and which contains not less than 30 p.c. of metallic Gold. **Official in** Russ. (Auro-natrium Chloratum).

The salts should be kept in well-stoppered bottles of a dark amber tint.

Some foreign samples of commercial Chloride of Gold are the double Chloride of Gold and Potassium $AuCl_3.KCl.2\frac{1}{2}H_2O$, corresponding to about 47 p.c. of metal.—*P.J.* (3) xxii. 902.

Medicinal Properties.—It has been given on the Continent for amenorrhœa and secondary syphilis. Chloride of Gold and Sodium has been used in tertiary syphilis, spinal sclerosis, hystero-epilepsy, asthma, chorea, and in uterine affections.

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain = 0·004 to 0·016 gramme.

Prescribing Notes.—*It may be given in the form of* **pills** *made with Massa Kaolini; or in aqueous solution. Its solutions should be protected from white light.*

It is also used in photography.

Not Official.

AZADIRACHTA INDICA.

INDIAN AZADIRACH.

Syns.—NEEM BARK, MARGOSA BARK.

The dried Bark of the stem of *Melia Azadirachta*, L.: **Infusum Azadirachtæ Indicæ** (1 in about 109), dose $\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.; and **Tinctura Azadirachtæ** (1 in 10), dose 30 to 60 minims = 1·8 to 3·6 c.c.; are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

BALSAMUM CANADENSE.

See TEREBINTHINA CANADENSIS.

Not Official.

BALSAMUM DIPTEROCARPI.

GURJUN BALSAM.

A balsamic exudation, obtained from the Trunk of *Dipterocarpus turbinatus*, Gärtn. f., and other species by incision and the application of heat. Imported from the East Indies. It is an oleo-resin, constituting a transparent liquid of the consistence of Olive Oil, lighter than Water, and of a dark brown sherry colour, slightly fluorescent.

Medicinal Properties.—Similar to those of Copaiba. Useful for leprosy. Mr. J. D. Hillis, of the Leper Asylum in British Guiana, is greatly in favour of it.—*L.* '80, i. 659; *M.P.* '89, i. 664; *see* also *L.* '90, i. 136. Von Reisnen gives Wood Oil internally, commencing with daily doses of 5 drops, increasing gradually to 70 or more, suspending the treatment when intolerance is shown. Externally the leprous parts are treated with an ointment of Gurjun Balsam, 3 parts; Lanolin, 1 part.—*P.J.* '95, ii. 27.

It is used in India as a substitute for Balsam of Copaiba in gonorrhœa; also as a natural varnish.

Prescribing Notes.—*Best prescribed in* **capsules** *for internal administration. As a local application in the form of an* **emulsion** *made with Lime Water, or as an ointment made with a Lanolin basis.*

Descriptive Notes.—It is also known as Wood Oil, but must not be confounded with the Wood Oil of China, which is a drying fixed Oil, used in China instead of Linseed Oil, and is derived from *Aleurites Fordii*, Hemsl., and other species; it is also known as Tung Oil. To prevent confusion only the names Gurjun Oil or Gurjun Balsam should be used for Balsamum Dipterocarpi.

BALSAMUM PERUVIANUM.

BALSAM OF PERU.

FR., BAUME DU PEROU; GER., PERUBALSAM; ITAL., BALSAMO PERUVIANO; SPAN., BALSAMO DEL PERU.

A dark brownish viscid liquid, obtained (by special treatment) from the Trunk of *Myroxylon Pereiræ*, Klotzsh, growing in San Salvador, Central America.

It consists mainly of Cinnamein, the Benzyl Ester of Benzoic Acid, with a smaller proportion of the Benzyl Ester of Cinnamic Acid, free Cinnamic Acid, traces of Vanillin and Peruresinotannol Esters of Cinnamic and Benzoic Acid.

Solubility.—1 in 1 of Alcohol (90 p.c.); when more than 3 of Alcohol are added to 1 of Balsam it becomes turbid; in all proportions of Chloroform; insoluble in Olive Oil.

Medicinal Properties.—Stimulant and disinfectant expectorant. Useful in chronic bronchitis; contra-indicated in acute bronchial catarrh because of its stimulant action; also used as a urinary antiseptic.

Externally as an **ointment** for chronic indolent ulcers and for sore nipples; for scabies and pediculi and parasitic skin diseases, to relieve itching in urticaria, and prevent or heal bedsores.

The Balsam contains an Essential Oil, the vapour of which is extremely toxic to the acarus of itch. The patient is rubbed in the evening for fifteen or twenty minutes with the Balsam; it is not necessary to rub hard, as the vapour is sufficient to kill the parasite.—*L.* '96, i. 1101.

As a dressing in warfare; it may be left on for 20 days without removal and disinfection, and sterilisation is unnecessary.—*L.* '04, ii. 1807.

Not to be applied to large areas of skin for scabies in children, small-bodied adults, and patients with renal trouble, as it may produce albuminuria or nephritis.—*B.M.J.* '07, i. 972.

Superior to sulphur in scabies.—*B.M.J.* '07, ii. 1710.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Prescribing Notes.—*Given as an* **emulsion** *with Mucilage of Gum Acacia, or Sugar and yolk of Egg with Water.*

Not Official.—Unguentum Peruvianum, and Unguentum Peruvianum Resinosum.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·14 to 1·16; Belg., 1·137 to 1·150; Dutch, sp. gr. 1·14 to 1·145; Dan., Ital., Norw. and Swed., sp. gr. 1·135 to 1·150; Fr., sp. gr. 1·135 to 1·150; Ger., sp. gr. 1·140 to 1·150; Hung., sp. gr. 1·137 to 1·150; Jap., sp. gr. 1·140 to 1·162; Russ., sp. gr. 1·135 to 1·145; Port., sp. gr. 1·15; Span., sp. gr., 1·13 to 1·16; Swiss, sp. gr. 1·145 to 1·155; U.S., sp. gr. 1·140 to 1·150, at 25° C. (77° F.); Mex., 1·14 to 1·145.

Descriptive Notes.—Balsam of Peru is not a natural exudation, but is a pathological product formed after the bark has been beaten and scorched. It is a nearly black, oily liquid, heavier than Water, and with a balsamic rather smoky odour, which is fragrant and agreeable when the balsam is smeared on paper and warmed. It has not a very pronounced taste, but leaves an unpleasant burning sensation in the fauces. It is liable to be adulterated with several substances, *see* Tests. An artificial Balsam of Peru, called Perugen, is now sold in commerce, but its use in medicine is not justified, since it cannot be said to be derived from *Myroxylon Pereiræ*. With the Nitric Acid test of Cæsar and Loretz, *P.J.* (4) xxi., p. 579, Perugen gives an intense olive-green colour, instead of the golden yellow yielded by pure Balsam.

Tests.—The distinguishing tests for Peruvian Balsam: are (1) the specific gravity, which should be 1·137 to 1·150 [the *U.S.P.* gives 1·140 to 1·150 at 25° C. (77° F.); the *P.G.* 1·140 to 1·150]; (2) the presence of from 57 to 60 p.c. of Cinnamein as determined by first shaking a weighed quantity of 5 grammes of the Balsam with 5 c.c. of Sodium Hydroxide Solution (15 p.c.) and shaking the latter solution with three successive portions each of 15 c.c. of Ether (sp. gr. 0·720), the residue from the ethereal solution on evaporation being dried until the loss between two weighings at intervals of five minutes does not exceed 0·01 gramme; (3) the percentage of Potassium Hydroxide required to saponify the residue, which should be from 23·23 to 23·76 p.c. as determined by saponifying the weighed residue from the Ether treatment with Normal Volumetric Alcoholic Potassium Hydroxide Solution titrating the uncombined alkali with Normal Volumetric Sulphuric Acid Solution.

The *U.S.P.* requires the Balsam to contain at least 56 p.c. of Cinnamein as determined by a single extraction with Ether from a mixture of the Balsam and Sodium Hydroxide Test Solution, the residue from the Ether treatment should require not less than 23·49 p.c. of Potassium Hydroxide for saponification. The *P.G.* test indicates 56 p.c. of Cinnamein as determined by extraction with three successive portions of Ether from a mixture of the Balsam, Water, and Sodium Hydroxide Solution (15 p.c.); the Ether residue should require not less than 23·66 p.c. of Potassium Hydroxide for its saponification. Both *U.S.P.* and *P.G.* employ Semi-normal Volumetric Hydrochloric Acid Solution for titrating the uncombined alkali after saponification. Attention has been called (*P.J.* '01, i. 29) to the ambiguous wording of the Pharmacopœia test. The original test directs the exhaustion of the Balsam with Ether and treatment of the filtered ethereal solution with Sodium Hydroxide Solution. The original directions are that the Balsam shall be shaken with Sodium Hydroxide Solution (15 p.c.) and then washed with Ether, the Ether removed and the residue weighed after suitable drying. The residue would be taken to mean the residual Balsam after treatment with Sodium Hydroxide Solution (15 p.c.) and Ether, whereas the residue of Cinnamein and other Ether soluble bodies is intended.

A determination of the Acid, Ester and Saponification value of the original Balsam is useful in judging of the quality of a sample. The *B.P.* does not make any reference to such determinations. The *U.S.P.*

gives a quantitative test for limit of Acid Resins, and according to the test these should not amount to more than 14·69 p.c. reckoned as Cinnamic Acid. No saponification test on the original Balsam is given. The *P.G.* omits the 'limit of Acid Resins,' but includes a Saponification test, the Balsam being required to neutralise not less than 22·46 p.c. of Potassium Hydroxide, indicating a Saponification value of 224·6.

The more generally occurring impurities are Copaiba Balsam, Colophony, fixed oils, *e.g.*, Olive and Castor Oils; Ethylic Alcohol, Turpentine, Storax and Gurjun Balsam. As a general rule adulterants raise the Acid and lower the Saponification values. The *B.P.* employs trituration with Lime as a test for ensuring the absence of Copaiba and Resins, and when warmed until the volatile matter is dissipated and charring commences, the absence of fatty odour is assumed to indicate the absence of Castor and other Fatty Oils. No diminution in volume when equal volumes of the Balsam and Water are shaken together indicates the absence of Ethylic Alcohol. The separation of about 40 p.c. of Resin and a clear pale brown supernatant fluid with only a slight fluorescence, when one part of the Balsam is treated with three parts of Carbon Bisulphide, is officially stated to indicate the absence of Gurjun Balsam. The trituration with Lime is included in the *U.S.P.*, though the latter part of the test is omitted; the test was official in *P.G.* iii., but is omitted altogether in *P.G.* iv. Neither *U.S.P.* nor *P.G.* includes a test for Ethyl Alcohol, nor the Carbon Bisulphide test. Both *U.S.P.* and *P.G.* include a Sulphuric Acid test for Fixed Oils and Gurjun Balsam. The *U.S.P.* alone includes a test with Benzin and concentrated Nitric Acid for the detection of Resin, the balance of the Benzin solution being shaken with Copper Acetate Solution, the non-production of a green or bluish-green coloration indicating the absence of Resin, Turpentine, Storax, Fatty Oils, etc. Dieterich is of opinion that qualitative reactions are devoid of any value in judging the quality of a Balsam, and suggests including a determination of the Resin-ester. The following test has been suggested by Dieterich (*Berichte der deutschen pharmaceutischen Gesellschaft* 18, 135) for inclusion in the *B.P.* tests:—The alkaline solution of the Resin obtained in the assay of the balsam is acidified and shaken with 10 c.c. of Ether, 5 c.c. of this solution is poured into a test-tube, and after inclining the tube 1 c.c. of concentrated Sulphuric Acid is allowed to flow in, the test-tube is brought into a vertical position, and after a short time is again inclined and 2 c.c. of concentrated Hydrochloric Acid allowed to flow in. A reddish-brown, but not a green or greenish-brown zone should develop between the Hydrochloric Acid and the Ether, a red zone between the Sulphuric Acid and the Hydrochloric Acid. This test is intended to detect the presence of synthetic Balsam of Peru (Perugen).

Calcium Oxide.—When the Balsam is mixed with half its volume of Calcium Hydroxide and heating on a water-bath for half an hour a solid mass should not be formed, indicating the absence of Rosin, Storax, or Copaiba, *U.S.P.*

Sulphuric Acid.—If 10 drops of the Balsam be triturated with 20 drops of Sulphuric Acid a tough homogeneous mass results, which when washed with cold

Water develops a violet colour on its surface, and after draining out the Water a brittle mass is obtained which may be crumbled up, indicating the absence of fixed oils, *P.G.* and *U.S.P.*

Benzin and Nitric Acid.—If 1 gramme of the Balsam be shaken with 5 c.c. of Petroleum Benzin, the mixture warmed on a water-bath for 10 minutes, and sufficient solvent added to replace loss by evaporation, then if 2 c.c. of this Benzin Solution be evaporated and treated with a drop of Nitric Acid, sp. gr. 1·42, a permanent green or bluish-green colour should not be produced (absence of Resin), *U.S.P.* The remaining 3 c.c. of Benzin Solution when shaken with an equal volume of aqueous Solution of Copper Acetate (1–1000) should not be coloured green or bluish-green (absence of Resin, Turpentine, Storax, Fatty Oils, etc.), *U.S.P.*

Saponification.—Let 1 gramme of Balsam be dissolved in 20 c.c. of Alcohol (90 p.c.) and 50 c.c. of Semi-normal Alcoholic Solution of Potassium Hydroxide be added, then let the mixture be heated on a water-bath for half an hour. Dilute with 300 c.c. of Water and titrate with Semi-normal Solution of Hydrochloric Acid; not more than 42 c.c. of the Acid solution should be necessary to neutralise the excess of Potassium Hydroxide Solution, *P.G.*

Volumetric Determination of Free Acid.—The *U.S.P.* directs 1 gramme of Balsam to be dissolved in 100 c.c. of Alcohol (94·9 p.c.), and titrated with Semi-normal Alcoholic Solution of Potassium Hydroxide, using 1 c.c. of Phenolphthalein T.S. as indicator, when not more than 2 c.c. of the Volumetric Alkali Solution should be required to produce a pink colour.

Gravimetric and Volumetric Determination of Cinnamein.—The *B.P.* quantities are outlined in the large type notes above, the *P.G.* quantities are 2·5 grammes of Balsam, 5 c.c. Sodium Hydroxide Solution (15 p.c. w/w) and 5 c.c. of Water, washing with three quantities of Ether 10 c.c. each. The final residue should amount to at least 1·4 grammes. The *U.S.P.* directs the mixture of 3 grammes of Balsam with 30 c.c. Sodium Hydroxide T.S., then washing with 60 grammes of Ether, and the careful evaporation of 51·5 grammes of the ethereal liquid, when not less than 1·4 grammes of residue of constant weight should be obtained (presence of at least 56 p.c. of Cinnamein). The residue obtained from the *B.P.* gravimetric determination of Cinnamein is dissolved in 40 c.c. of Alcohol (90 p.c.), and saponified under a reflux condenser for one hour with 20 c.c. of Normal Volumetric Alcoholic Potassium Hydroxide Solution; the excess of Volumetric alkali solution being titrated with Normal Volumetric Sulphuric Acid Solution, to neutralise this excess from 7·2 to 8·1 c.c. should be necessary. The *P.G.* and *U.S.P.* direct the solution of the weighed residue in 25 c.c. of Alcohol, mixing with 25 c.c. Semi-normal Volumetric Alcoholic Solution of Potassium Hydroxide and carefully heating on a water-bath for half an hour; then after the addition of 10 drops (1 c.c., *U.S.P.*) of Phenolphthalein T.S. as indicator, the mixture should require not more than 13·2 c.c. Semi-normal Volumetric Solution of Hydrochloric Acid for exact neutralisation.

Not Official.

UNGUENTUM PERUVIANUM.—Balsam, 1; Lard, 7.

This has been incorporated in the *B.P.C.*

UNGUENTUM PERUVIANUM RESINOSUM. — Balsam, 1; Resin Ointment, 1.

BALSAMUM TOLUTANUM.

BALSAM OF TOLU.

Fr., Baume de Tolu; Ger., Tolubalsam; Ital., Balsamo Tolutano;
Span., Balsamo de Tolu.

A yellowish-brown, soft, tenacious mass, which exudes from the Trunk of *Myroxylon Toluifera*, H. B. and K., on incision. Imported from the northern ports of Colombia, South America.

Balsam of Tolu consists principally of the Cinnamic and Benzoic Esters of Tolu-resinotannol, from 12 to 15 p.c. of free Cinnamic and Benzoic Acids, about 7·5 p.c. of Cinnamein, an oily fluid composed mainly of the Benzyl Ester of Benzoic Acid and in lesser amount of the Benzyl Ester of Cinnamic Acid, and a small quantity of Vanillin.

Solubility.—1 in 1 of Alcohol (90 p.c.); 1 in 3 of Benzol; 2 in 1 of Chloroform; 1 in 1 of Glacial Acetic Acid; insoluble in Petroleum Spirit; nearly insoluble in Carbon Bisulphide.

Medicinal Properties.—Similar to those of the Balsam of Peru, but not used externally.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Usually given as the* **Syrup,** *which is useful as a flavouring agent, and as an expectorant in cough mixtures. The* **Tincture** *when mixed with Water requires the use of Mucilage of Gum Acacia.*

Official Preparations.—Of the **Balsam,** Syrupus Tolutanus and Tinctura Tolutana; used in the preparation of Tinctura Benzoini Composita. The **Syrup** is contained in Mistura Ammoniaci. The **Tincture** is used in the preparation of Tolu Basis which is contained in Trochiscus Acidi Carbolici, Trochiscus Morphinæ, and Trochiscus Morphinæ et Ipecacuanhæ.

Not Official.—Liquor Tolutana pro Syrupo, Syrupus Tolutanus.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S. Not in Hung.

Descriptive Notes.—Balsam of Tolu when freshly imported is a light brown balsamic resin, soft enough to receive the impression of the finger, but gradually becoming harder and brittle in cold weather, but is even then easily softened by the warmth of the hand. It is exported from the United States of Colombia in cylindrical tins containing about 10 lb., but from New York in square tins containing about 44 lb. It has a delicate, fragrant, characteristic odour, especially when warmed, an aromatic and a feebly acid taste, due to the presence of Cinnamic and Benzoic acids, crystals of which can readily be seen with a lens when a thin layer of the balsam is pressed between two warm plates of glass.

Tests.—The distinguishing tests for this Balsam are its aromatic odour and taste; physical appearance; the presence of numerous crystals when thin sections are examined with a pocket lens; the distinctly crystalline residue obtained on extracting a weighed quantity of 5 grammes of the Balsam with two successive quantities each of 25 c.c. and 10 c.c. of Carbon Bisulphide and subsequent evaporation of that solvent; and that not less than one-third of its weight of Potassium Hydroxide should be required for the saponification of this residue. This test of the *B.P.*, though shown (*Y.B.P.* '06, 206; *C.D.* '06, ii. 164; *P.J.* '06, ii. 74) to be in many cases valuable as a means of discriminating between genuine and spurious balsams, may still be improved upon in several important particulars. The Carbon Bisulphide solution should be evaporated and the residue dried at a temperature not exceeding 43·3° C. (110° F.). Potassium Hydroxide in the form of Normal Volumetric Alcoholic Solution might be inserted in the place of the Potassium Hydroxide in the requirement as to the quantity necessary for saponification. One-third of the weight of the residue is considered to be too high, and it is suggested that the sentence should read not less than 290 parts of Potassium Hydroxide per 1000 parts of dry residue. A saving of time would, moreover, be accomplished by expressing the percentage of Potassium Hydroxide required, on the original Balsam instead of on the residue, the evaporation of the Carbon Bisulphide would then not require to be carried beyond the stage necessary for the removal of the solvent. The Carbon Bisulphide test is not included in the *U.S.P.* and *P.G.*, but both these Pharmacopœias give an Acid and Ester value. According to the *U.S.P.* the amount of Potassium Hydroxide required to neutralise the acidity should be not less than 11·14 p.c. nor more than 16·72 p.c. corresponding to an Acid value of 111·4 to 167·2. The *P.G.* requires not less than 11·23 p.c. nor more than 16·84 p.c. corresponding to an Acid value of 112·3 to 168·4. The amount of Potassium Hydroxide required by the *U.S.P.* to saponify the Esters should be not less than 15·32 p.c. nor more than 18·95 p.c. corresponding to a Saponification value of 153·2 to 189·5. That required by the *P.G.* is not less than 15·44 p.c. nor more than 19·09 p.c., corresponding to a Saponification value of 154·4 to 190·9.

The more generally occurring impurities are Resin and Copaiba. The *B.P.* relies solely on the sufficient proportion of Benzoates and Cinnamates as indicated by the Carbon Bisulphide residue and its Saponification figure; the *P.G.* on the Acid and Saponification value, whilst the *U.S.P.* gives in addition confirmatory qualitative tests with Sulphuric Acid on a solution in Glacial Acetic Acid of residue obtained on evaporating a Carbon Bisulphide solution of the Balsam; and the non-production of a green coloration when a 1 in 8 solution of the Balsam in Benzin is shaken with an equal volume of a 1 in 1000 aqueous Copper Acetate solution.

The following test has been suggested by Dieterich for the detection of Colophony:—A weighed quantity of 0·5 gramme of the balsam is mixed with 5 c.c. of Water, and 5 c.c. of Sodium Hydroxide Solution (15 p.c. w/w), the mixture is shaken with 10 c.c. of Ether, separated, acidified, and again shaken with Ether. A measured portion of the ethereal solution is introduced into a test-tube, the tube inclined and 1 c.c. of concentrated Sulphuric Acid allowed to flow in, again brought into a vertical position, and after a short time again inclined, and 2 c.c. of Hydrochloric Acid allowed to flow in. It should produce a red zone between the Hydrochloric Acid and the Ether, and a deep red zone between the Sulphuric Acid and the Hydrochloric Acid. A weighed quantity of 1 gramme of the balsam dissolved in 5 c.c. of Glacial Acetic Acid and 2 drops of Sulphuric Acid dropped into the solution, previously heated to boiling, should produce a bluish-violet or bluish-green colour.

Carbon Bisulphide, Glacial Acetic, and Sulphuric Acids.—If 0·5 gramme of the Balsam be shaken with 25 c.c. of Carbon Bisulphide, allowed to stand for 30 minutes, filtered, and the filtrate evaporated to dryness, a residue is obtained which when dissolved in Glacial Acetic Acid should not yield a green colour on the addition of a few drops of Sulphuric Acid, *U.S.P.*

Benzin and Copper Acetate.—If 1 gramme of the Balsam be agitated with 8 c.c. Petroleum Benzin for 5 minutes, the supernatant liquid should not be coloured green when shaken with an equal volume of a 1 in 1000 solution of Copper Acetate, indicating the absence of Resin and Copaiba, *U.S.P.*

Acid Value.—If 1 gramme of the Balsam be dissolved in 50 c.c. of Alcohol and 10 drops (1 c.c. *U.S.P.*) of Phenolphthalein Solution be added, then the addition of not less than 4 c.c. and not more than 6 c.c. of Semi-normal Volumetric Alcoholic Solution of Potassium Hydroxide should be required to produce a red colour, indicating the limit of acidity, *P.G.* and *U.S.P.*

Saponification Value.—If this liquid be mixed with more Semi-normal Alcoholic Solution of Potassium Hydroxide until the total amount used is 20 c.c., and the mixture heated on a water-bath for half an hour and allowed to cool, then on titrating with Semi-normal Volumetric Solution of Hydrochloric Acid (Semi-normal Volumetric Solution of Sulphuric Acid, *U.S.P.*) the liquid should require not less than 13·2 and not more than 14·5 c.c. of the Acid Solution to neutralise the excess of Potassium Hydroxide Solution, *P.G.* and *U.S.P.*

Preparations.

SYRUPUS TOLUTANUS. SYRUP OF BALSAM OF TOLU.

FR., SIROP DE BAUME DE TOLU; GER., TOLUBALSAMSIROP; ITAL., SCIROPPO DI BALSAMO DEL TOLU; SPAN., JARABE DE BALSAMO DE TOLU.

Balsam of Tolu, $1\frac{1}{4}$, is boiled with 20 of Distilled Water to produce 16 of liquid, in which (after filtration) are dissolved 32 of Sugar. When finished it should weigh 48.

A better flavoured Syrup may be made as follows:—Balsam of Tolu, $1\frac{1}{4}$; Sugar, 8. Powder the Tolu with the Sugar, macerate in Water 16, for 24 hours, with frequent agitation; filter bright, and dissolve in it (cold) Sugar 24.

In a paper read before the British Pharmaceutical Conference (*P.J.* '99, ii. 108, 116; *C.D.* '99, ii. 212, 228) the superiority of a Syrup made on the above lines has been clearly demonstrated. Six Syrups were prepared, the two samples of genuine Balsam used being previously submitted to careful examination. The Syrup prepared by the *Companion* process ranked first, having the best flavour and containing 1·12 parts of Cinnamic Acid out of 3·33 contained in the Balsam used. The *B.P.* Syrup ranked last, containing in summer 1·00, and in winter 0·60 parts of Cinnamic Acid.

Syrupus Tolutanus (*U.S.*).—Tincture of Tolu, 5, is triturated with Magnesium Carbonate, 1; and Sugar, 6; gradually adding Water 45, filtering, dissolving Sugar 76 in the liquor with aid of gentle heat, straining while hot and adding sufficient Water to make 100.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Liquor Tolutanus pro Syrupo.—Balsam of Tolu, 4, is dissolved in 12 of Alcohol (90 p.c.) and added to 26 of Water previously heated to 70° C. and placed in a bottle; shaken vigorously, then set aside for 24 hours, filter bright. To make **Syrup of Tolu** mix 1 of the solution with 7 times its volume of simple syrup.—(*Farr* and *Wright*) *Y.B.P.* 1899, 366.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Norw., Port., Span., Swed., Swiss and U.S.; Mex. made with Tincture. Not in the others.

Belg. and Fr. have **Tablets** of Balsam of Tolu.

TINCTURA TOLUTANA. TINCTURE OF BALSAM OF TOLU.

1 of Balsam of Tolu, macerated with Alcohol (90 p.c.) *q.s.* to yield 10.
(1 in 10)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., Dan., Fr., Swed. and U.S., 1 in 5; Port., 3 in 20. All by weight, except U.S. Not in the others.

Tests.—Tincture of Tolu has a sp. gr. of 0·860 to 0·865, it contains from 8 to 10 p.c. w/v of total solids and about 80 p.c. of Absolute Alcohol by volume.

Not Official.

BAPTISIN.

A powdered extract obtained from *Baptisia tinctoria*, R. Br. In small doses, laxative; in large doses, purgative and emetic.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme. Usually given in **pill.**

Not Official.

BARII SULPHIDUM.

It is somewhat difficult to obtain in a pure condition, and commercial samples as a rule do not contain more than 50 p.c. BaS.

Medicinal Properties.—The chief use of this is as a **depilatory,** for which purpose it is unequalled, removing hair with less injury to the skin than any other application.

Test.—For the estimation of BaS: 1. Make a standard Zinc Solution by dissolving 7·7 grammes of Zinc in about 75 c.c. of Diluted Hydrochloric Acid, adding excess of Ammonia Solution and diluting to 1000 c.c.; 2. Make an alkaline Lead Solution by dissolving 1 gramme Lead Acetate in about 20 c.c. of hot Solution of Potassium Hydroxide and diluting to 100 c.c.; 3. Heat to boiling 1 gramme of Barium Sulphide in about 50 c.c. of Water and titrate with the standard Zinc Solution till no black or brown colour is obtained by adding a drop of the filtered Barium Solution to a drop of the Lead indicator, spotted on a porcelain slab. Each c.c. of the Zinc Solution used is equivalent to 2 per cent. of Barium Sulphide in the sample operated upon.

Preparation.

DEPILATORY.—Barium Sulphide (containing 70 p.c. BaS, or an equivalent quantity of any other strength), in fine powder, 2; Starch, 5; Orris Root, in powder, 1. Mix.

For use make it into a thin paste with Water, apply to the part from which the hair is to be removed; after five minutes scrape off with a blunt knife.

Not Official.

BARII CHLORIDUM.

$BaCl_2$, eq, 206·78.

Colourless crystalline plates.

Solubility.—1 in 2½ of Water.

Medicinal Properties.—Occasionally given in syphilis, scrofula, and as a cardiac tonic, but requires care on account of its toxic properties.

Dose.—¼ to 2 grains = 0·016 to 0·13 gramme.

Toxic effects occur only with large doses.—*L.* '03, i. 1134.

Stated (*B.M.J.E.* '05, i. 24) to have no cumulative effect in ordinary doses, does not disturb the digestion or irritate the kidneys. Usual adult dose, 3 grains = 0·2 gramme, 3 or 4 times daily in Water.

Foreign Pharmacopœias.—Official in Ger., Mex. and Swiss. Not in the others.

Tests.—An aqueous solution yields with diluted Sulphuric Acid Solution or an aqueous solution of a soluble Sulphate, a heavy white precipitate insoluble in concentrated Hydrochloric Acid and in strong Nitric Acid; with Potassium Bichromate Solution it yields a yellow precipitate soluble in diluted mineral acid. With Silver Nitrate Solution it yields a white curdy precipitate insoluble in Nitric Acid, soluble in Ammonia Solution, and in Potassium Cyanide Solution. It should yield no coloration or precipitate when acidified with Hydrochloric Acid and tested with Hydrogen Sulphide Solution. The *P.G.* includes a test for Iron, 20 c.c. of a 1 in 20 aqueous solution shall not be coloured blue by 0·5 c.c. of Potassium Ferrocyanide Solution (5 p.c.). No residue shall remain after complete separation of the Barium by Sulphuric Acid, evaporation of the filtrate and ignition at a low red heat.

Not Official.

BEBEERINÆ SULPHAS.

Dark-brown thin translucent scales, yellow when in powder, with a strong bitter taste. A preparation made from *Nectandra* or *Bebeeru* Bark (*Nectandra Rodiæi*, Schomb.), containing about 60 p.c. of alkaloids, one half being **Bebeerine** (Beberine), $\mathbf{C_{19}H_{21}NO_3}$, eq. 308·87. It was official from 1864 till 1898.

Solubility.—Sparingly in Alcohol (90 p.c.); dissolves about 1 in 1 of Water, and the solution can be diluted up to 1 and 8 of Water, but on further dilution it precipitates until about 80 or 100 parts of Water have been added, but samples vary in this respect; readily soluble in Water containing a mineral Acid.

Medicinal Properties.—Aromatic bitter, stomachic tonic, an imperfect substitute for Quinine.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*Given in* **solution,** *or in* **pills** *made with 'Dispensing Syrup.'*

The following pure products are commercial: **Bebeerine pure,** slightly soluble in Water, readily in Alcohol, Chloroform and Ether; **Bebeerine Hydrochloride** and **Bebeerine Sulphate,** are both readily soluble in Water and Alcohol. Dose of the two latter 1 to 2 grains = 0·06 to 0·13 gramme.

Not Official.

BELÆ FRUCTUS.

Bael Fruit is obtained from *Ægle Marmelos*, Correa.

The dried half-ripe Fruit was formerly official, but is now omitted.

The fresh half-ripe Fruit is now official in the *Ind.* and *Col. Add.* for use in India and the Eastern Colonies, as is also the Liquid Extract.

Medicinal Properties.—The Fresh Fruit has been much extolled in India for diarrhœa and dysentery, and the Confection prepared in Britain appears to have similar properties. The Dried Fruit is not considered a trustworthy remedy.

If the fresh fruit is not obtainable, the official preparation Extract. Belæ Liquid. answers well in the treatment of dysentery. Generally speaking, Milk is the best vehicle for Bael Fruit and pulp.—*I.M.G.* '05, ii. 264.

CONFECTIO BELÆ RECENTIS (*Squire*).—Prepared from Fresh Fruits imported from India in the Spring months. It retains the odour and flavour of the Fresh Fruit.

Dose.—A teaspoonful.

EXTRACTUM BELÆ LIQUIDUM (*Ind.* and *Col. Add.*).—Made by macerating 4 of bruised Bael Fruit in Water by successive treatments, evaporating the mixed fluids to 3, and when cold adding Alcohol (90 p.c.), *q.s.* to make 4.

Dose.— 1 to 2 fl. drm. = 3·6 to 7·2 c.c.

BELLADONNA.

BELLADONNA.

Fr., Belladone; Ger., Belladonna; Ital., Belladonna; Span., Belladona.

The fresh Leaves and Branches of *Atropa Belladonna*, L., as well as the dried Root, are official.

Medicinal Properties.—Anodyne, antispasmodic, mydriatic, antigalactagogue, anhydrotic, and urinary sedative. There is no drug which can compare with it in checking the secretions of milk, sweat, and saliva. It is given for epilepsy, and is one of the best remedies for whooping-cough and for painful spasm of the bladder; in renal colic, dysmenorrhœa and typhlitis; in full and frequent doses for asthma, both as a prophylactic and curative. It is of the utmost value in relieving cardiac pain and distress, palpitation and aortic regurgitation. Useful in typhoid with contracted pupil, and in acute bronchitis it stops profuse secretion. In large or continued doses it causes dilatation of the pupil and dryness of the mouth and throat. For habitual constipation ⅛ to ½ grain of Extract on rising in the morning. For nocturnal incontinence of urine, 5 to 10 minims of the Tincture, with the same dose of Tinct. of Perchloride of Iron three times a day. Ringer recommends larger doses of Belladonna for this troublesome complaint in children, 10 to 30 minims of the Tincture three times a day; small doses often fail when large doses at once succeed. Useful in loss of tone and irritable state of the generative organs which gives rise to nocturnal emissions, although it has slightly aphrodisiacal properties.

For external uses, see Prescribing Notes.

In the treatment of epilepsy (*L.* '05, i. 710) it is a remedy which should be tried in all cases in which the Bromides have failed. Every now and again cases will be met with in which this drug produces remarkable and persistent arrest of seizures.

Cases of poisoning (*L.* '05, i. 714) by application of Belladonna plaster 8 × 5 applied to the loins for the relief of lumbago.—Recovery. Ointment of 4 grains Atropine Sulphate in the oz. applied for chronic eczema of the nates causes toxic symptoms.—Recovery.

Poisoning by liniment, recovery after use of Strychnine.—*B.M.J.* '07, ii. 1515.

Prescribing Notes.—*The* **Extract** *in pills, also the* **Tincture** *and* **Succus** *are for internal use. The* **Suppository** *is used in prostatitis, cystitis and chordee.* **Bougies** *made with Gelatin base or Oil of Theobroma contain* ¼ *to* 2 *grains of Alcoholic Extract of Belladonna. Externally the* **Liniment** *and* **Compound Liniment** *sprinkled on impermeable Piline are very useful in pleurodynia, lumbago and muscular rheumatism, as is also the* **Chloroform** *preparation alone or mixed with oil. The* **Glycerinum** *as a paint, and the* **Emplastrum,** *are used for sprains, acute synovitis, and to check mammary secretion and prevent inflammation of the breast; both are also an excellent remedy in cardiac pain and palpitation. Extract of Belladonna is a component of many Hospital formulas for* **pills,** *and is prescribed with Aloes, Camphor, Quinine, Rhubarb, Valerian and Zinc Oxide, in doses of* ⅛ *to* ¼ *grain in each pill. In* **Eye Lotions** 2 *grains of the green extract to the fl. oz.*

Dose.—Will be found under the respective preparations.

Incompatibles.—Caustic Alkalis, Opium, Strychnine.

Official Preparations.—Extractum Belladonnæ Viride, and Succus Belladonnæ, from the **fresh leaves** and **branches.** Extractum Belladonnæ Liquidum, from the **dried root.** Emplastrum Belladonnæ, Extractum Belladonnæ Alcoholicum, Linimentum Belladonnæ, Tinctura Belladonnæ, and Unguentum Belladonnæ, from the **Liquid Extract,** Suppositoria Belladonnæ, from the **Alcoholic Extract.** Atropine, from **leaves** or **root.**

Not Official.—Chloroformum Belladonnæ, Collodium Belladonnæ, Emplastrum Belladonnæ Viride, Extractum Belladonnæ Foliorum, Extractum Belladonnæ Exsiccatum, Glycerinum Belladonnæ, Linimentum Belladonnæ Compositum, and Ethereal Tincture of Belladonnæ.

Antidotes.—In cases of poisoning by Belladonna, use stomach-tube or give one of the following emetics: 10 grains of Copper Sulphate, 20 grains of Zinc Sulphate, 1 oz. of Ipecacuanha Wine, or hypodermic injection of $\frac{1}{10}$ grain Apomorphine. Give stimulants; inject Pilocarpine; an enema of Coffee. If necessary apply artificial respiration.

BELLADONNÆ FOLIA. Belladonna Leaves.

Fr., Feuilles de Belladone; Ger., Belladonnablätter; Ital., Foglie di Belladonna; Span., Hoja de Belladona.

The fresh Leaves and Branches of *Atropa Belladonna*, L., collected when the plant is in flower.

The Leaves are official in the *U.S.P.* and *P.G.* The *U.S.P.* has introduced a process of assay and requires that they shall yield not less than 0·33 p.c. of mydriatic alkaloids when assayed by this process. Neither *B.P.* nor *P.G.* fixes a standard for the Leaves.

Descriptive Notes.—The Pharmacopœia directs that the fresh Leaves and Branches of *Atropa Belladonna* should be collected when the plant is in flower. But the plant often continues to flower long after the fruits are ripe, and consequently the leaves are likely to vary in strength; it would, perhaps, have been better to use the words 'commencing to flower.' The flowering branches are easily recognised by the dull purple bell-shaped flowers, and the ovate entire leaves apparently arranged in pairs, of which one leaf is smaller than the other. The smaller leaf is, however, a bract belonging to the flower, which is placed outside, not in, the axil of the larger leaf. The lower stem leaves are alternate and not in pairs. The leaves vary in size from 3 to 8 inches (7·5 to 20 cm.) in length, and 2 to 3½ inches (5 to 9 cm.) broad and are glabrous or nearly so.

It will be noted that the dried leaves are not official in the *B.P.* although they are in the *U.S.P.* and the *P.G.* The dried leaves are usually brownish-green above and paler beneath, and present, especially on the under surface, when seen under a good lens, minute pale dots or prominences caused by cells filled with sandy crystals of Calcium Oxalate, which do not contract in drying. These crystal cells are easily seen under the microscope in a fragment of the leaf cleared by Chloral Hydrate Solution, as well as the striations of the epidermal cells, which are also characteristic. The dried leaves of *Scopola carniolica*, Jacq., have been offered in commerce when Belladonna leaves were scarce and dear, but they are thinner, darker green, and the small veins are more prominent. The leaves of *Phytolacca decandra*, L., from Bosnia, have also been offered as Belladonna in European commerce. Their upper surface has no hairs, and is of a lighter green, and contains no crystal sand, but acicular raphides, and the epidermal cells are polygonal, not sinuate as in Belladonna.

The *P.G.* leaves are collected in the flowering season.

The percentage of alkaloid varies considerably; a good well-dried sample should contain about 0·5 p.c.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S., Leaves; Port., Herb. Not in Hung.

The *Brussels Conference* (1906) uses only the leaf, dried; powdered drug to be used entire.

Tests.—No standard for Belladonna Leaves is given in either *B.P.* or *P.G.*; the *U.S.P.* states that they should yield not less than 0·33 p.c. of mydriatic alkaloids when assayed by the *U.S.P.* process. The *U.S.P.* method of standardisation is as follows:—A weighed quantity of 10 grammes of the leaves in No. 60 powder is allowed to stand for ten minutes in an Erlenmeyer flask with 50 c.c. of a mixture containing 4 parts by volume of Ether and 1 part by volume of Chloroform. A mixture of 2 c.c. of Ammonia Water with 3 c.c. of Water is added and the whole shaken at frequent intervals for one hour. The contents of the flask are then transferred, as far as possible, to a small percolator inserted in a separator containing 6 c.c. of Normal Volumetric Sulphuric Acid Solution diluted with 20 c.c. of Water. After the liquid has passed through, the leaves are packed in the separator, the flask washed first with 10 c.c. and then with several portions of 5 c.c. of the Chloroform-Ether mixture, and these with the remaining contents of the flask transferred to the percolator, the percolation being continued with the Chloroform-Ether mixture until 50 c.c. has been used. The separator is now securely stoppered, agitated for one minute, the fluids allowed to separate clear, and the acid aqueous solution removed to a second separator. A further quantity of 10 c.c. of a mixture of Normal Volumetric Sulphuric Acid Solution of the same strength as that previously used is added, the contents well shaken, allowed to separate and the acid aqueous portion again drawn off into the second separator, and this operation is repeated. To the mixed acid liquids in the second separator is added a small piece of red Litmus paper and sufficient Ammonia Water to render the fluid distinctly alkaline, the mixture being then shaken with two successive quantities of 15 c.c. and one of 5 c.c. of Chloroform. The Chloroform solutions are separated, collected, and evaporated in a beaker, the residue dissolved in 3 c.c. of Ether and the Ether allowed to evaporate. The residue is dissolved in 3 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, 5 drops of Cochineal Test Solution added and the excess of Acid titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required is divided by 5, the quotient subtracted from 3 and the product multiplied by 0·0287 and again multiplied by 10, giving the percentage of total mydriatic alkaloids in the leaves.

EXTRACTUM BELLADONNÆ VIRIDE. GREEN EXTRACT OF BELLADONNA.

Heat the expressed Juice of the Fresh Leaves and Young Branches to 54·4° C. (130° F.), and collect on a filter the green colouring matter which separates; heat the filtrate to 93·3° C. (200° F.) and filter. Evaporate the clear liquid to an Extract, returning the green colouring matter towards the end of the process and completing the operation at 60° C. (140° F.).

100 lb. of Herb yielded 56 lb. of Juice, or nearly 4 lb. Extract.

100 lb. Leaves, when dried, weighed 16 lb.

An estimation of the alkaloids contained in four samples of Extract of Belladonna, prepared in 1885 by different makers, gave 0·94 p.c., 1·17 p.c., 1·11 p.c., and 0·73 p.c. The following samples in good condition were examined at the same time: 1880—1·26 p.c., 1·22 p.c.; 1881—1·16 p.c., 1·21 p.c.; 1884—1·21 p.c.

A sample of 1892 Extract yielded 1·7 p.c. of alkaloids.

An average sample of Extract contains rather over 1 p.c. of alkaloids.

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg. and Mex., Alcoholic from the **leaves**; Mex. has also Alcoholic extract from the **root,** and a Fluid Extract 1 in 1; Dan., made from **leaves** with weak Spirit; Dutch, Alcoholic from **leaves;** Fr., Alcoholic from **leaves** and **seeds;** Ger., made with Water and Spirit from **leaves;** Hung. and Ital., Alcoholic from **root;** Norw. and Swed., Alcoholic from **leaves;** Port., aqueous from **dried leaves,** Alcoholic from **fresh herb** and Alcoholic extract purified by Alcohol; Russ., made from **leaves** with Water and Spirit; Span., aqueous from **fresh leaves;** also Alcoholic from **dried leaves;** U.S., an Alcoholic extract from the powder of the **leaf,** also **Fluid Extract** of the **root.**

Extractum Belladonnæ Foliorum (*U.S.*).—Belladonna Leaves exhausted with a mixture of Alcohol (95 p.c.) 2, and Water 1, evaporated to an extract and adjusted with powdered Sugar of Milk to contain 1·4 p.c. of mydriatic alkaloids.

Extractum Belladonnæ Exsiccatum. *Syn.* Extractum Belladonnæ Folii Exsiccatum.—Belladonna Leaves exhausted with Alcohol (70 p.c.) and adjusted with Powdered Belladonna Leaves so as to finally form a powder containing 1 p.c. of alkaloids.—*B.P.C.*

The *Brussels Conference* (1906) prepares a solid extract (containing about 10 p.c. of Water) by means of Alcohol (70 p.c).

The Belg., Dan., Fr. and Swiss Ph. adopt this standard.

Tests.—Green Extract of Belladonna, *B.P.*, is not a standardised preparation. The official alcoholic Extract is made from the standardised Fluid Extract, and is required to contain 1 p.c. of the alkaloids of Belladonna Root. The method of procedure adopted by the *U.S.P.* for the standardisation of the Extract from the leaves is as follows:—A weighed quantity of 5 grammes of the Extract is dissolved in a mixture of 5 c.c. of Alcohol (94·9 p.c.), 10 c.c. of Water, 2 c.c. of Ammonia Water, and 20 c.c. of Chloroform, and transferred to a separator, using a little Alcohol (94·9 p.c.) to wash out the vessel in which the Extract was dissolved. After the contents of the separator have been well shaken for half a minute they are allowed to separate, the chloroformic solution is removed to another separator, and the contents of the first separator are shaken with another 10 c.c. of Chloroform. After a similar period of shaking and allowing the liquids to separate, the chloroformic solution is transferred to the second separator. This process is repeated with a further quantity of 10 c.c. of Chloroform. The alkaloids are then extracted from the mixed chloroformic solutions by shaking for half a minute with 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 10 c.c. of Water. The chloroformic layer is removed and again shaken for half a minute with 1 c.c. of Normal Volumetric Sulphuric Acid Solution and 10 c.c. of Water, the liquids allowed to separate, and the chloroformic layer removed and rejected. The mixed acid aqueous solutions are filtered through a plug of Cotton-wool, the vessels in which they were contained being washed with about 10 c.c. of Water. After the addition of 15 c.c. of Chloroform and sufficient Ammonia Water to produce a distinctly alkaline reaction, the contents of the separator are shaken for half a minute, allowed to separate, and the chloroformic layer is drawn off into a beaker. The shakings are repeated, using two separate portions each of 10 c.c. of Chloroform, the mixed chloroformic liquids are evaporated to dryness, the residue is dissolved in 3 c.c. of Ether and again evaporated. It is now dissolved in 5 c.c. of Deci-normal Volumetric Sulphuric Acid Solution, 5 drops of Cochineal or Iodeosin Test-solution added, and the excess of Sulphuric Acid is titrated back with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution used is divided by 5, and the quotient is subtracted from 5; the remainder is multiplied first by 0·0287 and then by 20, which gives the percentage of mydriatic alkaloids.

The process of the *P.G.* is as follows:—A weighed quantity of 2 grammes of the Extract is dissolved in 5 grammes of Water and 5 grammes of Absolute Alcohol. 50 grammes of Ether and 20 grammes of Chloroform are added to the solution, and after brisk agitation 10 c.c. of a 1 in 3 Sodium Carbonate Solution. After the mixture has been allowed to stand for one hour, with frequent intervals of brisk shaking, 50 c.c. of the clear Chloroform-Ether solution is filtered through a dry, well-covered filter into a flask, and one-half distilled. The remaining Chloroform-Ether solution is transferred to a separator, the flask being washed out with three separate quantities each of 5 c.c. Ether, and the mixed fluids thoroughly shaken with 20 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. When the liquids have completely cleared, and after the addition of sufficient Ether to cause the Chloroform-Ether solution to float on the surface of the acid fluid, the latter is filtered through a small filter paper moistened with Water into a flask of white glass holding about 200 c.c. The Chloroform-Ether solution is shaken with three successive quantities each of 10 c.c. of Water, these being passed through the same filter, the filter washed with Water, and the filtrate and washings diluted to about 100 c.c. Sufficient Ether to form a layer of 1 cm. is added, 5 drops of a 1 in 500 alcoholic Iodeosin solution, and Hundredth-normal Volumetric Potassium Hydroxide Solution until the lower aqueous layer acquires a pale reddish coloration, the liquids being vigorously shaken after each addition. Not more than 13·0 c.c. of Hundredth-normal Volumetric Potassium

Hydroxide Solution should be required. The number of c.c. of Hundredth-normal Volumetric Potassium Hydroxide Solution required, subtracted from 20, multiplied first by 0·0028927, then by 100, and divided by 1·333, will give the percentage by weight of mydriatic alkaloids present in the Extract, which should amount to not less than 1·5 p.c.

The quantity chosen for the assay is a somewhat inconvenient one, the instructions given in the process necessitating the employment of 1·333 as a factor in calculating the percentage yield of alkaloid; the point has already been referred to in Merck's Annual Report for the year 1900. A stock of Chloroform-Ether mixture should be employed instead of a freshly-prepared mixture of Chloroform and Ether, an appreciable rise of temperature ensuing when the liquids are mixed in the indicated proportions. Great attention to the cleanliness of all the vessels employed is also necessary in dealing with Hundredth-normal Volumetric Solutions.

SUCCUS BELLADONNÆ. JUICE OF BELLADONNA.

Add 1 of Alcohol (90 p.c.) to 3 of the expressed Juice from the Fresh Leaves and Young Branches.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Belladonna Juice, which would yield an Extract containing 1 p.c. of alkaloid, would form a Succus of about 0·05 p.c., which is also the strength of the Tincture.

BELLADONNÆ RADIX. BELLADONNA ROOT.

FR., RACINE DE BELLADONE; GER., BELLADONNAWURZEL; ITAL., RADICE DI BELLADONNA; SPAN., RAIZ DE BELLADONA.

The Root of *Atropa Belladonna*, collected in the autumn and dried.

A good parcel of Roots should average 0·5 p.c. of alkaloid, but occasional bales are found averaging 0·7 to 0·8 p.c.

Foreign Pharmacopœias.—Official in Austr., Hung., Ital., Mex., Port., Span., Swiss and U.S. Not in Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Russ. or Swed.

Descriptive Notes.—The Belladonna root of commerce is either of English or European origin. That prepared in this country is usually derived from the cultivated plant, the roots of which are dug up every third and fourth year after having furnished Belladonna leaves during that period. It varies in quality, some samples consisting largely of the woody rootstock or underground stem crowning the roots, distinguished by its radiate woody zone, and by being more or less hollow; others consist almost entirely of the true root with occasionally pieces of the horizontal underground stems or suckers which show traces of leaf scars and buds at intervals. The true root, which is the official part, is cylindrical; it may vary considerably in size, but those of medium thickness are to be preferred. It is stated officially to be ⅜ to ¾ in. (9 to 19 mm.) in diameter and 6 to 12 in. (15 to 30 cm.) or more in length. *Vogl* gives it as about 10 cm. long, and 1 to 2 cm. thick. *Hanbury* and *Fluckiger* recommend roots which are not thicker than the finger. It is of a pale brownish colour with occasional short transverse scars and is finely wrinkled longitudinally, and the surface is easily abraded with the finger-nail showing the white starchy tissues beneath. The central portion, clearly defined by the darker cambium ring, is not radiate in structure, but the vascular bundles and vessels are small and scattered irregularly, although more numerous near the cambium. Under the microscope the scattered parenchymatous cells, filled with sandy crystals of Calcium Oxalate, and the starch grains usually in groups of 2 to 3, but rounded when free, form distinctive characters. The root is sometimes met with of darker colour internally and harder, due to slight charring during drying. From Germany it is sometimes imported in carefully dried thin longitudinal slices, so that the official characteristics are not easily seen, and dependence must then be placed on the presence of the sandy raphides, and the form and size of the starch granules. The *U.S.P.* test of a 0·5 percentage of mydriatic alkaloids is not given in the *B.P.* but would be useful, especially for the sliced root.

The 'root' of *Scopola Japonica*, Max., sometimes offered as Japanese Belladonna and that of *S. Carniolica*, Jacq., are both characterised by being prostrate rhizomes with numerous closely placed circular stem scars on the upper surface. The true roots, of which there are usually few present, are smaller than Belladonna root and only 2 to 4 inches (5 to 10 cm.) long and tapering, and the epidermis is not easily abraded by the nail. Recently Belladonna root imported from Austria has been found to be largely adulterated with the root of *Phytolacca decandra*, L., which though similar in colour is easily recognised by the concentric rings of woody tissue. It is a dangerous adulterant, as it is irritant, acrid and emetic.

Tests.—The *B.P.* does not include a process for the assay of Belladonna Root. The *U.S.P.* gives a process for the determination and requires that it shall yield not less than 0·45 p.c. of mydriatic alkaloids; with the exception that 10 grammes of the root in No. 60 powder are used in the place of 10 grammes of the Leaves, the process is essentially that described under Belladonna Leaves.

The root is not official in the *P.G.*, but the greater part of the root used in this country comes from Germany.

EMPLASTRUM BELLADONNÆ. BELLADONNA PLASTER.

4 of Liquid Extract of Belladonna evaporated to 1 and mixed with 5 of Resin Plaster.

Contains 0·5 p.c. of alkaloids.

This Plaster can be obtained spread on calico, linen, or leather; it is also supplied in rubber combination, spread on felt or kid, plain or porous.

Foreign Pharmacopœias.—Official in Fr., Extract 1 in 4; Mex., Belladonna Leaves 20, Alcohol (90 p.c.) 10, Ammonia 1, Yellow Wax 30, Turpentine 25, Colophony 25; Port., Alcoholic Extract 1, Lead Plaster 9; Span., Extract about 1 in 5; Swiss, Belladonna extract 1, Elemi 1, Colophony 2, Adhesive Plaster 6; U.S., Extract of Leaves 1, Adhesive Plaster 2⅓; Mex., from the leaves with Alcohol. Not in the others.

EMPLASTRUM BELLADONNÆ (*U.S.*).—Standardised Alcoholic Extract of Belladonna Leaves 3, Adhesive Plaster 7. Contains not less than 0·38 p.c. nor more than 0·42 p.c. of mydriatic alkaloids.

EMPLASTRUM BELLADONNÆ VIRIDE (*B.P.C.*).—Green Extract of Belladonna 1, treated with 4 of Alcohol (90 p.c.), evaporation of the Alcohol, and admixture of the residue with Resin Plaster *q.s.* to make 4.

It is not standardised and even when made from herb of good quality will only be about half the strength of the official plaster.

Tests.—The Emplastrum Belladonnæ of the *B.P.* is prepared with the official standardised Fluid Extract of Belladonna, and is officially stated to contain 0·5 p.c. of the alkaloids of the root. The figure is arrived at by calculation, but no process is given by which the presence of the requisite amount of alkaloids may be ensured. One or two processes have been recommended (*P.J.* '99, ii. 110, 114, 180; *C.D.* '99, ii. 214, 227, 331). One of the best and most generally employed is that suggested by Bird (*P.J.* '99, ii. 146; *Analyst* '99, 175), which is based upon the disintegration of the plaster by Chloroform and Acetic Acid, the removal of the Lead as an insoluble Sulphate, the extraction of the impure alkaloids from the filtered aqueous acid liquid by treatment with Ammonia Solution and Chloroform, and their final purification as in the *B.P.* process for Extractum Belladonnæ Liquidum.

The details of the process are as follows:—A weighed quantity of 15 grammes of the Plaster is gently warmed with 35 c.c. of Chloroform and 5 c.c. of Glacial Acetic Acid until dissolved, and after the addition of a mixture of 35 c.c. of a 1 in 12 dilute Sulphuric Acid Solution and 40 c.c. of Water is again gently warmed and filtered under pressure through a Buchner's filter. The cake of insoluble Lead Sulphate is disintegrated, warmed with a mixture of 10 c.c. of Chloroform, 5 c.c. of dilute Sulphuric Acid, and 10 c.c. of Water, and again filtered. The mixed filtrates are transferred to a separator, the chloroformic layer is removed and washed with two successive quantities of a mixture of 1 c.c. of dilute Sulphuric Acid and 4 c.c. of hot Water, the washings being returned to the aqueous portion. A measured quantity of 20 c.c. of Chloroform and a decided excess of Ammonia Solution are added to the mixed acid aqueous solutions, the mixture gently warmed and agitated. The chloroformic solution is drawn off, and to ensure the complete extraction of the alkaloids the agitation is twice repeated with 10 c.c. of Chloroform. The chloroformic solutions are in each instance separated, mixed and shaken with 5 c.c. of a mixture of 1 in 12 dilute Sulphuric Acid Solution and twice its volume of warm Water. When separation is complete the chloroformic layer is removed and again treated with 5 c.c. of the same mixture as above, the chloroformic layer being again removed, the acid aqueous liquids mixed together and washed with Chloroform, using about 3 c.c. Sufficient Ammonia Solution is then added to form a distinct excess, and the liberated alkaloids are then removed from the mixture by shaking three times in succession with 10 c.c. of Chloroform; the mixed chloroformic solutions, after washing with 5 c.c. of Water containing one drop of Ammonia Solution, are evaporated to dryness on a water-bath in a tared basin, and the residue dried at a temperature below 100° C. (212° F.). The amount of alkaloid in this residue may then be determined volumetrically by dissolving in 10 c.c. of Deci-normal Volumetric Hydrochloric Acid Solution and titrating the excess of acid with Centi-normal Volumetric Sodium Hydroxide Solution, using Tincture of Cochineal, Methyl Orange, Hæmatoxylin, or Iodeosin Solution as an indicator of neutrality. The number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution used, deducted from 100, the remainder multiplied first by 0·00287, then by 20, and divided by 3, will give the percentage by weight of the alkaloids of Belladonna Root present in the Plaster.

The process of assay adopted by the *U.S.P.* is essentially as follows:—A weighed quantity of 10 grammes of the Plaster in strips is macerated with a mixture of 50 c.c. of Chloroform and 3 c.c. of Ammonia Water, the mixture being stirred until the Plaster is completely removed from the cloth, when the Chloroform is transferred to another vessel, the cloth being washed with a mixture of 25 c.c. of Chloroform and 1 c.c. of Ammonia Water, if necessary with a further quantity of 25 c.c. of Chloroform, the chloroformic solutions in each case being removed and added to the main quantity. The cloth is dried at a low temperature, cooled and weighed, its weight being deducted from the original weight of Plaster. A measured quantity of Alcohol (94·9 p.c.) equivalent to four-fifths of its volume is added to the mixed chloroformic solution, the liquid is gently stirred and allowed to rest until the rubber separates. The supernatant liquid is transferred to a separator and agitated for two minutes with 20 c.c. of a solution prepared by diluting 40 c.c. of Normal Volumetric Sulphuric Acid Solution with 60 c.c. of Water. After separation, the chloroformic liquid is drawn off and again shaken for two minutes with 10 c.c. of an acid solution of the same strength, the separated acid liquid mixed with the main quantity, the treatment with this acid solution continued until the shakings fail to give a reaction with Mayer's reagent (Mercuric Potassium Iodide Test Solution). Sufficient Ammonia Water is added to the mixed aqueous acid liquids to ensure an alkaline reaction, and the liberated alkaloids are removed by shaking with Chloroform, using first 25 c.c., then 15 c.c., and finally 10 c.c. The chloroformic solutions are separated, mixed, and the Chloroform evaporated off on a water-bath. A slight excess of Deci-normal Volumetric Sulphuric Acid Solution is added to the alkaloidal residue, the actual amount added being carefully noted, 10 drops of Chloroform are added, the liquids rotated, and the Chloroform evaporated by means of a water-bath. The excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using Cochineal Test-solution as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution used divided by 5, the quotient subtracted from the number of c.c. of Deci-normal Volumetric Sulphuric Acid Solution first used, divided by the number of grammes of Plaster separated from the cloth, multiplied first by 0·0287 and then by 100, gives the percentage of mydriatic alkaloids present in the Plaster. The *U.S.P.* requires that it should contain not less than 0·38 p.c. nor more than 0·42 p.c. by weight of such alkaloids.

EXTRACTUM BELLADONNÆ ALCOHOLICUM. Alcoholic Extract of Belladonna.

Prepared from the Liquid Extract of Belladonna, and readjusted by means of Milk Sugar, so as to contain 1 p.c. of alkaloids.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Foreign Pharmacopœias compared under Extractum Viride.

EXTRACTUM BELLADONNÆ LIQUIDUM. Liquid Extract of Belladonna.

A fluid prepared from Belladonna Root in No. 20 powder, with a mixture of 7 volumes of Alcohol (90 p.c.) and 1 volume of Distilled Water, by repercolation, and standardised to contain 0·75 p.c. of alkaloids = ¾ grain in 110 minims.

A standardised Liquid Extract of Belladonna is official in the *B.P.*; the *U.S.P.* Fluid Extract is prepared with the official standard Belladonna Root in No. 60 powder and contains 0·4 p.c. w/v of mydriatic alkaloids, the *B.P.* from a root which is not standardised, in No. 20 powder. The *P.G.* does not include a fluid extract.

Commercial samples of this liquid extract vary enormously in colour and consistence, consequently all preparations made from the liquid extract will also have a tendency to vary in colour, and may necessitate explanations to physicians and patients.

Tests.—Liquid Extract of Belladonna has a sp. gr. of from 0·896 to 1·022, and may contain from 6·2 to 26·2 p.c. w/v of total solids and about 70 p.c. w/v of Absolute Alcohol. The *B.P.* process of assay consists in extracting the alkaloids from 10 c.c. of the liquid extract diluted with 5 times its volume of Water, by adding a decided excess of Ammonia Solution, and shaking out with three successive quantities each of 10 c.c. of Chloroform. The chloroformic layers are separated in each instance and the alkaloids are removed from the mixed chloroformic solutions by shaking with a mixture of 5 c.c. of Diluted Sulphuric Acid mixed with twice its volume of warm Water, the operation being repeated to ensure their complete extraction from the Chloroform. The mixed acid liquids are shaken with a small quantity (3 c.c.) of Chloroform, the latter separated and rejected, an excess of Ammonia Solution is added, and the liberated alkaloids are shaken out with two successive quantities each of 10 c.c. of Chloroform. The mixed chloroformic solutions, after being shaken with a little Water (5 c.c.) made faintly alkaline by the addition of one drop of Ammonia Solution, are separated and evaporated, the residue being subsequently weighed after drying at a temperature under 100° C. (212° F.). The actual amount of alkaloid present is then determined volumetrically by dissolving this residue in 10 c.c. of Deci-normal Volumetric Hydrochloric Acid Solution, the excess of acid being determined by titration with Centi-normal Volumetric Sodium Hydroxide Solution, Tincture of Cochineal being used as an indicator of neutrality. 10 c.c. of Deci-normal Volumetric

Hydrochloric Acid Solution being equivalent to 100 c.c. of Centi-normal Volumetric Hydrochloric Acid Solution, if the number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution required to restore neutrality be deducted from 100 and the product multiplied first by 0·00287 and then by 10, the result will be the weight in grammes of alkaloids present in 100 c.c. of the Fluid Extract. The *B.P.* requires 0·75 p.c. w/v of alkaloids. This process has been subjected to prolonged and severe criticism, and numerous processes have been suggested to fill its place. The obstinate emulsions formed in the very first stages of the process are the worst features. Of the many modifications suggested for the removal of the defects attending the *B.P.* method that of Bird's is probably the most generally used. It is rapid in execution, is free from emulsification, it extracts practically the whole of the alkaloids in a pure condition from any sample of fluid extract, and the results are about from 5 to 6 p.c. higher than by the *B.P.* process. A measured quantity of 10 c.c. is mixed with 2 c.c. strong Ammonia Solution and shaken vigorously with 16 c.c. of a mixture of 3 volumes of Amylic Alcohol, 1 volume of Chloroform and 4 volumes of Ether. The ethereal layer is separated, washed in a second separator with 4 c.c. of Water, added in two portions. The washings are returned to the first separator and the mixed fluids again shaken with 8 c.c. of the Amylic-chloroform-ether mixture. The ethereal layer is transferred to the second separator and again washed with 1 c.c. of Water, separated and returned to the first separator. It is extracted a third and a fourth time with 7 c.c. of the above-mentioned mixture and washed in the second separator with 1 c.c. of Water. The mixed ethereal liquids are now extracted four times, first with a mixture of 4 c.c. of Normal Volumetric Sulphuric Acid Solution and 6 c.c. of Water, and then three times in succession with 3 c.c. of Water. Sufficient Ammonia Solution is added to the mixed acid liquids to render them distinctly alkaline in reaction, and they are shaken out four times with Chloroform, using first 10 c.c. and then three successive quantities of 5 c.c. The mixed chloroformic solutions are evaporated on a water-bath at a temperature below 100° C. (212° F.) to a constant weight, and titrated in the usual manner. Bird has pointed out (*P.J.* [4] 8, 432) that Methyl Orange Solution gives good results as an indicator of neutrality for Belladonna alkaloids. He states that the difference between the results by weight and titration should not exceed 3 or 4 p.c.

The method adopted by the *U.S.P.* is essentially as follows:—A measured quantity of 10 c.c. of the fluid extract is diluted with an equal volume of Water and shaken with 20 c.c. of Chloroform and 2 c.c. of Ammonia Solution. The chloroformic layer is removed to a second separator, the treatment being continued with two portions each of 10 c.c. of Chloroform. The mixed chloroformic solutions are now shaken for one minute with 8 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of Water. The chloroformic layer is removed and rejected, the aqueous acid liquid is filtered into a clean separator, the first separator and filter being washed with 10 c.c. of Water and the washings added to the main quantity. After the addition of 4 c.c. of Ammonia Solution the latter is well shaken with 20 c.c. of Chloroform, the chloroformic layer is separated and the extraction repeated with two separate portions of 10 c.c. of Chloroform. The mixed chloroformic solutions are evaporated on a water-bath and the residue heated till perfectly dry. The residue is then dissolved in 5 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, and the excess of acid titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, 5 drops of Cochineal or of Iodeosin Test-solution being employed as an indicator of neutrality. If the number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required to neutralise the excess of acid be divided by 5, the quotient subtracted from 5, and then multiplied by 0·0287 and by 10, the product will be the weight in grammes of mydriatic alkaloids contained in 100 c.c. of the Fluid Extract. The opening stages of the *U.S.P.* process are very similar to those of the *B.P.*, and it has been remarked (*P.J.* '07, i. 393) that it is rather surprising that, after the somewhat harsh criticism to which the process of the *B.P.* has been subjected, the revisers of the *U.S.P.* should adopt a similar one, but on the whole comparatively little difficulty was experienced with the *U.S.P.* process, and subsequent experience has shown that if carried out to the letter sharp separations will be obtained. It must not, however, be too hastily assumed that the process is faultless and it is finally concluded that Bird's modification of the *B.P.* process is more suited to the requirements of pharmacists.

In the author's laboratory the *U.S.P.* process has given satisfactory results and is certainly considered preferable to the *B.P.* process. No emulsification occurred in the earlier stages of the process, the extracted alkaloid was of good appearance and free from dark colour. Although not specifically instructed to do so in the *U.S.P.* monograph, the residues were in nearly all cases weighed when constant, and the difference between the gravimetric and the volumetric estimations never amounted to more than from 3 to 4 p.c.

LINIMENTUM BELLADONNÆ. LINIMENT OF BELLADONNA.

Liquid Extract of Belladonna, 10; Camphor, 1; Distilled Water, 2; Alcohol (90 p.c.), *q.s.* to yield 20.

Prescribing Notes.—*Prescribed with equal parts of Soap Liniment or Compound Camphor Liniment. Does not mix readily with fixed Oils. When an oily liniment is required it is better to order the Chloroform of Belladonna mixed with Olive or Almond Oil.*

Foreign Pharmacopœias.—Official in U.S., Camphor 1, Fluid Extract of Belladonna to make 20; Mex. (Aceite de Belladonna), Dried Leaves 1, Sesame Oil 10. Not in the others.

SUPPOSITORIA BELLADONNÆ. BELLADONNA SUPPOSITORIES.

Made with alcoholic Extract of Belladonna and Oil of Theobroma. Each Suppository contains $1\frac{1}{2}$ grain of Extract = about $\frac{1}{64}$ grain of alkaloid.

TINCTURA BELLADONNÆ. Tincture of Belladonna.

1 of Liquid Extract of Belladonna diluted with Alcohol (60 p.c.) to yield 15.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Span., Swiss and U.S., 1 in 10; Ital., Mex. and Port., 1 in 5; Russ., 1 in 12. Port., also 1 in 1, from leaves. All by weight except U.S. Not in the others.

The Brussels Conference (1906) adopts a strength of 10 p.c., and prepares it by percolation with Alcohol (70 p.c.) The Belg., Fr. and Swiss Ph. adopt this standard.

Tests.—Tincture of Belladonna, *B.P.*, is prepared from the standardised Fluid Extract and is officially required to yield not less than 0·048 p.c. nor more than 0·052 p.c. w/v of alkaloid. The word 'alkaloid' is presumably intended to read 'alkaloids.' The Fluid Extract from which it is prepared is officially required to yield a fixed percentage of alkaloids. A measured quantity of 100 c.c. is employed in the process of assay. The Alcohol is removed by evaporating to a low bulk and the resultant product is assayed by the process described under Extractum Belladonnæ Liquidum. In calculating the result of the titration the number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution used should be deducted from 100 and the product multiplied by 0·00287, which will give the weight in grammes of alkaloids present in 100 c.c. of the Tincture.

The *U.S.P.* evaporates 100 c.c. of the Tincture until it is reduced to about one-tenth of its volume, adds sufficient Alcohol (94·9 p.c.) to redissolve any substance which has separated out and employs the process mentioned under Extractum Belladonnæ Fluidum. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required to restore neutrality divided by 5, subtracted from 5, and multiplied by 0·0287, gives the weight in grammes of mydriatic alkaloids present in 100 c.c. of the Tincture; it should be 0·3 p.c. w/v.

The specific gravity of the Tincture varies according to the specific gravity of the liquid extract with which it is prepared, it is usually about 0·910; it contains about 1 p.c. w/v of total solids, and about 60 p.c. w/v of Absolute Alcohol.

UNGUENTUM BELLADONNÆ. Belladonna Ointment.

8 of Liquid Extract of Belladonna evaporated to 1, and mixed with 9 of Benzoated Lard.

Contains 0·6 p.c. of Alkaloid.

Foreign Pharmacopœias.—Official in Belg. and U.S., Extract 1 in 10; Fr. (Pommade Belladonée), Extract 3, Glycerin 2, Benzoinated Lard 25; Ital. (Pomata di Belladonna), Extract 10, Glycerin 5, Benzoated Lard 85; Mex. (Pomada de extracto de Belladona), Extract 1, Lard 7½; Port. (Pomada de Belladona), aqueous Extract 1, Lard 9; (Pomada de Belladona Forte), Alcoholic Extract 1, Lard 9; Span. (Pomada de Belladona), Extract 1½ in 10. Not in the others.

Not Official.

CHLOROFORMUM BELLADONNÆ.—Belladonna Root, in powder, 20 percolate with Chloroform *q.s.* to yield 20.—*Squire's Companion* 1864.

Applied with equal parts of Camphor Liniment or Olive Oil, for painful rheumatism.

It is well known that this preparation only extracts about half of the total alkaloids. By mixing the Root (in No. 40 powder) with Slaked Lime and powdered Carbonate of Ammonium, four-fifths of the alkaloid will appear in the first 1 in 1 percolate.—*Squire's Companion* 1894.

Belladonna Root, in No. 60 powder, 100; Solution of Ammonia, 25; Absolute Alcohol *q.s.*; Chloroform *q.s.* Moisten the Belladonna root with the solution of Ammonia and set aside for 24 hours. Transfer to a percolator and percolate with a menstruum consisting of 1 of Absolute Alcohol to 7 of Chloroform until 100 of percolate is obtained.—*B.P.C.*

The above formula is the outcome of a series of experiments undertaken by R. Wright; full particulars will be found in *Y.B.P.* '03, 589; *P.J.* '03, ii. 153; *C.D.* '03, ii. 246; *Y.B.P.* '07, 367, 371; *P.J.* '07, ii. 106; *C.D.* '07, ii. 171.

Samples of Chloroform of Belladonna were prepared by the *Companion* 1894 process, and by that recommended by the *B.P.C.* That prepared by the *Companion* 1894 process had a specific gravity of 1·476, it contained 3·11 p.c. w/v of total solids, and when assayed according to an adaptation of the *U.S.P.* process for the assay of Belladonna Root yielded gravimetrically 0·25 p.c. w/v of alkaloids and volumetrically 0·236 p.c. w/v of alkaloids, calculated as Atropine. When assayed by the process recommended by Farr and Wright it yielded gravimetrically 0·24 p.c. w/v of alkaloids and volumetrically 0·235 p.c. w/v of alkaloids, calculated as Atropine. This latter process gave considerable trouble in its manipulation, and emulsions were produced which obstinately refused to separate even on prolonged standing, and clear separations had to be produced mechanically. The adaptation of the *U.S.P.* process of assay worked admirably, it yielded the alkaloids practically free from colour and in a pure condition, no trouble was experienced through emulsification. The *B.P.C.* product had a specific gravity of 1·419; it contained 3·79 p.c. w/v of total solids, and showed when assayed by a method founded on a modification of the *U.S.P.* process for the assay of Belladonna Root, gravimetrically 0·38 p.c. w/v of alkaloids, volumetrically 0·365 p.c. w/v of alkaloids, calculated as Atropine. By the process recommended by Farr and Wright it indicated gravimetrically 0·22 p.c. w/v of alkaloids, and volumetrically 0·209 p.c. w/v of alkaloids, calculated as Atropine.

COLLODIUM BELLADONNÆ. *Syn.* EMPLASTRUM BELLADONNÆ FLUIDUM.—Liquid Extract of Belladonna, 50; Canada Turpentine, 4; Castor Oil, 2; and Ether, 40. Mix and digest for 12 hours, filter and add Camphor, 1·5; Pyroxylin, 2·5; and Ether (sp. gr. 0·720), *q.s.* to make 100.—*B.P.C.*

This is a modification of the formula given in *B.P.C. Formulary* 1901.

GLYCERINUM BELLADONNÆ.—Green Extract of Belladonna, 8; boiling Distilled Water, 1; Glycerin, to 16.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*

This is practically the same strength as *London* and *Middlesex*; it also appears in other Hospital Pharmacopœias, with varying quantities.

Official in Port., 1 Extract in 10.

LINIMENTUM BELLADONNÆ COMP.—Liniment of Belladonna, 7; Chloroform of Belladonna, 1; mix. For application to the loins in lumbago it should be sprinkled on impermeable piline (not *spongio piline*), and firmly pressed with the hands on the part for five minutes to ensure perfect contact; it should then be kept on for at least 10 or 12 hours.

Peter Squire, who suffered much from lumbago, found this more effectual and much more convenient than Belladonna Plasters.

LINIMENTUM BELLADONNÆ CUM CHLOROFORMO.—Chloroform, 12·50; Liniment of Belladonna, *q.s.* to make 100.—*B.P.C.*

ETHEREAL TINCTURE OF BELLADONNA (*Sawyer*).—Substitute Pure Ether for Rectified Spirit in the Liniment of *B.P.* '85.—*L.* '90, ii. 67.

Not Official.

BENZIN.

PETROLEUM BENZIN. PETROLEUM ETHER.

A purified distillate from American Petroleum. It is a transparent, colourless, highly inflammable liquid, possessing a characteristic odour.

It should be preserved in well-stoppered bottles and in a cool atmosphere. It forms a highly explosive mixture with air.

Solubility.—Insoluble in Water, about 1 in 6 of Alcohol (90 p.c.); readily soluble in Ether, Chloroform, fixed and volatile Oils.

Medicinal Properties.—Used in seborrhœa, in acne, and generally for the purpose of dissolving off grease from the skin. It is highly inflammable, and must not be used near a fire or naked flame.

Foreign Pharmacopœias.—Official in Ger., Jap., Russ., Swiss and U.S. U.S. has also Benzinum Purificatum.

Tests.—The distinguishing tests for Benzin are its peculiar odour; the specific gravity which should be 0·670 to 0·675; the boiling point which should be from 45° to 60° C. (113° to 140° F.); and that it does not produce the odour of Nitro-benzene when treated with ten times its volume of a mixture of 4 volumes of Sulphuric Acid and 1 volume of Nitric Acid.

Petroleum Ether sp. gr. 0·716, generally known under the name of **Petrol**, is used extensively for the internal combustion engines of motor vehicles.

BENZINUM PURIFICATUM.—Potassium Permanganate, 1; Sodium Hydroxide, 0·2; Sulphuric Acid, 6; Petroleum Benzin, 100; Water *q.s.* Add the Acid to 55 of Distilled Water and when cold pour into a bottle having the capacity of about 200. Add 0·8 of Potassium Permanganate, agitate till dissolved, then add the Petroleum Benzin in four portions, shaking the liquid after each addition, allow the liquids to remain in contact for 24 hours, shaking the bottle at frequent intervals, then decant the Petroleum Benzin, and having dissolved 0·2 gramme of Potassium Permanganate in 24 of Water, in which the Sodium Hydroxide has previously been dissolved, mix and agitate frequently, then decant, repeat the washing with Water, and again decant the Petroleum Benzin.—*U.S.P.*

This has been incorporated in the *B.P.C.*

BENZOINUM.

BENZOIN.

Fr., Benjoin; Ger., Benzoëharz; Ital., Benzoino; Span., Benjui.

A balsamic Resin, obtained from *Styrax Benzoin*, Dry., and probably from other species of *Styrax;* both Siam and Sumatra Benzoin are specifically mentioned in *B.P.*, but the latter very seldom complies with the official characters.

Siam Benzoin consists of about 38·0 p.c. of Benzoic Acid, 56 to 57 p.c. of the Benzoic Ester of Siaresinotannol, and about 5 p.c. of the Benzoic Ester of Benzoresinol, a small amount of Vanillin, and an oily neutral liquid consisting of the Benzoic Ester of Cinnamyl or Benzyl Alcohol. Sumatra Benzoin consists chiefly of the Cinnamic Ester of Benzoresinotannol, some Cinnamic Ester of Benzoresinol, Styracin, Cinnamic Acid Ester of Phenylpropyl Alcohol, a little Vanillin, free Benzoic and Cinnamic Acids, and traces of Benzaldehyde and Benzol.

Solubility.—The tears are as a rule wholly soluble 1 in 5 of Alcohol (90 p.c.); 1 in 1 of Ether; and in Solution of Potassium

Hydroxide. The mass contains impurities, which are left after treating it with Alcohol. The Solution in Alcohol or Ether is acid.

B.P. requires Benzoin to be almost entirely soluble in Alcohol (90 p.c.), but Sumatra Benzoin is rarely so.

Medicinal Properties.—Expectorant, styptic, antiseptic, used in making aromatic fumigating pastilles. The **compound tincture** is given internally for chronic bronchitis; the **vapour** or **spray** is used in chronic laryngeal and bronchial catarrh to check abundant secretion and cough; lint soaked in the compound tincture forms a styptic and antiseptic dressing for wounds.

Prescribing Notes.—*If given in the form of* **mixture** *the Tincture should be emulsified with Mucilage of Gum Acacia, or yolk of Egg. A nice lotion to protect the face from the heat of the sun is made with Tincture of Benzoin* 1, *Rose Water* 40.

Official Preparation.—Tinctura Benzoini Composita. Used in the preparation of Acidum Benzoicum, Adeps Benzoatus, and Unguentum Cetacei.

Not Official.—Tinctura Benzoini, Insufflatio Benzoini, Lait Virginal, Lotio Benzoini, Sevum Benzoatum, Sebum Benzoinatum, Unguentum Benzoini, Vapor Benzoini.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger. (Benzoë), Hung., Ital., Jap., Norw., Port., Russ., Mex., and Span., Swed., Swiss and U.S.

Descriptive Notes.—Several varieties of Benzoin are met with in commerce known respectively as Siam, Saigon, Sumatra, Penang and Palembang. The last three kinds are produced in different districts of Sumatra, probably by different trees. Of each kind several grades occur, varying in freedom from foreign matter and in their appearance. Siam Benzoin almost always occurs in more or less distinct tears, or when agglomerated into masses they leave interstices and the masses have a translucent or varnished surface. The odour of Siam Benzoin recalls that of Vanilla. The tears may vary in size from that of small shot to an inch or two (25 to 50 mm.) in length and breadth and ½ inch (12·5 mm.) in thickness, the tears being usually flattened and of a pale brown externally but milky-white internally. It is remarkably free from impurity and rich in Benzoic Acid, and contains Vanillin. Sumatra Benzoin occurs in solid masses, presenting irregular white tears immersed in a dull greyish-brown resin, and does not exhibit the translucent varnished appearance of the Siam lump Benzoin. It has a characteristic odour resembling Storax rather than Vanilla. It contains Cinnamic as well as Benzoic Acid. It is chiefly produced in Sumatra. Penang Benzoin resembles that of Sumatra, but has a much more pronounced Storax or Hyacinth odour. It is probably produced in W. Sumatra from *Styrax subdenticulatum*, Miq., and comes *viâ* Penang. It is rarely met with in the form of tears. Saigon Benzoin, imported from Cochin China, resembles that of Sumatra in appearance and odour. Palembang Benzoin is distinguished by almost entire absence of white tears and a varnished, not dull, appearance as in Sumatra Benzoin; it has but little odour. It is produced in the East of Sumatra.

Unfortunately the commercial Benzoin which has a Storax odour is sometimes sold under the name of Penang, and sometimes sold under that of Sumatra Benzoin, so that one is often mistaken for the other. Cinnamic Acid is present in Sumatra Benzoin and the Storax smelling Benzoin, but absent in Siam, Saigon, and Palembang Benzoins, according to E. Wightman Bell, who states that Siam is the richest in Benzoic Acid, yielding 30 to 37 p.c.

Tests.—The distinguishing tests for Benzoin are its physical appearance and agreeable aromatic odour; that it readily softens when warmed, and on being subjected to a still higher degree of heat yields vapours of Benzoic Acid; it should be almost entirely soluble in Alcohol (90 p.c.) and in Potassium Hydroxide Solution. The Acid and Saponification values afford useful data for judging the quality of the Gum, but no mention of these values is made in either the *B.P.*, *U.S.P.*, or *P.G.* The Acid value of a good specimen of Siam Benzoin should be between 140–170, and the Saponification value 220–240. Three good commercial samples of Siam Benzoin examined in the author's laboratory, leaving only about 1 p.c. insoluble in Alcohol (90 p.c.), gave Acid values ranging from 154·6 to 184·8, and Saponification values ranging from 197 to 218. A sample of Siam Benzoin which left 14·7 p.c. insoluble in Alcohol (90 p.c.) yielded an Acid value of 123·2, and a Saponification value of 184·8. A fine commercial sample of Sumatra Benzoin, leaving 1·4 p.c. insoluble in Alcohol (90 p.c.), had an Acid value of 132·2, and a Saponification value of 181·5. The five samples of Siam Benzoin left ashes ranging from 0·01 p.c. to 0·88 p.c.; the Sumatra Benzoin left 0·68 p.c. of ash. The solubility in Alcohol (90 p.c.) varies with the origin of the Gum. The best Siam Benzoin is as a rule wholly soluble 1 in 5. Sumatra Benzoin, although distinctly specified, would appear from the description not to be intended for use, since it is almost impossible to obtain it in commerce with less than 7 to 10 p.c. of residue, which is not presumably covered by the words 'almost entirely soluble in Alcohol (90 p.c.).' In view of the use of Benzoin in the preparation of the Compound Tincture, the question of the solubility of the sample assumes some importance.

Attfield has pointed out in his *Digest of Researches and Criticisms* (Report for 1898) that Benzoin containing the usual varying proportions of bark (1 to 30 p.c.) may be employed in preparing the Compound Tincture, due allowance being made for the insoluble matter, until it can be shown that the attached bark has parted with harmful soluble matter to the Alcohol (90 p.c.). The *U.S.P.* requires Benzoin to be almost wholly soluble 1 in 5 parts of warm Alcohol (94·9 p.c.); the *P.G.*, which only recognises the Siam variety, requires that it shall leave not more than 5 p.c. by weight of insoluble residue when exhausted with boiling Alcohol (90 p.c.).

The more generally occurring adulterants are inferior varieties of Gum, Colophony, Storax, Turpentine, and mineral matter. The *B.P.* does not include tests for any of these substances. The *U.S.P.* and *P.G.* require that it should not, on incineration, leave more than 2 p.c. by weight of Ash. The *P.G.* also requires that crystals of Benzoic

Acid shall separate from the colourless fluid obtained on warming 1 part of the Gum with 10 parts of Carbon Bisulphide. Styrax lowers the Acid value, and Turpentine the Ester and Saponification value.

Preparation.

TINCTURA BENZOINI COMPOSITA. COMPOUND TINCTURE OF BENZOIN.

B.P.Syn.—FRIAR'S BALSAM. *N.O.Syn.*—TRAUMATIC BALSAM.

Benzoin, 8; prepared Storax, 6; Balsam of Tolu, 2; Socotrine Aloes, $1\frac{1}{2}$ (less $\frac{1}{40}$)*; macerated with Alcohol (90 p.c.) to yield 80.

(1 in 10)

Although Sumatra Benzoin is permitted by the Pharmacopœia only Siam should be used, on account of its superior solubility.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex. (Tinctura de benjui compuesta), Port., Swed., and U.S.; Fr. (Teinture Balsamique); the tinctures vary considerably in composition and strength. Not in the others.

Benzoin, in No. 40 powder, 10; Purified Aloes, in No. 40 powder, **2**; Storax, 8; Balsam of Tolu, 4; Alcohol (95 p.c.), *q.s.* to make 100.—*U.S.P.*

Tests.—It possesses a specific gravity of about 0·900, and contains from 17 to 18 p.c. of total solids and about 75 p.c. w/v of Absolute Alcohol. It has been suggested (*C.D.* '02, i. 432) that independently of the percentage of extractive matter, a determination of free and combined Benzoic and Cinnamic Acids should be made, and that a good Tincture should yield not less than about 5 p.c. of balsamic acids calculated as Benzoic Acid, of which neither more nor less than two-fifths should be present in an uncombined condition.

Not Official.

LOTIO BENZOINI.—A nice lotion to protect the face from the sun is made with Tincture of Benzoin, 1; Rose Water, 40.—*Squire.*

This has been incorporated in the *B.P.C.*

LAIT VIRGINAL.—Tincture of Benzoin, 2 fl. drm.; Rose Water, to 8 fl. oz.

A proof-spirit tincture gives the best result, but the Milk is greatly improved by the addition of 3 fl. drm. of Glycerin to the Water. Orange-flower Water or other aromatic Water may also be used.—*Pharm. Form.*

TINCTURA BENZOINI.—1 of Benzoin in powder, macerated with Alcohol (90 p.c.) *q.s.* to yield 10.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 in 5; all by weight, except U.S. Swiss includes also Tinct. Benzoës Ætherea 1 in 5. The Austr. and Belg. Ph. require the tincture to yield at least 18 p.c. of dry residue; the Dutch not less than 15 p.c.

INSUFFLATIO BENZOINI (*Vigier*).—Tincture of Benzoin, 1; Boric Acid, 1; Starch Powder, 1. Mix, and let the Alcohol evaporate. Used as a snuff in coryza.—*T.G.* '88, 141.

SEVUM BENZOATUM.—Benzoated Suet is prepared in the same manner as Benzoated Lard, Prepared Suet being used in place of Lard.—*Ind.* and *Col. Add.*

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* To be exact, 16 grains are to be taken from every $1\frac{1}{4}$ oz. of Aloes.

Sebum Benzoinatum.—Suet, 100; Benzoin, 4; Dried Sulphate of Soda, 6. —*Swiss.*

UNGUENTUM BENZOINI.—Benzoin, in fine powder, 1; Adeps, 4.

VAPOR BENZOINI.—Compound Tincture of Benzoin, 60 minims in a pint of Water at 140° for each inhalation.

For bronchitis and laryngitis.

This has been incorporated in the *B.P.C.* as follows:—
Compound Tincture of Benzoin, 0·50; Water at 60° C., 100.

BENZOL.

A colourless, inflammable, volatile liquid, containing about 70 p.c. of Benzene and 20 to 30 p.c. of Toluene. It is obtained from Coal-tar Naphtha and must not be confused with Benzin from Petroleum. *See* p. 237.

Introduced into *B.P.* as a solvent for india-rubber.

Solubility.—Insoluble in Water. Soluble in all proportions of Absolute Alcohol, Chloroform, and Ether.

Medicinal Properties.—Stated to be useful in influenza.

Only the purest crystallisable Benzol should be used for internal administration.

Dose.—For children 3 minims, adults 5 minims; prescribed in capsules every two or three hours, or in mixture.

Benzol 80 minims, Alcohol (90 p.c.) ½ oz., Sp. Chloroformi 3 fl. drm., Mucilag. Trag. to 8 oz.; dose, ½ oz. every three hours, in lemonade.—*B.M.J.* '92, i. 171; '93, ii. 1425; *L.* '92, i. 234.

Foreign Pharmacopœias.—Official in Dutch, Fr. (Benzine), Mex. (Bencina), Port. (Benzina), and Swed.

Tests.—The distinguishing tests for Benzol are its peculiar somewhat aromatic odour, its specific gravity, about 0·885. It should commence to boil at 80° C. (176° F.), nine-tenths should distil below 100° C. (212° F.), and the remainder below 120° C. (248° F.).

The *U.S.P.* gives the specific gravity as 0·871 at 25° C. (77° F.), and the boiling point as 80·4° C. (176·7° F.).

The more generally occurring impurities are readily oxidisable organic compounds or Thiophene. The *B.P.* does not include tests for these compounds. The *U.S.P.* requires that Sulphuric Acid mixed with an equal volume of Benzol shall not become coloured, indicating the absence of readily charred organic impurities; and that no green or blue tint shall be developed on shaking it with quarter its volume of Sulphuric Acid and one drop of Fuming Nitric Acid, indicating the absence of Thiophene.

Not Official.

BERBERIS.

The Bark of the root of *Berberis vulgaris*, L.

It contains the alkaloids, **Berberine** $C_{20}H_{17}NO_{4}$, and **Oxyacanthine** $C_{19}H_{1}NO_{3}$.

The dried stem of *Berberis Aristata* is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies, also **Tinctura Berberidis,** 1 in 10 of Alcohol (60 p.c.), dose, 30 to 60 minims = 1·8 to 3·6 c.c.

Medicinal Properties.—A bitter tonic. Has been used with success in intermittent fevers.

It has also been used in India as a local application in affections of the eye.

EXTRACTUM BERBERIDIS FLUIDUM.—Made with Alcohol (60 p.c.). One fl. oz. of Extract is equal to 1 oz. of Bark.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Liquor Berberidis Concentratus (1 in 2), dose 30 to 60 minims, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

BERBERINÆ PHOSPHAS.—This is the most soluble salt of Berberine. Soluble 1 in 15 of Water; 1 in 9 of hot Water, but part separates out on standing; it is also thrown down as a yellow precipitate by excess of Alcohol.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Not Official.

BETEL.

The Leaves of *Piper Betle*, L., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies. It is largely employed in India as a masticatory in conjunction with Lime and the nut of *Areca Catechu*, L.

Not Official.

BETULÆ ALBÆ OLEUM.

BIRCH TAR OIL.

Syn.—OLEUM RUSCI.

A bituminous liquid obtained by destructive distillation of the Wood of *Betula alba*, L., produced in Russia.

Principally employed as an application in skin diseases, also in rheumatism and gout. Was at one time given also internally, in doses of 3 to 8 grains = 0·2 to 0·52 gramme, in pill.

Official in Austr., Jap. and Swiss.

Oleum Betulinum Rectificatum.—A light-brown Oil, obtained by the steam distillation of Birch Tar Oil.

The active constituents of the Rectified Oil are probably Guaiacol and Cresol.—*P.J.* (3) xxi. 661.

Solubility.—Almost insoluble in Water, soluble in all proportions of Alcohol, Chloroform or Ether.

Official in Dutch.

Tests.—The specific gravity should be from 0·900 to 0·920. A saturated aqueous solution of the Oil gives a green coloration on the addition of a few drops of a 1 in 1000 aqueous Ferric Chloride Solution.

Not Official.

TINCTURA RUSCI (*Hebra*).—Birch Tar Oil, 25; Oils of Lavender, Rue and Rosemary, of each 1; Ether, 36; Alcohol (90 p.c.), 36.

Official in Austr., Lavender Oil, 1; Rosemary Oil, 1; Birch Tar Oil, 26; Ether, 36; Alcohol, 36.

UNGUENTUM OLEI BETULÆ.—Birch Tar Oil, 5 fl. drm.; Yellow Beeswax, 120 grains; melt the Beeswax, add the Oil, and stir till cold.

Used in psoriasis and dry eczema.

Caution.—The use of this Ointment in eczema demands care.

UNGUENTUM BETULÆ COMPOSITUM.—Oil of Cade, 10; Resorcin, 1; Ichthyol, 1; Birch Tar Oil, 1; Lard, 30.—*St. George's.*

Not Official.

BISMUTHUM.

Bi, eq. 207·30.

FR., BISMUTH PURIFIÉ; GER., WISMUT; ITAL., BISMUTO; SPAN., BISMUTO.

Bismuth in its crude state is generally impure; the official salts, however, are required to give no reaction with a special test for Selenium and Tellurium.

Official in Mex. (Bismuto), Port., Span. and Swiss.

Official Bismuth Salts.—Bismuthi Carbonas, Bismuthi Oxidum, Bismuthi Salicylas, and Bismuthi Subnitras.

Not Official.—Bismone (Colloidal Bismuth Oxide), Bismuthum Purificatum, Bismuthi Benzoas, Bismuthi Betanaphtholas (Orphol), Bismuthi et Cerii Salicylas, Bismuthi Citras, Bismuthi et Ammonii Citras, Bismuthi et Cinchonidinæ Iodidum (Erythrol), Bismuthi Di-thio-Salicylas (Thioform), Bismuthi Iodoresorcin Sulphonas (Anusol), Bismuthi Methylenedigallas (Bismal), Bismuthi Nitras, Bismuthi Oleas, Bismuthi Oxychloridum (Pearl white), Bismuthi Oxyiodogallas (Airol), Bismuthi Phenolas, Bismuthi Phosphas, Bismuthi Quinolini Sulphocyanidum (Crurin), Bismuthi Sulphis, Bismuthi Subgallas (Dermatol), Bismuthi Subiodidum, and Bismuthi Tribromophenolas (Xeroform).

BISMUTHI CARBONAS.

BISMUTH OXYCARBONATE.

$(Bi_2O_2CO_3)_2, H_2O$, eq. 1029·70.

FR., SOUSCARBONATE DE BISMUTH; GER., WISMUTSUBCARBONAT; ITAL., BISMUTO CARBONATO; SPAN., CARBONATO DE BISMUTO.

A white or almost white, odourless and tasteless amorphous powder, which varies much in density; the lighter variety is most suited for dispensing, being more easily suspended.

It may be prepared from the Subnitrate by precipitation with Ammonium Carbonate.

Solubility.—Soluble with effervescence in Nitric Acid; insoluble in Water.

Medicinal Properties.—Similar to the Subnitrate, and often preferred to it.

The Carbonate is most generally useful as a gastric sedative; the Subnitrate is the most effective as an intestinal antiseptic, the Salicylate being weaker and the Carbonate inert for this purpose.—*L.* '05, i. 432.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Suspended in mixture by Compound Tragacanth Powder.*

Mucilage of Gum Acacia is not a good vehicle for Bismuth salts. On standing, a compact mass forms at the bottom of the bottle, which is difficult to diffuse.

When Sodium Bicarbonate is to be given with a Bismuth salt, the Carbonate should be selected.

The following prescription is a good one for pyrosis: Bismuthi Carbonatis, 2 drm.; Magnes. Carb. Levis, 1 drm.; Pulv. Tragac. Comp., 1 drm.; Aq. Flor. Aurant., Glycerini, of each 2 fl. drm.; Aquæ Chloroformi, 1½ fl. oz.; Aquam ad 6 fl. oz. 3 to 4 teaspoonfuls three times a day after meals.

Official Preparation.—Trochiscus Bismuthi Compositus.

Not Official.—Glycerinum Bismuthi Carbonatis, Mistura Bismuthi, Mistura Bismuthi cum Soda, Pastillus Bismuthi, Pastillus Bismuthi et Morphinæ.

Foreign Pharmacopœias.—Official in Dutch, Jap,, Mex. (Carbonato de Bismuto), Port., Span. and U.S. Not in the others.

Tests.—The distinguishing tests for Bismuth Carbonate are that it dissolves with effervescence in Hydrochloric Acid yielding a solution from which: (1) Hydrogen Sulphide throws down a brownish-black precipitate, insoluble in Ammonium Hydrosulphide Solution, in Potassium or Sodium Hydroxide Solution, but soluble in hot Nitric Acid; (2) except in the presence of Citric Acid or Citrates, Ammonium, Potassium or Sodium Hydroxide Solution throws down a white precipitate insoluble in excess; (3) the copious dilution with Water of a strong solution of the salt in a sufficiency of mineral acid results in the formation of a white precipitate; in the case of the solution in Nitric Acid if no precipitation results on dilution, the addition of Ammonium or Sodium Chloride Solution brings about immediate precipitation, the presence of Tartaric Acid not affecting the precipitation; (4) the addition of Potassium Chromate Solution causes a yellow precipitate insoluble in Potassium or Sodium Hydroxide Solution, soluble in dilute Nitric Acid. When treated with Hydrochloric Acid it effervesces briskly evolving a gas, which, passed through Calcium Hydroxide Solution, affords a white precipitate. The salt is officially required to indicate 99·93 p.c. of Bismuth Carbonate, as ascertained from the weight of Bismuth Sulphide (99·0 p.c.) resulting from precipitation with Hydrogen Sulphide, the *B.P.* employing the latter reagent for the determination of the Bismuth. A weighed quantity of 1 gramme of the Carbonate is dissolved in a little Hydrochloric Acid, the solution diluted with Water acidified with Hydrochloric Acid, and Hydrogen Sulphide is passed through the solution until the Bismuth is completely precipitated. The precipitate is filtered off, rapidly washed with Water and dried at 100° C. (212° F.) till constant in weight, and when cool, weighed. The weight of Bismuth Sulphide should amount to 0·99 gramme. The *U.S.P.* method of determination is to ignite at a red heat and to weigh the residue of Bismuth Oxide which should amount to not less than 90 p.c., equivalent to 100 p.c. of Bismuth Subcarbonate. The results obtained by the Sulphide method of determination are likely to be much higher than those obtained by the *U.S.P.* method owing to the tendency towards co-precipitation of Sulphur which would not be washed out and which would be weighed as Bismuth Sulphide. It is considered (*C.D.* '98, i. 674; '98, ii. 348) that the differences by the ignition method are much smaller than those occurring in the Sulphide method.

The Carbonate is not official in the *P.G.*

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver and Zinc, Chlorides, Nitrates and Sulphates, Selenium and Tellurium. These are characteristically lumped together by the *B.P.* without any regard to their relative importance, and so long as the salts are 'suitably treated,' the usual tests for these substances are employed. A standard of 2 parts per 1,000,000 is suggested (*C.D.* '08, i. 795) for Arsenic. It should yield no reactions for Arsenic when examined by the Bettendorf's test. When 3 grammes of the salt is dissolved in just sufficient warm Nitric Acid to affect solution, and this solution be then poured into 100 c.c. of Water, filtered, the filtrate evaporated on a water-bath to 30 c.c., and again filtered; portions each of 5 c.c. of this filtrate should not yield a blue supernatant fluid on the addition of an excess of Ammonia Solution when the precipitate is allowed to settle, indicating the absence of Copper; should not become cloudy when mixed with an equal volume of Diluted Sulphuric Acid, indicating the absence of Lead; should not yield a precipitate on the addition of Hydrochloric Acid, indicating the absence of Silver, nor yield a turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphates. If 1 gramme of the salt be dissolved in equal parts of Acetic Acid and Water, and the Bismuth be completely removed by Hydrogen Sulphide, the filtrate from the Sulphide precipitate should yield no residue on evaporation, indicating the absence of metals of the alkalis and alkali earths. The *U.S.P.* disregards the presence of Iron and Zinc, Selenium and Tellurium, except in so far as the two latter are covered by Bettendorf's Arsenic test. A special test for Ammonium salts with Potassium Hydroxide Solution is given, a limit for Chlorides is adopted and in contradistinction to the *B.P.* the presence of Nitrates is prohibited; the *B.P.* allows not more than the slightest reactions. The commercial Carbonate invariably contains more than a trace of Nitrate (*P.J.* (3) xiii. 936; (3) xviii. 721, 780), but it can be obtained in commerce free from Nitrate (*C.D.* '98, i. 837). Nitrates may be detected, if present, by the Ferrous Sulphate and Sulphuric Acid test given under that heading in the small type below; Chlorides by the test given under the heading of Silver Nitrate. When testing for Selenium and Tellurium the *B.P.* removes the major portion of the Bismuth as an oxy-salt by the addition of Sodium or Ammonium Chloride to the Nitric Acid solution, and adds an excess of Sodium Sulphite to the filtrate; no precipitate or coloration should be given after 12 hours, indicating the absence of Selenium and Tellurium. A delicate test for Tellurium given (*C.D.* '97, i. 631) is to dissolve without heat 10 grains of Bismuth salt in 60 minims of strong Hydrochloric Acid mixed with 60 minims of Water; add 10 grains of Sodium Hypophosphite; an evolution of Nitrous fumes will take place in the case of Subnitrate and of Carbonic Anhydride only if it be Carbonate, but no development of colour or precipitation if the Bismuth salt be pure. If Tellurium be present in very small proportion a black precipitate will form, and if Arsenic be the impurity the precipitate will be brown.

Ferrous Sulphate and Sulphuric Acid.—If a mixture of 0·05 gramme of Bismuth Subcarbonate and 5 c.c. of equal parts of Water and Ferrous Sulphate T.S. be agitated and poured as a layer over 5 c.c. of Sulphuric Acid (free from

Nitrous compounds) no brownish-red zone should form at the junction of the liquids, indicating a limit of Subnitrate, *U.S.P.*

Silver Nitrate.—If the precipitate (if any) formed by the addition of 0·1 c.c. Tenth-normal Volumetric Silver Nitrate Solution to a solution of 0·3 gramme of Bismuth Subcarbonate in 10 c.c. of Nitric Acid be filtered off the clear filtrate should be unaffected by the further addition of the reagent, indicating a limit of Chlorides, *U.S.P.*

Gravimetric Determination.—1 gramme of Bismuth Subcarbonate ignited in a porcelain crucible should yield a residue of not less than 0·9 gramme of Bismuth Oxide, *U.S.P.*

Preparations.

TROCHISCUS BISMUTHI COMPOSITUS. COMPOUND BISMUTH LOZENGE.

2 grains of Bismuth Oxycarbonate, 2 grains Heavy Magnesium Carbonate, and 4 grains Precipitated Calcium Carbonate in each, with Rose basis.

Dose.—1 to 6 lozenges.

A modification, known as the **Gastric Antacid Lozenge**, has been recommended by Sir W. Roberts; the Bismuth is omitted and Sodium Chloride added. —*B.M.J.* '89, ii. 374.

Foreign Pharmacopœias.—Official in Port., 1½ grain of subnitrate in each. Not in the others.

Not Official.

GLYCERINUM BISMUTHI CARBONATIS.—Bismuth Oxynitrate, 2820 grains; Water, 3 fl. oz.; Nitric Acid, 4½ fl. oz. Dissolve the Bismuth Oxynitrate in the mixture of Water and Nitric Acid and pour into a solution of Ammonium Carbonate 5½ oz. in Water 30 fl. oz., wash the precipitate by decantation, drain, and mix the residue with Glycerin, *q.s.* to make 10 fl. oz. This preparation contains 1 grain of Bismuth Oxycarbonate in 2 minims.—*St. Thomas's.*

Bismuth Nitrate, in crystals, 100; Nitric Acid, 15; Ammonium Carbonate, 50; Distilled Water, 360; Glycerin, *q.s.* to produce 100. The product contains about 50 p.c. of Bismuth Carbonate.—*B.P.C.*

The *B.P.C. Supplement* gives the first formula as an alternative method, with the *syn.* Bismuth Cream.

MISTURA BISMUTHI.—Glycerin of Bismuth Carbonate, 30 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI CUM SODA.—Bismuth Oxycarbonate, 15 grains; Sodium Bicarbonate, 10 grains; Tragacanth, in powder, 1 grain; Water, to 1 fl. oz. This mixture may be made without Tragacanth, but the Bismuth Oxycarbonate subsides more quickly.—*St. Thomas's.*

Sodium Bicarbonate, 10 grains; Bismuth Mixture, *q.s.* to produce 1 fl. oz.—*B.P.C.*

PASTILLUS BISMUTHI.—Carbonate of Bismuth, 3 grains; Glycerin, 3 minims. Rub together and add the mixture to the melted Glycogelatin, 18 grains.—*Throat.*

This has been incorporated in the *B.P.C.*

PASTILLUS BISMUTHI ET MORPHINÆ.—Carbonate of Bismuth, 3 grains; Acetate of Morphine, $\frac{1}{40}$ grain; Glycerin, 3 minims; Glycogelatin, 18 grains.—*Throat.*

This has been incorporated in the *B.P.C.*

BISMUTHI OXIDUM.

BISMUTH OXIDE.

Bi_2O_3, eq. 462·24.

A pale yellowish-white, amorphous powder.

It may be prepared by the interaction of Bismuth Oxynitrate and Sodium Hydroxide Solution at a boiling heat.

Solubility.—Insoluble in Water; soluble in Nitric Acid mixed with half its volume of Water.

Medicinal Properties.—Similar to the subnitrate.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Not Official.—Bismuthi Oxidum Hydratum and Cremor Bismuthi.

Tests.—Bismuth Oxide should answer the tests distinctive of Bismuth given under the Carbonate. It is officially required to contain 99·68 p.c. of Bismuth Oxide, as gravimetrically determined by conversion into Bismuth Sulphide. 1 gramme of the Oxide should yield 1·1 gramme of the Sulphide. The objections to this method of determination are given under Bismuth Carbonate.

The more generally occurring impurities are such as are also found in the Carbonate and are there discussed. In addition it may contain Bismuth Oxycarbonate or the Oxynitrate, or moisture, in which case there will be an appreciable loss of weight when a weighed quantity is heated to incipient redness. Such diminution in weight is officially prohibited.

Not Official.

BISMUTHI OXIDUM HYDRATUM.—A white amorphous powder, soluble in an excess of Hydrochloric Acid and precipitated again on the addition of Water as Oxychloride. It mixes readily with Water to form a cream.

Official in Fr. and Span.

CREMOR BISMUTHI.—Hydrated Bismuth Oxide, 1; Water, 4. Rub together till smooth.

Under the name **'Intestin'** a mixture containing Bismuth Oxide, Benzoic Acid and Naphthalene has been introduced.

BISMUTHI SALICYLAS.

BISMUTH SALICYLATE.

$C_6H_4.OH.COO.BiO$, eq. 359·19.

A white or nearly white, odourless powder, but also supplied in crystals. It should contain 62 to 64 p.c. of Bismuth Oxide.

It may be prepared by precipitating Bismuth Nitrate with a solution of Sodium Salicylate.

Solubility.—Insoluble in Water and Alcohol (90 p.c.).

Medicinal Properties.—An excellent intestinal antiseptic and sedative; has been given with success in gastro-intestinal affections, particularly the summer diarrhœa of children.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Given in* **cachets**, *or in a* **mixture** *suspended with Mucilage. The salt is dissociated by contact with Water, and if an alkaline Carbonate be present the mixture effervesces; in such cases it is better to prescribe Bismuth Carbonate and Sodium Salicylate.*

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Ital., Jap. and Swiss, 63 p.c. of Bismuth Oxide; Dutch, 60 to 65 p.c.; Fr. and Mex., 61 p.c.; Russ., 60 p.c.; Dan. and Swed. 60 p.c.; Norw. and Span., no p.c. given; U.S., 62 to 64 p.c. Not in the others.

Tests.—Bismuth Salicylate, when dissolved in diluted Hydrochloric Acid, and the Salicylic Acid separated, yields the distinctive tests for Bismuth which are mentioned under Bismuth Carbonate. It gives a violet coloration when treated with diluted Ferric Chloride Test-solution. The salt undergoes dissociation rapidly and even Alcohol (90 p.c.) causes the liberation of a certain amount of free Salicylic Acid notwithstanding the official requirement that such alcoholic liquid should not give a violet coloration with Ferric Chloride Test-solution. It is officially required to contain 98·59 p.c. of Bismuth Salicylate as gravimetrically determined by conversion into Bismuth Sulphide; 1 gramme of the Salicylate is required to yield 0·7 gramme of the Sulphide. When gravimetrically determined as Oxide it is officially required to yield 96·35 to 99·46 p.c. of Bismuth Salicylate. It will thus be seen that the amount of Bismuth Salicylate calculated from the Sulphide determination does not agree with that calculated from the Oxide determination. The *U.S.P.* requires it to yield not less than 62 p.c. nor more than 66 p.c. of Bismuth Oxide, when ignited as described in the small type below under the heading of Gravimetric Determination. This amount of Bismuth Oxide calculates out to not less than 96·4 p.c. nor more than 102 p.c. of Bismuth Salicylate. The *P.G.* requires it to leave not less than 63 p.c. of Bismuth Oxide when the salt is calcined as described in the same paragraph; corresponding to a calculated figure of not less than 97·96 p.c. of Bismuth Salicylate.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver and Zinc; Selenium and Tellurium, Chlorides, Nitrates and Sulphates, free Salicylic Acid.

The detection of the majority of these impurities is referred to under Bismuth Carbonate; in carrying out the tests for them the Bismuth Oxide left on the ignition of the Salicylate should be dissolved in Nitric Acid, and the major portion of the Bismuth removed as an oxy-salt. With regard to the detection of free Salicylic Acid the methods adopted vary. The employment of Alcohol (90 p.c.) as recommended in the *B.P.* results in the liberation of a sufficient amount of free Salicylic Acid to give a pronounced coloration with Ferric Chloride Test-solution. Chloroform is a more appropriate solvent and the *U.S.P.* test is carried out with this menstruum; a weighed quantity of 1 gramme of the salt being shaken with 5 c.c. of Chloroform and the chloroformic solution filtered into an equal volume of Water containing 3 drops of the Ferric Chloride Test-solution, when no violet zone should form at the junction of the two liquids within one minute. The *P.G.* requires that a weighed quantity of 0·5 gramme of the salt when shaken with 5 c.c. of water shall yield a filtrate which produces no reddening of blue Litmus paper, but does not also test the solution with Ferric Chloride Test-solution.

The Salicylic Acid liberated when the salt is treated with an acid, when filtered off, washed free from mineral acid and carefully dried, should possess the melting point and answer the tests given under Acidum Salicylicum and should otherwise conform to the tests of purity given for this acid. The *B.P.* and *P.G.* formulate no such requirement; the *U.S.P.* has carefully noted this.

The three Pharmacopœias differ widely in the test adopted for the detection of Nitrates. The *U.S.P.* uses a mixture of Bismuth Salicylate, Sodium Salicylate and Sulphuric Acid; the *P.G.* test depends upon the reduction of the Nitrates to Ammonia by the use of Zinc foil and powdered Iron and its liberation by Sodium Hydroxide Solution (15 p.c.); the *B.P.* depends upon the formation of Nitrous Oxide and liberation of red fumes when the salt is warmed with Sulphuric Acid and Copper; the *U.S.P.* and *P.G.* tests are compared in detail in small type below under the heading of Sodium Salicylate and Sulphuric Acid and Zinc foil, powdered Iron, and Sodium Hydroxide. The most delicate is that of the *U.S.P.* Both the *U.S.P.* and *P.G.* employ Bettendorf's test as a means of detecting Arsenic. The Uranium Nitrate test for distinguishing it from Carbolates and Sulpho-carbolates is peculiar to the *B.P.*, and is commented upon in the large type under Acidum Salicylicum.

Sodium Salicylate and Sulphuric Acid.—0·05 gramme triturated with 0·1 gramme of Sodium Salicylate and 5 c.c. of Water, carefully poured as a layer over 5 c.c. of Sulphuric Acid (free from Nitrous Compounds) should not immediately form a pink to brownish red zone, *U.S.P.*

Zinc Foil, Powdered Iron, and Sodium Hydroxide.—On warming 0 5 gramme Bismuth Subsalicylate with 5 c.c. Sodium Hydroxide Solution and the addition of 0·5 gramme of Zinc foil and reduced Iron, Ammonia gas should not be evolved, *P.G.*

Gravimetric Determination.—If 1 gramme of Bismuth Subsalicylate be calcined and the residue dissolved in Nitric Acid, this solution carefully evaporated, and the residue again calcined, a final residue of at least 0·63 gramme of Bismuth Oxide should be obtained, *P.G.* The *U.S.P.* directs the use of 5 c.c. of Nitric Acid in above test, adding it to the residue drop by drop until solution is complete. The final residue obtained as above should weigh not less than 0·62 gramme and not more than 0·66 gramme.

Stannous Chloride.—The residue of Bismuth Oxide obtained when 2 grammes of Bismuth Subsalicylate is ignited as described above, should not respond to Bettendorf's test for Arsenic, *U.S.P.* A mixture of 1 gramme of Bismuth Subsalicylate and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Not Official.

BISMUTHI CERII SALICYLAS.—A reddish-white powder, insoluble in Water and Alcohol (90 p.c.). Recommended in diarrhœa and dysentery.

Dose.—5 grains = 0·32 gramme.

The following mixture was proposed by the Royal College of Physicians for use during the prevalence of cholera in 1892.—*L.* '92, ii, 682:—

Cholera Mixture.—Bismuthi et Cerii Salicylas, 5 grains; Mist. Cretæ Aromat., 1 fl. oz.; Tinct. Camph. Co., ½ fl. drm.; Tinct. Chloroformi Co., 20 drops; Spirit Ammon. Aromat., 20 drops; Ess. Menth. Pip., 10 drops.

Should this mixture disagree, or in 24 hours fail to give relief, the following mixture should be substituted and taken in 1 oz. doses every 3 or 4 hours:—

Acid Sulph. Aromat., 15 drops; Tinct. Camph. Co., ½ drm.; Tinct. Chloroformi Co., 20 drops; Tinct. Coto, 20 drops; Syrupi Aurantii Flor., 1 drm.; Aq. Menth. Pip. ad. 1 oz.

BISMUTHI SUBNITRAS.

BISMUTH OXYNITRATE.

$BiONO_3,H_2O$, eq. 302·64.

FR., SOUSNITRATE DE BISMUTH; GER., BASISCHES WISMUTNITRAT; ITAL., SOTTONITRATO DI BISMUTO; SPAN., NITRATO (SUB) BISMUTICO.

A heavy, white, odourless, crystalline powder, which may be prepared from Bismuth Nitrate by the action of Water.

The formula calculates into 77 p.c. of Oxide, but it always contains 79 to 82 p.c. If the compound **$BiONO_3$, H_2O** exists, it is so unstable that it could certainly not be kept without decomposition.—*C.D.* '85, 561.

Although Mr. David Howard called attention to the inaccuracy of the formula given in *B.P.* '85, the error is repeated in *B.P.* '98. It is also at variance with the official test, which requires that it should yield 84 p.c. of Bismuth Sulphide.

Solubility.—Insoluble in Water. Insoluble in Alcohol (90 p.c.). Soluble in Hydrochloric and in Nitric Acid.

Medicinal Properties.—Sedative and astringent both internally and externally. It is highly useful in pyrosis, all forms of vomiting and irritative dyspepsia; in gastric ulcer, also in diarrhœa from any cause; usually combined with Soda, Magnesia, Opium, etc.; it renders the fæces leaden-grey in colour. It is recommended to be injected in gonorrhœa and leucorrhœa, 60 grains to the oz. of Water; the Bismuth is mixed with an equal quantity of Glycerin or suspended with Compound Tragacanth powder. The addition of Bismuth to mixtures for diarrhœa of phthisis controls it better than other ingredients alone. As an intestinal antiseptic, *see* under Bismuthi Carbonas.

Externally it is sometimes used as a cosmetic, but is more or less blackened by an impure atmosphere; as lotion, powder, or ointment in burns, eczema, and other skin diseases when exudation and itching are present; also as an ingredient of Ferrier's Snuff in acute coryza and chronic rhinitis.

Has been recommended as a dressing for wounds.—*L.* '85, ii. 634; *T.G.* '85, 266; *B.M.J.* '01, ii. 811.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*When prescribed in a* **mixture,** *it should be suspended with Compound Powder of Tragacanth,* 1 *drm. in a* 6-*oz. mixture.* See *Bismuthi Carbonas.*

As Bismuth Oxynitrate in Water slowly parts with its Nitric Acid, the mixture is always acid, and this somewhat interferes with its suspension, and when prescribed with Sodium Bicarbonate it causes a slight but steady evolution of Carbonic

Acid, which may cause the bottle to burst; these objections do not apply to the Bismuth Carbonate, which is therefore preferable in mixtures.

Incompatibles.—Effervescence ensues if prescribed in Water with Alkaline Bicarbonates. With Potassium Iodide double decomposition slowly ensues.

Official Preparations.—Used in the preparation of Liquor Bismuthi et Ammonii Citratis, and Bismuthi Oxidum.

Not Official.—Ferrier's Snuff, Elixir Bismuthi, Glyceritum Bismuthi, Liquor Bismuthi Conc., Lotio Bismuthi, Mistura Bismuthi Comp., Mistura Bismuthi Composita cum Pepsino, Mistura Bismuthi Composita cum Morphina, Unguentum Bismuthi Oleatis, and Unguentum Bismuthi.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Bismuth are given in large type under Bismuth Carbonate, and the Subnitrate when dissolved in dilute Nitric Acid should conform to these. When heated in a porcelain crucible nitrous vapours are evolved and a white residue of Bismuth Oxide remains; red fumes are evolved when a little of the salt is warmed with Sulphuric Acid and metallic Copper; after separation of the Bismuth the filtrate affords when mixed with an equal volume of Sulphuric Acid, cooled and poured gently on to the surface of Ferrous Sulphate Solution a brown ring at the junction of the two fluids. It is officially required to contain 99·68 p.c. of Bismuth Subnitrate, as gravimetrically determined by conversion into Bismuth Sulphide. 1 gramme of the Subnitrate is required to yield 0·84 gramme, corresponding to 84 p.c. of the Sulphide. The criticism of this method of determination appearing under Bismuth Carbonate applies with still greater force here, as owing to the oxidising influence of Nitric Acid, Sulphur is almost certain to be precipitated along with the Bismuth Sulphide. The *U.S.P.* and *P.G.* employ the Oxide method of determination, the former requiring that the salt shall yield not less than 80 p.c. of pure Bismuth Oxide, the latter that it shall yield from 79 to 82 p.c. of Bismuth Oxide. Bismuth Subnitrate is distinguished from the Carbonate by being soluble without effervescence in diluted Nitric Acid, from the Oxychloride by dissolving in Acetic Acid.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver, and Zinc; Chlorides and Sulphates; Carbonates; Selenium or Tellurium; Calcium Phosphate. A standard of 2 parts per 1,000,000 is suggested (*C.D.* '08, i. 795) for Arsenic. With the exception of Carbonates and Calcium Phosphate the remarks upon the detection of these impurities appearing under Bismuth Carbonate are also applicable here. The presence of Carbonates is shown by effervescence produced when the salt is dissolved in Nitric Acid; Calcium Phosphate by a precipitate or opalescence produced when a solution of 1 gramme of the salt in Nitric Acid is mixed with a solution containing twice this weight of Citric Acid and sufficient Ammonia Solution to produce a decided alkalinity. Neither the *U.S.P.* nor the *P.G.* include a similar test. The *U.S.P.* requires that no residue should be left when the salt is dissolved in warm Nitric Acid, indicating the absence of foreign salts.

Diluted Sulphuric Acid.—The *P.G.* directs that 0·5 gramme should form a clear solution at ordinary temperature with 25 c.c. of Diluted Sulphuric Acid without evolution of Carbon Dioxide, indicating the absence of Lead and Carbonates.

Stannous Chloride Solution.—If 1 gramme of Bismuth Subnitrate be heated until vapours cease to be given off, the residue cooled and dissolved in a little Hydrochloric Acid, this solution, with double its volume of Stannous Chloride Solution, should not assume a dark colour in the course of an hour, *P.G.* The *U.S.P.* requires that the residue, obtained by heating 2 grammes of Bismuth Subnitrate in a porcelain crucible until nitrous vapours cease to be given off, should weigh not less than 1·6 grammes and should not respond to Bettendorf's test for Arsenic.

Silver Nitrate Solution.—0·5 gramme of Bismuth Subnitrate dissolved in 5 c.c. of Nitric Acid should give a clear solution which is not rendered more than opalescent by 5 c.c. of Silver Nitrate Solution, *P.G.*

Barium Nitrate Solution.—0·5 gramme should dissolve to a clear solution in 5 c.c. of Nitric Acid, and be unaffected by 0·5 c.c. of Barium Nitrate Solution diluted with an equal quantity of Water, *P.G.*

Potassium or Sodium Hydroxide Solution.—Warmed with Sodium Hydroxide Solution in excess, Bismuth Subnitrate should not evolve Ammonia, *P.G.*; the *U.S.P.* directs that 1 gramme of the salt be boiled with 5 c.c. Potassium Hydroxide T.S.

Gravimetric Determination. — The *P.G.* requires that 100 parts of Bismuth Subnitrate heated until the evolution of yellowish red fumes ceases should yield from 79 to 82 parts of residue; and the *U.S.P.* that 2 grammes, heated in a porcelain crucible until nitrous vapours cease to be evolved, should yield a residue weighing when cold not less than 1·6 grammes.

Preparation.

LIQUOR BISMUTHI ET AMMONII CITRATIS.

SOLUTION OF BISMUTH AND AMMONIUM CITRATE. *B.P.Syn.*—LIQUOR BISMUTHI.

A clear, colourless liquid possessing generally a faint odour of Ammonia and a slight metallic taste; 1 fl. drm. is equal to rather less than 3 grains of Bismuth Oxide.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

A formula is given in *U.S.N.F.*, using Glycerite of Bismuth (*see* below), Alcohol and Distilled Water. 1 fl. drm. equals 1 grain Bismuth and Ammonium Citrate.

Tests. — Bismuth and Ammonium Citrate Solution should possess a specific gravity of 1·070. It should be faintly alkaline in reaction towards red Litmus paper, and when warmed with an excess of Potassium or Sodium Hydroxide Solution should yield a strong ammoniacal odour and a white precipitate. It is officially required to contain 9 p.c. by weight equivalent to 9·61 p.c. w/v of Bismuth Ammonium Citrate $BiC_6H_5O_7(NH_3)_3$, eq. 445·64, as gravimetrically determined by precipitation of the Bismuth as Sulphide. The amount of Bismuth Sulphide yielded by the *B.P.* test is 5·14 p.c. by weight equivalent to 5·5 p.c. w/v; the corresponding amount of Bismuth Oxide being 4·65 p.c. by weight equivalent to 5 p.c. w/v.

The more generally occurring impurities are Arsenic, Copper, Iron, Lead, Silver, Selenium or Tellurium. Of these the more important are Arsenic and Lead, Selenium and Tellurium. To detect these impurities the liquor is evaporated to dryness, ignited and the residue redissolved in diluted Nitric Acid. The presence of Arsenic may be detected by Bettendorf's test, Lead by diluted Sulphuric Acid after separation of the Bismuth as an oxy-salt, and Selenium or Tellurium by the Sodium Hypophosphite or Sodium Sulphite tests.

A good deal of controversy has ranged round the official method of preparation. The earlier criticisms (*C.D.* '98, i. 620) were apparently favourable to the new formula. Later (*C.D.* '98, i. 955) it has been pointed out that when the process is carried out strictly according to the *B.P.* directions that considerable difficulty arises in taking into solution the whole of the Bismuth Citrate precipitate, it being shown that the quantity of Ammonium Citrate ordered is the main factor in determining this insolubility. An increase in the amount of Ammonium Citrate is also suggested (*C.D.* '99, ii. 211, 233; *P.J.* '99, ii. 101, 116), the addition of Liquor Ammonii Citratis (after the solution of the precipitate), in the proportion of 8 fl. oz. (or 400 c.c.) and then dilution to 20 fl. oz. (or 1000 c.c.) is recommended. Amongst other modifications suggested in the same reference are the omission of the addition of Distilled Water until the liquid is very faintly opalescent; the use of 236 grains instead of 175 grains of Potassium Carbonate per pint of liquor, the latter quantity being inadequate to neutralise the free Nitric Acid and a corresponding amount of Bismuth being lost in the acid liquid; the non-dilution of the Bismuth Oxynitrate and Nitric Acid mixture; the reversion of the order of mixing, the Bismuth mixture being added to the Potassium Citrate and Carbonate instead of *vice versa*; and the use of a definite quantity of Water for dissolving the Potassium salts. The precipitate thus produced is easily washed, and is perfectly soluble. Samples containing the exact amount of Ammonium Citrate recommended by the *B.P.* formula deposit when dispensed with alkali Bicarbonates, solutions containing an additional quantity remain clear.

The conclusion drawn (*C.D.* '02, i. 852; '02, ii. 312; *P.J.* '02, ii. 135) is that Bismuth Citrate is an acid and not a salt, being Citric Acid with one of the Hydrogen atoms replaced by Bismuthyl. Its acid properties are shown by it forming salts with Ammonia and yielding an effervescence with alkali Carbonates and Bicarbonates. Determinations of the combining weight of the acid are also recorded in support of this theory. The following process is suggested:—629 grains of Bismuth Subnitrate mixed in a mortar with 1½ fl. oz. of Water, is set aside for 2 hours, occasionally stirring, or until the mixture yields a clear solution with Ammonia Solution; sufficient of the latter is then added to form a clear solution and the mixture diluted to 20 fl. oz. with water and filtered. An alteration in the official title to Liquor Ammonii Bismuthyl-Citratis is recommended. The chief drawback to the official method of preparation appears (*P.J.* '99, ii. 604) to be the use of a smaller quantity of Potassium Citrate than is necessary for converting the whole of the Bismuth into Citrate. The method recommended in this reference is to dissolve 70 grammes Bismuth Oxynitrate in diluted Nitric Acid by gently warming, to add 50 grammes of Citric Acid dissolved in a little water (and if a

Carbonate is used two-thirds of it may be mixed with the Citric Acid), and a solution of 103 grammes of Potassium Bicarbonate or 86 grammes of Sodium Bicarbonate and dilute with hot Water to 1000 c.c., cool, filter and wash free from Nitrate. The precipitate is dissolved in 60 c.c. of Liquor Ammoniæ *B.P.* diluted to 200 c.c. with Water and made up to 1000 c.c. or to a specific gravity of 1·070.

Not Official.

ELIXIR BISMUTHI.—Bismuth and Ammonium Citrate, 3·50; Distilled Water, hot, 6; Water of Ammonia (*U.S.P.*), *q.s.*; Aromatic Elixir, *q.s.* to produce 100.—*U.S.N.F.* 1896.

This has been incorporated in the *B.P.C.*

Glycerite of Bismuth (*N.F.*), 12·5; Glycerin, 12·5; Water, 25; Aromatic Elixir (*U.S.P.*), 50.—*U.S.N.F.* 1906.

BISMUTH ET AMMONII CITRAS EFFERVESCENS.—2 grains are contained in 1 drm.

FERRIER'S SNUFF.—Bismuth Subnitrate, 6 drm.; Morphine Hydrochloride, 2 grains; Gum Acacia, in powder, 2 drm.—*L.* '76, i. 525.

It is described as a speedy and efficacious remedy for a recent cold in the head; each time the nostrils are cleared another pinch should be taken, using it frequently at first. One quarter to one half of this formula may be used in the twenty-four hours.

Glass insufflators are made to blow it up the nostrils.

This has been incorporated in the *B.P.C.* as follows:—

Insufflatio Bismuthi et Morphinæ.—Bismuth Subnitrate, 75; Morphine Hydrochloride, 0·40; Gum Acacia, in powder, to make 100.

GLYCERITUM BISMUTHI.—A solution of Bismuth and Ammonium Citrate in Ammonia and Water containing Glycerin. 1 fl. drm. contains 16 grains of the salt.—*U.S.N.F.* 1896.

4 c.c. (1 fl. drm.) contains about 1 gm. (16 grains) of Bismuth and Sodium Tartrate.—*U.S.N.F.* 1906.

LIQUOR BISMUTHI CONC.—Dissolve 7 of Bismuth Subnitrate in 10 of equal volumes of Nitric Acid and Distilled Water with a gentle heat; when cold add first a solution of Citric Acid 5 in Distilled Water 7, and subsequently stirring in a solution of Sodium Bicarbonate 8¾ in Distilled Water 7. Wash the precipitate free from Nitrates, and after draining dissolve it in solution of Ammonia 6, or a sufficiency, and add solution of Ammonium Citrate 12, and Distilled Water, *q.s.* to yield 50.—*B.P.C. Formulary* 1901.

Incorporated in the *B.P.C.*

LOTIO BISMUTHI.—Bismuth Subnitrate, 10 grains; Water, 1 fl. oz. A sedative lotion in cases of eczema.

MISTURA BISMUTHI COMPOSITA.—Compound Tincture of Cardamoms, 3 fl. oz.; Chloroform, 70 minims; Liquid Extract of Nux Vomica, 135 minims; Diluted Hydrocyanic Acid, 320 minims. Mix and add Concentrated Solution of Bismuth, 15 fl. oz.; Morphine Hydrochloride, 8 grains, dissolved in 4 fl. drm. of Distilled Water; add finally Distilled Water, *q.s.* to yield 20 fl. oz.

Each fl. drm. contains 2 minims of Diluted Hydrocyanic Acid, $\frac{1}{20}$ grain of Morphine Hydrochloride, and the equivalent of 5 minims of Tincture of Nux Vomica.—*B.P.C. Formulary* 1901.

Dose.—20 to 30 minims = 1·2 to 1·8 c.c.

Mistura Bismuthi Composita.—Bismuth Citrate, 320 grains; Solution of Ammonia, *q.s.*; Chloroform, 32 minims; Tincture of Nux Vomica, 1 fl. oz.; Diluted Hydrocyanic Acid, 128 minims; Solution of Carmine (Martindale), 32 minims; Distilled Water, *q.s.* to produce 8 fl. oz. Rub the Bismuth Citrate with a little Water, add Solution of Ammonia until salt is just dissolved and make up to 6 oz. with Distilled Water. Dissolve the Chloroform in the Tincture of Nux Vomica and add to the Bismuth Solution, then add the Solution of Carmine and filter, wash the filter paper with sufficient Distilled Water to produce with the Hydrocyanic Acid 8 fl. oz. of finished product. Each fl. drm. is equivalent to 1 drm. of the *B.P.* Bismuth Solution, 10 minims of Spirit of Chloroform, $7\frac{1}{2}$ minims of Tincture of Nux Vomica, and 2 minims of Diluted Hydrocyanic Acid. **Dose.**—$\frac{1}{2}$ to 1 drm.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI COMPOSITA CUM PEPSINO.—Bismuth Citrate, 320 grains; Solution of Ammonia, *q.s.*; Soluble Scale Pepsin, 64 grains; Chloroform, 32 minims; Tincture of Nux Vomica, 1 fl. oz.; Diluted Hydrocyanic Acid, 128 minims; Solution of Carmine (Martindale), 32 minims; Distilled Water, *q.s.* to produce 8 fl. oz. Rub the Bismuth Citrate with a little Water, add Solution of Ammonia until salt is just dissolved, and make up to 4 oz. with Distilled Water. Dissolve the Pepsin in 2 oz. of Water and add to the Bismuth Solution, then add the Chloroform dissolved in the Tincture of Nux Vomica, and the Carmine Solution, filter, and wash the filter paper with sufficient Water to produce with the Hydrocyanic Acid 8 fl. oz. of finished product. Each fl. drm. is equivalent to Solution of Bismuth, 1 drm.; Spirit of Chloroform, 16 minims; Tincture of Nux Vomica, $7\frac{1}{2}$ minims; Pepsin, 1 grain; Hydrocyanic Acid, 2 minims.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI COMPOSITA CUM MORPHINA.—Morphine Hydrochloride, 1 grain; Compound Bismuth Mixture, 3 fl. oz. Each fl. drm. contains $\frac{1}{24}$ grain of Morphine Hydrochloride. **Dose.**—$\frac{1}{2}$ to 1 drm.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

UNGUENTUM BISMUTHI.—Bismuth Subnitrate, 60 grains; Lard, 1 oz. Bismuth Subnitrate, 12·5; Lard, 87·5.—*B.P.C.*

BISMUTHI BENZOAS.—A white powder, without taste, almost insoluble in Water. Given internally as an antiseptic and sedative. Used externally as an antiseptic dusting powder.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Foreign Pharmacopœias.—Official in Mex.; not in the others.

Tests.—When dissolved in diluted Hydrochloric Acid and separated from the precipitated Benzoic Acid, the filtrate should answer the tests distinctive of Bismuth given under Bismuth Carbonate. When shaken with a few drops of Ferric Chloride Test-solution a buff coloration is produced. The Benzoic Acid separated from the salt should possess the melting point and conform to the tests for identity and purity given under Benzoic Acid. The salt should leave from 60 to 70 p.c. of Bismuth Oxide after ignition at a low red heat.

It should be free from the impurities mentioned under Bismuth Carbonate.

BISMUTH CITRAS.—A white amorphous, odourless and tasteless powder.

Solubility.—Insoluble in Water; readily in Solution of Ammonia, and in solutions of alkali citrates.

Medicinal Properties.—Similar to the Subnitrate.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—The residue obtained on ignition, when dissolved in warm Nitric Acid yields the tests distinctive of Bismuth given under Bismuth Carbonate. The salt chars when first heated and the residue left on ignition is more or less black in colour with a yellow surface. If to the solution of Bismuth Citrate in Ammonia Solution sufficient Hydrogen Sulphide be added to precipitate the whole of the Bismuth, the filtrate, when freed from Hydrogen Sulphide and boiled with an excess of Calcium Hydroxide Solution yields a white precipitate. The salt is official in the *U.S.P.* and is required to contain not less than 95·75 p.c.

nor more than 99·17 p.c. of pure Bismuth Citrate, as gravimetrically determined by weighing the Oxide produced on ignition.

As regards impurities the salt should not respond to Bettendorf's test for Arsenic, it should be free from the impurities mentioned under Bismuth Carbonate and when the Bismuth is separated by Hydrogen Sulphide, the latter removed, the filtrate when mixed with an equal volume of concentrated Sulphuric Acid, and cooled should produce no brown or brownish-black colour round a crystal of Ferrous Sulphate.

BISMUTHI ET AMMONII CITRAS.—Small shining translucent scales, which yield Ammonia when warmed with a solution of a fixed alkali, and gradually lose Ammonia on exposure to the air.

Solubility.—1 in 1 of Water; sparingly in Alcohol (90 p.c.).

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—A blackish residue with a yellow surface remains when the salt is ignited, and a solution of this residue in warm Nitric Acid yields the tests distinctive of Bismuth given under Bismuth Carbonate. When heated with an excess of Potassium or Sodium Hydroxide Solution, the salt evolves a strong odour of Ammonia and yields a white precipitate. When the Bismuth is separated from its solution by means of Hydrogen Sulphide and the excess of the latter is removed by heat, the filtrate when boiled with an excess of Calcium Hydroxide Solution yields a white precipitate. The *U.S.P.* requires the salt to yield not less than 46 p.c. nor more than 50 p.c. of pure Bismuth Oxide as gravimetrically determined by ignition and oxidation with Nitric acid.

It should be free from the more generally occurring impurities mentioned under Bismuth Carbonate, should not respond to Bettendorf's test for Arsenic, and when separated from the Bismuth by Hydrogen Sulphide and from the excess of the latter by boiling should, when mixed with an equal volume of concentrated Sulphuric Acid and cooled, yield no brown or brownish-black coloration to a crystal of Ferrous Sulphate dropped into the mixture.

BISMUTHI NITRAS ($Bi(NO_3)_3$ 5 H_2O, eq. 481·44).—In colourless transparent crystals. Decomposed by Water, giving a white precipitate of Subnitrate. Soluble in Glycerin, but is slowly deposited from the solution when Water is added.

A **glycerole** can be made containing 60 grains to the oz.; but as an application in skin diseases the strength should in most cases not exceed 10 grains to the oz.—*M.T.* '76, ii. 646.

The salt should be dissolved without the application of heat.

Official in Fr. (Azotate Neutre de Bismuth).

BISMUTHI OLEAS.—Crystallised Bismuth Nitrate, 280 grains; dissolve cold in Glycerin 4 oz. by weight; add slowly Solution of Sodium Oleate, 20 fl. oz.; warm gently, wash by decantation, collect and dry. It forms a pearly-grey soft bland substance.

Medicinal Properties.—It is a reliable application in pustular eruptions and hyperæmia of the skin.—*B.M.J.* '84, ii. 751.

Unguentum Bismuthi Oleatis (Sir T. McCall Anderson). — Oxide of Bismuth, 1 drm.; Oleic Acid, 1 drm.; White Wax, 1½ drm.; Vaseline, 9 drm.—*Pharm. Form.*

Bismuth Oleate, 10; Soft Paraffin, 90.—*B.P.C.*

BISMUTH-PHENOL (Bismuth Phenate).—Prepared by adding a solution of Phenol in an alkali, to a solution of Bismuth Oxynitrate. A greyish-brown amorphous powder, insoluble in Water and Alcohol (90 p.c.). Recommended as an intestinal antiseptic.—*P.J.* (3) xxiv. 182; *C.D.* '93, ii. 576.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

BISMUTHI SUBGALLAS (Dermatol).—A light yellow amorphous insoluble powder, introduced as an odourless substitute for Iodoform.

Sometimes causes symptoms of Bismuth poisoning.

Given for gastric ulcer and diarrhœa in doses of 8 to 30 grains twice a day.—*L.* '97, ii. 404.

Solubility.—Insoluble in Water, Alcohol (90 p.c.) and in Ether. Soluble with decomposition in mineral acids, and readily soluble in alkali Hydroxide Solutions.

Foreign Pharmacopœias.—Official in Austr., 53 to 55 p.c. of Bi_2O_3; Belg., 52 p.c.; Dutch, 52 to 56 p.c.; Dan., Ger., Swed. and Swiss, 52 p.c.; Fr., 56·45 p.c.; Ital., not less than 55 p.c.; Jap., 51 p.c.; Mex. and Russ., no p.c. given; Russ. also includes a **Tannate**; Span., 56·66 p.c.; U.S., 52 to 57 p.c. Not in the others.

Tests.—When strongly heated it chars, and on ignition leaves a yellow residue, which dissolves in Hydrochloric and in Nitric Acids, yielding a solution which answers the tests distinctive of Bismuth given under Bismuth Carbonate. After complete separation of the Bismuth by means of Hydrogen Sulphide and the removal of the latter by boiling, the cold filtrate yields with a drop of Ferric Chloride Test-solution a bluish-black coloration. The salt is official in the *U.S.P.* and in the *P.G.*; the former requires it to yield not less than 52 p.c. nor more than 57 p.c. of pure Bismuth Oxide, the latter not less than 52 p.c. of Bismuth Oxide.

The more generally occurring impurities are Arsenic and those usually associated with Bismuth, Ammonium salts, Carbonate and Nitrate; free Gallic Acid. Bettendorf's test is employed in both Pharmacopœias as a test for Arsenic. The methods of detecting the impurities usually associated with Bismuth are given under Bismuth Carbonate. The *U.S.P.* and *P.G.* both use Alcohol as a solvent for free Gallic Acid, the former being content with the neutrality of the alcoholic solution towards blue Litmus paper as ensuring its absence; the latter evaporating the alcoholic solution to dryness, when no weighable residue should remain. The *U.S.P.* employs the Sulphuric Acid and Ferrous Sulphate test for Nitrate; the *P.G.* the reduction with Zinc and powdered Iron, when on boiling with Sodium Hydroxide Solution (15 p.c.), no evolution of Ammonia should take place.

Bismal (Bismuth Methylendigallate).—Introduced as an astringent for internal administration in cases of diarrhœa. Insoluble in Water.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme.

BISMUTHI OXYIODOGALLAS (Airol, Airoform and Airogen.)—A bulky greyish powder, odourless and tasteless, insoluble in Water and Alcohol; soluble in dilute mineral acids and in Sodium or Potassium Hydroxide Solution. It is gradually converted into a more basic salt by the action of light and moist air, and should therefore be kept in well-stoppered dark amber-tinted glass bottles. A combination of Dermatol with Iodine, introduced as a substitute for Iodoform, has attracted a good deal of attention as an antiseptic dressing. Used as a dusting powder for ulcers, also mixed with Vaseline or anhydrous Lanolin.—*B.M.J.* '98, i. 144; *L.* '99, i. 240.

Sometimes badly tolerated.—*B.M.J.E.* '97, ii. 43.

Comparative experiments with Airol, Dermatol and Iodoform.—*B.M.J.E.* '97, i. 67.

Foreign Pharmacopœias.—Official in Belg. and Swiss. Not in the others.

Tests.—A solution in dilute Hydrochloric Acid gives with Hydrogen Sulphide a black precipitate, and if this precipitate be separated, washed and dissolved in Nitric Acid the solutions should yield the tests distinctive of Bismuth given under Bismuth Carbonate. A small quantity of the salt warmed with a few drops of concentrated Sulphuric Acid evolves violet vapours of Iodine; its Hydrochloric Acid Solution when treated with Chlorine Water and shaken with Carbon Bisulphide, colours the latter violet. A solution in very dilute Hydrochloric Acid gives with Ferric Chloride Test-solution a dark green coloration. It should contain about 46 p.c. by weight of Bismuth Oxide, and about 24·0 p.c. by weight of Iodine.

It should be free from the impurities mentioned under Bismuth Carbonate.

BISMUTHI BETA-NAPHTHOLAS (Orphol).—A reddish-brown powder, insoluble in Water. Recommended as an intestinal antiseptic and astringent, both for adults and children.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Experiments with Bismuth Subnitrate and Beta-naphthol as intestinal antiseptics.—*B.M.J.* '95, ii. 1483.

BISMUTHI SUBIODIDUM.—A brick-red amorphous powder, insoluble in Water.

Has been recommended as a substitute for Iodoform in the treatment of chancres and foul ulcers.—*T.G.* '87, 612; *Y.B.P.* '87, 286; *B.M.J.* '89, i. 783.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

BISMUTHI TRIBROMOPHENOLAS (Xeroform).—A yellow powder, insoluble in Water and in Alcohol (90 p.c.). It has been recommended as a non-irritating antiseptic.

Used in wound dressing in the Cuban war.—*L.* '99, i. 1509; and '99, ii. 1459; *B.M.J.E.* '99, ii. 88.

Foreign Pharmacopœias.—Official in Jap., Span. and Swiss. Not in the others.

Tests.—A white curdy precipitate is thrown down when a solution of the powder in Potassium Hydroxide Solution is acidified with diluted Sulphuric Acid, and if this precipitate be separated, washed and dried it should possess a melting point of 95° C. (203° F.). The filtrate from this precipitate should yield the tests distinctive of Bismuth given under Bismuth Carbonate. The powder should yield on ignition from 57 to 61 p.c. of Bismuth Oxide. It should be free from the more generally occurring impurities mentioned under Bismuth Carbonate and the residue remaining after ignition at a dull red heat when moistened with Nitric Acid, again ignited and when cool dissolved in Hydrochloric Acid should yield no reaction for Arsenic when tested by Bettendorf's test.

Bismone (Colloidal Bismuth Oxide); **Bismuthi Iodo-Resorcin-Sulphonas** (Anusol), supplied in Suppository form; **Bismuthi Quinolini Sulphocyanidum** (Crurin); **Bismuthi Cinchonidinæ Iodidum** (Erythrol); **Bismuthi Di-thio-Salicylas** (Thioform); **Bismuthi Oxychloridum, Bismuthi Phosphas,** and **Bismuthi Sulphis,** are combinations of Bismuth, mostly insoluble in Water, which have received notice in Medical Literature.

Not Official.

BOLDO.

The Leaves and young Twigs of the *Peumus Boldus*, Mol., a native of Chili. The activity is due to a Glucoside, Boldine, and a volatile Oil (sp. gr. 0·918).

Foreign Pharmacopœias.—Official in Mex. and Span. Not in the others.

Medicinal Properties.—Has been used as a liver stimulant and as a diuretic; as a stimulant to digestion; also as a hypnotic.—*B.M.J.* '85, ii. 1134; '88, i. 918; gastric stimulant and sedative, antispasmodic, cholagogue.—*B.M.J.E.* '07, ii. 72.

Boldine has been given as a hypnotic in **capsules** containing 3 grains.

TINCTURA BOLDO.—Boldo Leaves, 1; Alcohol (60 p.c.), 10.

Macerate seven days and filter.

Dose.—10 to 40 minims = 0·6 to 2·4 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex., 1 and 5; by weight. Not in the others.

BONE MARROW. *See* MEDULLA RUBRA.

BORAX.

BORAX.

B.P.Syn.—Biborate of Sodium.

Fr., Borate de Soude; Ger., Natriumborat; Ital., Borato di Sodio; Span., Borato Sodico.

$Na_2B_4O_7$, $10H_2O$, eq. 379·12.

Transparent colourless monoclinic prisms, usually efflorescent. Though this salt is acid in constitution, it gives alkaline reactions with Litmus and Methyl Orange Solutions.

Solubility.—1 in 25 of Water; 2 in 1 of boiling Water; 2 oz. of Borax are dissolved by 2 fl. oz. of Glycerin, and the solution measures only 3¼ fl. oz. By the aid of 1 of Glycerin, 1 part of Borax will dissolve in 12 of Water. Insoluble in Alcohol (90 p.c.).

Borax is decomposed by Glycerin, forming a solution which reddens Litmus paper, and effervesces with Sodium Bicarbonate.

Medicinal Properties.—Antiseptic and parasiticide; mildly astringent. A local sedative to inflamed mucous membrane. As a **lotion** 10 grains to the oz.; as a **gargle** (saturated solution) about 20 grains to the oz., and as an **injection** in leucorrhœa and gonorrhœa. The Glycerin of Borax is used as a **paint** for the throat, for cracked nipples, and for erythematous skin eruptions. The Glycerin or Mel is used in aphthous ulceration of the tongue or buccal mucous membrane, and for mercurial salivation.

Internally in epilepsy (*L.* '93, ii. 1586; '95, ii. 755), but is inferior to Bromide and has many inconveniences.—*B.M.J.E.* '95, i. 4.

Has been recommended by some authorities in epilepsy, but (*L.* '05, i. 710) unless in combination with Bromides it has not been found of much use, although a combination of Borax and Digitalis has been found serviceable in some cases of minor epilepsy.

The effects of Borax on infants.—*L.* '07, ii. 369.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*For internal use it is generally given in solution. Should not be prescribed with salts of Cocaine or other alkaloids.*

Incompatibles.—Mineral Acids and most of their metallic salts, also alkaloidal salts. Mucilage of Gum Acacia.

Official Preparations.—Glycerinum Boracis and Mel Boracis.

Not Official.—Gargarisma Boracis, Liquor Boracis, Liquor Sodii Boratis Compositus, Lotio Boracis, Nebula Antiseptica Alkalina, Seiler's Antiseptic, Tinctura Myrrhæ et Boracis, Trochisci Boracis, and Unguentum Boracis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Sodium Borate are the brown coloration (changing to bluish-black on treatment with alkalis) which its acidified aqueous solution produces with Turmeric paper; the intense yellow coloration which the salt imparts to a non-luminous flame; the white scaly crystalline precipitate thrown down when a hot saturated solution of the salt is acidulated with a mineral acid, and the green coloration imparted to a non-luminous flame when the solution of this precipitate in Alcohol (90 p.c.) is ignited. *U.S.P.*

states that an aqueous solution (1 in 20) after being acidulated with Hydrochloric Acid colours blue Litmus red; yellow Turmeric paper remains unchanged until after drying.

It is officially required to contain 98·57 p.c. of Sodium Pyroborate, as volumetrically determined by titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as the indicator of neutrality; 1 gramme neutralises 5·2 c.c. of the Volumetric Solution. Phenolphthalein Solution is of no use for this titration, and even Litmus Solution gives a rather indefinite end reaction. Although Borax is constitutionally an acid salt, Boric Acid has so little action upon the usual indicators that the Sodium Oxide can be estimated by standard acid just as if no Boric Acid were present. It has been pointed out (*P.J.* '02, i. 345) that inasmuch as the salt is likely to contain Sodium Carbonate, the official process is apt to give erroneous figures. The direct determination of the Boric Acid by a double titration has been suggested. The same number of c.c. of Normal Volumetric Sodium Hydroxide Solution should be required to neutralise the Boric Acid as are required of Semi-normal Volumetric Sulphuric Acid to liberate it, the titration of the free Boric Acid being conducted in 50 p.c. Glycerin Solution. The proportions indicated in the test recommended are:—1 gramme of Borax dissolved in 40 c.c. of Water should require for exact neutralisation 10·55 c.c. of Semi-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality; after boiling and adding 50 grammes of Glycerin, 10·55 c.c. of Normal Sodium Hydroxide Solution should be required to exactly neutralise, Phenolphthalein Solution being employed as the indicator of neutrality. Neither *P.G.* nor *U.S.P.* gives any quantitative test for Borax.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Bicarbonates, Carbonates and Nitrates, Phosphates, Chlorides and Sulphates. The *B.P.* group these collectively under the usual elastic expression. A standard of 5 parts per 1,000,000 is suggested (*C.D.* '08, i. 726) for Arsenic. Tests for heavy metals, Carbonate and Bicarbonate, Nitrate and Phosphate appear in the *U.S.P.*, but no tests for Calcium, Magnesium, or Sulphate. The *P.G.* includes, in addition to tests for heavy metals, specific tests for Calcium, Iron, Chlorides and Sulphates. A 2 p.c. aqueous solution of the salt when acidified with Hydrochloric Acid should be unaffected by Hydrogen Sulphide Solution, indicating the absence of Arsenic, Copper and Lead. 50 c.c. of a 1 in 50 aqueous solution, after the addition of a few drops of Hydrochloric Acid should not yield an immediate coloration on the addition of 0·5 c.c. of Potassium Ferrocyanide Solution, indicating the absence of more than a faint trace of Iron. The 1 in 50 aqueous solution acidified with Acetic Acid should yield no turbidity on the addition of Ammonium Oxalate Solution, indicating the absence of Calcium; nor when, after standing some time, this solution is filtered, should the filtrate yield on the addition of Ammonium Phosphate Solution a turbidity or precipitate, indicating the absence of Magnesium. The aqueous solution should not effervesce on the addition of mineral acid, indicating the absence of Bicarbonates and Carbonates. A 1 in 50 aqueous solution should not be rendered turbid on the addition of either Silver Nitrate or Barium Nitrate Solution, indicating the absence of Chlorides and Sulphates; nor should it be rendered turbid by Magnesium Ammonio-sulphate Solution, indicating the absence of Phosphates. The *U.S.P.* employs the Indigo test for Nitrates, requiring that if 1 gramme be dissolved in 20 c.c. of diluted Sulphuric Acid, by the aid of heat, and 3 drops of Indigo Test-solution be added, the blue coloration should not be discharged after heating for 10 minutes on a water-bath.

Preparations.

GLYCERINUM BORACIS. Glycerin of Borax.

Borax, 1; Glycerin, 6. (by weight 1 in 8½, measure 1 in 6½)

This is not merely a solution of Borax in Glycerin; the Glycerin splits up the Biborate into free Boric Acid and a more basic Borate with secondary reactions. It reddens blue Litmus paper, and effervesces on the addition of Sodium Bicarbonate.

Dose.—½ to 1½ fl. drm. = 1·8 to 5·4 c.c.

20 minims given in diarrhœa of infants.—*L.* '89, ii. 739.

Foreign Pharmacopœias.—Official in Mex. (Glicerina Boratada), 1 and 19; Dan. and Norw. (Linctus boracinus), 1 and 9; all by weight. Not in the others.

MEL BORACIS. Borax Honey.

Borax, 2; Glycerin (by weight), 1; Clarified Honey (by weight), 16. (about 1 in 7 by volume)

Foreign Pharmacopœias.—Official in Austr., 1 in 20; Mex. (Colutorio boratado), Borax 1, Honey 1; Swiss, 1 in 10; the ingredients vary slightly. Not in the others.

Not Official.

GARGARISMA BORACIS.—Borax, 1; Water, to 20.—*St Thomas's.*

Borax, 4; Distilled Water, to produce 100.—*B.P.C.*

Borax, 10 grains; Glycerin, 30 minims; Distilled Water, to 1 fl. oz.—*St. George's.*

LIQUOR BORACIS (Thompson's Fluid).—Borax, 1; Glycerin, 2; Water, 2. ½ oz. to be mixed with 4 fl. oz. of warm Water before use.—*Guy's.*

LIQUOR SODII BORATIS COMPOSITUS (Dobell's Solution) (*U.S.N.F.*).—Sodium Borate, 15; Sodium Bicarbonate, 15; Carbolic Acid, 3; Glycerin, 35; Water, *q.s.* to yield 1000.

This has been incorporated in the *B.P.C.*

LOTIO BORACIS.—Borax, 1; Rose Water, 24.

Borax, 1; Glycerin, 1; Rose Water, 16.

SEILER'S ANTISEPTIC.—Sodium Bicarbonate, 8 drm.; Borax, 8 drm.; Sodium Benzoate, 20 grains; Sodium Salicylate, 20 grains; Eucalyptol, 10 grains; Thymol, 10 grains; Menthol, 5 grains; Oil of Wintergreen, 6 minims; Glycerin, 8½ oz.; Alcohol, 2 oz.; Water, to make 256 oz.—*Pharm. Form.*

Nebula Antiseptica Alkalina.—Sodium Bicarbonate, 1; Borax, 1; Sodium Benzoate, 0·04; Sodium Salicylate, 0·04; Eucalyptol, 0·02; Thymol, 0·02; Menthol, 0·01; Oil of Gaultheria, 0·01; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

TINCTURA MYRRHÆ ET BORACIS.—Myrrh, 1; Eau de Cologne, 16; Borax, 1; Water, 3; Syrup, 3.

Borax, 2; Glycerin, 2; Rose Water (undiluted), 24; dissolve and add Eau de Cologne, 48; Tincture of Myrrh (*B.P.* 1885), 96.

Tincture of Myrrh, 37·50; Oil of Bergamot, 0·20; Oil of Lemon, 0·20; Oil of Orange, 0·20; Oil of Neroli, 0·10; Oil of Rosemary, 0·20; Borax, in powder, 2·50; Glycerin, 5; Alcohol, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* alters the quantity of Tincture of Myrrh to 35, and adds 3·5 of Tincture of Krameria.

TROCHISCI BORACIS.—Each Lozenge contains 3 grains of Borax. Sedative.—*Throat.*

This has been incorporated in the *B.P.C.*

UNGUENTUM BORACIS.—Borax, 1; Spermaceti Ointment, 8.

For chilblains or cracked nipples.

This has been incorporated in the *B.P.C.* as follows:—

Borax, in fine powder, 12·50; Spermaceti Ointment, 87·50.—*B.P.C.*

Not Official.

BROMUM.

BROMINE.

FR., BROME; GER., BROM; ITAL., BROMO; SPAN., BROMO.

Br., eq. 79·35.

A heavy, dark red liquid, which evolves dense red, intensely irritating vapours. It is obtained from sea water and from some saline springs.

It should be preserved in dark, amber-tinted glass bottles, provided with closely fitting glass stoppers, and should be kept in a cool place.

Solubility.—In Water, 1 in 30 by weight. Readily soluble in Glycerin, Alcohol (90 p.c.), Ether, Chloroform, and Carbon Bisulphide, with gradual decomposition of the solvents.

Medicinal Properties.—Deodoriser and disinfectant. Used medicinally as a sedative in the form of Bromides and Diluted Hydrobromic Acid.

Official Preparations.—Used to prepare Potassii Bromidum and Sodii Bromidum.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Mex. (Bromo), Ital., Jap., Port., Span., Swiss and U.S. Not in Austr., Dan., Dutch, Hung., Norw., Russ. or Swed.

Tests.—Bromine has a specific gravity of 2·97 to 3·14, and a boiling point of about 63° C. (145·4° F.). It should be completely volatilised by heat, without leaving any residue. When treated with Potassium Hydroxide Solution in excess it should form a perfectly clear liquid. If this liquid be rendered faintly acid with diluted Nitric Acid it yields with Silver Nitrate Solution a yellowish precipitate soluble with difficulty in Liquor Ammoniæ, insoluble in Nitric Acid. It gives a yellow coloration to Starch Solution, and decolorises Litmus and Indigo Solutions.

The more generally occurring impurities are mineral matter, organic Bromine compounds, and Iodine. Mineral matter is readily detected by a residue remaining after volatilisation. Organic Bromine compounds are manifested by the failure to produce a clear solution on treatment with an excess of Potassium Hydroxide Solution. Iodine by the blue colour imparted to Starch Solution by an aqueous solution of Bromine, which has been nearly decolorised by the addition of a slight excess of reduced Iron, and to which a small amount of Ferric Chloride has been added.

Bromine is official in the *U.S.P.* and in the *P.G.*; the former stipulates that it shall contain not less than 97 p.c. of pure Bromine, but give no process for its quantitative determination.

HYPOBROMITE SOLUTION FOR UREA-ESTIMATION.—Prepare a stock Solution of Soda (sp. gr. 1·310) by dissolving 3½ oz. of pure Sodium Hydroxide in 9 fl. oz. of Water. To 7 fl. drm. of this add 42 minims (about 114 grains) of Bromine when the Solution is wanted for use.

Note.—*The vapour of Bromine is very irritating to the air-passages. Bromine can be weighed by taking the difference between the weight of the bottle before and after pouring some out, and calculating the quantity of Soda Solution required.*

Glass tubes (hermetically sealed) containing the above quantity of Bromine are made.

In place of 42 minims of Bromine, 2 fl. drm. of the following concentrated solution of Bromine can be used to 6 fl. drm. of the Soda Solution:—

Liquor Bromi Conc.—Bromine, 168 minims = 450 grains; Potassium Bromide, 240 grains; Water, to 1 fl. oz. Mix the Bromine and Potassium Bromide and add the Water gradually with constant stirring until 1 fl. oz. of solution is obtained.

This has been incorporated in the *B.P.C.* as follows:—

Liquor Bromi Fortis.—Bromine, by volume, 33; Potassium Bromide, 54; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

BROMIPIN.—A pale yellow oily liquid. It is a Bromine addition-compound of the fatty acid of Sesame Oil, containing about 33 p.c. of Bromine.

Introduced for the treatment of epilepsy, in doses of 1 fl. drm.

Being difficult to dispense and costly has not met with much success in epilepsy.—*L.* '05, i. 710.

Prescribing Notes.—*It may be given in* **capsules,** *or in* **emulsion** *with Mucilage of Gum Acacia.*

BROMOFORM ($CHBr_3$, eq. 250·96).—A heavy, translucent, colourless, mobile liquid, about twice as heavy as Chloroform. It has a pleasant ethereal odour, and a sweetish taste somewhat resembling Chloroform. The *U.S.P.* defines Bromoform as a liquid consisting of 99 p.c. by weight of absolute Bromoform and 1 p.c. of Absolute Alcohol.

It undergoes change in colour on exposure to the light, and should therefore be kept in well-stoppered dark amber-tinted glass bottles, and should be kept in a cool atmosphere.

Solubility.—1 in 800 of Water, soluble in all proportions of Alcohol (90 p.c.), of Ether, and of Almond Oil; about 1 in 80 of Glycerin.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*It is but slightly soluble in Water, and owing to its high sp. gr. it is difficult of suspension, and from this cause accidents have occurred from patients taking an excessive quantity in the last dose of a mixture. For oral administration it is best dissolved in Almond Oil, which can then be put into* **capsules** *or made into an* **emulsion,** *see below.*

It decomposes and becomes yellow on exposure to sunlight, and should not then be dispensed.

Given for the relief of whooping-cough in doses of 2 to 5 drops three or four times a day; in some cases it caused languor and drowsiness, and an over-dose produced toxic symptoms.—*L.* '90, ii. 139; '93, i. 1062; *Pr.* xlv. 47; *T.G.* '90, 694; '91, 214; *B.M.J.* '01, i. 1202, 1543.

Importance emphasised of shaking the mixture containing it, before pouring out dose, and of accurately measuring it.—*B.M.J.* '07, ii. 299.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ger., Span., Swiss and U.S.

Tests.—Bromoform has a specific gravity of 2·829 to 2·833, a boiling point of 148° C. to 150° C. (298·4° F. to 302° F.), and a solidifying point of 6° C. (42·8° F.). A few drops of Bromoform boiled with Potassium Hydroxide Solution, and the mixture evaporated to dryness on a water-bath, yield a residue, a portion of which dissolved in Water and faintly acidified with diluted Nitric Acid yields with Silver Nitrate Solution a yellowish precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution; another portion of the residue when dissolved in Water, acidified with diluted Sulphuric Acid and Chlorine Water added, yields a reddish-brown coloration, and when shaken with Chloroform the reddish-brown colour passes into the chloroformic liquid.

The more generally occurring impurities are mineral matter, free Hydrobromic Acid, Bromides, and Bromine derivatives, free Bromine, and Acetone. Mineral impurity is at once manifested by a residue remaining after evaporation. Free Acid may be detected by the reaction towards Litmus paper, of Water which has been shaken with an equal volume of the sample and allowed to separate. Bromides and Bromine derivatives by the production of a turbidity or precipitate on the addition of Silver Nitrate Solution to the same aqueous menstruum. Free Bromine is detected by the liberation of Iodine from solution of either Cadmium, Potassium, or Zinc Iodide Solution and the subsequent production of a blue colour with Starch Solution. The *U.S.P.* employs Potassium Iodide and Starch Solution, the *P.G.* Zinc Iodide Starch Solution, and the *Belg.* Cadmium Iodide Starch Solution. Acetone may be detected by the formation of Iodoform, when the aqueous layer separated after shaking together equal volumes of the sample and Water, is treated first with Ammonia Solution in excess and then with Iodine and Ammonium Iodide Solution. A test for this impurity is included in the *U.S.P.*, but not in the *P.G.* The *P.G.* states that when equal parts of Bromoform and Sulphuric Acid are shaken together, in a vessel which has been rinsed with Sulphuric Acid, no coloration of the Acid shall take place within 10 minutes. No such test appears in the *U.S.P.*

Emulsio Bromoform.—Bromoform, 40 minims; Almond Oil, 70 minims; Gum Acacia, 40 grains; Syrup, 100 minims; Distilled Water, to 1 fl. oz. Dissolve the Bromoform in the Oil of Almonds and emulsify in the usual way.

One minim is contained in 6 minims of the Emulsion.

Dose.—5 to 20 minims = 0·6 to 1·2 c.c.

Mistura Bromoformi.—Bromoform, 12 minims; Almond Oil, 60 minims; Powdered Gum Acacia, 120 grains; Simple Syrup, 240 minims; Water, to make 3 fl. oz. Dissolve the Bromoform in the Almond Oil, rub this with the Powdered Gum Acacia, add 3½ fl. drm. of Water and rub into a paste, gradually add the remainder of the Water, and finally the Syrup.

One minim is contained in 2 fl. drm. of the Mixture.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

BROMETHYLFORMINE (Bromaline).—A white crystalline, almost odourless powder. Has been recommended as a sedative in epilepsy.

Solubility.—2 in 1 of Water; 1 in 28 of Alcohol (90 p.c.); insoluble in Ether and in Chloroform.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Tests.—Bromethylformine dissolves readily in Water, forming a clear neutral solution. The aqueous solution when gently warmed with Sodium Hydroxide Solution yields on the addition of a slight excess of Iodine a strong characteristic odour of Iodoform. When Bromine Water is added in excess an orange-red precipitate is thrown down, the precipitation being more pronounced in strong solutions. When boiled with Sodium Hydroxide Solution it evolves Ammonia gas readily recognised by its odour and by its action on red Litmus paper. If the liquid be now cooled, acidified with Sulphuric Acid, and again boiled, it evolves the characteristic irritating odour of Formaldehyde. Boiled with Sodium Hydroxide Solution, cooled, and acidified with dilute Nitric Acid, it yields with Silver Nitrate Solution, a yellowish precipitate practically insoluble in Ammonia Solution, insoluble in Nitric Acid; when dissolved in Sulphuric Acid a yellowish-brown coloration, which passes into solution when shaken with Chloroform. It leaves no residue when ignited with free access of air.

Not Official.

BRYONIA.

The Root of *Bryonia alba*, L., and of *Bryonia dioica*, Jacq.

Medicinal Properties.—In large doses it is an active hydragogue cathartic, in small doses it is given in pleurisy. It has also been used as a hæmostatic in menorrhagia.—*L.* '88, ii. 438.

It has been used for many years by the homœopaths in the form of **tincture.** The active principle is a glucoside.

Foreign Pharmacopœias.—Official in Mex. and Port. Not in the others.

Descriptive Notes.—The root of *Bryonia dioica*, Jacq., is usually the kind met with in commerce. It occurs in circular transverse slices of a yellowish-white colour, about 1½ to 3 inches (37 to 75 mm.) or more in diameter and ¼ to ⅓ inch (6 to 8 mm.) thick. The narrow bark, which is a very pale brown externally, is separated from the fleshy centre by a fine line, and the cut surface is marked with concentric rings, and with radiating lines of vascular tissue. The dried root has no definite odour, but has a bitter and acrid taste. The fresh root, which is often as much as 2 feet (60 cm.) long and 3 inches (75 mm.) in diameter at the upper end, is occasionally offered by gardeners under the name of Mandrake root. In homœopathic medicine, the root of *Bryonia alba* is preferred, and is imported from Germany. The plant is distinguished from *Bryonia dioica* by having monœcious flowers and black berries. The plant contains Brein, a glucoside not found in *B. dioica*, and the root is considered to have a different medicinal action; it is stated by Petresco to be not purgative.

TINCTURA BRYONIÆ.—Made from fresh Bryony Root of such a strength that 10 fl. oz. shall represent 1 oz. of the dried root and shall contain 60 p.c. by volume of Alcohol.—*B.P.C. Formulary* 1901.

Fresh Bryony Root yields on an average 32 to 40 p.c. of dried root.

Dose.—1 to 10 minims = 0·06 to 0·6 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex., 1 and 5, **dried Root.**

Antidotes.—An emetic; stimulants, Brandy or Spirit of Sal Volatile.

BUCHU FOLIA.

BUCHU LEAVES.

N.O.Syn.—Bucco; Diosma.

Fr., Feuilles de Bucco; Ger., Buccoblätter.

The dried leaves of *Barosma betulina*, contain a volatile oil, a bitter principle, and a mucilage.

Medicinal Properties.—Tonic, stomachic, diuretic, and diaphoretic. Given chiefly in complaints of the urinary organs, as an antiseptic in chronic cystitis, and in irritation of the bladder and urethra. Also in dyspepsia, chronic rheumatism, and dropsy.

Dose.—Usually given in the form of Infusion or Tincture, *q.v.*

Official Preparations.—Infusum Buchu and Tinctura Buchu.

Not Official.—Fluidextractum Buchu, Infusum Buchu Concentratum, Mistura Buchu Composita.

Foreign Pharmacopœias.—Official in Jap., Mex., Port. and U.S. Not in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Norw., Russ., Span., Swed. or Swiss.

Descriptive Notes.—The dried leaves of *Barosma betulina*, Bart. and Wendl., are alone official. These are easily distinguished from the leaves of *B. serratifolia*, Willd., and *B. crenulata*, Hook., which were formerly official, and are still to be met with in commerce, by their obovate shape and recurved obtuse apex. The oil glands on the toothed margin of the leaf and its size (which is given in *B.P.* as ½ to ¾ inch, or 12 to 20 mm., in length), and the layer of mucilaginous cells below the epidermis and the yellow crystals of hesperidin contained in the epidermal cells, are useful characters for distinguishing Buchu from other leaves. The oil of the leaves *B. betulina* deposits crystals of Diosphenol, to which the antiseptic properties of the leaves are probably due; this is not the case with the Oil from the other species. Diosphenol has an odour like Menthol. The official leaves have also the advantage that they cannot be mistaken, like those of *B. serratifolia* and *B. crenulata*, for the leaves of any other species, on account of their very characteristic shape.

Tests.—Buchu Leaves yield about 5 p.c. of ash on ignition, and 6 p.c. is seldom exceeded. 12 samples examined in the author's laboratory yielded from 3·6 to 5·68 p.c., with an average of 4·52 p.c.

Preparations.

INFUSUM BUCHU. Infusum of Buchu.

Buchu, 1; boiling Distilled Water, 20; infuse 15 minutes. (1 in 20)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Not in the other Pharmacopœias.

TINCTURA BUCHU. Tincture of Buchu.

1 of Buchu Leaves, in No. 20 powder percolated with Alcohol (60 p.c.) to yield 5. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 and 5; both by weight. Not in the others.

Tests.—Tincture of Buchu has a sp. gr. of 0·925 to 0·935; it contains about 4 p.c. w/v of total solids and about 58 p.c. of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM BUCHU.—Macerate 100 of Buchu in No. 60 powder with 40 of a mixture of Alcohol (95 p.c.) 3 and Water 1, and percolate with more of the mixture until the drug is exhausted. Reserve the first 85 of the percolate and evaporate the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract, dissolve this in the reserved portion and add enough menstruum to make 100.—*U.S.P.*

INFUSUM BUCHU CONCENTRATUM.—Buchu Leaves, bruised, 40; Tincture of Buchu, 22·5; Alcohol (90 p.c.), 10; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by macero-expression. Dose.—1 to 2 fl. drm.—*Farr* and *Wright*; *P.J.* '06, i. 165; '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* '07, 249.

The authors state that it keeps well, but the product of dilution is not equal to the fresh infusion.

This appears in the *B.P.C.*

MISTURA BUCHU COMPOSITA.—Potassium Citrate, 30 grains; Tincture of Hyoscyamus, 30 minims; Infusion of Buchu, to 1 fl. oz.—*Charing Cross.*

Potassium Bicarbonate, 15 grains; Tincture of Hyoscyamus, 20 minims; Spirit of Chloroform, 10 minims; Infusion of Buchu, to 1 fl. oz.—*King's.*

Potassium Citrate, 20 grains; Tincture of Hyoscyamus, 15 minims; Infusion of Buchu, to 1 fl. oz.—*St. Thomas's.*

The last has been incorporated in the *B.P.C.*

BUTYL-CHLORAL HYDRAS.

BUTYL-CHLORAL HYDRATE.

$C_4H_5Cl_3OH_2O$, eq. 191·97.

White crystalline scales of a silky lustre, with a somewhat fruit-like but disagreeable odour and bitter nauseous taste.

Butyl-Chloral Hydrate, formerly known as Croton-Chloral Hydrate, is, chemically, Trichlorbutylidene Glycol, and is prepared by acting upon Aldehyde or, preferably, Paraldehyde with Chlorine gas.

It should be preserved in well-stoppered amber-tinted glass bottles.

Solubility.—1 in 44 of Water; 1 in 1 of Glycerin (very slowly); 5 in 3 of Alcohol (90 p.c.); 1 in 20 of Olive Oil; 1 in 2 of Ether; 1 in 20 of Chloroform.

Some books give the solubility as 4 in 1 of Glycerin, but this is incorrect.

Medicinal Properties.—Analgesic; is frequently but not always an efficient remedy in neuralgia of the face and head, and in tic-douloureux. As a hypnotic it is seldom used, being weaker and less certain than Chloral Hydrate.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Generally given in the form of pills made with a little Compound Powder of Tragacanth and Syrup. The addition of Alcohol or Glycerin to aqueous mixtures increases its solubility.*

Not Official.—Mistura Butyl-Chloral, Pilula Butyl-Chloral, Pilula Butyl-Chloral cum Gelsemio, Syrupus Butyl-Chloral.

Antidotes.—The same as for Chloral Hydrate.

Tests.—The distinguishing tests for Butyl-Chloral Hydrate are its melting point, about 78° C. (172·4° F.), and which is officially required to be about 77·8° C. (172° F.), and its solidifying point, which should be, according to the *B.P.*, about 71·1° C. (160° F.). Some samples are acid, very pungent and acrid. Of these the author found that 1 gramme heated in a porcelain capsule over a water-bath for 10 minutes wholly volatilised; but the sample lost its pungency and acridity after having been washed with about twice its weight of Water, pressed, and dried by exposure to air, and when heated as above lost less than half its weight. The slow volatility of a sample may therefore be taken as a test of purity. An acrid sample by washing and drying had its melting point raised from 73·9° C. (165° F.) to 78·9° C. (174° F.). When warmed with concentrated Sulphuric

Acid, Trichlorbutyl-aldehyde separates out in oily drops. The aqueous solution of Butyl-Chloral Hydrate reduces Silver Ammonio-nitrate Solution.

The more generally occurring impurities are free acid, Chloral Hydrate, and Chlorine derivatives. The behaviour of the aqueous solution towards blue Litmus paper affords a measure of the free acid; the non-production of a turbidity with Silver Nitrate Solution indicates the absence of free Hydrochloric Acid or Chlorine derivatives, and should the sample evolve no odour of Chloroform when heated with Calcium, Potassium, or Sodium Hydroxide Solution, the absence of Chloral Hydrate may be inferred.

Its behaviour when gently warmed with concentrated Sulphuric Acid affords an additional test for Chlorine derivatives. Thus treated the liquid should not turn brown. The *B.P.* says nothing respecting these Chlorine derivatives, only testing for freedom from acidity and Chloral Hydrate; the aqueous solution is required to be neutral or but slightly acid to Litmus; the salt should leave no weighable residue when ignited with free access of air.

Not Official.

MISTURA BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 5 grains; Glycerin, 15 minims; Chloroform Water, $\frac{1}{2}$ fl. oz.; Water, to 1 fl. oz.

This has been incorporated in *B.P.C.* as follows:—

Butyl-Chloral Hydrate, $4\frac{1}{2}$ grains; Glycerin, 15 minims; Chloroform Water, 240 minims; Distilled Water, *q.s.* to make 1 fl. oz.—*B.P.C.*

PILULA BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 5 grains; Compound Powder of Tragacanth, 1 grain; Syrup *q.s.*; in 1 pill.

PILULA BUTYL-CHLORAL CUM GELSEMIO.—Butyl-Chloral Hydrate, 3 grains; Alcoholic Extract of Gelsemium, 1 grain.—*Guy's* and *Sheffield Union.*

PILULA BUTYL-CHLORAL ET GELSEMINÆ.—Butyl-Chloral Hydrate, 3 grains; Gelsemінæ Hydrochloridum, $\frac{1}{200}$ grain; Pulvis Tragacanthæ Compositus, 1 grain; Syrupi Glucosi *q.s.*—*Westminster.*

SYRUPUS BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 16 grains; Syrup, *q.s.* to make 1 fl. oz.; dissolve by the aid of heat.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Not Official.

BYNE. MALT.

Good Malted Barley is tolerably uniform in diastase, and the widely differing results published from time to time by different analysts as to the strength of commercial Extracts must be due partly to a destruction of diastase in the manufacture of the Extracts, and partly to an ambiguity attaching to the phrase 'conversion of Starch.'

EXTRACTUM BYNES. *Syn.* EXTRACTUM MALTI. MALT EXTRACT.

Is made by infusing or mashing ground Malt in Water at a temperature under 160° F., preferably 140° F., filtering and evaporating the solution *in vacuo* to the consistence of a thick syrup. It is more convenient to use when it is evaporated only to a thin syrup, but in that condition the Extract is more liable to undergo fermentation.

Medicinal Properties.—Malt Extract is prescribed as a nutrient in wasting diseases, and where the digestion is weak it is given for its diastasic value of converting Starch into Maltose and Dextrin. It is also given with Cod Liver Oil. It is useful for covering the taste of nauseous drugs.

Dose.—A teaspoonful to a tablespoonful, immediately after food.

Hale White states, 'like the ferments of pancreatic juice and saliva, diastase can only act in an alkaline medium, and therefore extract of malt should not be given till at least two hours after a meal.'—*Hale White Mat. Med.* But the usual custom of most prescribers is probably that expressed in the following reasoned statement of the *B.M.J.* '08, i. 363 :—

Malt Extract is prescribed with one of two objects : (1) To increase the supply of carbohydrates in the diet. When given for this purpose it is a matter of indifference at what hour it is taken, and the choice may well be left to the individual taste of the patient. (2) To help in the conversion of starch into sugar by means of the diastase it contains. The contents of the pyloric half of the stomach become acid at a very early stage in digestion. Those of the cardiac half are alkaline for a considerable period, so that amylolytic digestion may continue in the latter after a full meal for an hour or more. The first part of a meal finds its way into the pyloric half; the second part remains in the cardiac half until the former passes into the duodenum. Hence if the latter part of a meal is largely starchy, malt extract taken with it or immediately after it helps in the conversion of starch into sugar. If taken an hour or more after the meal the Malt will be useless, as the contents of all parts of the stomach are then acid.

It is very useful when mixed with baked wheaten flour to form foods for infants and invalids when a certain amount of pre-digestion is required.

For a substance with similar properties *see* TAKA-DIASTASE.

Foreign Pharmacopœias.—The *U.S.P.* 1882 ordered the Malt to be macerated in cold Water for six hours, then digested for an hour at 131° F., strained and evaporated at a temperature not exceeding 131° F. to the consistence of Honey. This contained active diastase. It was omitted in *U.S.* 1893. It was re-introduced in *U.S.P.* 1905 as follows :—

Extractum Malti.—Upon 1000 grammes of Malt in coarse powder (not finer than No. 12), contained in a suitable vessel, pour 1000 c.c. of Water, and macerate for six hours. Then add 4000 c.c. of Water, heated to about 30° C. (86° F.), and digest for an hour at a temperature not exceeding 55° C. (131° F.). Strain the mixture with strong expression. Finally, by means of a water-bath, or vacuum apparatus, at a temperature not exceeding 55° C. (131° F.), evaporate the strained liquid rapidly to the consistence of thick Honey.

This has been incorporated in the *B.P.C.*

Test.—For Malt or Malt Extract, three solutions, *A*, *B*, and *C*, are required. (*A*) Infuse 5 grammes of ground Malt in 100 c.c. of Water at 140° F. (60° C.) for one hour, cool to 60° F. (15·5° C.), and make up to 100 c.c with Water; filter. For testing Malt Extract, dissolve 5 grammes of the Extract in sufficient Water to make 100 c.c. of solution. (*B*) Mix 1 gramme of Potato Starch with 10 c.c. of Water, add to it 90 c.c. of boiling Water; boil the mixture for ten minutes; cool to 60° F. (15·5° C.) and make up to 100 c.c.; strain through fine muslin. (*C*) Dilute 1 c.c. of *B.P.* Volumetric Solution of Iodine to 75 c.c. with Water.

Method.—Run 2 c.c. of the Iodine Solution into each of one dozen test-tubes. Bring solution *A* and solution *B* to 100° F. (37·8° C.); place 50 c.c. of *B* in a beaker immersed in Water at 100° F. (37·8° C.), and add to it 10 c.c. of *A*; at the end of a minute draw off 2 c.c. of the mixture and add it to the Iodine Solution in one of the test-tubes, and at the end of each subsequent minute repeat the operation. If the test-tubes are arranged in the order in which the solution is added, the colour in each test-tube will represent the amount of action in a given time represented by minutes. As it occupies from ten to fifteen seconds to run the Malt Solution from a pipette into the Starch, we usually start the stop-watch or chronograph when half of the solution has run out of the pipette. When a first-class sample of Malt Extract is used, the contents of the first test-tube will be of a blue colour, the second will be red, and the third or fourth yellow, but the changes will be somewhat slower in a sample which is not so good.

Six of the best known brands of Malt Extract examined by this test ceased to produce a red colour at the end of three, four, six, eight, fourteen, and fifteen minutes respectively, showing a variation of from three to fifteen minutes, in the digestion of *their own weight* of Starch. A fluid Malt Extract, containing Alcohol, ceased to give a red colour at the end of thirty-five minutes.

The best sample, when treated with *five times* its weight of Starch, ceased to produce a red colour at the end of fourteen minutes.

It is important that the conditions should be the same in each experiment, for any variation in the quantity of Iodine Solution to the volume of liquid employed will affect the results, but under the conditions given, when the colours are viewed in series, two independent workers should not vary more than 1 minute in the reading.

This process has been found (*Suggested Standards of Purity for Foods and Drugs*, p. 184) useful and convenient, but it is mentioned that it might have been better to adopt a standard time and vary the proportion of Starch. This suggestion would render the process much less convenient, and the amount of Starch digested in a Standard time can easily be calculated by a simple formula, the activity of Malt Diastase towards Starch Solution, unlike Pancreatic Diastase (Amylopsin), being inversely proportional to the amount of enzyme present. A more striking contrast is, moreover, obtained by taking the relative time required by different samples to digest a definite weight of Starch.

LIQUID MALT.—Malt Extract, sp. gr. 1·375, to which diluted Alcohol is added, sufficient to produce a liquid, sp. gr. 1·250, containing 7·3 p.c. of Alcohol (90 p.c.) by weight, equal to about 15 p.c. Proof Spirit.

Preparations somewhat similar to this are sold as **Fluid Extract of Malt, Bynin,** etc.

Liquid Malt Extract.—Extract of Malt (sp. gr. 1·375), by volume, 68; Alcohol (90 p.c.), 7·50. Distilled Water, *q.s.* to produce 100.—Mix to form a liquid sp. gr. 1·2.—*B.P.C.*

FLUIDEXTRACTUM MALTI (*U.S.N.F.*).—Malt in coarse powder, 100, percolated with a mixture of Alcohol (94 p.c.) 1 and Water 3, until the percolate weighs 75.

MALT EXTRACT WITH COD LIVER OIL.—This is supplied under several well-known brands, but can be prepared extemporaneously by thinning ordinary Malt Extract with 10 to 15 p.c. of Water, heating the mixture to 120° F., adding the oil and shaking thoroughly until mixed. The commercial product contains from 20 to 30 p.c. of Cod Liver Oil.

Examination of commercial samples gave from 20 to 30 p.c. of Oil by volume.—*P.J.* (3) xxv. 162.

Prescribing Note.—*Usually given in milk.*

EXTRACTUM MALTI CUM OLEO MORRHUÆ (*B.P.C.*).—Extract of Malt, 17 fl. oz.; Cod Liver Oil, 3 fl. oz. Heat the Extract to 110° F., and pour it into a warm mortar; add the Oil gradually and with constant trituration.—*B.P.C. Formulary* 1901.

B.P.C. incorporates this formula without heating the extract.

EXTRACTUM MALTI FERRATUM.—Iron Pyrophosphate, 2; Water 3. Dissolve and add Extract of Malt, 95.—*Guy's.*

Dose.—1 to 4 drm. = 3·6 to 14·2 c.c.

Each fl. drm. contains about 1 grain Iron Pyrophosphate.

TAKA-DIASTASE.—A powder of a light brown colour, possessing a nutty taste. Derived from a fungus of the species *Eurotium Oryzæ.* It possesses high diastasic properties, readily converting over a hundred times its weight of Starch at body temperature.

Specially indicated as an artificial digestant of starchy food in dyspepsia cases in which there is a deficiency of saliva. Also found useful in hyperacidity of the stomach and in gouty dyspepsia.—*L.* '96, i. 856; '03, ii. 1052; *A.J.P.* '98, 138.

Most useful in gouty dyspepsia; it encourages the digestion of carbohydrates and so prevents the development of fatty acids which, by their irritating effects, are so common a factor in the development of gouty dyspepsia; a 2½ grain tablet before each meal.—*Pr.* '07, i. 168.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme, in capsules in the middle of or immediately after a meal.

Diastase from Malt is official in Fr., Jap., Mex. and Span.

CADINUM OLEUM.

OIL OF CADE.

B.P.Syn.—JUNIPER TAR OIL.

FR., HUILE DE CADE; GER., KADEÖL; ITAL., OLIO CADINO; SPAN., BREA DE OXICEDRO.

A brownish or dark brown, viscid fluid, of an oily nature, with a tarry odour and an empyreumatic and somewhat bitter taste; a product of the dry distillation of the Branches and Wood of *Juniperus Oxycedrus*, L., and other species. It contains a high percentage of the sesquiterpene, Cadinene.

Solubility.—Mixes in all proportions with Chloroform and Ether; partially soluble in Alcohol (90 p.c.); slightly soluble in Water.

Medicinal Properties.—An agreeable form of Tar. Used as a stimulant in cases of psoriasis and of chronic eczema.

Prescribing Notes.—*It is used in the form of Ointment; the Oil mixed with equal parts of Yellow Wax, and further diluted with Lard or Vaseline if required.*

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Hung., Ital., Norw., Port., Spań. (Brea de Oxicedro), Russ., Swed. (Pyroleum Oxycedri), Swiss and U.S. Not in the others.

In **Balzer's Cade Baths** the oil is emulsified before being added to the bath.

An emulsion of Oil of Cade and a fluid extract from the decoction of the tops of the Taunus Pines. The baths are given daily, and can be used in all varieties of psoriasis.

Cade Bath Fluid is put up in bottles, one of which, being mixed with a little warm Water, is added to an ordinary bath, which should last from half an hour to an hour, and should be accompanied by slight friction on the affected patches.

These baths may be used as an adjuvant to the ordinary treatment, and are suitable both for hospital and private cases.

Tests.—Oil of Cade has a specific gravity of about 0·990. When shaken with Water and filtered it should yield an almost colourless filtrate possessing an acid reaction. In a sample (sp. gr. 0·996), examined by the author, the acidity amounted to 0·7 p.c. of pure Acetic Acid.

The filtered aqueous solution should yield a red coloration with diluted Ferric Chloride Test-solution.

The *B.P.* states that the filtered aqueous solution is almost colourless and possesses an acid reaction; and the *U.S.P.* that it imparts to Water an acid reaction.

VASOLIMENTUM EMPYREUMATICUM. — Juniper Tar Oil, 25; Vasoliment, 75.—*Hager.*

Parogenum Empyreumaticum.—Oil of Cade, 25; Parogen, 75.—*B.P.C.*