines,—indicated at first by violent burning pain, prostration and vomiting, which is sometimes bloody,—and afterwards, provided death does not ensue in a few days, by excessive emaciation, and constant irritability of the stomach and bowels. Sometimes membranous tubes are discharged from the rectum, and more frequently than in the case of other corrosives, symptoms of stricture of the gullet present themselves. The proper antidotes are vinegar, lemon-juice, or fixed oil. An ounce has occasioned death; and less would undoubtedly suffice. In doses of a drachm or thereabouts, and somewhat diluted, carbonate of potash acts as an irritant. Its medicinal actions are nearly the same with those of the bicarbonate of this alkali, and of the two carbonates of soda. It is antacid, antilithic, and diuretic. As a diuretic it has been commonly preferred to the bicarbonate; but both of them are much inferior as such to other potash salts, especially the nitrate, acetate, and bitartrate. It should be given for this purpose thrice a day. As an antacid it is less used now than the alkaline bicarbonates;—not that it is less efficacious, but simply because its strong alkaline taste renders it more disagreeable to take. In calculus of the bladder or kidney, as well as in gravel, it is of great service where the morbid secretion consists of lithic acid and the lithates. When the tendency to lithic discharge is great, about thirty-five grains should be given in the course of the day in divided doses. In phosphatic gravel, the bicarbonate is preferable, for reasons to be mentioned under the head of the bicarbonate of soda,—where a fuller account will be found of the actions and uses of alkalis as antilithic remedies. It may be here observed, however, that many prefer the potash carbonates to those of soda for antilithic purposes, on the supposition that they are more energetic solvents. They are sometimes used in the way of injection into the bladder; in which case the carbonate is preferable to the bicarbonate. Both salts are most extensively used as pharmaceutic agents and chemical tests.

The doses and preparations of carbonate of potash are, *Carbonas potassæ*, U.S. E. L. D. gr. v. ad gr. xii. *Potassæ carbonatis liquor*, L. U.S. (*Aqua*, D.), fl. dr. ss. ad fl. dr. i.

POTASSA CAUSTICA, *D.* See *Potassa.*

POTASSÆ CAUSTICÆ AQUA, *D.* See *Potassæ Aqua.*

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POTASSA CAUSTICA CUM CALCE, *D.* See *Potassa cum calce.*

POTASSÆ CHLORAS, *L.* *Chlorate of Potash.*

TESTS, *Lond.* Entirely soluble; and the solution is not affected by nitrate of silver. Fusible; and a higher heat expels oxygen, leaving chloride of potassium. A little sulphuric acid renders the crystals first yellow, and then red, and expels peroxide of chlorine.

PROCESS. None.

No evidence has yet been published of such a nature as to entitle this salt to admission into the Pharmacopœias. It was distinguished from other salts for the first time by Berthollet in 1786; but had been previously prepared by Higgins.

Chemical History.—It is obtained by transmitting chlorine to saturation through a solution of fifteen parts of carbonate of potash in thirty-eight of cold water,—exposing the solution, with the salt which crystallizes in it, for a few days to the air, and agitating occasionally until the odour of chlorine passes off,—and then separating the crystals, and recrystallizing them from twice their weight of boiling water. In this process a part of the potash is decomposed, and its oxygen unites with a part of the chlorine to form chloric acid. The acid unites with the remaining potash, while another portion of chlorine unites with the potassium of the decomposed potash to form chloride of potassium. Hence chloride of potassium is found in the mother-water from which the chlorate of potash, owing to its inferior solubility, had separated by crystallization. On the supposition that the chloride is dissolved in the form of hydrochlorate of potash, the chemical actions are easily understood on the principle of water being decomposed, instead of potash.

Chlorate of potash is usually in the form of colourless tabular crystals, four-sided or six-sided, of pearly lustre, permanent in the air, and of a cooling saline taste like that of nitre. Heat fuses it. If maintained for two hours at such an elevation as to produce only a slight discharge of gas, the fused mass again concretes, and is found to consist of chloride of potassium and perchlorate of potash,—a portion of the chloric acid having abstracted oxygen from the rest. A stronger heat drives off the whole oxygen both from the acid and the potash, and leaves only chloride of potassium. It enlivens the combustion of burning fuel like nitre; and when mingled with various inflammable substances, it imparts the property of deflagrating or exploding, when the mixture is struck or exposed to heat. It is soluble in two parts of boiling water, and in about twelve parts at 60°. It consists of one equivalent of chloric acid and one of potash (ClO^5+KO); that is of 75.42 parts of chloric acid, and 47.15 parts of base.

Adulterations.—It is subject to be impregnated with chloride of potassium from faulty preparation. This will be detected as the London College points out, by nitrate of silver occasioning a white precipitate in its solution. The other characters given in the London Pharmacopœia are merely intended for ascertaining its nature. The effect of sulphuric acid in rendering the crystals first yellow, and then red, with the expulsion of the green gaseous peroxide of chlorine, is very characteristic.

Actions.—Chlorate of potash has been proposed as a calmative and refrigerant in pulmonary consumption; and Dr. Stevens used it in malignant fevers and cholera for promoting the arterialization of the blood. It is said to moisten and clean the tongue (Copland). It has not, however, been currently adopted for these, or, so far as I know, for any other purposes, and I am not aware why the London College has made it officinal. I have tried the effects of seven-grain doses thrice a-day in phthisis, but could not observe any physiological or therapeutic action whatever.

POTASSÆ HYDRAS, *L.* See *Potassa.*

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POTASSÆ HYDRIODAS, *D.* See *Potassii Iodidum.*

[POTASSII CYANURETUM, *U.S.* *Cyanuret of Potassium.*

For. Names.—*Fr.* Cyanure de potassium; Cyanure potassique; Azocarbure de potassium.—*Ger.* Cyankalium; Hydrocyansaures kali.

Process, *U.S.* Take of
Ferrocyanuret of potassium, in powder, eight ounces;
Distilled water six fluidounces.
Expose the ferrocyanuret to a moderate heat until it becomes white, and is wholly deprived of its water of crystallization. Put the residue in an earthen retort, with the beak loosely stopped, and expose it to a red heat for two hours, or till gas ceases to be disengaged. Withdraw the retort from the fire, close the orifice with lute, and then let the whole stand until quite cold. Break the retort, remove the black mass, reduce it to fine powder, introduce it into a bottle of the capacity of twelve ounces, and then add the distilled water. Agitate the mixture occasionally for half an hour; filter; evaporate the filtered solution to dryness, and keep the dry mass in a closely stopped bottle.

In this process, the salt being deprived of its water of crystallization by the exposure to heat, is calcined at a red heat to decompose the cyanuret of iron; when this is accomplished, the result is a black, porous mass, consisting of cyanuret of potassium, much contaminated with charcoal and carburet of iron. The direction to close the orifice of the retort, is to prevent the salt from absorbing oxygen from the air. When cold, the mass is powdered, and cold distilled water added to dissolve out the cyanuret of potassium from the carburet and charcoal. This solution on being rapidly evaporated, leaves the cyanuret in a solid state; but, however speedily this process is conducted, a small portion of it undergoes decomposition, a formiate of potassa being produced, with a disengagement of ammonia. If the cyanuret be dissolved out of the black mass with alcohol of 0.89 at a boiling temperature, and afterwards evaporated to a pellicle, it crystallizes on the cooling of the solution in a perfectly white and pure state, with no loss by decomposition.

Numerous other processes have been employed for the formation of this salt; among which, that of the Paris codex is stated by Mr. Donovan to be the best. This consists in introducing ferrocyanuret of iron into a coated and well luted earthen retort, provided with a curved tube connected with a vessel containing a small quantity of water. Heat is to be applied in by means of a reverberatory furnace, and raised gradually; when gas is no longer disengaged, the heat is to be suddenly and greatly increased, till bubbles are no longer formed; the fire is then to be checked, and the apparatus suffered to grow cold, when the retort may be broken and the product collected. This the pure cyanuret mixed with an impure salt, mixed with carbonaceous matter, &c. It often is found in two layers, the one pure and white, and the other impure and black; these should be separated, and the first kept for use. Mr. Donovan recommends the use of an iron mercury bottle for the earthen retort.

Dr. Hamilton and Mr. McKenzie, of Baltimore, describe the following method as efficient and simple, being a modification of the plan recommended by Chevallier. Ferrocyanuret of potassium is to be heated to redness in a common Hessian crucible, till fumes are no longer given off; the crucible is then to be broken, and the black mass contained in it is to be rapidly powdered, and alcohol added, and the mixture repeatedly stirred, till it attains the temperature of about 150° F.; it is then to be filtered and evaporated by means of a water bath, at a temperature below the boiling point of alcohol. The evaporation should be conducted in a broad and shallow vessel. By this means four ounces of the ferrocyanuret will yield from six to seven drachms of dry white cyanuret.

The best process is said to be that of Wiggers; this consists in slowly distilling two parts of ferrocyanuret of potassium, and one and a half parts of

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sulphuric acid, diluted with an equal quantity of water, and suffered to cool; the hydrocyanic acid that passes over is received into a cooled receiver containing one part of pure hydrate of potassa dissolved in three or four parts of alcohol of 0.882. When there is a diminution of the ebullition, the process is to be stopped; the alcoholic solution of potassa in the receiver will be found thickened with cyanuret of potassium; the whole is then to be poured on a filter, well washed with alcohol, and without being removed from the filter, pressed and dried. (*Wood and Bache.*)

Pure cyanuret of potassium is white and somewhat transparent; it has a sharp, somewhat alkaline and bitter almond taste, and an alkaline reaction. It forms cubic or octahedral cystals, is very deliquescent in the air, and soluble in water, and dissolves in boiling alcohol, but separates in a great measure on cooling. It is readily fused, and undergoes no change if access of air be prevented; but when this is not the case, it absorbs oxygen and becomes cyanate of potassa. It is decomposed by all acids, even the carbonic acid of the atmosphere, giving off the hydrocyanic acid, and becoming carbonate of potassa. When it is boiled in a retort, it is slowly changed into formiate of potassa, with a separation of ammonia. No pharmaceutic preparation is more liable to change than this, though the change takes place slowly. From bad preparation, it also varies much in quality and strength, so that much caution must be exercised in prescribing it.

Adulterations.—These are principally dependent on an original defect in the preparation, or from the effects of atmospheric influences, and are, besides an undue proportion of water, the carbonate, cyanate or formiate of potassa. The first two salts may be detected by effervescence taking place on the addition of an acid, and the latter by its becoming dark coloured when heated.

Actions and Uses.—Cyanuret of Potassium is very poisonous, and the experiments of Robiquet and Villerme, and those of Dr. Letheby, show that, with the exception of hydrocyanic acid, it is the most active of all the compounds of cyanogen. It has been proposed as a substitute for hydrocyanic acid, on the ground of its uniformity of strength, and less liability to change. Magendie proposed that it should be dissolved in eight times its weight of distilled water, when it becomes changed into hydrocyanate of potassa. This is to be administered in the same cases and in similar doses, as the medicinal hydrocyanic acid. It has been prescribed in a variety of diseases by Bally, Lombard and others, with very variable success; nor does it appear to possess any advantages over the hydrocyanic acid, even taking in view the uncertainties attendant on the employment of that article. Externally, it has been used as a lotion, made with four grains to the fluidounce of water, in facial and other forms of neuralgia. Its solution is one of the best means of removing stains of nitrate of silver, and this has been taken advantage of by Mr. Guthrie for the obliteration of the dark-coloured spots on the conjunctiva, in patients who have taken the nitrate of silver for some time; he advises a solution of the cyanuret, made with six grains to the fluidounce of distilled water, to be applied to the eye by drops on each alternate day. The dose of the cyanuret is a quarter of a grain, gradually increased to a grain.]

POTASSÆ LIQUOR, *U.S. L.* See *Potassæ aqua.*

POTASSÆ LIQUOR EFFERVESCENS, *L.* See *Potassæ Aqua Effervescens.*

POTASSÆ NITRAS, *U.S. E. L. D.* *Nitrate of Potash.*

Tests, *Edin.* Entirely soluble: its solution is not affected by solution of nitrate of baryta, and faintly, or not at all, by solution of nitrate of silver.

Tests, *Lond.* Entirely soluble in distilled water: the solution is not affected by chloride of

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barium or nitrate of silver: heat fuses it; and, when raised, expels oxygen; and the residuum gives nitrous vapours with sulphuric acid.

POTASSÆ NITRAS PURIFICATUM, D. *Purified Nitrate of Potassa.*

PROCESS, *Dub.* Take of
Nitrate of potash one part.
Dissolve it in two parts of boiling water, and set the solution aside to cool and crystallize.

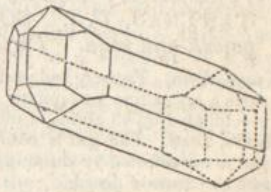
FOR. NAMES.—*Fr.* Nitrate de potasse; Nitre; Salpêtre.—*Ital.* Nitrato di potassa; Nitro; Salnitro.—*Span.* Salitre nitro.—*Port.* Nitro.—*Ger.* Salpetersaures kali; Salpeter.—*Dut.* Salpeter.—*Swed.* Saltpeter.—*Dan.* Saltpeter.—*Russ.* Azotnokisloe kali; Selitra.—*Arab.* Ubkir.—*Pers.* Shorah.—*Tam.* Potti-looppoo.—*Beng.* Shorah.—*Hind.* Bajee.

NITRATE OF POTASH (Nitre, Saltpetre, Sal-prunelle) has been known from remote antiquity; but in ancient times it was not accurately distinguished from other salts which form by efflorescence on the surface of the soil, more especially from carbonate of soda.

Chemical History.—It exists naturally in some soils, and may also be formed artificially. The greater proportion of what is used in Britain is obtained in various parts of the East Indies by lixiviating certain kinds of soil. An essential part of the composition of such soils is, that they shall contain decomposing felspar, mica, or other destructible minerals which consist partly of potash. The production of nitre from them is promoted by the presence of animal matter, but may also go on without it; so that the nitric acid must be formed through the intervention of atmospheric air. The soluble salts of the nitre salts consist of sulphates, muriates, and nitrates of potash, lime, and soda. The whole nitrates are converted into nitrate of potash by lixiviating the soil over a filter of wood-ashes containing carbonate of potash, and then duly evaporating the filtered liquor (Stevenson, Journ. Asiat. Soc. of Bengal, ii.). The crystalline matter thus obtained has a dirty yellowish hue; it contains much foreign matter technically called "refraction," and is known in commerce by the name of Crude nitre or Crude Saltpetre. This is purified in various degrees, both in India and after importation into Britain, by repeated crystallization. Nitrate of potash is likewise prepared in many parts of Europe from soils artificially impregnated with animal matter,—or from the mortar of old buildings, especially of the under-ground floor,—or from artificial composts consisting of animal substances, decaying vegetables, ashes, and chalk, marl or lime. The nitrate thus in the first place produced is the nitrate of lime, which is converted into the nitrate of potash by double decomposition with carbonate of potash; and the salt is then obtained by lixiviation, and purified as above by repeatedly crystallizing it.

Nitrate of potash, as now usually found in the shops, is a salt of considerable purity. It forms fragments of crystals of considerable size, which are striated, opaque, colourless, six-sided prisms, terminated by one, two, or six converging planes. It has a peculiar, cool, saline taste. It is permanent in the air. Heat fuses it, and when raised to redness drives off oxygen, and converts it into hyponitrite of potash. When thrown upon burning fuel, it enlivens greatly the combustion, causing deflagration. When allowed to cool from a state of fusion, it concretes into a hard, fibrous, opaque, white mass, known in commerce by the name of Sal-prunelle. This substance was at one time thought to differ from the crystals, or Saltpetre, in containing no combined water. The two forms, however, are identical in constitution, there being no water of crystallization in either. It is soluble in less than half its weight of boiling water, and in about four

Fig. 161.



parts at 60°. It occasions considerable cold in the act of dissolving. It is composed of one equivalent of each of its constituents (NO^5+KO), and therefore of 54.15 parts of acid, and 47.15 of potash. It is sparingly soluble in rectified-spirit.

Adulterations.—Its adulterations, as indicated by the tests of the Edinburgh and London Pharmacopœias, are with sulphate of potash and muriate of potash. The former, in good nitre, as now often met with in the shops, is scanty or even altogether wanting. It is detected by solution of nitrate of baryta, occasioning a white precipitate. Muriate of potash is always present more or less, and is discovered by nitrate of silver causing a white precipitate of chloride of silver. Lime, which occurs only in the inferior sorts, and has not been provided for by the College formulas, is detected by solution of oxalate of ammonia throwing down the white oxalate of lime. The process of purification recommended by the Dublin College is now seldom necessary, as the salt of commerce is pure enough for most medical purposes. In order to obtain pure nitric acid, however, it must be crystallized once or oftener, till nitrate of silver ceases to affect its solution in distilled water.

Actions and Uses.—The actions of nitrate of potash are chiefly fourfold,—irritant, cathartic, refrigerant, and diuretic. When swallowed in a state of solution, in doses between half an ounce and two ounces, it occasions heat and pain in the stomach, vomiting, excessive nervous depression, and sinking of the pulse. It has thus proved fatal in a few hours; but its poisonous effects are uncertain, for I have known an ounce retained for fifteen minutes without occasioning any inconvenience except a few attacks of vomiting. In less doses it is cathartic, but uncertain as such; and it is therefore never used in medicine as a purgative. Its refrigerant action, generally admitted by systematic writers on Materia Medica and by many practitioners, is of doubtful existence,—having probably been inferred rather from the coldness it occasions while dissolving in water, than from actual evidence of its effects in disease. The sedative action ascribed by some to it has been probably inferred from its supposed refrigerant property, and not from observation. Like some other saline bodies it enjoys some reputation as a remedy in serous inflammations and articular rheumatism. Its diuretic action is the most undoubted of its medicinal properties, and has led to the extensive employment of it in dropsy. It is conceived by some to be best adapted for the treatment of ascites among dropsies. My own observation leads me to consider it as greatly inferior to other saline diuretics, and very uncertain in its operation in ascites, the disease in which it has been most recommended. It may be given either in powder with sugar, or in solution with syrup and some aromatic distilled water.

Its doses are: gr. x. ad gr. xx. as a sedative refrigerant; and scr. ii. ad dr. i. as a diuretic.

POTASSÆ ET SODÆ TARTRAS, *E. D.* SODÆ ET POTASSÆ TARTRAS, *U.S.* SODÆ POTASSIO-TARTRAS, *L.* *Tartrate of potash and soda. Tartarized soda; Rochelle salt.*

Tests, *Edin.* Entirely and easily soluble in five parts of boiling water; muriatic acid occasions a crystalline precipitate in a strong solution; 37 grains in solution are not entirely precipitated by 43 grains of nitrate of lead.

Tests, *Lond.* The salt is entirely soluble; the solution does not affect litmus or turmeric, and is not affected by chloride of barium or nitrate of silver: sulphuric acid converts part into bitartrate of potash.

[Process, *U.S.* Take of
Carbonate of soda a pound;
Bitartrate of potassa, in powder, sixteen ounces;
Boiling water five pints.
Dissolve the carbonate of soda in the water, and gradually add the bitartrate. Filter the solution and evaporate till a pellicle

forms, and set aside to crystallize. Pour off the liquor, and dry the crystals on bibulous paper; again evaporate the liquor to obtain more crystals.]

PROCESS, *Edin. Lond. Dub.* Take of
Bitartrate of potash, in powder, sixteen ounces (seven parts, *D.*);
Carbonate of soda twelve ounces (five parts, *D.*);
Boiling water four pints (fifty parts, *D.*).
Dissolve the carbonate in the water; add the bitartrate (to neutralization, *E.*); boil and filter. Concentrate the liquor till a pellicle forms on its surface, and then set it aside to cool and crystallize. The residual liquor will yield more crystals by farther concentration and cooling.

FOR. NAMES.—*Fr.* Tartrate de potasse et de soude; Sel de Seignette.—*Ital.* Tartrato di potassa et di soda; Sal di Seignette.—*Ger.* Weinsaures natronkali; Seignettesalz.

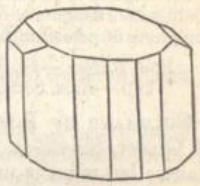
THE London College, in attempting to shorten the pharmaceutic name of this salt, have chosen one involving a doctrine as to the constitution of the salt, which no chemist has hitherto advocated (see *Antimonium Tartarizatum*).

The TARTRATE OF POTASH AND SODA was discovered in 1672, and long secretly prepared by Seignette, an apothecary of Rochelle; whence it is still commonly called Rochelle-salt, and sometimes Seignette's salt. Geoffroy discovered the mode of preparing it in 1731.

Chemical History.—It has been prepared in various ways; but it is now universally made in Britain, according to the College process, by neutralizing bitartrate of potash with carbonate of soda. There is an advantage in having a slight excess of the carbonate, notwithstanding the directions of the Edinburgh Pharmacopœia to observe exact neutralization.

It is met with in the shops in beautiful, colourless, and nearly transparent crystals, which are prisms or halves of prisms, presenting six, eight or ten sides, and whose primitive form is the right rhombic prism. It has a mild, saline, not disagreeable taste. It is permanent in the air, except that it effloresces slightly when the air is very dry. Heat causes it to fuse in its water of crystallization, and when elevated, ocasions decomposition, producing charcoal and carbonates of its two alkaline bases. Temperate water dissolves it in the proportion of two parts and a-half to one of salt; and at 212° it is much more soluble. The strong acids, such as sulphuric or muriatic acid, decompose the solution, appropriating the soda, and causing a crystalline precipitate of bitartrate of potash, if the solution be not too diluted. It is composed of one equivalent of tartrate of potash, one equivalent of tartrate of soda, and eight equivalents of water ($2\overline{T} + KO + NaO + 8\,Aq$); and therefore of 132.96 parts of acid, 47.15 of potash, 31.3 of soda, and 72 of water.

Fig. 162.



Adulterations.—As a tartrate of potash and soda is almost always sold in crystals, it is little exposed to adulteration. The Edinburgh formula of tests is chiefly intended to meet the admixture of tartrate of lime and bitartrate of potash; both of which are left behind on dissolving the salt in a small quantity of boiling water. The nitrate of lead applied to a solution of a given quantity, according to the method directed in the formula, will show the presence of a due proportion of tartaric acid, and consequently the absence of the mineral acids in the form of salts. For the latter purpose the London College indicates the want of precipitation with chloride of barium and nitrate of silver; but these tests precipitate tartaric acid in the form of tartrate of silver and tartrate of baryta, unless the solution be considerably diluted; so that the London formula requires correction. One part of pure salt dissolved in ten parts of water is precipitated by both nitrate of baryta and nitrate of silver, if added in sufficient quantity.

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Actions and Uses.—This salt is only known and used as a laxative. It is exceedingly convenient as such, both because very effectual, and because it has a less disagreeable taste than most efficacious purgatives among the neutral salts. It is administered in solution in eight or ten parts of water. A drachm added to one of the papers for effervescing powders increases their purgative power, and constitutes what are incorrectly called Seidlitz (Seignette's?) powders in the shops. See *Sodæ bicarbonas.*

The dose of *Tartras potassæ et sodæ* varies from dr. ii. to dr. x.

POTASSÆ SULPHAS, *U.S., E. L. D. Sulphate of potash.*

Tests, *Edin.* Not subject to adulteration.

Tests, *Lond.* Not soluble in alcohol, sparingly so in distilled water: chloride of platinum occasions in the solution a yellow precipitate, and chloride of barium a white one insoluble in nitric acid.

Process, *Edin.* Take of
The residuum of the preparation of pure nitric acid two pounds;
Boiling water two pounds;
White marble, in powder, a sufficiency.
Dissolve the salt in the water; add the marble gradually till effervescence ceases and the solution is completely neutralized; filter the liquor and evaporate it till a pellicle forms on its surface; then set it aside to cool and form crystals.

Process, *Lond.* Take of
The residuum of the preparation of nitric acid two pounds;
Boiling water two gallons.
Expel the excess of acid by heating the salt in a crucible; boil what remains in the water till a pellicle forms; filter the solution, set it aside for crystallization, pour off the liquor, and dry the crystals.

Process, *Dub.* Dissolve in a sufficiency of boiling water the salt left after the distillation of nitric acid. Saturate the excess of acid with carbonate of potash; filter and evaporate with a very gentle heat till the salt crystallizes.

Pulvis Salinus Compositus, E. *Compound Saline Powder.*

Process, *Edin.* Take of
Pure muriate of soda, and
Sulphate of magnesia, of each four ounces;
Sulphate of potash three ounces.
Dry the salts separately with a gentle heat, and pulverize each, then triturate them well together, and preserve the mixture in well-closed vessels.

For. Names.—*Fr.* Sulphate de potasse.—*Ital.* Solfato di potassa.—*Ger.* Schwefelsaures kali.—*Russ.* Sernokisloe kali.

Sulphate of Potash (Sulphate of Kali, Vitriolated tartar, Sal-polychrest of Glaser, Sal-de-duobus, &c.) occurs in volcanic regions and in the juices of plants; but what is used in medicine is all prepared artificially. The process for making it was first discovered by Croll about the middle of the seventeenth century.

Chemical History.—The Colleges direct it to be prepared from the residuum of the manufacture of nitric acid. The first step is to neutralize or remove the excess of sulphuric acid, of which, along with neutral sulphate of potash, that residuum is composed. The Dublin College saves the excess of acid by neutralizing it with carbonate of potash; which is comparatively expensive in relation to the value of the product. The London College more economically expels the acid by heat; and the Edinburgh College with equal economy neutralizes the excess with marble. The subsequent part of the process is the same in all the formulas, being simply the evaporation and crystallization of the neutral sulphate.

Sulphate of potash occurs in the shops under the form of small, but often well formed crystals, whose primary form is the right rhombic prism (Geiger), or rhombic octaedre (Mitscherlich), but which generally are six-sided prisms terminated by six-sided pyramids. They are transparent, and colourless, very hard for a salt, of a bitterish, sharp, saline taste, and permanent in the air. Heat causes them to decrepitate slightly; a strong red heat fuses them; but no farther change occurs, however high the temperature may be raised.

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When heated with carbonaceous matter, the sulphate is deoxidised, and sulphuret of potassium formed. It is soluble in five parts of boiling water, and in sixteen parts at 60°. Its solution, acidulated with nitric acid, yields a white precipitate with the salts of baryta; and a solution not too diluted gives a yellow precipitate with chloride of platinum. These two characters distinguish it when dissolved from other neutral salts. It is insoluble in alcohol or rectified spirit. It is composed of an equivalent of each constituent, without any water of crystallization (SO^3+KO); and hence it consists of 40.1 parts of acid, and 47.15 of alkali.

Fig. 163.

Adulterations.—It is so cheap and put to so little use in medicine or the arts, that it is scarcely subject to adulteration. The Edinburgh College has not given any tests of its purity; and those in the formula of the London College are mainly intended for ascertaining its nature, not for discovering adulterations.

Actions and Uses.—In action, sulphate of potash is a mild cathartic, which has been supposed to act more permanently than other saline remedies of the class. Though now little employed, it is really a convenient laxative, and undeserving of the neglect into which it has fallen. In doses of one or two ounces, however, it is a powerful irritant, and has given rise to fatal accidents. It may be usefully combined with other saline laxatives, and forms a considerable part of a convenient compound cathartic of the kind, the *Pulvis salinus compositus*, E. Sulphate of potash being rather an insoluble salt, it should be given dissolved in warm water. On account of its great hardness, and little tendency to absorb moisture from the air, it is an excellent substance for triturating with tough vegetable articles, to promote their thorough pulverization.

The doses of its preparations are: *Sulphas potassæ*, dr. i. ad dr. iv., according to the effect desired. *Pulvis salinus compositus*, E. dr. ii. ad dr. vi.

POTASSÆ SULPHAS CUM SULPHURE, *E.* *Nature undetermined.* *Sulphate of Potassa with Sulphur.*

PROCESS, *Edin.* Take of
Nitrate of potash, and
Sulphur, equal parts of each.
Mix them thoroughly; throw the mixture in small successive portions into a red-hot crucible; and when the deflagration is over and the salt has cooled, reduce it to powder, and preserve it in well-closed bottles.

WHEN a mixture of sulphur and nitre is projected in small quantities at a time into a heated crucible, the sulphur burns with a blue flame, and becomes oxidated at the expense of the nitric acid in the nitre. A grayish-white substance remains, whose nature has not been hitherto ascertained. It is much more soluble than sulphate of potash; and it crystallizes from a state of solution in rhombic prisms, the primitive form of that salt. Both the substance itself and its solution have a sulphurous odour; but sulphuretted-hydrogen is not disengaged on a strong acid being added; nor is sulphuret of lead thrown down by the salts of that metal. The salts of baryta cause a white precipitate insoluble in nitric acid, so that sulphate of potash is present.

In action, it is a mild cathartic; and it was at one time much used as a purgative, especially in cases of dyspepsia, and chronic cutaneous eruptions, where frequent laxatives are required. It is given for these purposes in doses of thirty or sixty grains, commonly along with some other gentle laxative, such as bitartrate of potash. The bowels may often be very well regulated by a mixture of forty or sixty grains of the present preparation, and sixty or ninety of bitartrate of potash, taken in water before breakfast, and followed by gentle exercise.

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POTASSÆ TARTRAS, *U.S. E. L. D. Tartrate of Potash. Soluble Tartar.*

TESTS, *Edin.* Entirely and easily soluble in four parts of boiling water: solution neutral, and it yields a crystalline precipitate with muriatic acid: forty-four grains in solution are not entirely precipitated by 55 grains of nitrate of lead.

TESTS, *Lond.* Easily soluble: most acids separate from its solution crystals of bitartrate of potash, which chiefly adhere to the vessel. The precipitate occasioned by chloride of barium or acetate of lead is soluble in diluted nitric acid.

[PROCESS, *U.S.* Take of
Carbonate of potassa sixteen ounces;
Bitartrate of potassa, in fine powder, three pounds, or a sufficiency;
Boiling water a gallon.
Dissolve the carbonate of potassa in the water, then gradually add the bitartrate to the solution till it is perfectly saturated, and boil. Filter the liquor, evaporate it till a pellicle is formed, and set it aside to crystallize. Pour off the liquid, and, having dried the crystals on bibulous paper, keep them in closely-stopped bottles.]

PROCESS, *Edin. Lond. Dub.* Take of
Bitartrate of potash, in powder, three pounds (fourteen parts, *D.*);
Carbonate of potash sixteen ounces (five parts, *D.*);
Boiling water six pints (forty-five parts, *D.*).
Dissolve the carbonate in the water; add the bitartrate till the liquor is neutralized; boil and filter. Concentrate the liquor till a pellicle forms on its surface, and then set it aside to cool and crystallize. The residual liquor will yield more crystals by farther concentration and cooling.

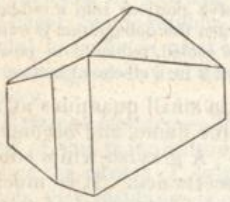
FOR. NAMES.—*Fr.* Tartrate de potasse.—*Ital.* Tartrato di potassa.—*Ger.* Einfach weinsaures kali.—*Russ.* Vinnokisloe kali.

TARTRATE OF POTASH (Soluble tartar; *Sal vegetabile;* Tartarized kali) was known at least so early as the seventeenth century by the chemist Lemery.

Chemical History.—It is always obtained, as the Colleges direct, by adding bitartrate of potash to a hot solution of carbonate of potash, till exact neutralization is accomplished; after which some insoluble tartrate of lime is separated by filtration, and the liquor reduced by evaporation till it is sufficiently concentrated to crystallize on cooling.

It is sold commonly in the form of crystals, which are right rhombic prisms, or derived six-sided prisms, terminated by two converging planes. It is transparent and colourless, and has a mildly saline, bitterish taste. It becomes moist in damp air, but without deliquescing. At the temperature of 250° it gives off its water of crystallization without previously fusing, and becomes anhydrous. A higher heat decomposes it, producing carbonate of potash and charcoal. It is soluble in its own weight of water (Geiger); whence one of its old names, Soluble-tartar. The solution is precipitated by the salts of baryta, silver, and lead; white tartrates of the metallic oxides are thrown down; and these are redissolved on the addition of nitric acid. Sulphuric, nitric, muriatic, and many other acids, take to themselves a portion of the potash, and separate the rest in the form of bitartrate; which, according to the strength of the solution, forms quickly a sandy precipitate, or slowly a crystallization adhering to the vessel. It is composed of one equivalent of acid, one of base, and two of water ($T+KO+2Aq.$); and therefore of 66.48 parts of tartaric acid, 47.15 of potash, and 18 of water.

Fig. 164.



Adulterations.—It is subject to adulteration with bitartrate of potash, but scarcely with any other substance. Its freedom from this impurity will be detected by the tests indicated by the Colleges,—its easy solubility, and the neutral state of the solution. The solvent power of nitric acid over the precipitates occasioned in its solution by chloride of barium and nitrate of silver, which is given among the tests of its purity by the London College, shows the absence of any sulphate or muriate. The application of nitrate of lead as a precipitant, in the manner stated in the Edinburgh formula, will prove whether

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or not the due proportion of tartaric acid be present, furnishing thereby a strong presumption of the purity or impurity of the salt in a general way.

Actions and Uses.—The neutral tartrate of potash is at present little used in medicine; but it is a very good laxative, like the other tartrates of the fixed alkalis. Its taste, however, is not so purely saline as that of the double tartrate of potash and soda, which it otherwise resembles closely in properties.

Its dose is dr. ii. ad dr. x.

POTASSII BROMIDUM, *L.* *Bromide of Potassium.*

Tests, *Lond.* Entirely soluble: it does not affect litmus or turmeric, and is not affected by chloride of barium. Starch and sulphuric acid together turn it yellow. Its weight is not lessened by heat. Ten grains decompose 14.28 grains of nitrate of silver, precipitating a yellow bromide of silver, which is little affected by nitric acid, but is redissolved by ammonia.

Process, *Lond.* Take of
Bromine two ounces;
Carbonate of potash two ounces and a drachm;
Iron filings an ounce;
Distilled water three pints.
Add the iron to a pint and a-half of the water, then the bromine, and stir frequently for half an hour. Apply a gentle heat, and when the colour becomes greenish, add the carbonate of potash previously dissolved in the rest of the water. Filter; wash the residue with two pints of boiling distilled water, and filter again; concentrate the united liquor for crystallization.

For. Names.—*Fr.* Bromure de potassium.—*Ger.* Bromkalium.—*Russ.* Bromistoi kali.

The medicinal virtues of Bromide of Potassium are far from being so well established as to entitle it to a place in the Pharmacopœias.

Chemical History.—The process for preparing it given in the Pharmacopœia of London is that usually followed. This method,—which consists in combining bromine directly with iron in solution, and decomposing the dissolved hydrobromate of protoxide of iron by means of carbonate of potash,—is the exact counterpart of the process for preparing iodide of potassium.

Bromide of potassium crystallizes in cubes or rectangular four-sided tables, of a pearly lustre, and of a sharp pungent taste, somewhat like that of common salt. It is permanent in the air, decrepitates when heated, and, at a red heat, fuses, without undergoing decomposition. It is very soluble in water, but sparingly so in alcohol. The watery solution is decomposed by sulphuric, muriatic, and nitric acids, as well as by chlorine; and bromine is disengaged, which colours the fluid brown. Nitrate of silver occasions a white precipitate, insoluble in weak ammonia. Acetate of lead, and the salts of protoxide of mercury also occasion a white precipitate. It is composed of one equivalent of each of its elements (K Br.), and consequently of 39.15 parts of potassium and 78.4 of bromine.

Adulterations.—The formula of tests given by the London College is partly intended for ascertaining the nature of the salt. The non-action of chloride of barium shows the absence of sulphates from its solution; but these are scarcely ever present. No test is given for the most common impurity, chloride of sodium. This cannot be detected without some trouble. It may be discovered by distilling the salt with an excess of bichromate of potash and sulphuric acid into a receiver containing strong Aqua ammoniæ. If no chloride be present, bromine alone passes over, and the ammonia is not coloured; if the salt contain chloride, chromate of the chloride of chrome also passes over, and tinges the ammonia yellow (Rose).

Actions and Uses.—Bromide of potassium is a diuretic and cathartic, and is conceived to be, like the preparations of iodine, a powerful deobstruent and alterative. It is on the last account only that it has been of late used in medical practice, and admitted into the London Pharmacopœia. In some trials by Dr. Williams it seemed to manifest a remarkable influence as a deobstruent in enlargements of the spleen (Elements of Medicine). In scrofulous tumours

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and in bronchocele it has also been used with apparent advantage both internally and externally, and it has been used with success in syphilis as a substitute for the iodide of potassium (Ricord). If a poison at all, it seems not to be an energetic one; for a drachm produces only vomiting in dogs (Barthez in Pereira).

The dose of *Potassii bromidum* is from three to twelve grains thrice a-day. Externally it is used as an ointment with eight times its weight of lard.

POTASSII FERROCYANIDUM, *E. L.* POTASSII FERROCYANURETUM, *U.S.* *Ferrocyanide of potassium. Ferrocyanate of potash. Ferrocyanuret of potassium.*

TESTS, *Edin.* Not subject to adulteration.

TESTS, *Lond.* Entirely soluble. It loses 12.6 per cent. of its weight with a gentle heat; it is decomposed by a strong heat; the residuum is soluble in hydrochloric acid, and precipitation is caused in this solution by ammonia; one hundred parts thus yield 18.7 of sesquioxide of iron. It feebly affects turmeric. It occasions a blue precipitate with the salts of sesquioxide of iron, and a white one with the salts of zinc.

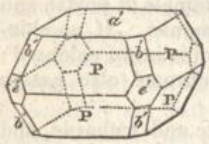
FOR. NAMES.—*Fr.* Ferrocyanure de potassium; Cyanure de fer et de potassium; Prussiate de potasse ferrugineux; Prussiate jaune de potasse.—*Ital.* Idroferrocyanato di perossido di ferro.—*Ger.* Kaliumeisencyanür; Cyaneisenkalium; Blutlaugensalz.—*Russ.* Geletsisto-sinerodistoi kali.

FERROCYANIDE OF POTASSIUM (Prussiate of potash; Ferroprussiate of potash; Ferrocyanate of potash; Phlogisticated kali) was known in the beginning of last century.

Chemical History.—It may be obtained by boiling purified Prussian blue in solution of potash, till the blue colour disappears, filtering the liquor, concentrating it for crystallization, and crystallizing the product several times till it is rendered pure. It is prepared, however, in a different way on the great scale, for the use of the dyer and calico-printer. This method consists in projecting a mixture of pearl-ashes with hoofs, horns, and other animal matters, in the proportion of two to five, into a red-hot iron crucible, and stirring diligently the pasty mass thus formed, until fetid vapours cease to arise from it. When the product has cooled, it is lixivated with cold water, filtered, and concentrated; upon which yellow crystals of ferrocyanide of potassium are formed on cooling. These are purified by repeated crystallization (Ure). Another method, followed in France, consists in subjecting an intimate mixture of three parts of dried blood, one of nitre, and smithy-ashes in the proportion of one part for fifty of blood, to a low red heat till vapours cease to be disengaged, dissolving the product in twelve times its weight of water, concentrating the filtered liquor to the density of 1280, separating the fluid from the crystals of bicarbonate of potash which form on cooling, evaporating again to the density of 1300, and leaving the solution at rest for some days till the ferrocyanide of potassium crystallizes in its turn (Gaultier).

This salt occurs in commerce in broken or entire crystals of large size, whose form is commonly a rectangular prism, truncated on the ends and edges, or a four-sided table derived from the rhombic octaedre by excessive truncation of the apices. It is yellow, somewhat flexible, of a sweetish-bitter, saline taste, and permanent in the air. A gentle heat below 212° expels its water of crystallization, leaving a white anhydrous salt. A low red heat decomposes it, and converts it into cyanide of potassium, carburet of iron, and other compounds which have not yet been fully examined. It is soluble in four parts of temperate, and two parts of boiling, water; but insoluble in alcohol. Its solution is a useful reagent in chemistry

Fig. 165.



Truncated octahedron of ferrocyanide of potassium.

on account of the variously coloured precipitates it causes in solutions of metallic salts. It precipitates the salts of sesquioxide of iron deep-blue, of protoxide of iron white passing quickly to blue, of zinc and lead white, of copper chestnut-brown. Different views have been taken of its constitution. Some regard it as a compound of two equivalents of cyanide of potassium, and one equivalent of cyanide of iron, with three equivalents of water of crystallization ($2KCy+FeCy+3Aq.$), and, consequently, of 39.15 parts of potassium, 79.17 cyanogen, 28 iron, and 27 water. According to Liebig and Gregory, it is composed in the anhydrous state of two equivalents of potassium and one of a compound radicle, which is called ferrocyanogen, and consists of three equivalents of cyanogen and one of iron ($FeCy^3+2K$).

Adulterations.—The salt of commerce is remarkably pure. The testing formula of the London College presents a number of characters which chiefly indicate its nature. The Edinburgh College has not thought any tests necessary.

Uses.—Ferrocyanide of potassium is scarcely used in medicine, and, notwithstanding its apparent relationship to cyanogen and hydrocyanic acid, it is not poisonous. When swallowed it is absorbed, and passes off quickly with the urine. It is officinal chiefly as being the material from which hydrocyanic acid is most easily and cheaply prepared. It is the best reagent for detecting iron in solution: though there should be a mere trace only present, it occasions a blue precipitate. Dr. Smart (U. S.) says he has found it a useful sedative and calmative in the febrile inflammations in doses varying from eight to fifteen grains; and he adds that too large doses cause giddiness, weakness, and sometimes ptyalism, red gums, and aphthæ of the mouth, without fetor.

POTASSII IODIDUM, *U.S. E. L.* POTASSÆ HYDRIODAS, *D.*
Iodide of Potassium. Hydriodate of Potassa.

Tests, *Edin.* Its solution is not affected, or is merely rendered hazy, by solution of nitrate of baryta: a solution of five grains in a fluidounce of distilled water, precipitated by an excess of solution of nitrate of silver, and then agitated in a bottle with a little aqua ammoniæ, yields quickly by subsidence a clear supernatant liquid, which is not altered by an excess of nitric acid, or is rendered merely hazy.

Tests, *Lond.* Entirely soluble in water and in alcohol. It affects turmeric feebly or not at all, and does not affect litmus. Its weight is not diminished by heat. It is rendered blue by starch and sulphuric acid. Ten grains decompose 10.24 grains of nitrate of silver; and the precipitate is not altered by ammonia; but is partly dissolved, partly altered in appearance by nitric acid.

[Process, *U.S.* Take of
Iodine six ounces;
Iron filings three ounces;
Carbonate of potassa four ounces, or a sufficiency;
Distilled water four pints.
Mix the iodine with three pints of the distilled water, and add the iron filings, stirring frequently with a spatula for half an hour. Apply a gentle heat, and when the liquor assumes a greenish colour, add gradually the carbonate of potassa, previously dissolved in half a pint of the distilled water till it ceases to produce a precipitate. Continue the heat for half an hour, and filter. Wash the residuum with half a pint of the distilled water, boiling hot, and filter. Mix the filtered liquors and evaporate that crystals may form. Pour off the liquid, and dry the crystals on bibulous paper.]

Process, *Edin.* Take of
Iodine (dry) five ounces;
Fine iron-wire three ounces;
Water four pints;
Carbonate of potash (dry) two ounces and six drachms.
With the water, iodine, and iron-wire prepare solution of iodide of iron as directed for *Ferri Iodidum.* Add immediately, while it is hot, the carbonate of potash previously dissolved in a few ounces of water, stir carefully, filter the product, and wash the powder on the filter with a little water. Concentrate the liquor at a temperature short of ebullition till a dry salt be obtained; which is to be purified from a little red oxide of iron and other impurities by dissolving it in less than its own weight of boiling water, or still better, by boiling it in twice its weight of rectified spirit, filtering the solution, and setting it aside to crystallize.

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More crystals will be obtained by concentrating and cooling the residual liquor.

PROCESS, *Lond.* Take of
Iodine six ounces;
Carbonate of potash four ounces;
Iron filings two ounces;
Distilled water six pints.
Mix the iodine with four pints of the water, add the iron, and stir frequently for half an hour with a spatula. Apply a gentle heat until the liquid becomes greenish; add then the carbonate of potash dissolved in two pints of the water, and filter; wash the residuum with two pints of boiling distilled water, and filter again. Evaporate the mixed liquors to obtain crystals.

PROCESS, *Dub.* Take of
Iodine one part;
Sulphuret of iron, in coarse powder, five parts;
Sulphuric acid seven parts;
Distilled water forty-eight parts;
Solution of carbonate of potash a sufficiency;
Rectified spirit six parts.
Triturate the iodine with sixteen parts of the water, and put the mixture in a glass vessel. Pour upon the sulphuret in a matrass the acid previously diluted with thirty-two parts of the water; and by means of a tube reaching to the bottom of the vessel containing the iodine, transmit the disengaged gas till the iodine disappear. Filter the liquor; concentrate it by boiling to an eighth, and filter again; add the solution of carbonate of potash gradually to saturation, namely, till effervescence ceases; evaporate the fluid to dryness; dissolve the residual salt in the spirit with the aid of heat; decant the solution, evaporate to dryness, and keep what remains in a well-closed bottle.

UNGUENTUM HYDRIODATIS POTASSÆ, D. *Ointment of Hydriodate of Potassa.*

PROCESS, *Dub.* Take of
Hydriodate of potash a scruple;
Axunge an ounce.
Make them into an ointment.

UNGUENTUM IODINEI COMPOSITUM, L.

For this and other compound preparations of Iodide of potassium, see *Iodineum.*

FOR. NAMES.—*Fr.* Iodure de potassium; Hydriodate de potasse.—*Ital.* Ioduro di potassio.—*Ger.* Iodkalium.—*Russ.* Iodistoi kali.

THE IODIDE OF POTASSIUM (Hydriodate of potash) was first prepared soon after the discovery of iodine by Courtois in 1812.

Chemical History.—It may be obtained in a variety of ways; but whatever mode may be chosen, much care is required to produce a pure salt. On this account it is seldom met with in the shops perfectly pure, and sometimes contains a large proportion of foreign salts.

Of the numerous processes which have been lately proposed, three have been generally preferred to the rest. The first consists in converting iodine into hydriodic acid by a stream of sulphuretted hydrogen gas, saturating the acid by means of carbonate of potash, and then obtaining the iodide of potassium by evaporating the solution to dryness. In this process the iodine takes the hydrogen from the sulphuretted-hydrogen, and sulphur is thrown down. In the next step the hydriodic acid combines with the potash of the carbonate; or, as some think, iodide of potassium is formed, in consequence of the hydracid and metallic oxide reciprocally parting with hydrogen and oxygen to form water. Such is the process of the Dublin Pharmacopœia. Its disadvantages are,—that unless the iodine is kept in agitation, much gas escapes undecomposed, and the iodine is apt to be enveloped and rolled into masses by the disengaged sulphur. But the salt obtained is pure, if the manipulations be carried on with care. The Dublin College, however, is wrong in directing the evaporation to be conducted by ebullition; for at this temperature a little iodine is given off by the iodide, and carbonic acid is absorbed, so that carbonate of potash is mingled with the dry salt.——The second method consists in first making a mixture of iodide of potassium and iodate of potash by saturating a solution of caustic potash with iodine,—and then heating the residuum of evaporation to a red heat so as to convert the iodate into iodide. This method is disadvantageous, inasmuch as caustic potash is an expensive material, and the whole manipulations require to be conducted with much nicety. The iodine should be added to the potash solution in slight excess;

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that is, so as to leave the fluid somewhat coloured. The potash must be completely caustic, otherwise the iodide will contain carbonate of potash. The ignition should be cautiously conducted at a low or cherry-red heat, and not higher, because iodide of potassium volatilizes at a full-red heat. The heat must be continued till bubbles cease to escape from the fused mass, for without this precaution some iodate will remain undecomposed.——The third process, which is that of the Edinburgh and London Pharmacopœias, and which has also been generally practised of late by manufacturers, commences with the formation of a solution of iodide of iron, as directed under that article (p. 428). This salt is then decomposed by a solution of carbonate of potash,—the iron and potassium interchanging places, so that the carbonate of protoxide of iron falls down, and iodide of potassium comes into the solution. And the dry iodide is obtained in the usual way by evaporation. This appears a cheap and convenient method; but, like other processes, it will not yield a pure iodide without certain precautions. In the first place, both the iodine and the carbonate of potash must be quite dry and otherwise pure, or an allowance must be made for impurities. Secondly, iron-wire is preferable to iron-filings; for it is more pure, and, in consequence of being better diffused through the fluid, it undergoes solution more quickly. Thirdly, an excess of carbonate of potash should be avoided. Some, indeed, use an excess in order to precipitate the carbonate of iron thoroughly; but this is done to no purpose, for the carbonate is sufficiently soluble in water to pass in small quantity into the solution of iodide of potassium, during the washing of the precipitate on the filter. Fourthly, as this carbonate of iron occasions an admixture of sesquioxide of iron with the dry salt, a second solution and evaporation are necessary. Lastly, with all the care which can be taken, a little carbonate of potash is apt to be obtained in the end; and hence the second solution of the salt ought to be crystallized, and not evaporated to dryness. On the small scale it is convenient to use rectified-spirit for the second solution and crystallization. On the large scale water is employed as being a more economical menstruum; and any carbonate of potash remaining in the concentrated solution is converted into iodide of potassium before crystallization, by adding a little hydriodic acid prepared as described in the first of the present processes.——The following new method, proposed by Pypers, seems to deserve attention on account of its simplicity and despatch. A mixture of one hundred grains of iodine, seventy-five of carbonate of potash, and two drachms of water, is triturated with thirty grains of iron-filings, until effervescence ceases; and the product is first gently dried and then ignited. Water forms with the saline mass a colourless feebly alkaline solution, which yields a pure iodide of potassium by crystallization.——Whatever method be preferred, the evaporation of watery solutions of iodide of potassium should be conducted at a temperature a little below 212°, on account of the tendency of iodine to escape from the liquid when it boils.

Iodide of potassium, when of good quality, is sold in crystals, or fragments of crystals, which are cubes or four-sided prisms, generally, however, showing a slight tendency to the rhombic form. They are colourless and opaque,—minute if obtained from rectified spirit, but sometimes an inch or more in length, if crystallized from water,—of a somewhat pearly lustre,—and of a sharpish saline taste. The salt has often a faint peculiar odour of iodine, and a pale yellowish tint, from a slight excess of that substance. It is permanent in dry air, slightly deliquescent in a moist atmosphere. A low red heat fuses, without decomposing it; and a full red heat volatilizes it. It is soluble in two-thirds of its weight of temperate water, and in still less at 212°. It is also very soluble in rectified spirit, which at the boiling temperature takes up half its weight of the salt, and on cooling to 50° retains twenty-three per cent.

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From the former fluid spontaneous evaporation, and from the latter slow cooling, will furnish regular crystals. The watery solution, as well as the dry salt, is decomposed by nitric acid, and iodine is evolved. It possesses the property of dissolving iodine largely, and a dark reddish-brown fluid is formed, the officinal *Iodinei liquor compositus*, *Liquor iodidi potassii compositus*, E., or *Liquor iodidi potassii compositus*, L. (see *Iodinum*, p. 590). A similar compound solution is obtained with rectified-spirit, constituting the officinal *Tinctura iodinei composita*, L. The simple solution in water yields with salts of lead a beautiful yellow precipitate, the iodide of lead. With corrosive sublimate a yellow precipitate is occasioned, which quickly passes to the splendid crimson-red biniodide of mercury. This precipitate is soluble in an excess both of iodide of potassium and of corrosive sublimate. An infusion of starch has no effect on a solution of pure iodide of potassium; but if it be decomposed by chlorine, or nitric acid, or sulphuric acid which contains nitrous acid, the disengaged iodine is at once indicated by a deep blue precipitate of iodide of starch. Iodide of potassium consists of one equivalent of each element (KI), and consequently of 126.3 parts of iodine, and 39.15 parts of potassium.

Adulterations.—It is exceedingly subject to adulteration, both from faulty manufacture, and fraudulent admixture. The principal adulterations hitherto observed are with carbonate of potash, water, chloride of potassium or sodium, and iodate of potash. 1. Carbonate of potash is generally present to between one and five or even ten per cent., owing in all probability to errors in preparing the salt; but I have sometimes found 74.5 per cent. of carbonate and 16 of water along with it, so that there was only 9.5 per cent. of pure salt,—an amount of impurity which can arise only from fraud on the part of the maker. At one time most of the iodide of potassium used in Britain was of this composition. A proportion of five or ten per cent. may be present without altering the crystallization or appearance of the salt; but the tendency to deliquesce is increased. A larger adulteration renders it granular and highly deliquescent. The existence of carbonate of potash is best detected by the action of nitrate of baryta on the solution, which yields an insoluble white precipitate of carbonate of baryta. Where the proportion of impurity is large, it may be both detected and removed by boiling the salt in three or four parts of rectified-spirit; for carbonate of potash is left at the bottom of the vessel, either in the form of a pasty mass, or completely dissolved in the water of the spirit in the form of a substratum. 2. Water is always present when carbonate of potash abounds, being retained by that salt during the process of drying. It may be detected by heating the iodide in a tube, upon which water will condense in the upper part of the tube. 3. Iodate of potash is only present as an accidental impurity, where the process followed in preparing the iodide is the second of those described above. It may be discovered by tartaric acid and starch solution striking a rich blue colour. Neither pure iodide of potassium, nor pure iodate of potash is thus affected; but if they be mixed, the blue colour is struck at once. 4. Chloride of potassium or sodium is the most frequent adulteration, next to carbonate of potash. It may be discovered through the comparatively easy solubility of chloride of silver in ammonia. With this view the Edinburgh Pharmacopœia directs a solution to be treated with an excess of nitrate of silver, and then agitated with solution of ammonia. Any chloride of silver thrown down by the nitrate is thus redissolved, while the iodide acquires great density by agitation, so as to subside quickly and leave a clear liquor above. In the clear fluid, nitric acid added to saturation of the ammonia, or in excess, will make the chloride of silver reappear in the form of a white precipitate; but if there was no alkaline chloride in the salt, the clearness of the fluid will scarcely be disturbed.

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The object of the characters given by the Edinburgh and London Colleges for detecting adulterations, may be easily inferred from the preceding statements.

Actions and Uses.—The actions and uses of iodine of potassium have been made the object of numberless investigations during the last twenty years; but the results are discrepant. On the whole it seems to be an irritant in large doses, and in medicinal doses a diuretic, as well as to possess the property of exciting iodism, and of acting as a deobstruent and alterative. And the want of agreement among different observers has been probably owing, either to the salt being often much adulterated, or to its action being very liable, like that of mercury, to be modified by constitutional peculiarities. When applied to the skin, it produces some irritation. When given internally, two or three drachms will kill a dog (Devergie), and one drachm a rabbit (Cogswell) in the course of a few days; and the symptoms are those of inflammation of the alimentary canal, attended with extreme depression. In like manner four grains thrice a-day have occasioned in the human subject sickness, colic, and diarrhœa (Cogswell, Hill); and one drachm has excited the same symptoms to a distressing degree (Wallace). Devergie even thinks that twenty grains might occasion death. On the contrary it is said, that thirty, sixty, and even one hundred and twenty grains have been given repeatedly within twenty-four hours (Wallace, Magendie, Buchanan),—nay, that six drachms have been swallowed in the same interval (Elliotson), without any unpleasant consequence resulting.

Iodide of potassium is a diuretic, though not an active one. When swallowed, it passes off quickly by the urine; in which it may accordingly be detected by chlorine and starch solution. When taken continuously for a length of time, it occasionally excites ptyalism, sometimes an affection like cold-in-the-head, sometimes catarrhal cough,—thus showing a tendency to act remotely as an irritant of the respiratory mucous membrane. Doubts have been entertained whether in the like circumstances it has the property, possessed by iodine, of inducing iodism. Though the current opinion would seem to deny to it any such power, I apprehend the real fact to be, that iodism may be induced by it in some constitutions easily enough, and sooner or later in most persons if sufficiently large doses be taken for an adequate length of time; but that its power in this respect is greatly inferior to that of iodine. At all events iodide of potassium has been known actually to excite disturbed digestion, a tendency to diarrhœa, emaciation, nervous irritability, tremors, and on one occasion even absorption of the mammæ (Hill, Wallace),—which are the leading features of iodism. Whether the alterative and deobstruent properties conceded by most observers to this salt depend or not upon its iodismal action, is a question which cannot at present be answered.

The special diseases in which iodide of potassium is used are the same with those formerly enumerated under the head of Iodine, to which article the reader is here referred. It has seemed most serviceable in goitre, strumous enlargement of the glands, strumous sores and eruptions, strumous ophthalmia, and secondary syphilis in scrofulous habits. Benefit has also been apparently derived from it in certain mammary tumours, enlargement of the liver, amenorrhœa, leucorrhœa, and ascites connected with hepatic disease. In most of these circumstances, however, it has been a common practice, which general experience has sanctioned, to combine free iodine with the iodide of potassium; so that it is not easy to know how much of the curative effects may have been owing to the one preparation, and how much to the other. No doubt can exist, that whatever virtues may reside in the iodide, they are generally fortified by iodine. The simple iodide has seemed to me, as to many others, one of the best alterative remedies for mercurio-syphilitic sore-throat and eruptions,

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as well as for the *Cachexia mercurialis* generally.——When administered internally, it is given in the state of a diluted solution; and in consequence of its numerous chemical reactions with other bodies, as well as its slight taste, it is usually prescribed in the simplest possible shape. It ought not to be given along with the salts of the ordinary metals, because many of them decompose it, and produce insoluble iodides. It may likewise be administered externally, either in the form of simple ointment, as in that of the Dublin *Unguentum hydriodatis potassæ*, or still better with only eight times its weight of axunge, or in the form of bath. But its virtues as an external remedy are feeble unless when iodine is given along with it, as in the formulas for the London and Edinburgh ointments.

Its preparations and their doses are—*Potassii iodidum*, U.S. E. L. *Potassæ hydriodas*, D. gr. ii. ad gr. xx.? *Iodidi potassii liquor compositus*, L. *Liquor iodini compositus*, U.S. fl. dr. ii. ad fl. unc. i. *Iodinei liquor compositus*, E. min. v. ad fl. dr. ss. *Iodinei tinctura composita*, L. *Tinctura iodini composita*, U.S. min. x. ad fl. dr. i. *Unguentum hydriodatis potassæ*, D. *Iodinei unguentum*, E. *Iodinei* (*Iodini*, U.S.) *unguentum compositum*, L., for external use. For the processes for most of these preparations, see *Iodinum*.

POTASSII SULPHURETUM, *U.S. E. L.* POTASSÆ SULPHURETUM, *D.* *A mixture of sulphate of potash with persulphuret of potassium. Sulphuret of potash.*

Tests, *Lond.* Its fresh fracture is brownish-yellow. Its solution in water, as well as in most acids, emits an odour of hydrosulphuric acid. Its watery solution is yellow; and yields with acetate of lead a precipitate at first red, but afterwards black.

[Process, *U.S.* Take of
Sulphur an ounce;
Carbonate of potassa two ounces.
Rub the carbonate of potassa, previously dried, with sulphur, melt the mixture in a covered crucible over the fire, then pour it out, and when it is cold put it into a bottle, which is to be well stopped.]

Process, *Dub.* Take of
Washed sulphur one part;
Solution of potash eleven parts.

Process, *Edin. Lond. Dub.* Take of
Sulphur one ounce;
Carbonate of potash four ounces.
Triturate them well together, and heat them in a covered crucible till they form a uniform fused mass (which when cold is to be broken to pieces, and kept in well-closed bottles, *Edin.*).

Potassæ Sulphureti Aqua, L *Water of Sulphuret of Potassium.*

Boil for ten minutes; filter; and preserve the liquid in well-closed vessels. Its density is 1117.

Chemical History.—This preparation, modified by differences in the proportions of the materials used for making it, constitutes the Liver of sulphur of the older Pharmacopœias. There is some doubt both as to the nature of the officinal compound, and the accuracy of the process for preparing it. The view taken by many of its composition is, that it consists of protosulphuret of potassium and sulphate of potash, in the proportion of three equivalents of the former and one of the latter. Berzelius and Turner, however, consider that in all varieties of liver of sulphur the sulphuret present is the tersulphuret of potassium; and that consequently complete chemical action cannot take place unless where the sulphur is in larger proportion than in the College formulas, namely in that of 58 to 100 of carbonate, or ten equivalents of the former to four of the latter. According to the most recent investigation, the pharmaceutic preparation is a much more composite substance; for Winckler has found it to consist of 53.3 parts of tersulphuret of potassium, 29.5 hyposulphite of potash, 7 sulphite of potash, and also a little sulphate and carbonate.

Liver of sulphur has when fresh a liver-brown tint, a disagreeable, acrid, alkaline taste, but no odour till it is moistened, upon which a powerful odour of sulphuretted-hydrogen is disengaged. Under exposure to the air it gradu-

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ally absorbs oxygen, and undergoes a series of changes, which end in the formation of sulphate of potash and free sulphur as the only constituents. It is soluble in water, to which it imparts a yellow colour and a strong sulphureous odour. The solution precipitates the salts of lead at first red, but soon afterwards black. The stronger acids decompose it, throwing down sulphur and disengaging sulphuretted-hydrogen gas.

It is subject to become altered through careless keeping; but is not liable to adulteration.

Actions and Uses.—In action it is an irritant and narcotic, producing in doses of a few drachms inflammation of the alimentary canal and tetanic spasms, which may prove quickly fatal. It is considered to be a good antipsoric remedy, both taken internally and applied externally; and its use has been extended from scabies to other chronic eruptions, especially lepra and psoriasis. In this country its employment internally has been altogether abandoned. In eruptive diseases it has been chiefly employed in the form of bath, consisting of one part of sulphuret to one thousand of water. The antidotal powers, once universally ascribed to it in most kinds of metallic poisoning, have been fully disproved by Orfila.

Its dose inwardly is gr. iii. ad gr. viii. in scabies, &c.

[PRINOS, *U.S.* Secondary. *The bark of Prinos verticillatus, L. W. DC. Black Alder.*

Figured in Bigelow, Med. Bot. 56.—Barton, Veg. Mat. Med. 17.

The generic name of this plant was used by Theophrastus and Dioscorides for very different shrubs than the one now to be considered. It comes from πρίω to saw, and was probably applied by Linnæus to the present genus, from the leaves of many of the species being strongly serrated.

Natural History.—The Black Alder, or Winter Berry as it is also called, is a native of the United States, from Canada to Florida, growing in damp situations and on the borders of water courses, flowering in June and ripening its fruit late in the autumn. It belongs to *Aquifoliaceæ* in the Natural orders and to *Hexandria Monogynia* of the Linnæan classification. It is a shrub from five to fifteen feet in height, with a bluish-gray or ash-coloured bark. The branches are alternate, horizontal, and furnished with ovate-acuminate leaves, serrate on their edges, of an olive-green colour, and smooth above, but pubescent beneath, especially on the nervures; they are alternate and petiolate. The flowers are small and white, and are clustered in axillary and lateral groups. The berries are globular, of a bright red colour and persistent during the winter. The officinal portion is the bark, which should be collected late in the autumn. When dried for use it is in slender pieces, more or less rolled, of a greenish-white internally, and of an ash-gray mixed with brown externally, brittle, without odour, but of a bitter and astringent taste, which is imparted to boiling water. No analysis has been made of it. The berries have much the same qualities.

Actions and Uses.—The bark is tonic and astringent and is much employed in domestic practice. It was known to the Indians, and was first mentioned by Schoepf, who says that it is an antiseptic and is used in gangrene and jaundice. It is still, in popular estimation, an excellent local application to ill-conditioned ulcers and chronic cutaneous eruptions. There is much evidence of its good effects in diarrhœa. Dr. W. P. C. Barton speaks of it in high terms as a valuable astringent and tonic.

It is administered either in substance or decoction. The dose of the first is from thirty grains to a drachm, several times a-day. The decoction, which is the preferable form, is made with two ounces of the bark to three pints of water, boiled down to a quart, of which a wineglassful is to be taken every

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two hours. It has also been employed in a saturated tincture made from the bark or berries, or from both combined.]

PRUNA, *E. L.* PRUNA GALLICA, *D.* PRUNUM, *U.S.* *Dried fruit of Prunus domestica, L. W. DC. Spr.* *Prunes.*

For. Names.—*Fr.* Pruneaux.—*Ital.* Prugna; Susina secca.—*Span.* Ciruelas Damascenas.—*Port.* Ameixas.—*Ger.* Pflaumen.—*Dut.* Gedroogde pruim.—*Dan.* Blommer.—*Russ.* Tschernosliv.

Figures of Prunus domestica in Nees von E. 319.—Hayne, iv. 43.—Steph. and Ch. iii. 117.

It is thought by some that the modern Plum-tree is the Κοκκυμηλεα of Dioscorides; but according to others this was the *Prunus Cocumiglia* of Tenore, a very small species, which, however, may be merely a wild variety of the *P. domestica.*

Natural History.—The plum-tree belongs to the Linnæan class and order *Icosandria Monogynia*, and to the Natural family *Rosaceæ* of Decandolle and *Amygdaleæ* of Lindley. It is cultivated everywhere in the temperate regions of Europe; and in many parts of the continent, as well as in England, it is seen growing apparently wild; but its real native country is Syria, especially near Damascus. It flowers in April and May before the leaves are developed; and the fruit, which is a drupa, ripens from August to October. Long cultivation has multiplied exceedingly its varieties. The fruit, dried in the sun or with artificial heat, constitutes the Prune, or French-plum, of the grocer. This differs much in size, colour, sweetness and aroma, according to the variety of plum from which it is prepared. Those most esteemed for the dessert are the pale, sweet, high-flavoured kinds; but that used in medicine is dark, less sweet, and somewhat austere. Prunes of all sorts are largely imported into Britain from Bordeaux. Medicinal prunes are said to be obtained from the Small-Damascus-plum (Mérat), or from the St. Julien-plum (Pereira), the fruit of the *Prunus domestica, var. γ. Juliana*, of Decandolle.

Chemical History.—The fresh ripe fruit contains about twenty per cent. of solid matter; of which 11.5 are sugar, nearly 5 gum, and the rest malic and pectic acids, albumen, and digestible ligneous fibre (Berard). The proportion of sugar is probably increased in the prune by the process of drying; but the change has not yet been accurately investigated. The branches of the tree, and also the fruit, often exude a gum resembling cherry-gum and containing a large proportion of bassorin. The kernel of the fruit, like the seeds of the rest of this Natural family, yields by distillation with water a poisonous hydrocyanated oil, identical or nearly so with that of the bitter almond.

Actions.—Plums are nutritive and refrigerant; but, in common with other stone-fruit, are apt to disorder the stomach and bowels, if eaten freely or not quite ripe. They become more digestible when converted into prunes; which constitute an agreeable and light article of diet for convalescence and in chronic diseases. With some people, when taken habitually in the evening, they tend to move the bowels in the morning. The only use to which they are applied in the Pharmacopœias of the Colleges is in preparing the *Electuarium Sennæ*, or Lenitive electuary; but they might be extensively used for similar purposes.

PRUNUS LAUROCERASUS. See *Laurocerasus.*

[PRUNUS VIRGINIANA, *U.S.* *The bark of Cerasus serotina, (DC.) Cerasus Virginiana (Michaux).* *Wild Cherry Bark.*

Infusum Pruni Virginianæ, U.S. *Infusion of Wild Cherry Bark.*

Process, *U.S.* Take of	Cold water a pint.
Wild cherry bark bruised, half an ounce;	Macerate for twenty-four hours, and strain.

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FIGURED as Cerasus Virginiana in Michaux, Sylv. t. 88;—as Prunus serotina in Willdenow, Arb. t. 5, f. 2;—as Prunus Virginiana in Waugel, Amer. t. 14, f. 2.

Natural History.—MUCH confusion has existed as to the tree which is entitled to the name of C. Virginiana, in consequence of a transposition of names between two American species by Michaux, in which he was followed by most botanists, till the mistake was rectified by Decandolle. The United States Pharmacopœia still adheres to the old nomenclature, in part, citing it as a Prunus under the specific name of Virginiana, but in its definition, giving it its true denomination.

It is a large tree, found in many parts of the country, but most abundant and attaining the greatest magnitude in the Southwestern states. It belongs to *Icosandria Monogynia* of Linnæus, and to *Rosaceæ* of Decandolle, or *Drupaceæ* of Lindley among the Natural orders. It attains a great height and size in favourable situations, and affords a hard, close-grained wood of a light-red colour, which is much used as a substitute for mahogany. The trunk is covered with a rough, blackish bark, which spontaneously detaches itself in thick narrow strips. The bases are ovate-oblong, acuminate, unequally serrate, smooth on both sides, except the mid-rib, and supported on petioles, furnished with two or more glands. The flowers are in elongated, spreading, and sometimes pendulous racemes, of a white colour, and having a smell of bitter almonds. The fruit is globose, of a purplish-black colour, eatable, but having a bitter taste. The flowers appear in May, and the fruit ripens in August and September.

The officinal portion is the bark, and that of the root should be preferred to that of the trunk or branches. When dried, and prepared for use, it is in pieces of various lengths and sizes, deprived of epidermis, of a reddish-brown colour, bitter and easily pulverized. When fresh, it has an odour of bitter almonds, which is very faint in the dried article, but becomes more apparent on maceration. The taste is bitter and aromatic, resembling that of peach kernels. It should be employed in a recently dried state, as its properties are much impaired by keeping.

Chemical History.—It imparts its properties to water, whether hot or cold, but boiling almost destroys its remedial qualities, as the active principle is volatile. Many chemical examinations have been made of it; but the first that afforded a clear view of its true constituents, was by Dr. S. Procter (*Journ. Phil. Coll. Pharm.* vi. 8). He found in it resin, starch, gallic acid, tannin, a fatty matter, some salts, &c., and on distilling it with water obtained a volatile oil, combined with hydrocyanic acid; this product has since been investigated by Mr. W. Procter (*Am. Journ. Pharm.* iii. 300, and iv. 197), and shown to be nearly identical with the oil of bitter almonds; and like that substance, not to pre-exist in the bark, but be formed by the action of emulsine on amygdaline as in the almond. This proves the close chemical alliance existing between the genera Amygdalus and Cerasus, and which the same able chemist has proved to extend to that of Armeniaca, thus confirming the validity of their botanical arrangement. Dr. Wood (*U.S. Dispen.*) thinks that this bark may also contain Phloridzin, a bitter, tonic principle found in the bark of the root of several allied trees; this supposition is highly probable, and is deserving of investigation.

Actions and Uses.—The wild cherry bark is tonic and stimulant in its operation on the digestive organs, and at the same time exercises a sedative influence on the circulatory and nervous systems. From this combined action, it has been found useful in a variety of diseases or states of disease, where it is of importance to impart tonicity, and yet to avoid any undue excitement of the heart and blood-vessels, as during the first stages of convalescence from inflammatory attacks, and in many pulmonary diseases. In

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phthisis, where hectic fever exists, it has proved highly beneficial, and its employment has become very general in this state of things. It has likewise been advantageously given in some forms of dyspepsia, especially in the cold infusion. In large doses it diminishes the action of the heart, and in confirmation of which, Dr. Eberle states, that the cold infusion taken freely several times a day, for upwards of a week, reduced his pulse from seventy-five to fifty beats in the minute. It has been administered as a febrifuge in intermittent fever, and like all the other bitter tonics, with occasional success; but should not be relied upon except where Peruvian bark and its salts are inadmissible, or are not to be procured.

It is given in powder in doses of a drachm to two drachms, or in infusion. *Infusum Pruni Virginianæ*, U.S. fl. ounce ii. and iij. several times a day. An excellent preparation which is much used, though not officinal, is the syrup; this is made by macerating four ounces of the powdered bark in twelve fluidounces of water for two days, placing the mixture in a percolator, returning the fluid that filters through, till it comes away clear, displacing with an additional quantity of water, till twelve fluidounces of infusion are obtained, and then making this into a syrup with twenty-four ounces of sugar; this is the process given by Mr. Procter (*Am. Journ. Pharm.* xiv. 27); but it has been subsequently ascertained that the syrup will keep perfectly well if made with half this quantity of sugar. The dose is from a fluidrachm to a fluidounce. In the first of these quantities it forms an excellent remedy in alleviating catarrh.]

PTEROCARPUS, *E. L.* SANTALUM, *U.S.* LIGNUM SANTALI RUBRI, *D.* *Wood of Pterocarpus santalinus*, *L. Suppl. W. DC. Spr.* —*Red-sandal-wood.* *Red-saunders.*

For. Names.—*Fr.* Santal rouge.—*Span.* Sandala rubio.—*Ger.* Rothes Santelholz.—*Swed.* Rödt sandelträdt.—*Arab.* Sundal ahmer.—*Pers.* Sundul soorkh.—*Tam.* Segapoo shandanum.—*Hind.* Ruckut chundun.

Red-sandal-wood, often also called Red-Saunders-wood, has been known in medicine since the time of the Arabian physicians.

It is the wood of the *Pterocarpus santalinus*, a tall forest-tree, belonging to the Linnæan class and order *Diadelphia Decandria*, and to the Natural family *Leguminosæ*. It inhabits Ceylon and the mountains of the opposite Coromandel coast on the Indian continent. The wood is imported in billets, which are dense, heavy, dark-brown externally, and internally dark-red, variegated with light red rings. It is reduced with difficulty to powder, which is blood-red, of a faint, peculiar odour, and obscurely astringent to the taste. Its chief ingredient is about seventeen per cent. of a peculiar resinoid principle, Santalin, $C^{16}H^{16}O^{3}$ (Pelletier). It is obtained either by rectified spirit and precipitation of the spirituous solution with water, or by ammonia and precipitation with an acid. It is insoluble in water, soluble in alcohol and ether, slightly soluble in volatile oils, readily soluble without decomposition in alkalis, and also soluble in acetic acid. The last solution is somewhat astringent to the taste, and is precipitated by solution of gelatin. These various solutions are blood-red or purple, but santalin is originally yellow and becomes red from the action of the air. The wood when heated exudes a red resinous-like matter, somewhat resembling Dragon's-blood (Geiger), and which is probably santalin.

This wood was at one time prized as a dye-stuff, but is now not much used in this country, though still a staple article in the Eastern art of dyeing. The only use made of it in medicine is for imparting a red colour to the *Spiritus lavandulæ compositus*.

PULEGIUM, *E.* See *Mentha*.

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PYRETHRUM, *U.S. L. E. D. Root of Anacyclus Pyrethrum, DC. (Edin.);—of Anthemis Pyrethrum, L. W.—(U.S. Lond. Dub.) Pellitory of Spain.*

For. Names.—*Fr.* Pyrèthre.—*Ital.* Pilatro; Piretro.—*Span.* Pelitre.—*Port.* Pyretro.—*Ger.* Bertramwurzel.—*Dut.* Tandwortel.—*Swed.* Bertramsrot.—*Dan.* Spytteurt.—*Arab.* and *Beng.* Akkurkurha.—*Tam.* Akkarakarum.

Figures of Anacyclus officinarum in Hayne, ix. 46.—Anthemis pyrethrum in Nees von E. 244.—Steph. and Ch. iii. 97.

This root has been used in medicine since the time of Dioscorides, by whom it was called Πυρεθρον.

Natural History.—There is some uncertainty as to its botanical source. Linnæus described the plant as a species of *Anthemis*, with a perennial root and several prostrate stems, inhabiting Arabia, Syria, France, Italy, Germany, and other parts of Europe. Decandolle removed it into a new genus chiefly on account of a difference in the structure of its seeds, and called it *Anacyclus Pyrethrum*. Hayne, however, ascertained from genuine plants growing in Thuringia, where it is much cultivated, that the true medicinal root proceeds from a species, which, besides other differences, has an annual fusiform root and an erect branchy stem, and which he therefore established as a distinct species under the name of *Anacyclus officinarum*. He considers the species *Anthemis* (or *Anacyclus*) *Pyrethrum* to be vaguely determined; but the specimen of it in Willdenow's herbarium seemed to correspond with his new species. It belongs to the Linnæan class and order *Syngenesia superflua*, and to the Natural family *Compositæ* of Decandolle, or *Asteraceæ* of Lindley.

The pellitory-root of English commerce is usually brought from the Levant; but none has been imported since 1836 (Pereira). It is in pieces towards four inches long and a third of an inch thick, externally brown, mottled with black shining spots, and internally somewhat resinous-like. It has no odour; but when chewed, it produces a peculiar sense of heat, pungency and tingling in the mouth, which lasts for some time, and is attended with a copious flow of saliva. The expressed juice of the fresh root is not acrid.

Chemical History.—Alcohol and ether dissolve out the active ingredient of the dried root. This has been supposed to be an acrid fixed oil (Gaultier), or an acrid resin (Parisel), or to be attached equally to a resin, a fixed oil, and a volatile oil (Koene). As both Hagen and Schonwald have obtained from it a scentless volatile oil, possessing the peculiar taste of the root, it is probable that this is the active principle, and that it adheres with force to the resin and fixed oil. The root consists otherwise chiefly of inulin and ligneous fibre, with a little tannin, gum, and various salts.

Actions.—Pellitory-root has been used immemorially, but is now chiefly employed in domestic practice, as a masticatory for relieving toothache and neuralgia of the face, or as a stimulant gargle in relaxed sore-throat and paralysis of the tongue. A strong tincture is still used by some dentists (Duncan). Dioscorides used an oleaginous preparation of it as a stimulant embrocation in palsy; and the active principle in the form of tincture makes a good rubefacient. The native doctors of Hindostan give it inwardly in palsy (Ainslie); a practice which has been also followed in Europe.

PYROLA, *E. D.* CHIMAPHILA, *U.S. L. Herb of Chimaphila umbellata, Nuttall's Gen.—Spr. (U.S. Edin.);—of Chimaphila corymbosa, Pursh Fl. Amer. Sept. (Lond.);—of Pyrola umbellata, Linn. (Dub.) Pyrola. Pipsissewa.*

Decoctum Pyrolæ, D. Decoctum Chimaphilæ, L. *Decoction of Pipsissewa.*

[Process, *U.S.* Take of Pipsissewa bruised an ounce; Water a pint and a-half. Boil down to a pint, and strain.]

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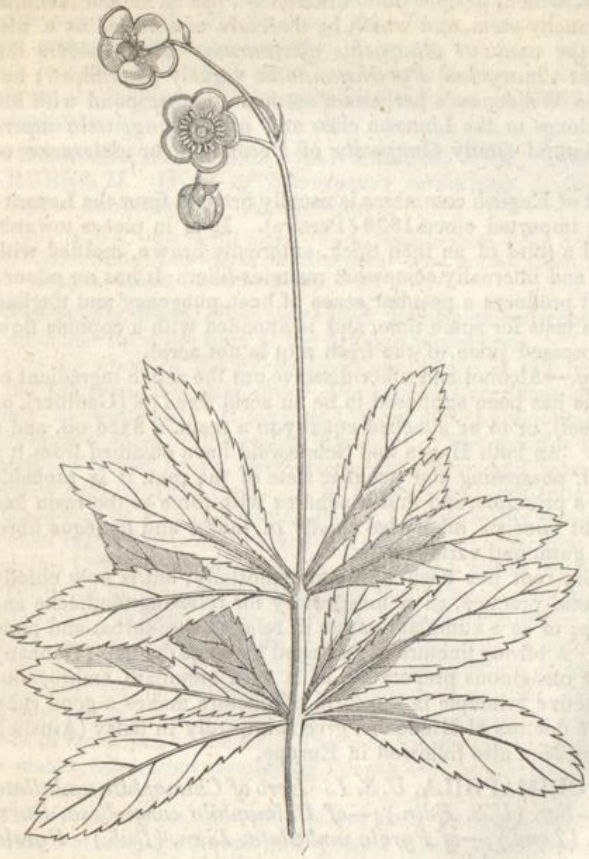
PROCESS, *Lond. Dub.* Take of Chimaphila (Pyrola, *D.*) an ounce; Distilled water a pint and a-half (water two pints, old wine measure, *D.*). Macerate for six hours, take out the pyrola, bruise and replace it in the water, *D.*; boil down to a pint (old wine measure, *D.*), and strain.

FIGURES of Pyrola umbellata in Hayne, xiii. 13.—Bigelow, Med. Bot. 21;—as Chimaphila umbellata in Barton, Med. Bot. 1.—Carson, Illust. 53.

THIS is a native North American remedy, which in 1803 was introduced into medical practice by Dr. Mitchell of the United States, and afterwards to the notice of European practitioners by Dr. Somerville of Chelsea-Hospital.

Natural and Chemical History.—It is the herb or leaves of a beautiful little plant belonging to the Linnæan class and order *Decandria Monogynia*, and to the Natural family *Ericineæ* of Decandolle or *Pyrolaceæ* of Lindley. Linnæus called it *Pyrola umbellata;* but the best authorities, following Pursh and Nuttall, consider it to present different generic characters, and term it *Chimaphila umbellata* or *corymbosa*. Its native name is Pipsissewa; and the inhabitants of the United States call it Winter-green, on account of its evergreen leaves. It grows in mossy turf under shady woods throughout North America, in central Europe, and in Siberia. It has a creeping root-stock,—a stem towards six inches high,—glossy, dark-green, coriaceous, wedge-shaped, serrated leaves,—and an umbelliform cluster of drooping bell-shaped, odoriferous, white flowers dotted with red points, which blow in July and August. The leaves have a bitter astringent taste, and a peculiar odour if bruised while fresh, but none when dried.—Their bitterness and astringency are communicated to boiling water, which is therefore used for the officinal

Fig. 166.



C. umbellata.

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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.* Quassia.—*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

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