HÆMATOXYLI LIGNUM.

LOGWOOD.

Fr., Bois de Campêche; Ger., Blauholz; Ital., Campeggio; Span., Palo de Campeché.

The Heart-wood of the trunk of *Hæmatoxylon Campechianum*, L.

Imported from Campeachy in Central America, from Honduras and Jamaica, that from Campeachy being the most valuable.

Medicinal Properties.—Astringent, without irritating properties, useful in diarrhœa of phthisis and chronic diarrhœa and dysentery, and in passive hæmorrhages; in infantile diarrhœa; it does not tend to cause subsequent constipation. Also as an injection for leucorrhœa. It colours the urine and fæces dark red.

Incompatibles.—Mineral Acids, metallic salts, Lime Water, Tartar Emetic.

Official Preparation.—Decoctum Hæmatoxyli.

Not Official.—Extractum Hæmatoxyli, Extractum Hæmatoxyli Liquidum, Hæmatoxylin, and Hæmatein.

Foreign Pharmacopœias.—Official in Austr., Mex. (Palo de Campeche), Port. (Campeche), U.S. Not in the others.

Descriptive Notes.—Logwood consists of the heart-wood of the trunk of *Hæmatoxylon Campechianum*, a leguminous tree indigenous in Central America. There are several varieties of the tree, four being recognised in Honduras and three in Jamaica, the wood of which varies in tinctorial power. The kinds imported from Campeachy and San Domingo are considered the best. The heart-wood of the tree only is used, the bark and sapwood being removed. It is imported in logs about 3 feet long, externally often dark purplish-red, and reddish or orange-brown internally. In retail commerce it is sold in chips or, more rarely, in coarse powder, and for dyeing purposes is usually fermented from four to six weeks by moistening it and exposing it to the air. During this process the Hæmatoxylin, which in the pure state is colourless, becomes oxidised in the presence of atmospheric Ammonia to Hæmatein, the presence of which is recognised by the bronzy-green iridescence observable on the surface of the chips. The unfermented wood is official for use in medicine, and is described as being purplish-red externally, and internally reddish-brown with medullary rays 4 cells wide (*U.S.P.*). When chewed it colours the saliva pink. It should have a slight, agreeable odour and a sweetish, astringent taste. The odour recalls that of violets, and is perceptible in the decoction. The wood contains about 9 to 12 p.c. of Hæmatoxylin. An extract of Logwood is prepared for technical purposes which resembles Kino in appearance, but is easily distinguished by its sweet taste. The only wood with which it is likely to be confounded is Brazil wood, which gives a red, not blue, colour with alkalis, and gives Picric Acid when boiled with Nitric Acid, whilst Logwood gives only Oxalic Acid.

See also *P.J.* (4) vi. 284.

Tests.—Hæmatoxylin Wood when ignited with free access of air should not leave more than 2 p.c. of ash.

Preparation.

DECOCTUM HÆMATOXYLI. Decoction of Logwood.

Boil 1 oz. of Logwood, in chips, with 24 fl. oz. of Distilled Water, adding 70 grains of bruised Cinnamon Bark towards the end of the process; strain, and wash with Distilled Water to make 20 fl. oz.

(1 in 20)

Iron vessels should not be used.

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

Not Official.

EXTRACTUM HÆMATOXYLI (*B.P.* 1885).—Logwood, in fine chips, 1; boiling Distilled Water, 10; infuse 24 hours, boil to 5, strain and evaporate to dryness by a water-bath, stirring with a wooden spatula. Iron vessels should not be used.

Dose.—10 to 30 grains = 0·65 to 1·94 gramme.

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

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

EXTRACTUM HÆMATOXYLI LIQUIDUM.—Boil 20 of *Unfermented* Logwood, in No. 16 powder with 40 of Distilled Water for half an hour, and strain; repeat the process with 40 more of Water, and again for the third time, and having mixed the strained liquors, evaporate over a water-bath (or preferably *in vacuo*) to the measure of 17 and add 3 of Alcohol (90 p.c.); allow it to settle for a week, then draw off the clear liquor from the sediment.

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.

The above *B.P.C. Formulary* 1901 general process has been incorporated in the *B.P.C.*, except that Logwood is in No. 20 powder instead of No. 16, and the product is made up to a volume of 1 in 1.

HÆMATOXYLIN. $C_{16}H_{14}O_6$, eq. 299·84.—Bright yellow prismatic or granular crystals, sometimes brownish externally. It possesses a sweet taste somewhat resembling Liquorice. The prismatic crystals contain 3 molecules of Water of crystallisation, the granular crystals 1 molecule. Sparingly soluble in cold Water, readily in Alcohol and Ether. It is also soluble in solutions of the fixed and volatile alkalis with the production of solutions which rapidly acquire a purple colour. It has the characters of a weak acid, and unites with basic ions to form compounds, which are colourless when perfectly pure, but soon pass into strongly coloured products owing to the great avidity with which they absorb atmospheric Oxygen. Used as a nuclear stain for histological and pathological sections.

Tests.—Hæmatoxylin loses part of its Water of crystallisation at 100° C. (212° F.), but the remainder only at a higher temperature. It fuses upon further heating, about 110° to 120° C. (230° to 248° F.), and at a still higher temperature decomposes, leaving a bulky carbonaceous residue. Its solution yields with neutral or basic Lead Acetate a bluish-white precipitate, rapidly darkening when exposed to the air; with Stannous Chloride Solution a permanent rose-coloured precipitate is produced; Solution of Alum yields a bright red colour, but no immediate precipitate, and Aluminium Acetate Solution yields a fine purple. Hæmatoxylin readily reduces Chromic Acid and Potassium Bichromate, and its solution reduces both Potassio-cupric Tartrate (Fehling's) Solution and Silver Nitrate Solution.

Foreign Pharmacopœias.—Official in Belg. and Jap.

HÆMATOXYLIN SOLUTION. *See* Indicators of Neutrality.

HÆMATEIN. $C_{16}H_{12}O_6$, eq. 297·84. — A brownish-red powder sparingly soluble in cold Water; produced by the atmospheric oxidation of an ammoniacal solution of Hæmatoxylin, the Ammonium salt of Hæmatin being decomposed by

Acetic Acid. The Ammonium salt forms a deep violet crystalline powder exhibiting a metallic lustre. It is soluble in Water, the solution readily reducing Silver Nitrate Solution. It yields with Copper Sulphate Solution a violet-blue precipitate, and with Stannous Chloride Solution a violet precipitate.

Not Official.

HÆMOGLOBIN.

The substance to which in one or other of its modifications the blood owes its colour, and the chief solid constituent of the red blood corpuscles. Has been given with considerable success in the treatment of anæmia. It readily combines with free Oxygen to form **oxyhæmoglobin** or hæmato-crystallin. It has been prepared in the form of crystals, but its preparation in this form is attended with some difficulty on account of its ready solubility in Water. A colloidal form is also known as **colloidal hæmoglobin.**—*L.* '02, i. 910; *B.M.J.* '02, i. 738.

It occurs in commerce as an **Extract** (Pfeuffer's), in **Scales** (Merck) and as a dry powder, **Sanguis Bovinus Exsiccatus,** defibrinated and desiccated ox blood.

HÆMATOGEN.—An aromatic fluid preparation, stated to contain pure hæmoglobin, the salts of the blood, the albuminous constituents of the serum, and glycerin.—*L.* '99, ii. 388.

Under the name of **Sicco,** a solid preparation of hæmatogen has been introduced. It is a brownish-black powder, soluble in Water.

LIQUOR HÆMOGLOBIN CO. (Vinsip).—A fluid preparation, stated to contain hæmoglobin, and the albuminous constituents of the blood.—*L.* '01, ii. 735.

HÆMOL.—A dark brown powder, slightly soluble in Water, produced by the action of reducing substances, *e.g.*, Zinc dust, on the colouring matter of the blood.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Under the name of **Ferrohæmol, Cuprohæmol** and **Zincohæmol,** compounds containing respectively Iron, Copper and Zinc with Hæmol have been introduced; **Bromo-hæmol** has been used in the treatment of epilepsy.

HÆMOGALLOL.—A dark brown or reddish-brown amorphous powder, slightly soluble in Water. Produced by the action of Pyrogallol on the colouring matter of the blood.

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

HAMAMELIS.

HAMAMELIS.

Both the dried Bark, and the fresh and dried Leaves of *Hamamelis Virginiana*, L., are official.

Medicinal Properties.—A local astringent and hæmostatic. Used in epistaxis, hæmatemesis, bleeding piles, and other conditions in which tannin is used.

Prescribing Notes.—*For local application, 1 of the Tincture is diluted with 10 or 20 of Water or the Liquor with 1 or 2 of Water. The ointment is used for piles, as is also a suppository of Hamamelin.*

When equal Volumes of Tincture of Hamamelis and Tincture of Hydrastis are mixed, a precipitation will occur unless each Tincture be mixed with an equal Volume of Glycerin.

Official Preparations.—Of the **Bark**, Tinctura Hamamelidis; of the **Dried Leaves**, Extractum Hamamelidis Liquidum; of the **Fresh Leaves**, Liquor Hamamelidis; of the **Liquid Extract**, Unguentum Hamamelidis.

Not Official.—Extractum Hamamelidis, Gossypium Hamamelidis, Pasta Hamamelidis, Suppositorium Hamamelidis, Witch Hazel Snow, and Hamamelin.

Descriptive Notes.—Hamamelis leaves are official in the *B.P.*, both fresh and dried, but in the *U.S.P.* only the dried leaves, collected in autumn. The dried leaves are more or less broken in commerce, but the fresh leaves are broadly oval, 3 to 6 inches (7 to 15 cm. long) (10 cm. *U.S.P.*), shortly stalked, cordate and unequal at the base, and sinuate at the margin, pinnately veined, paler below, with prominent veins furnished with stellate hairs, and an astringent taste, with slight bitterness. It has been found that the leaves contain more tannin in the autumn, and that the cells of the hairs have thicker walls, a dark line often marking the lining of the cell in the autumn, the walls becoming yellow, and the granular and oily contents disappearing. The odour of the distillate of the leaves is quite characteristic and is apparently the result of decomposition of the volatile oil, and is not perceptible in the dried leaves.

HAMAMELIDIS CORTEX. Hamamelis Bark. *B.P.Syn.*—Witch Hazel Bark.

The dried Bark of *Hamamelis Virginiana.*

Foreign Pharmacopœias.—Official in Mex., Span. and U.S.

Descriptive Notes.—Hamamelis Bark occurs in commerce in thin quilled pieces of pale brownish-buff or fawn colour, the outer surface or cork being thin, of a greyish tint, cracking and forming scales, and easily exfoliating, so that the inner bark, which is Cinnamon-coloured or reddish-brown, often occurs free from it in commerce. The transverse fracture is short externally, but laminated internally with weak fibres. The taste is faintly astringent and somewhat mucilaginous. Its activity is apparently due chiefly to a volatile oil, as it only contains 8 to 10 p.c. of Tannin and a small quantity of bitter principle. Hamamelis Bark is about $\frac{1}{16}$ inch (1·5 mm.) thick, *B.P.* (1 to 2 mm. *U.S.P.*); 2 to 8 inches long (0.5 to 2 dm.). The transverse section exhibits a complete ring of sclerenchymatous cells near the outer surface and numerous tangentially elongated bundles of bast fibres. Willow Bark bears some resemblance to Hamamelis Bark. It has a dull greyish-brown cork, is usually striated or wrinkled on the outer surface and does not exhibit a line of sclerenchymatous cells, and the bast fibres are much tougher than those in Hamamelis Bark; the taste also is more astringent.

Tests.—The Bark yields about 5 p.c. of ash and the amount yielded should not be much in excess of this figure.

An ash limit is stated not to be necessary for inclusion in the *B.P.*

Preparations.

TINCTURA HAMAMELIDIS. Tincture of Hamamelis.

2 of Hamamelis Bark, percolated with Alcohol (45 p.c.) to yield 20. (1 in 10)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr., 1 in 5 from leaves prepared with Alcohol (60 p.c.); Mex., 1 in 5, and Span., Bark 1 and Leaves, 1 in 20.

Tests.—Tincture of Hamamelis has a sp. gr. of 0·950 to 0·955; contains about 2·0 p.c. w/v of total solids and about 49·0 p.c. v/v of Absolute Alcohol.

Not Official.

EXTRACTUM HAMAMELIDIS.—Hamamelis Bark in powder, percolated with Alcohol (60 p.c.) and the percolate evaporated to the consistence of an extract. Yield of Extract, 20 to 25 p.c.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme in **pill.**

1½ grains = 0·1 gramme, in **suppositories**; 1 drm. in 7 drm. of Soft Paraffin or other diluent, for an **ointment.**

B.P.C. employs Alcohol (45 p.c.) and evaporates to dryness and powders it.

Official in Mex.

GOSSYPIUM HAMAMELIDIS.—Tincture of Hamamelis ½ fl. oz., Glycerin 10 minims, Cotton-Wool, in a thin sheet, 60 grains. Mix the Tincture and Glycerin, and saturate the wool evenly with the mixture. Dry by exposure to the air. Astringent and sedative.

SUPPOSITORIUM HAMAMELIDIS.—Extract of Hamamelis, 1½ grain; Oil of Theobroma, 15 grains.—*Samaritan.*

HAMAMELIN.—A powdered extractive prepared from either the Leaves or the Bark of Hamamelis Virginiana.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

Two forms of Hamamelin are known in commerce, the green powder (non-hygroscopic) prepared from the Leaves, and a chocolate brown hygroscopic amorphous powder prepared from the Bark.

Hamamelin prepared from the Leaves with strong Alcohol was far more efficacious in suppositories than the resinoid from the Bark.—*C.D.* '98, i. 86; *P.J.* '01, ii. 231.

HAMAMELIDIS FOLIA. Hamamelis Leaves. *B.P.Syn.*—Witch Hazel Leaves.

The Leaves, fresh and dried, of *Hamamelis Virginiana.*

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Jap., Mex., Norw., Span., Swed., Swiss and U.S.

Tests.—The Leaves yield from 5 to 8 p.c. of ash. The inclusion of an ash limit in the *B.P.* is stated not to be a necessity.

Preparations.

EXTRACTUM HAMAMELIDIS LIQUIDUM. Liquid Extract of Hamamelis.

20 of Hamamelis Leaves, percolated with Alcohol (45 p.c.) until exhausted, the first 17 reserved and the remainder evaporated to an Extract, which is dissolved in the first portion, and made up with Alcohol (45 p.c.) to 20. (1 in 1)

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

Foreign Pharmacopœias.—Official in Austr., to yield not less than 23 p.c. residue; Belg., to yield 23 p.c. residue; Fr., Jap., Norw., Span., Swed., Swiss and U.S., all 1 in 1.

Tests.—Liquid Extract of Hamamelis has a sp. gr. of 1·025 to 1·050; contains about 21 p.c. w/v of total solids and about 32 p.c. w/v of Absolute Alcohol.

LIQUOR HAMAMELIDIS. SOLUTION OF HAMAMELIS. EXT. HAMAMELIDIS DEST.

Fresh Hamamelis Leaves, 50; Water 100; Alcohol (90 p.c.), 10. Macerate in a still for 24 hours; then distil one half.

It probably owes its virtues to the presence of a small quantity of essential Oil.

Pond's Extract and Hazeline are products distilled from Hamamelis.

Official in U.S.

Tests.—The Liquor has a sp. gr. of 0·980 to 0·985; it contains about 16 p.c. w/v of Absolute Alcohol.

UNGUENTUM HAMAMELIDIS. HAMAMELIS OINTMENT.

Liquid Extract of Hamamelis, $\frac{1}{4}$; Hydrous Wool Fat, $2\frac{1}{4}$. (1 in 10)

Now made with Hydrous Wool Fat in place of simple Ointment.

Not Official.

WITCH HAZEL SNOW.—Melt 2 oz. of Stearic Acid and add it to a hot solution of Glycerin 2 fl. drm., Sodium Carbonate 180 grains, in Water 10 fl. oz. After heating the mixture for one hour on a water-bath, make up the volume with Water to 10 fl. oz. and add Liquor Hamamelidis 10 fl. oz. Transfer to a hot mortar and agitate very thoroughly with an egg-whisk. Continue agitation till quite thick. Let stand 12 hours, stir well and bottle.—*P.J.* '06, i. 337.

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

Pasta Hamamelidis. *Syn.* Witch Hazel Snow or Foam.—Stearic Acid, 10; Sodium Carbonate, 1·50; Glycerin, 1·50; Solution of Hamamelis, by weight, 50; Distilled Water, *q.s.* to produce by weight 100.

Directions for preparing are the same as **Witch Hazel Snow** given above.

Not Official.

HELLEBORUS.

CHRISTMAS ROSE.

The Rhizome and Rootlets of *Helleborus Niger*, L.

It contains the glucosides Helleborein and Helleborin.—*J.C.S. Abs.* '98, i. 39.

(It may be noted that 'White Hellebore' is Veratrum Album, and 'Green Hellebore' is Veratrum Viride.)

Medicinal Properties.—A hydragogue cathartic and emmenagogue. Poisonous in large doses, producing gastro-intestinal inflammation.

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

TINCTURA HELLEBORI.—Hellebore Root, 1; percolated with Alcohol (60 p.c.) to yield 8. (1 in 8)

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

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

Official in Port., 1 in 5.

HEMIDESMI RADIX.

HEMIDESMUS ROOT.

The dried Root of *Hemidesmus Indicus*, R. Brown.

Imported from India.

It was brought to England by Dr. Ashburner about the year 1830, and was

prescribed for the same purposes as Sarsaparilla, but it did not prove satisfactory, and is now used chiefly as a flavouring agent.

Official Preparation.—Syrupus Hemidesmi.

Descriptive Notes.—Hemidesmus Root occurs in pieces about 6 inches (15 cm.) or more in length and $\frac{1}{8}$ to $\frac{1}{2}$ inch (3 to 12 mm.) in thickness; rarely exceeding $\frac{1}{4}$ inch (6 mm.) in diameter.—*B.P.* It is cylindrical, slightly tortuous, and longitudinally furrowed, and has transverse fissures, and is of a reddish or dark brown colour, often with a violet-grey hue. On one side the cork is frequently separated and raised above the cortex. The roots are furnished with a few slender rootlets, and at the upper end with slender woody stems $\frac{3}{16}$ inch (7·5 mm.) or less thick, bearing opposite leaf scars. The root has a characteristic odour resembling that of Coumarin. Laticiferous vessels are found in the cortex, the wood is yellowish and porous, showing radiate medullary rays only in the smaller pieces, in the larger pieces the rays are visible only in the longitudinal or tangential section.

Tests.—It yields from 3 to 4 p.c. of ash.

Preparation.

SYRUPUS HEMIDESMI. Syrup of Hemidesmus.

Infuse 4 of Hemidesmus Root in 20 of boiling Distilled Water for 4 hours; strain, and after standing, decant the clear fluid, in which dissolve 28 of Refined Sugar with a gentle heat. It should weigh 42. (about 1 in 8)

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

HIRUDO.

THE LEECH.

Fr., Sangsue; Ger., Blutegel; Ital., Sanguisuga; Span., Sanguijuela.

1. *Sanguisuga medicinalis*, the Speckled Leech; and
2. *Sanguisuga officinalis*, the Green Leech.
3. *Hirudo quinquestriata*, the Five-Striped or Australian Leech, is official in the *Ind.* and *Col. Add.* for the Australian Colonies.

Leeches are imported chiefly from Hamburg. They are also collected in large numbers in Spain, France, Italy and Hungary.

Used for the abstraction of blood from congested parts; in pleurisy, typhlitis, pericarditis, and in cardiac distress.

When about to apply a Leech, it should be handled as little as possible, and the part of the body should be clean, and free from grease or soap, and, if a hairy part, it should be first shaved. Several suggestions have been made, in case the Leech should refuse to bite: to smear the part with Milk, Cream, or Sugar; to apply a sinapism and thoroughly clean the part afterwards; to scratch the part with a needle. When the Leech is required to bite a particular spot, it is useful to cut a small hole in blotting paper, and place it on the part.

When applying a Leech to one of the orifices of the body, the Leech should be confined in a Leech glass. Should a Leech be swallowed, a strong solution of common salt (Sodium Chloride) should be drunk.

Bleeding from Leech bites is sometimes difficult to stop. The following remedies have been applied with advantage:—Matico, Solution of Ferric Chloride, Silver Nitrate Point, saturated Solution of Alum, and pressure on the part.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr. (Sangsue), Ger., Hung., Ital., Jap. (Hirudines), Port. (Sanguesugas), Swed. and Swiss. Not in the others.

Descriptive Notes.—There are two species met with in European commerce, viz., the Speckled or German Leech (*Sanguisuga medicinalis*, Savigny) and the Green or Hungarian Leech (*S. officinalis*, Savigny), the former having the ventral surface greenish-yellow, spotted with black, and the latter the ventral surface olive green and not spotted with black. Leeches should weigh 1 to 5 grammes only. In the Australian Colonies, the Five-Striped or Australian Leech, *Hirudo quinquestriata*, Schmarda, may be substituted for the European Leeches. It has a greenish-yellow brown dorsal surface with five longitudinal stripes, and a greenish-yellow ventral surface not spotted. Leeches should be kept in Distilled Water with a piece of charcoal in it and in the shade. After feeding, if placed in Camphor Water they will vomit the blood they have sucked, and can then be placed in clear Distilled Water, and will be ready for use again in about 10 days. The Water requires changing about once a week.

HOMATROPINÆ HYDROBROMIDUM.

HOMATROPINE HYDROBROMIDE.

Hydrobromate of Homatropine.—*B.P. Add.* '90.

$C_{16}H_{21}NO_3$, **HBr**, eq. 353·49.

Fr., Bromhydrate d'Homatropine; Ger., Homatropinhydrobromid; Ital., Bromidrato di Omatropina.

Colourless, small, rhombic prisms, or a white crystalline, odourless powder. It is the Hydrobromide of Tropine Mandelic Acid Ester, which is a lower homologue of Atropine.

It possesses a bitter taste.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

Solubility.—1 in 6 of Water; 1 in 18 of Alcohol (90 p.c.); insoluble in Ether and in Chloroform.

Medicinal Properties.—Mydriatic. Dilates the pupil as rapidly, though not so energetically as Atropine, but its effects disappear much sooner—in about a quarter of the time. When used with Cocaine the action is quicker and more powerful.

When an oily solution is required, the alkaloid (not the salt) is dissolved in Castor Oil.

For hypodermic injection 4 grains of Homatropin Hydrobromide dissolved in 1 fl. oz. of sterilised Distilled Water, 6 minims = $\frac{1}{30}$ grain.

1 to 2 drops of a 1 p.c. solution in some cases of muscular asthenopia.—*B.M.J.* '99, ii. 765.

Dose.—$\frac{1}{80}$ to $\frac{1}{20}$ grain = 0·0008 to 0·0032 gramme.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Official Preparation.—Lamellæ Homatropinæ.

Not Official.—Guttæ Homatropinæ, Guttæ Homatropinæ cum Cocaina, Lamellæ Homatropinæ cum Cocaina, Homatropina, Oleum Homatropinæ cum Cocaina.

Foreign Pharmacopœias.—Official in Dutch, Ger., Ital., Jap., Swed., Swiss and U.S.

Tests.—Homatropine Hydrobromide melts at 209° to 212° C. (408·2° to 413·6° F.). Neither the *B.P.* nor the *P.G.* includes a m.p.; the *U.S.P.* gives 213·8° C. (417° F.). Its solution should be neutral in reaction towards Litmus paper. It exerts a powerful mydriatic action on the pupil of the eye. The 1 in 50 aqueous solution yields with Iodine Solution a brown precipitate; with Mercuric Chloride Test-solution a white precipitate; with Potassium Hydroxide Solution a white precipitate soluble in excess of the reagent; but no precipitate with Tannic Acid Solution or with Platinic Chloride Solution. The *P.G.* states that it also, after the addition of Hydrochloric Acid, yields no precipitate with Platinic Chloride Solution. The solution yields with Silver Nitrate Solution a yellowish curdy precipitate, readily soluble in Potassium Cyanide Solution, practically insoluble in Ammonia Solution, and insoluble in Nitric Acid. 1 c.c. of a 10 p.c. solution when cautiously mixed with Chlorine Water yields a brownish colour to Chloroform when shaken with one-fifth its volume of the latter fluid; the *U.S.P.* uses twice the volume of Chloroform. The crystalline alkaloid obtained by adding an excess of Potassium Hydroxide Solution to an aqueous solution of the salt and extracting with Ether (allowing the Ether to evaporate spontaneously), should possess a m.p. of 96° C. (204·8° F.). 1 centigramme of the salt mixed with a few drops of Fuming Nitric Acid, and evaporated to dryness on a water-bath, leaves a yellowish residue, which, when cool, yields on the addition of a freshly-prepared Alcoholic Potassium Hydroxide Solution a reddish-violet colour. The *U.S.P.* states that the salt yields an evanescent pink colour, changing rapidly to green when mixed with Sulphuric Acid containing a crystal of Potassium Bichromate.

The more generally occurring impurities are alkaloids other than Homatropine (Atropine, Hyoscyamine, and Hyoscine), and mineral matter. The *B.P.* states that a 2 p.c. aqueous solution yields no precipitate on the cautious addition of Ammonia Solution previously diluted with twice its volume of Water. A 2 p.c. solution of Atropine Sulphate with Ammonia Solution under these conditions gives a distinct turbidity, but with Hyoscyamine and Hyoscine Hydrobromides no reaction is visible. A 1 p.c. solution of Atropine Sulphate remains unchanged. Most alkaloids other than Atropine and Hyoscyamine may be detected by the Ammonia and Mercuric Chloride Test described below. Any

salt of Atropine or Hyoscyamine under exactly similar conditions will give the same reaction, but with Hyoscine no formation of Mercuric Oxide appears to take place. The most characteristic test for Homatropine is that described above, with Fuming Nitric Acid and Alcoholic Potassium Hydroxide Solution. It distinguishes it from Atropine, the latter giving a deep purple coloration, as do also Hyoscyamine and Hyoscine, but in the case of the two latter, the coloration is less intense and more transient. It should leave no weighable residue when ignited with free access of air, any residue indicating mineral impurity.

Ammonia and Mercuric Chloride.—If 1 c.c. of a 1 in 100 aqueous solution of the salt (0·01 gramme of the Salt, *B.P.*) be made alkaline with Ammonia Water, shaken out with Chloroform, and the chloroformic solution evaporated to dryness, the residue should turn yellow, and finally brick-red, when warmed with about 1·5 c.c. of a solution made by dissolving 1 part of Mercuric Chloride in 50 parts of a mixture of Alcohol, 5 volumes, and Water, 3 volumes; indicating the absence of most other alkaloids except Atropine and Hyoscyamine, *U.S.P.* and *B.P.*

Platinic Chloride.—An aqueous solution of the salt is not precipitated by T.S. of Platinic Chloride, *U.S.P.*; after the addition of Hydrochloric Acid, *P.G.*

Nitric Acid and Alcoholic Potassium Hydroxide Solution.—If 0·01 gramme of the salt be added to 5 drops of Nitric Acid and evaporated to dryness in a porcelain dish, the residue should not acquire a violet colour upon the addition of a few drops of Alcoholic T.S. of Potassium Hydroxide, *U.S.P.*; 0·01 gramme evaporated with 5 drops of Fuming Nitric Acid in a porcelain dish on a water-bath leaves a faint yellow residue which, on cooling and adding Alcoholic Solution of Potassium Hydroxide, assumes a transient violet colour, quickly becoming reddish-yellow.

Preparation.

LAMELLÆ HOMATROPINÆ. Discs of Homatropine.

Discs of Gelatin and Glycerin, each weighing about $\frac{1}{50}$ grain = 0·0013 gramme; and containing $\frac{1}{1000}$ grain = 0·00065 gramme of Homatropine Hydrobromide.

Not Official.

GUTTÆ HOMATROPINÆ.—Homatropine Hydrobromide, 4 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic* and *Guy's.*

GUTTÆ HOMATROPINÆ CUM COCAINA.—Homatropine Hydrobromide, 4 grains; Cocaine Hydrochloride, 10 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

Homatropine Hydrobromide, 7 grains; Cocaine Hydrochloride, 10 grains; Boric Acid, 5 grains; Distilled Water, 1 fl. oz.—*Westminster Ophthalmic.*

LAMELLÆ HOMATROPINÆ CUM COCAINA.—Each disc contains $\frac{1}{50}$ grain of Homatropine Hydrobromide, and $\frac{1}{50}$ grain of Cocaine Hydrochloride. —*London Ophthalmic.*

HOMATROPINA.—Colourless crystals, not deliquescent, nearly insoluble in Water, but soluble 1 in 80 of Olive Oil, 1 in 20 of Castor Oil. They combine readily with Oleic Acid.

Used in cases where an oily preparation or an ointment is required.

Foreign Pharmacopœias.—Official in Mex.

Homatropine Hydrochloride and **Salicylate** form colourless crystals or white crystalline powders. Both salts are readily soluble in Water, and in Alcohol (90 p.c.).

OLEUM HOMATROPINÆ CUM COCAINA.—Homatropine, pure, 10 grains; Cocaine (alkaloid), 10 grains; Castor Oil, 1 fl. oz. Heat together till dissolved.—*London Ophthalmic.*

Not Official.

HORDEUM DECORTICATUM.

PEARL BARLEY.

The dried Seed of *Hordeum distichum*, L. divested of its early integuments; from plants cultivated in Britain.

Foreign Pharmacopœias.—Official in Fr. (Orge Perlé), Port. (Cevada Santa), Mex. and Span. (Cebada). Not in the others.

DECOCTUM HORDEI.—Pearl Barley, 1; wash the Barley with cold Water, and reject the washings; boil the washed Barley with 15 of Distilled Water for 20 minutes in a covered vessel, and strain. Product about 10. (about 1 in 10)

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

Foreign Pharmacopœias.—Official in Fr. (Tisane d'Orge), 1 in 50. Not in the others. Decoctum Hordei Compositum, 1 in 50 is official in Span.

Medicinal Properties.—Nutritive and demulcent, used in catarrhal conditions of the respiratory and urinary systems; as a drink in febrile diseases, and to dilute cow's Milk for feeding children, thus forming a more easily digested curd.

Dose.—1 to 4 fl. oz. = 28·4 to 113·6 c.c.

DECOCTUM HORDEI TARTARISATUM.—Acid Potassium Tartrate, 80 grains; the Peel of ½ Lemon; Sugar, 2½ oz.; Decoction of Barley, 40 oz.; boil and strain.—*St. George's.*

HYDRARGYRUM.

MERCURY.

Hg, eq. 198·80.

Fr., Mercure Purifié; Ger., Quecksilber; Ital., Mercurio; Span., Mercurio.

A shining, silver-white, metallic-looking fluid obtained from native Mercuric Sulphide.

It should be kept in strong, well-closed bottles.

Solubility.—Insoluble in the usual solvents; insoluble in Hydrochloric Acid, insoluble in cold Sulphuric Acid, but dissolved by hot Sulphuric Acid with evolution of Sulphur Dioxide. It dissolves readily and completely in Nitric Acid.

Medicinal Properties.—Mercury as a metal is seldom given alone. In a state of minute sub-division with Chalk, or in pill form, however, it has the effect of increasing the various secretions, and is itself absorbed by all the tissues of the body. It is an alterative, indirect cholagogue, purgative, diuretic, and a glandular stimulant. When given as a purgative it is usually combined with other purgatives, or followed by a purgative saline.

Of great use, internally, in primary and secondary, and with Iodides in tertiary syphilis, but the doses should not be such as to cause salivation.

Externally, by means of the **ointment, oleate** or **liniment**, in syphilis, in parasitic skin diseases, and as a stimulant in chronic

synovitis, peritonitis and other chronic inflammations, and glandular enlargements.

See also under the various salts of Mercury.

Two cases of acute intestinal obstruction successfully treated with Quicksilver.—*B.M.J.* '02, i. 1023.

Of the drugs frequently used in the treatment of syphilis, Blue Ointment is regarded as of most value.—*L.* '01, ii. 1038.

As an inunction (½ to 1 drm. of the ointment well rubbed in at night before bedtime) it forms one of the most satisfactory ways of exhibiting Mercury.—*B.M.J.* '00, ii. 1762.

A mercurial cream prepared with a Lanolin basis, and containing Carbolic Acid for use as an intramuscular injection in the treatment of syphilis.—*B.M.J.* '03, i. 1258.

Metallic Mercury still continues to be largely used in the treatment of syphilis, and preparations for use as inunctions or for intramuscular injection are in good demand. For intramuscular injection in the treatment of syphilis a preparation made according to the following formula is stated (*M.P.* '06, i. 149) to be useful:—Purified Mercury, 40 grammes; anhydrous sterilised Lanolin, 12 grammes; white sterilised Vaseline, 13 grammes; sterilised liquid Vaseline, 35 grammes. One c.c. contains ½ gramme Mercury. The average dose is 7 or 8 centigrammes.

The administration of Mercury internally is stated (*B.M.J.* '05, i. 700) to be specially apt to cause symptoms of poisoning when combined with the extensive use of Tar externally.

Of the numerous salts and preparations of Mercury which have from time to time been recommended in the treatment of syphilis, attention still seems to centre round those preparations partaking of the nature of an ointment, and which can be used by inunction. In the *L.* '04, ii. 1405, 15 grains Ung. Hydrarg. are recommended to be gently rubbed over the abdomen or the inside of the thigh or arm at night, and then covered with a flannel bandage until the following morning, when it is washed off, and this treatment is repeated unless the skin shows signs of irritation.

0·05 cm. of a mixture of two parts of metallic Mercury, one part each of Lanolin and liquid Paraffin, has been recommended (*B.M.J.* '04, ii. 1702) for subcutaneous injection. Intramuscular or intravenous injections unsuitable in infants, owing to the pain and the risk of inflammation (*L.* '04, ii. 1405).

A cream containing Mercury, Lanolin and Carbolised Soft Paraffin (white) is used in the Royal Navy.—*B.M.J.* '07, ii. 512.

Official Preparations.—Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Hydrargyrum cum Creta, Liquor Hydrargyri Nitratis Acidus, Linimentum Hydrargyri, Pilula Hydrargyri, Unguentum Hydrargyri, Unguentum Hydrargyri Compositum, and Unguentum Hydrargyri Nitratis.

Not Official.—Mercurial Cream (Squire), Mercury Plaster Mull, Mercury and Carbolic Plaster Mull, Oleum Cinereum, Parogenum Hydrargyri, Pilula Hydrargyri Carbolici, Pilula Hydrargyri cum Opio, Pilula Hydrargyri cum Rheo, Suppositoria Hydrargyri, Unguentum Hydrargyri Mitius, Unguentum Cinereum, Vasolimentum Hydrargyri, Hyrgolum, Hydrargyri Benzoas, Hydrargyrum Carbolicum, Hydrargyrol, Hermophenyl, Hydrargyri Cyanidum, Injectio Hydrargyri Cyanidi, Mercury Zinco-Cyanide, Unguentum Hydrargyri et Zinci Cyanidi, Hydrargyri Ethylenediamine Citras, Hydrargyri Gallas, Hydrargyri-Naphtholacetas, Hydrargyri Salicylas, Hydrargyri Succinimidum, Hydrargyri Sulphas, Unguentum Hydrargyri Sulphatis Flavæ, Hydrargyri Tannas, Hydrargyri Thymolacetas.

Foreign Pharmacopœias.—Official in all.

Tests.—Mercury has a sp. gr. of 13·5. It solidifies at −39·4° C. (−39° F.). It boils at 360° C. (680° F.), and volatilises slightly even at ordinary temperatures. The fully-oxidised solution in Nitric Acid, freed from excess of Nitric Acid, affords with Ammonia Solution a

white precipitate, with Potassium or Sodium Hydroxide a yellow precipitate, with Potassium Iodide Solution a bright scarlet precipitate, soluble in excess of the reagent and in a considerable excess of the Mercuric salt; excess of Hydrogen Sulphide yields a black precipitate insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid Solution. A bright piece of Copper foil immersed in the solution is coated with a grey film which, on rubbing, shows a bright silvery lustre. When the coated foil is heated in a dry clean test-tube the Mercury condenses on the sides of the tube in minute globules. The solution yields with Stannous Chloride Solution first a greyish-white precipitate of Mercurous salt and subsequently a grey precipitate of metallic Mercury. The *U.S.P.* requires that it shall contain not less than 99·9 p.c. of metallic Mercury, but gives no method of determination. It also requires that globules of Mercury dropped upon white paper should roll about freely and leave no streaks or traces. It should present a bright surface even after agitation in contact with air.

The more generally occurring impurities are foreign metals and fixed residue. More than slight traces of foreign metals may be detected by the Sodium Thiosulphate Test described below, fixed residue by the volatilisation test.

Sodium Thiosulphate.—On boiling 5 grammes of Mercury with 5 c.c. of Water and 4·5 grammes of Sodium Thiosulphate in a test-tube for about one minute, the Mercury should not lose its lustre, and should not acquire more than a slightly yellowish shade, indicating the absence of more than slight traces of foreign metals, *U.S.P.*

Volatilisation.—At a temperature of 357·25° C. (675·05° F.) it is completely volatilised, leaving no appreciable residue, *U.S.P.*; it is volatilised leaving an insignificant amount of fixed residue below visible redness, *B.P.*

Preparations.

EMPLASTRUM HYDRARGYRI. Mercurial Plaster.

3 oz. (by weight) of Mercury is rubbed with a heated mixture of 56 grains of Olive Oil, and 8 grains of Sublimed Sulphur; and finally incorporated with 6 oz. of melted Lead Plaster. (about 1 in 3)

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Hung., Ital., Jap., Norw., Russ. and Swiss, 1 in 5.; Dan. and U.S., 3 in 10; Dutch, 1 in 4; Mex., 1 in 5·57; Span., 1 in 7·5; Swed., 1 in 3. The ingredients differ considerably.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Ammoniacum and Mercury Plaster.

3 oz. (by weight) of Mercury treated as above with Olive Oil and Sulphur and mixed with 12 oz. of purified Ammoniacum.

(nearly 1 in 5)

Applied in glandular swellings, in chronic hepatic enlargement, syphilitic nodes, and in chronic synovitis.

Foreign Pharmacopœias.—Official in U.S., resembles Brit. Not in the others.

LINIMENTUM HYDRARGYRI. Liniment of Mercury.

Mix 1 oz. of Mercury Ointment with Liniment of Camphor to

make 1½ fl. oz.; and add 160 minims of strong solution of Ammonia diluted with Liniment of Camphor to 1½ fl. oz.

(1 Ointment in 3, or 1 of Mercury in 6)

A stimulating Liniment, applied as an absorbent to swollen joints, or placed with Lint in the arm-pits, or rubbed into the abdominal wall in tubercular peritonitis.

PILULA HYDRARGYRI. Mercury Pill. *B.P.Syn.*—Blue Pill.

2 (by weight) of Mercury intimately mixed with 3 of Confection of Roses, and finally with 1 of powdered Liquorice Root. (1 in 3)

8 commercial samples examined contained 28 to 41 p.c. of Mercury, and little or no Oxide; 5 of the 8 samples were prepared with Confection of Hips.—*P.J.* (3) xv. 230.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Fr., Pilules Mercurielles Simples; Jap., Mex., Pildoras Azules; Port., Pilulas Mercurials; Swed., Pilulæ Hydrargyri; U.S., Massa Hydrargyri; all 1 in 3. Not in the others.

UNGUENTUM HYDRARGYRI. Mercury Ointment.

Mercury (by weight), 16; Lard, 16; Prepared Suet, 1.

(nearly 1 in 2)

Official Preparations.—Used in the preparation of Linimentum Hydrargyri and Unguentum Hydrargyri Compositum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch and Span. (Pomada Mercurial), 3 in 10; Fr., Ital. (Pomata Mercuriale), Mex. (Unguento de Mercurio Doble), Port. and U.S., 1 in 2; Fr. has also Pommade Mercurielle Faible, 1 in 8; Ger., Hung., Jap., Russ., Swed. and Swiss (Ung. Hydr. Ciner.), 1 in 3. Span. has also Pomada Mercurial Simple, 3 in 20.

The **Brussels Conference** adopted a strength of 30 p.c. for Unguentum Hydrargyri.

Mercury, 50; Oleate of Mercury, 2; Suet, 23; Benzoinated Lard, 25.—*U.S.*

UNGUENTUM HYDRARGYRI COMPOSITUM. Compound Mercury Ointment.

Mercury Ointment, 10; Yellow Beeswax, 6; Olive Oil (by weight), 6; Camphor, in flowers, 3. Mix the Beeswax, Olive Oil, and Mercury Ointment with the aid of heat, add the Camphor, triturate until cold. (1 Mercury in 5)

Contains rather less Mercury Ointment than B.P. '85, and the manipulation is modified, as previously suggested in the *Companion*.

This is Scott's celebrated absorbent Ointment (**Scott's dressing**), the Soap Cerate being replaced by the Oil and Beeswax.

It is an admirable Ointment to apply to chronic joint enlargements.

Not Official.

MERCURY PLASTER MULL (*Unna*).—Containing 1 grain = 0·06 gramme of Mercury to the square inch.

MERCURY AND CARBOLIC PLASTER MULL (*Unna*).—Containing 1 grain = 0·06 gramme of Mercury and ⅔ grain = 0·02 gramme of Carbolic Acid to the square inch.

MERCURIAL CREAM (*Squire*).—Pure re-distilled Mercury, by weight, 48 grains; sterilised anhydrous Lanolin, by weight, 240 grains; pure sterilised Olive Oil, *q.s.* to produce 1 fl. oz.

10 minims = 1 grain of pure metallic Mercury.

Dose.—10 minims = 0·6 c.c. by intramuscular injection. The preparation recommended by Dr. Julius Althaus, in his paper before the International Medical Congress at its Berlin meeting in 1890, consisted of 1 part of metallic Mercury, thoroughly rubbed up with 4 parts of purest Lanolin, and then mixed with 5 parts of carbolised oil of 2 p.c. strength, 10 minims of the resultant grey cream contained 1 grain of metallic Mercury. Lang's formula, published in 1888, suggested the original principle of the process, namely the minute subdivision of the metallic Mercury by means of Lanolin, and the thinning of the emulsion with Olive Oil.

The following formula is given (*B.M.J.* '03, i. 1258) by Colonel F. J. Lambkin, R.A.M.C.—Mercury, 2 drm.; anhydrous Lanolin, 2 drm. by weight; Paroleine, 4 drm.; Carbolic Acid, 2 p.c., by measure.

Dose.—5 to 10 minims once a week as an intramuscular injection.

The two under-mentioned formulas are given by Colonel F. J. Lambkin, R.A.M.C., in *L.* '07, ii. 14.

Mercury, 10 grammes; absolute Creosote and Camphoric Acid (Creo-Camph.) of each equal parts, 20 c.c.; Palmitin Basis to 100 c.c.

Calomel, 5 grammes; absolute Creosote and Camphoric Acid (Creo-Camph.) of each equal parts, 20 c.c.; Palmitin Basis to 100 c.c.

As a basis for Calomel Injection used in Syphilis, Dr. Allaire ('Nouveaux Remèdes') recommends Palmitin prepared from palm oil. It does not become rancid, easily saponifies in the body, and is readily absorbed. A little Guaiacoloid (a combination in molecular proportions of Guaiacol and Camphor) is added to the injection.—*C.D.* '07, ii. 411.

OLEUM CINEREUM (Grey Oil).—White Vaseline, 2·5; Mercury Ointment, 1; Mercury, 19·5; triturate in a warm mortar until the Mercury is incorporated; then add White Vaseline, 7; Liquid Vaseline, 20. All by weight.

This preparation contains 40 p.c. of Mercury.—*P.J.* (3) xix. 704.

For **hypodermic injection** in syphilis. **Dose.**—1 to 2 minims.—*B.M.J.* '88, i. 1296; *T.G.* '94, 319.

A modification of 'Grey Oil,' is Mercury, 1; Lanolin anhydrous, 2; Carbolic Oil (2 p.c.), 1; all by weight. 10 minims used for each injection.—*B.M.J.* '98, i. 485.

Mercury, 40; Wool Fat, 10; Liquid Paraffin, *q.s.* to produce (by weight) 100. **Dose.**—1 to 2 minims.—*B.P.C.*

The following formula appears in the *Fr. Codex* (1908) under the title of

Huile Grise.—Purified Mercury, 40; anhydrous Lanolin, 26; Vaseline Oil (Huile de Vaseline medicinale), 60. The Lanolin and the Vaseline Oil are sterilised separately in glass flasks in an autoclave at 120° C. (248° F.) for 20 minutes. A pestle and mortar are sterilised by means of burning Alcohol, and placed therein are the Mercury, and then the Wool Fat. The metallic particles are triturated until they are extinguished, and then the Liquid Paraffin is added in small portions. The product should weigh 126 grammes, and measure 100 c.c., and therefore contains almost exactly 40 centigrammes of Mercury per c.c., or 40 p.c. w/v, and should be transferred immediately to phials of two, five, and ten c.c. capacity previously sterilised at 180° C. (356° F.).

PILULA HYDRARGYRI CUM OPIO.—Mercury Pill Mass, 5 grains; Opium, in powder, ¼ grain.—*St. Thomas's.*

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

Mercurial Pill to 3¾ grains, Opium, in powder, ¼ grain.—*Guy's.*

Mercury Pill, 5 grains; Opium, in powder, ½ grain.—*University* (No. 3) and *London Ophthalmic.*

PILULA HYDRARGYRI CUM RHEO.—Mercury Pill Mass, 2½ grains; Compound Rhubarb Pill Mass, 2½ grains.—*St. Thomas's* and *London Ophthalmic* and *King's.*

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

SUPPOSITORIA HYDRARGYRI.—Mercury Ointment, 5 grains; Oil of Theobroma, 10 grains, in each suppository.

UNGUENTUM HYDRARGYRI MITIUS.—Mercurial Ointment, 1; Lard, 2.—*P.L.* '36.

This has been incorporated in the *B.P.C.* under the title Unguentum Hydrargyri Dilutum.

Mercurial Ointment (*U.S.P.*), 67; Petrolatum, 33.—*U.S.P.*

UNGUENTUM CINEREUM.—Mercury and Lanolin, of each 1 oz.; best Olive Oil, ½ fl. oz.—*Lock.*

VASOLIMENTUM HYDRARGYRI.—Mercury, 40; Wool Fat, 20; Thick Vasoliment, 60.—*Hager.*

Parogenum Hydrargyri. *Syn.* Mercury Vasoliment.—Mercury, 30; Wool Fat, 15; Thick Parogen, 55.—*B.P.C.*

HYRGOLUM (Colloid Mercury).—Heavy black grains exhibiting a metallic lustre, containing 73 to 80 p.c. of Mercury; soluble in Water. On account of its freedom from causticity and from irritating properties, it has been suggested as an anti-syphilitic remedy in the form of a 10 p.c. ointment, or internally in ¾ grain dose in pill form.—*L.* '00, i. 1450; *B.M.J.* '01, i. 1551.

HYDRARGYRI BENZOAS. $Hg(C_7H_5O_2)_2$, eq. 439·06.—A white crystalline salt, practically insoluble in Water and in Alcohol (90 p.c.), but soluble in solutions of the Benzoates of the alkali metals. Has been used in the treatment of syphilis. The hæmostatic effects of intramuscular injections in cases of uterine hæmorrhage are stated to far surpass Ergot (*B.M.J.* '04, ii. 1085).

Mercury Benzoate, Biniodide and Lactate are employed (*M.P.* '05, ii. 622) in the treatment of syphilis in daily doses of ⅓ grain and should be sufficiently diluted (2 c.c. of Water). Mercury Salicylarsenate and Hermophenyl are generally but little painful in injections in syphilis, and are given in larger doses, *e.g.*, ½ to 1 grain. Hermophenyl may be employed in larger doses (1¼ grains), but only as a weekly injection.

One centigramme (⅙ grain) Benzoate is a small daily dose in the treatment of syphilis, and 2 centigrammes daily for three weeks may be safely given (*M.P.* '06, i. 148). A good formula is Mercury Benzoate, 1 gramme; Sodium Chloride pure, ¾ gramme; Distilled Water, 100 grammes.

Six cases of general paralysis and tabes treated by hypodermic injection of 3 centigrammes Mercury Benzoate daily for 15 days alternated by a 15 days' interval.—*B.M.J.E.* '02, ii. 87.

A suitable solution (*Desesquelle* and *Bretonneau*) for hypodermic injection in syphilis, Mercuric Benzoate, 0·3 gramme; Ammonium Benzoate, 1·5 grammes; Sterilised Distilled Water, to 30 c.c.—*P.J.* '02, ii. 73.

Foreign Pharmacopœias.—Official in Fr.

Tests.—Mercuric Benzoate Solution yields the tests distinctive of Mercury given under that substance. With Ferric Chloride T.S. it yields a buff-coloured precipitate. When shaken with Water and filtered, the filtrate, when acidified with Nitric Acid, yields no precipitate or turbidity with Silver Nitrate Solution. Another portion of the filtrate, when mixed with an equal volume of Sulphuric Acid, keeping the mixture cool, should yield no brown ring at the junction of the two fluids on the careful addition of Ferrous Sulphate Solution. The Benzoic Acid obtained from the salt should possess the m.p., answer the tests distinctive of Benzoic Acid, and be free from the impurities mentioned under Acidum Benzoicum. 0·5 gramme ignited with free access of air should leave no weighable residue. It contains theoretically 45·3 p.c. of metallic Mercury.

HYDRARGYRUM CARBOLICUM (Mercury Carbolate, Mercury Phenate) (*Schadek*).—Colourless crystals, or a white powder. Obtained by precipitating an alcoholic Solution of Mercuric Chloride with an alcoholic Solution of Phenol and Potassium Hydroxide, and evaporating nearly to dryness, with subsequent washings.

Nearly insoluble in Water, and soluble with difficulty in cold Alcohol.

Medicinal Properties.—Recommended in secondary syphilis.—*L.* '87, i. 943; *L.* '87, ii. 277; *P.J.* (3) xviii. 605.

Dose.—⅛ to ½ grain = 0·02 to 0·032 gramme, three times a day in pill; also **hypodermically** suspended in Mucilage, strength 2 p.c.

Pilula Hydrargyri Carbolici.—Mercury Carbolate, $\frac{1}{3}$ grain; Extract of Liquorice, 1 grain; Powdered Liquorice, 1 grain, in each pill.

Dose.—Two to four pills daily.

Hydrargyrol (Mercury Phenol-para-sulphonate).—Brownish-red crystalline scales or crusts. Decomposed by Water with the formation of basic salts. Insoluble in Alcohol (90 p.c.). Introduced as an antiseptic.

A combination of the above salt with Ammonium Tartrate is known under the name of '**Asterol,**' a white or reddish-white micro-crystalline powder, soluble in Water. Introduced as an antiseptic, used in the form of 2 to 5 p.c. solution.—*B.M.J.E.* '01, ii. 64; *P.J.* '99, i. 538; '99, ii. 216; *C.D.* '01, ii. 872.

Hermophenyl (Sodium Mercuro-phenol Disulphonate).—A white amorphous powder, readily soluble in Water. It contains about 40 p.c. Mercury. Introduced as an antiseptic.—*P.J.* '01, ii. 245.

HYDRARGYRI CYANIDUM. $Hg(CN)_2$, eq. 250·5.—Colourless or white prismatic crystals.

It contains theoretically 79·36 p.c. of metallic Mercury. It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

Solubility.—1 in 13 of Water; 1 in 20 of Alcohol (90 p.c.).

Medicinal Properties.—A powerful antiseptic. Used as a local **application** (5 to 15 grains in 1 fl. oz. of Water = 0·3 to 1 gramme in 28·4 c.c.) to syphilitic rashes and sores of the throat, tongue, etc.—*Ringer.*

Intravenous injection in syphilis.—*P.J.* '95, ii. 91. $\frac{1}{2}$ p.c. solution as an antiseptic in ophthalmic practice.—*P.J.* '96, ii. 19.

Subconjunctival and intravenous injections, in the treatment of serous syphilitic disease of the eye.—*B.M.J.* '03, ii. 269.

A lotion containing 0·25 gramme per 1000 grammes of Water used in acute conjunctivitis (*M.P.* '05, ii. 303).

Solutions of the Cyanide or Oxycyanide are used for intravenous injection (*M.P.* '06, i. 149), as they do not coagulate the blood. One c.c. of a solution containing Mercury Cyanide, 1 gramme; Distilled Water, 100 grammes; is injected daily in syphilis. The intravenous injections appear to act very promptly, but the most absolute asepsis must be insisted on.

Dose.—Internally $\frac{1}{16}$ to $\frac{1}{8}$ grain = 0·004 to 0·008 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Foreign Pharmacopœias.—Official in Belg. (Cyanuretum Hydrargyri); Fr. (Cyanure Mercurique); Ger., Hung. and Russ. (Hydrargyrum Cyanatum); Port. (Cyaneto Mercurico); Mex. (Cianuro de Mercurio).

Tests.—Mercuric Cyanide is decomposed on heating into metallic Mercury and Cyanogen gas, which burns with a purple flame. The aqueous solution is neutral in reaction towards Litmus paper; on the addition of Hydrochloric Acid it evolves the characteristic and highly poisonous odour of Hydrogen Cyanide; neither Potassium Hydroxide Solution nor Ammonia Solution yields a precipitate; Potassium Iodide Solution yields no precipitate until after the addition of Hydrochloric Acid, when the solution behaves in a similar manner to Mercuric Chloride Solution; Hydrogen Sulphide Solution yields a black precipitate, insoluble in Ammonium Hydrosulphide Solution and in diluted Nitric Acid; Stannous Chloride Solution yields at first a whitish precipitate of Mercurous salt and subsequently a grey deposit of metallic Mercury. When gently heated with an equal part of Iodine in a dry test-tube it yields in the lower portion of the tube a yellow sublimate subsequently becoming red, and in the upper portion a colourless needle-shaped crystalline deposit.

The more generally occurring impurities are Mercuric Chloride and mineral residue. A delicate test for the former is to add to the 5 p.c. aqueous solution faintly acidified with Nitric Acid, one or two drops of Silver Nitrate Solution, no precipitate or turbidity should result. A solution of similar strength to the above

should yield no reddish precipitate soluble in an excess of the reagent on the gradual addition of Potassium Iodide Solution. Mineral residue is indicated by the ash left when the sample is ignited with free access of air.

Injectio Hydrargyri Cyanidi (Intravenous).—Mercuric Cyanide, 1 p.c.; inject 20 minims.—*Lock.*

Mercury Oxycyanide as an antiseptic, in aqueous solution, 1 in 200.—*B.M.J.E.* '95, ii. 104; *T.G.* '96, 405.

Mercury Oxycyanide is official in Mex.

MERCURY ZINCO-CYANIDE.—A product which has been found by Lord Lister to have valuable antiseptic properties.—*P.J.* (3) xx. 653; (3) xxii. 769.

There is also a **gauze** prepared with it.—*B.M.J.* '89, ii. 1025; *L.* '89, ii. 943.

Mercurialism resulting from use of the Cyanide gauze as a dressing.—*P.J.* '96, ii. 382.

Unguentum Hydrargyri et Zinci Cyanidi.—Mercury Zinc Cyanide, 2, 4 or 8 grains; Soft Paraffin, 1 oz.—*London Ophthalmic.*

HYDRARGYRI ETHYLENEDIAMINE CITRAS (Mercuramine).—A clear, colourless liquid, stated to be a 10 p.c. aqueous solution of Mercury Citrate containing 4 p.c. Ethylenediamine.

Introduced as an antiseptic.—*B.M.J.* '01, ii. 85; *P.J.* '01, ii. 142.

Under the title of **Sublamin** a combination of Mercury Sulphate and Ethylenediamine has been introduced. A 3 p.c. solution has been recommended as a disinfectant for the hands.—*B.M.J.E.* '02, i. 56.

This salt is stated (*B.M.J.* '05, i. 727) not to injure the skin or discolour steel instruments in alcoholic solution. As a 2 in 1000 alcoholic solution it gave results in sterilisation of the hands superior to any claimed for other methods, especially with regard to the power of penetration. May be conveniently kept as a 10 p.c. solution in Alcohol (50 p.c.).

HYDRARGYRI GALLAS (Mercury Gallate).—A dark grey or greyish-green amorphous powder, insoluble in Water. Is stated to be a more stable salt than the Tannate. Used in syphilis.

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

HYDRARGYRI NAPHTHOLACETAS.—Colourless, needle-shaped crystals, or as a white amorphous powder, insoluble in Water, has been used in syphilis.

Dose.—$\frac{1}{2}$ to 1 grain = 0·032 to 0·06 gramme.

HYDRARGYRI SALICYLAS ($HgC_7H_4O_3$, eq. 333·81).—A white or whitish amorphous odourless powder; practically insoluble in Water, and in Alcohol (90 p.c.). It contains theoretically 59·5 p.c. of metallic Mercury. It is soluble in Potassium or Sodium Hydroxide Solution with the production of double salts. It is not dissolved in the cold by halogen compounds of the alkali metals, but dissolves on warming, and when the solution cools double salts crystallise out.

Employed internally and by hypodermic injection, also as a dusting powder, in syphilis. Is stated to be as powerful an antiseptic as corrosive sublimate. An injection of 0·05 gramme recommended (*B.M.J.* '04, ii. 69) in tabes.

Intramuscular injection of Mercury Salicylate, 5; Liquid Paraffin, 50; one Pravaz syringeful, in syphilis.—*B.M.J.* '99, i. 122.

Maximum single dose, 0·02 gramme: maximum daily dose, 0·06 gramme.

In a large number of cases of syphilis intramuscular injections of 1 c.c. of the following emulsion. Mercury Salicylate, 1; Liquid Paraffin, 10. Injections once a week, and not more than six injections, followed by an interval of rest of about a couple of months.—*B.M.J.* '04, i. 609, 816.

Foreign Pharmacopœias.—Official in Ger., Jap., Mex., Russ., Swed. and Swiss.

Tests.—Mercuric Salicylate does not answer the tests distinctive of Mercuric salts. It yields no precipitate with Hydrogen Sulphide or Ammonium Hydrosulphide. It is decomposed by concentrated Hydrochloric, Nitric, and Sulphuric Acids, the solutions then yielding the distinctive tests given under Mercury. It yields a sublimate of metallic Mercury when heated in a dry

test-tube. A saturated aqueous solution yields with Ferric Chloride T.S. a violet coloration. The method adopted by the *P.G.* for the determination of the Mercury is to mix a weighed quantity of 0·3 gramme with ten times its weight of Sodium Chloride and to dissolve the mixture in 100 c.c. of boiling Water, diluting the resulting solution to 400 c.c. The solution when slightly acidified with Hydrochloric Acid shall yield when completely precipitated with Hydrogen Sulphide 0·2 gramme of Mercuric Sulphide corresponding to 57·4 p.c. of metallic Mercury and 96·4 p.c. of pure Mercuric Salicylate. An alternative method is to dissolve the salt in 3·5 c.c. of Nitric Acid and 13 c.c. of Hydrochloric Acid, evaporate to dryness, the residue is rendered acid with Hydrochloric Acid dissolved in Water, filtered, and the filtrate precipitated with Hydrogen Sulphide.

The more generally occurring impurities are free Salicylic Acid and Sodium Salicylate. The former may be detected by the marked acid reaction of the salt towards a piece of moistened blue Litmus paper, the latter by any residue remaining when the specimen is ignited with free access of air.

HYDRARGYRI SUCCINIMIDUM ($Hg(C_4H_4O_2N)$, eq. 393·48).—White crystalline powder, soluble in Water. It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light. It contains theoretically 50·5 p.c. w/w of metallic Mercury. Its solutions are stated not to precipitate albumen, and are therefore useful for hypodermic use. Used as a solution of Mercury Succinimide, 38¾ grains; Cocaine Hydrochloride, 15½ grains; Distilled Water, 775 grains.—*L.* '02, i. 1712.

The use of Cocaine Nitrate in place of the Hydrochloride would avoid the precipitation of Calomel.

Dose.—$\frac{1}{8}$ to $\frac{1}{4}$ grain = 0·008 to 0·016 gramme.

Foreign Pharmacopœias.—Official in Ital.

Tests.—Mercuric Succinimide yields a solution which gives with Potassium Iodide Solution a bright scarlet precipitate soluble in excess of the reagent; when acidified with diluted Hydrochloric Acid, Hydrogen Sulphide yields a black precipitate, insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid Solution; a piece of bright Copper foil immersed in an acidified solution of the salt becomes coated with a bright metallic film; with Stannous Chloride Solution a grayish-white precipitate is produced changing to gray; with Albumen solution no precipitate is produced. When ignited with free access of air no weighable residue should remain.

HYDRARGYRI SULPHAS (Mercuric Sulphate). *Syn.* — HYDRARGYRI PERSULPHAS; SULPHATE OF MERCURY.

A white, heavy, crystalline powder, $HgSO_4$, eq. 294·14; prepared by dissolving Mercury in strong Sulphuric Acid and evaporating to complete dryness. It contains theoretically 67·6 p.c. w/w of metallic Mercury. It is decomposed by Water, forming a yellow oxysulphate called Turpeth Mineral (**$HgSO_4.2HgO$**), and free Sulphuric Acid.

Foreign Pharmacopœias.—Official in Fr. (Sulfate Mercurique Basique); Mex. Port. and Span. (Sulfato Mercurico). Not in the others.

Unguentum Hydrargyri Sulphatis Flavæ (Turpeth Mineral Ointment. Bazin's Ointment).—Yellow Mercury Sulphate, 15 grains; Benzoated Lard, 1 oz.

Useful in ringworm and seborrhœa capitis.

HYDRARGYRI TANNAS.—A greyish-green or blackish-grey powder, containing 40 to 50 p.c. of Mercury.

It should be preserved in well-closed bottles of a dark amber tint and protected as far as possible from the light.

It is decomposed by Water and the solutions of the alkalis. It is not materially affected by Diluted Hydrochloric Acid.

Medicinal Properties.—Very useful in syphilis.

It is decomposed by the alkali of the intestines, and the Mercury rapidly passes into the system.—*L.* '84, i. 723; *M.T.* '85, ii. 869.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme, in a **pill**, three times a day, an hour before meals.

Foreign Pharmacopœias.—Official in Austr. (Hydrargyrum tannicum oxydulatum), contains about 55 to 57 p.c. of Mercury; Mex. (Tanato de Mercurio). Not in the others.

Tests.—Mercury Tannate is not materially affected by dilute Hydrochloric Acid, but the concentrated acid decomposes it with formation of Mercurous Chloride and Tannic Acid. It is decomposed by alkali Hydroxide solutions and solutions of alkali carbonates, the alkaline solution rapidly darkening on exposure to air. It should be free from Nitrates as ascertained by rubbing 0·3 gramme of the salt with 3 c.c. of Water, filtering and adding two drops of the filtrate to 5 c.c. of Diphenylamine Solution, when no blue colour should be produced. When ignited with free access of air it leaves no weighable residue.

HYDRARGYRI THYMOLACETAS.—A white micro-crystalline powder, almost insoluble in Water. Has been used in syphilis internally, or as an intramuscular injection (10 p.c. in liquid paraffin or vaseline oil).

Dose.—½ to 1 grain = 0·032 to 0·06 gramme.

HYDRARGYRI IODIDUM RUBRUM.

MERCURIC IODIDE.

B.P.Syn.—Biniodide of Mercury.

HgI_2, eq. 450·60.

Fr., Bi-iodure de Mercure; Ger., Quecksilberjodid; Ital., Bijoduro di Mercurio; Span., Yoduro Mercurio.

Scarlet-red crystals, or a scarlet-red crystalline powder.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

It contains theoretically 44·1 p.c. of metallic Mercury.

Solubility.—Almost insoluble in Water; sparingly soluble in Glycerin; 1 in 300 of Alcohol (90 p.c.); 1 in 70 of Ether; 1 in 280 of Olive or Almond Oil or Lard; 1 in 50 of Castor Oil; insoluble in Paraffinum Molle; freely in an aqueous solution of Potassium Iodide or Mercuric Chloride.

Medicinal Properties.—Alterative. A powerful irritant poison in over-doses, similar to the Green Iodide, only much more active. It is used internally in the same cases as Corrosive Sublimate, more particularly in chronic glandular enlargements and rheumatism and cutaneous diseases when due to syphilis. As an antiseptic lotion (1 in 5000) in surgical and obstetric practice.

The Ointment is a most effective application for bronchocele, and a good application for warts and syphilitic nodes and for lupus. If applied to the eyelids, should be diluted to quarter the strength.

In infantile diarrhœa.—*Pr.* lv. 208; *P.J.* '95, ii. 215.

Has been used (*L.* '04, ii. 1396) in the form of a 1 in 1000 Chloroform solution for the sterilisation of cat-gut ligatures.

Recommended (*B.M.J.* '05, ii. 785) in the sterilisation of the hands before surgical operation; a 1 in 500 solution applied for two minutes by means of gauze, the hands being previously washed in a spirituous solution of green soft soap and very hot water, and dehydrated by means of gauze soaked in methylated spirit.

Dose.—$\frac{1}{32}$ to $\frac{1}{16}$ grain = 0·002 to 0·004 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Usually given in the form of* **Pilules** *well triturated with Milk Sugar and 'Diluted Glucose.' When prescribed in* **Solution** *it is dissolved by the aid of Potassium Iodide. It can also be dissolved in Castor Oil and given in Capsules.*

Official Preparation.—Unguentum Hydrargyri Iodidi Rubri. Used in the preparation of Liquor Arsenii et Hydrargyri Iodidi.

Not Official.—Hydrargyri et Potassii Iodidum, Injectio Hydrargyri Iodidi Rubri and Unguentum Hydrargyri et Potassii Iodidi (Lutz's Ointment).

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

Tests.—Mercuric Iodide becomes yellow when heated, but again assumes its scarlet colour on cooling; the *U.S.P.* specifies the temperature 150° C. (302° F.). When heated with Potassium Hydroxide Solution and a little Milk Sugar it yields a grayish precipitate of metallic Mercury. If this precipitate be well washed and dissolved in a mixture of Nitric and Hydrochloric Acid, it yields on neutralisation of the excess of acid the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. A portion of the filtrate, when slightly acidified with diluted Nitric Acid, yields with Silver Nitrate Solution a curdy yellow precipitate, insoluble in Nitric Acid, almost insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. Another portion of the filtrate acidified with Hydrochloric Acid affords, on the addition of Chlorine Water, or Sodium Nitrite Solution, a reddish-yellow colour, soluble to a violet coloured solution in Carbon Bisulphide. The *B.P.* states that when heated with excess of Copper it should yield from 43·5 to 44 p.c. of metallic Mercury, but gives no indication as to whether the Mercury is to be gravimetrically or volumetrically determined. The *U.S.P.* states that it should contain not less than 98·5 p.c. of pure Mercuric Iodide, but gives no method of determination.

The more generally occurring impurities are Mercurous Iodide, Mercuric Chloride, soluble Chlorides or Iodides, and mineral matter. The absence of Mercurous Iodide may be ensured by the ready and complete solubility of the specimen in Ether, and in Potassium Iodide Solution; Mercuric Chloride, by Alcohol (94·9 p.c.) and Litmus Test described below; soluble Chlorides and Iodides, by the Hydrogen Sulphide and the Silver Nitrate Tests also given. When ignited with free access of air the salt leaves no weighable residue.

Alcohol and Litmus.—The cooled alcoholic solution of the salt should be colourless, and should not redden blue Litmus paper, *P.G.*; a saturated solution of the salt in hot Alcohol (94·9 p.c.), when cooled and diluted with an equal volume of Water should not redden blue Litmus paper, *U.S.P.*

Hydrogen Sulphide.—If the salt be thoroughly agitated with Water (0·5 gramme with 10 c.c., *U.S.P.*) and filtered, the filtrate should be only slightly coloured by T.S. of Hydrogen Sulphide, *P.G.* and *U.S.P.*

Silver Nitrate.—The filtrate obtained as above should only be rendered slightly opalescent with T.S. of Silver Nitrate, *P.G.* and *U.S.P.*

Preparations.

UNGUENTUM HYDRARGYRI IODIDI RUBRI. Mercuric Iodide Ointment. *B.P. Syn.*—Ointment of Red Iodide of Mercury.

Mix 1 of Mercuric Iodide, in fine powder, with 24 of Benzoated Lard. (1 in 25)

Foreign Pharmacopœias.—Official in Fr., Mercuric Iodide 1, Lard 8; Mex., Pomada, 1 in 50. Not in the others.

Not Official.

HYDRARGYRI ET POTASSII IODIDUM.—Yellow acicular crystals. It is a powerful antiseptic.

INJECTIO HYDRARGYRI BINIODIDI (pro Vagina).—Mercuric Chloride 8 grains, Potassium Iodide 5 grains, Water to 1 fl. oz.; 1 fl. drm. to a pint of Water = 1 in 10,000.—*Lock.*

It requires 22 grains of the Potassium Iodide to form a solution.

INJECTIO HYDRARGYRI IODIDI RUBRI.—Red Iodide of Mercury, 5 grains; Iodide of Potassium, 20 grains; Water to 20 fl. oz..—*St. Bartholomew's.* (1 in 1750)

Mercuric Iodide, 1; Potassium Iodide, 4; Distilled Water, *q.s.* to produce 100. The dilution of this solution to 100 times its volume forms a 1 in 10,000 solution of Mercuric Iodide.—*B.P.C.*

UNGUENTUM HYDRARGYRI ET POTASSII IODIDI (Lutz's Ointment).—Red Mercuric Iodide, 5 grains; Potassium Iodide, 5 grains; Water, *q.s.*; Prepared Lard, 1 oz.

University has a similar preparation containing Wool Fat.

Not Official.

HYDRARGYRI IODIDUM VIRIDE.

GREEN IODIDE OF MERCURY. GREEN MERCUROUS IODIDE.

HgI, eq. 324·73.

A dull green powder containing excess of Mercury, which decomposes upon exposure to light.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

It has been shown (*P.J.* '00, ii. 87) that the intensity of the green colour naturally depends upon the relative proportions or excess of Mercury employed. The yellow Mercurous Iodide of the *U.S.P.* is shown to be quite uniform in composition and also sufficiently stable when properly protected. It is naturally for the therapeutist to decide whether a Mercurous Iodide containing more or less free Mercury is preferable to the pure salt for medicinal use.—*C.D.* '00, ii. 164; *P.J.* '00, ii. 86.

Solubility.—Insoluble in Water, Alcohol, and Ether.

Medicinal Properties.—Given in syphilis and in tubercular and rheumatic affections. Employed as an **ointment** (1 part to 8 of Lard) for syphilitic eruptions, chronic skin diseases, enlarged glands, and bronchocele.

Dose.—It varies with different prescribers from $\frac{1}{6}$ grain to 2 grains = 0·01 to 0·13 gramme.

Ital. maximum single dose, 0·05 gramme; maximum daily dose, 0·20 gramme.

$\frac{1}{4}$ or $\frac{1}{5}$ grain three times daily, increasing the dose slowly until constitutional effects are produced.—*L.* '01, ii. 1038.

Prescribing Notes.—*It makes a good pill with Sugar of Milk and 'Diluted Glucose.'*

Incompatible with soluble Iodides.—*C.D.* '92, ii. 275.

Foreign Pharmacopœias.—Official in Austr., Hung., Swiss and U.S., (Hydrargyrum Iodatum flavum); Belg. (Proto Ioduretum Hydrargyri); Dutch and Swed. (Iodetum Hydrargyrosum); Fr. (Protoiodure de Mercure); Ital. (Joduro Mercuroso); Jap., (Hydrargyrum Iodatum); Mex. (Yoduro Mercurioso); Port. (Iodeto Mercuroso); Swiss (Hydrargyrum Iodatum); Span. (Ioduro Mercurioso).

Tests.—Mercurous Iodide melts when heated, and is entirely volatilised at a red heat. Dissolved in Nitric Acid it yields a solution answering the tests characteristic of Mercury given under Hydrargyrum. Under the influence of light it undergoes decomposition, with formation of Mercuric Iodide and metallic Mercury. Heated with Manganese Dioxide and Sulphuric Acid it evolves violet vapours of Iodine. When shaken in a dry test-tube with purified Ether, filtered, and the Ether evaporated, no residue should remain indicating the absence of Mercuric Iodide.

The yellow Mercurous Iodide is official in the *U.S.P.* and is required to contain not less than 99·5 p.c. of pure Mercurous Iodide. The absence of more than traces of Mercuric Iodide is ensured by shaking 0·5 gramme of the salt with 10 c.c. of Alcohol (94·9 p.c.) allowing to stand, and filtering; portions of the perfectly clear filtrate should be scarcely affected by Hydrogen Sulphide, should yield only a faint opalescence when dropped into Water, and only a faint red stain when evaporated in a white porcelain dish.

PILULA HYDRARGYRI IODIDI VIRIDIS.—Green Mercurous Iodide, ½ grain; Opium, ¼ grain; Extract of Gentian, 2 grains.

PILULES D'IODURE MERCUREUX OPIACÉES. Pilules de Ricord (*Fr.*).—Recently prepared Mercurous Iodide, 0·5 gramme; Powdered Opium, 0·2 gramme; Liquorice Powder, 0·3 gramme; Honey *q.s.*; divide into 10 pills.

UNGUENTUM HYDRARGYRI IODIDI VIRIDIS CUM ATROPINA.—Green Mercurous Iodide, 10 grains; Atropine, 1 grain; Lard, ½ oz.

HYDRARGYRI NITRATIS LIQUOR ACIDUS.

ACID SOLUTION OF MERCURIC NITRATE.

A heavy, colourless, strongly acid solution, containing about 33 p.c. of Mercury in the form of Mercuric Nitrate. It is obtained by dissolving, in the cold, 4 (by weight) of Mercury in 5 of Nitric Acid diluted with 1½ of Water. It should be preserved in well-stoppered amber-tinted glass bottles.

Medicinal Properties.—Caustic and antiseptic. Applied to syphilitic warts, ulcers, etc.; care should be taken that the surrounding healthy parts are not touched. Used in cancerous growths and in lupus. As a **gargle**, 1 or 2 minims to 1 fl. oz. Water. As an **injection** in gonorrhœa, 1 minim to 2 fl. oz. Water.

Official Preparations.—Unguentum Hydrargyri Nitratis and Unguentum Hydrargyri Nitratis Dilutum contain Mercuric Nitrate.

Foreign Pharmacopœias.—Official in U.S. (Liquor Hydrargyri Nitratis) prepared from Mercuric Oxide, sp. gr. about 2·086 at 25° C. (77° F.); Fr. (Azotate de Bioxyde de Mercure Dissous), sp. gr. 2·246; Ital. (Nitrato Mercurico liquido), sp. gr. 2·250; Port. (Soluto de Azotato Mercurico); Span. (Nitrato Mercurico Acido), sp. gr. 2·246; Mex. (Nitrato Mercurico). Not in the others.

Tests.—Acid Solution of Mercuric Nitrate has a sp. gr. of about 2·0. It yields when diluted the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. Ferrous Sulphate Solution carefully poured on to the surface of the solution yields a dark brown ring at the point of contact of the two fluids. It should be free from Mercurous salts as ascertained by the non-appearance of a precipitate or cloudiness, when the solution is diluted with Water, or on the addition of diluted Hydrochloric Acid. When evaporated to dryness and ignited with free access of air no weighable residue should remain.

UNGUENTUM HYDRARGYRI NITRATIS. Mercuric Nitrate Ointment. *B.P.Syn.*—Ointment of Nitrate of Mercury. *N.O.Syn.*—Citrine Ointment.

Mercury (by weight), 1; Nitric Acid, 3; Lard, 4; Olive Oil (by weight), 7. Dissolve the Mercury in the Nitric Acid without the aid of heat, agitating gently from time to time. Heat the Lard and Olive Oil together on a sand-bath, so that the mixture when transferred to a heated earthenware jar, capable of holding 10 times the quantity, shall be at a temperature of about 290° F. (143·3° C.). Add the cold Mercurial Solution very gradually, stirring constantly to promote disengagement of the fumes. After frothing has ceased, the mixture, which should have a temperature of not less than 200° F. (93·3° C.), must be kept stirred until it is cold. The resulting Ointment should be firm in consistence and have a pale lemon colour.

(about 1 in $16\frac{1}{4}$)

The official directions given above do not work satisfactorily, the temperature is much too high and yields varying results with different operators, and even by the same operator at different times. The following method will yield a more uniform product.

Dissolve the Mercury in the Nitric Acid without the aid of heat. Heat the Lard and Oil on a water-bath, until the Lard is dissolved, and when at a temperature of 82·2° to 87·8° C. (180° to 190° F.) add the Mercuric Solution (cold) to the melted fats and stir continuously. When brisk effervescence has commenced continue the heat for 10 minutes, then remove from the water-bath and stir till cold.

The product should have a good consistence, and if kept in covered pots should retain its pale lemon colour for several months. In the hands of the author this method has never yielded a 'spongy' product. The heat should not be continued until all action has ceased, for the product will then be of a darker colour and blacken in the course of a week or two.—*P.J.* '97, i. 172; '98, ii. 165, 179, 232, 236; *C.D.* '98, i. 933; *A.J.P.* '97, 208, 232.

Two specimens made by the above process in 1898 were exhibited at an evening meeting in 1902 on account of their good condition of preservation. It is noted (*P.J.* '02, i. 314) that the two chief objections which have been raised to the Squire process are (*a*) that the Ointment must be, from the nature of the case, extremely acid, and (*b*) that however well stirred it is apt to be spongy. With regard to the former, it is shown that an Ointment prepared by the *B.P.* process contained the equivalent of 5·04 p.c. of Nitric Acid, whilst one prepared by 'Squire's process' indicated only 4·4 p.c.; with regard to the latter, the percentage of spongy batches was greater in the case of the Ointment made by the official than in that made by 'Squire's process.'

It is contended (*P.J.* '02, i. 350) the keeping properties of the above specimens were due to their initial excessive acidity, and that a specimen of Citrine Ointment should not necessarily be expected to retain its colour for a prolonged

period. Attention is again drawn to the fact (*P.J.* '02, i. 368) that an Ointment prepared by the *B.P.* 1898 process was more acid than one prepared by the Squire process, and that, with one or two exceptions, it is generally admitted that the latter gives more uniform results than the former process. It is still regarded (*P.J.* '02, i. 394) as inconceivable that a carefully made *B.P.* Ointment could by any possibility contain more acid than one made by 'Squire's process'; and an explanation is asked for a specimen assaying 2·1 p.c. of acid. For a refutation of the opinion respecting the comparative acidities the reader is referred (*P.J.* '02, i. 436) to the experiments recorded *P.J.* '02, i. 314. The Mercury has generally been assumed to exist in the state of Mercuric Nitrate, and hence, presumably, the name given to it in the *B.P.* A percentage of 2·1 corresponds very closely with Mercurous Nitrate.

Ointments prepared by the official process and by that recommended by the author have been critically compared (*P.J.* '04, ii. 736). When freshly prepared there was little difference in them, the official being slightly darker. After six weeks the official Ointment had become slightly spongy. After a further six weeks the official was distinctly darker. After nearly five months that made by the author's process was still pale yellow in colour, whilst the official was distinctly darker. Although there is little to choose between the two methods, yet the evidence is somewhat in favour of Squire's method. The experiments repeated with ingredients obtained from different sources showed, in each case, a slight advantage in favour of Squire's method.

Medicinal Properties.—Applied in diseases of the skin as a parasiticide; in tinea tarsi it is diluted with 7 parts of Vaseline and applied by means of a camel's-hair pencil to the eyelids. Diluted with Glycerin and applied by a brush to the nostrils in ozœna.

This Ointment, when diluted with Lard, soon acquires a leaden colour; it changes less with Spermaceti Ointment, and least of all when diluted with Soft Paraffin.

Incompatibles.—All reducing agents, Camphor, Essential Oils, Lard, etc.

Official Preparation.—Unguentum Hydrargyri Nitratis Dilutum.

Not Official.—Unguentum Metallorum, Unguentum Hydrargyri Zinci et Plumbi.

Foreign Pharmacopœias.—Official in Belg., Mercury 5, Nitric Acid 7, Lard 45, Olive Oil 43; Fr., Mercury 1, Nitric Acid (sp. gr. 1·394) 2, Lard 10, Olive Oil 10; Mex., Mercury 4, Nitric Acid 6, Lard 64; Port., Sol. Mercuric Nitrate 2, Lard 9, Olive Oil 9; Swed., Mercury 1, Nitric Acid (sp. gr. 1·5) 2, Lard 12; U.S., Mercury 7, Nitric Acid (sp. gr. 1·414) 17·5, Lard 76.

UNGUENTUM HYDRARGYRI NITRATIS DILUTUM.

Diluted Mercuric Nitrate Ointment. *B.P.Syn.*—Diluted Ointment of Nitrate of Mercury.

Mix 1 of Mercuric Nitrate Ointment with 4 of yellow Soft Paraffin. (1 in 5)

It is more dilute than *B.P.* '85.

Not Official.

UNGUENTUM METALLORUM.—Mercuric Nitrate Ointment, Lead Acetate Ointment, Zinc Ointment, equal parts.—*King's and Great Northern.*

UNGUENTUM HYDRARGYRI ZINCI ET PLUMBI. *Syn.*—Unguentum Metallorum.—Mercurous Chloride, 10 grains; Mercuric Nitrate Ointment, 20 grains; Lead Acetate, 10 grains; Zinc Oxide, 20 grains; Soft Paraffin (yellow), to 1 oz.—*St. Thomas's.*

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

Mercurous Chloride, 2; Mercuric Nitrate Ointment, 4; Lead Acetate, in powder, 2; Zinc Oxide, finely sifted, 4; Soft Paraffin (yellow), sufficient to produce 100.

HYDRARGYRI OLEAS.

MERCURIC OLEATE.

Fr., Oléate de Mercure; Ger., Oelsaures Quecksilber.

A brownish-yellow semi-solid oleaginous mass when fresh, but becoming of a stiffer consistence and darker colour on keeping, it should therefore be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible. It is the precipitate obtained on mixing solution of Mercuric Chloride and Hard Soap.

An Oleate containing 20 p.c. is readily made as follows:—Mercuric Oxide (finely powdered), 4; Oleic Acid (by weight), 16; Ether (0·720), 1. Mix the Oxide of Mercury with the Ether and stir in rapidly the whole of the Oleic Acid, warm to 120° F., stirring frequently until the Oxide is dissolved. The operation should be complete in 1 to 2 hours.

This method has been incorporated in the *B.P.C.* under the title Oleinatum Hydrargyro.

A reversion to the method of direct combination of Mercuric Oxide and Oleic Acid has been recommended.

Mercuric Oleate was introduced by Prof. Marshall in 1872, and was made of three different strengths, containing respectively 5 p.c., 10 p.c., and 20 p.c. of Mercuric Oxide.

The 5 p.c. very quickly changed to a black colour, owing to reduction of the Mercuric Oxide; the 10 p.c. kept better, but not very long without change. It is better to keep the 20 p.c. and dilute it when required for use.

The Mercuric Oleate of the *U.S.P.* is prepared by the interaction of yellow Mercuric Oxide and Oleic Acid.

Medicinal Properties.—Similar to those of Mercury Ointment and Liniment, but more easily absorbed. Used with great success in tubercular peritonitis. Has been strongly recommended as an application for persistent inflammation in the joints or other parts near the surface, more particularly when combined with Morphine. It is useful, spread on lint and placed in the axilla, for syphilis; also as an application for non-ulcerated syphilitic indurations. A good application for pityriasis versicolor and for killing pediculi.

Official Preparation.—Unguentum Hydrargyri Oleatis.

Not Official.—Hydrargyri Oleas c. Morphina.

Foreign Pharmacopœias.—Official in Jap., Mex. and U.S. Not in the others.

Tests.—Mercuric Oleate heated with a piece of bright Copper foil and a little dilute Hydrochloric Acid deposits a film of metallic Mercury. When dissolved in Ether shaken with diluted Nitric Acid, and the aqueous acid portion separated, the latter yields the tests distinctive of Mercuric salts given under Hydrargyri Perchloridi. The washed ethereal liquid transferred to a flask, the Ether removed by distillation leaves a residue which consists mainly of Oleic Acid. A method for the determination of the Mercury is described *Y.B.P.* '01, 200. A weighed quantity of 2 grammes of the Oleate is weighed into a small tared beaker and stirred with 10 c.c. of Ether until completely disintegrated, 25 c.c. of Alcohol (90 p.c.) and 5 c.c. of Hypophosphorous Acid (30 p.c.) are then added and the whole retained on a water-bath until the reduced Mercury completely subsides leaving the fatty matter in

solution. The liquid is poured off, the precipitate washed by decantation successively with Alcohol (90 p.c.) and Ether, the beaker and Mercury dried at 100° C. (212° F.), cooled and weighed. The weight multiplied by 50 yields the percentage w/w of metallic Mercury. The official Oleate was found to contain 23 p.c. The Oleate should leave no weighable residue upon ignition; when shaken with Water and filtered, the filtrate yields only a faint opalescence with Silver Nitrate Solution, and no marked darkening in colour with Hydrogen Sulphide.

Preparation.

UNGUENTUM HYDRARGYRI OLEATIS. MERCURIC OLEATE OINTMENT.

Mercuric Oleate, 1; Benzoated Lard, 3.

Not Official.

HYDRARGYRI OLEAS C. MORPHINA is made by dissolving 1 grain of Morphine alkaloid in each drm. of Mercuric Oleate (10 p.c.).

HYDRARGYRI OXIDUM FLAVUM.

YELLOW MERCURIC OXIDE.

HgO, eq. 214·68.

FR., OXYDE DE MERCURE JAUNE; GER., GELBES QUECKSILBEROXYD; ITAL., OSSIDO GIALLO DI MERCURIO; SPAN., OXIDO MERCURIO AMARILLO.

An orange-yellow heavy amorphous powder, being the precipitate obtained from solutions of Mercuric Chloride and Sodium Hydroxide. It is important that it should be protected from light.

Solubility.—Practically insoluble in Water or Alcohol (90 p.c.). Asparagin dissolves the freshly precipitated Oxide (*see* p. 125) to form **Mercury-Asparagin.**

Medicinal Properties.—Similar to Red Mercuric Oxide.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Official Preparation.—Unguentum Hydrargyri Oxidi Flavi.

Foreign Pharmacopœias.—Official in Austr., Hung., Jap. and Swiss, (Hydrargyrum Oxydatum Flavum); Belg. (Oxydum Hydrargyri Flavum); Dan. and Dutch (Oxydum Hydrargyricum Flavum); Fr. (Oxyde de Mercure Jaune); Ger. and Russ. (Hydrargyrum Oxydatum viâ Humidâ Paratum); Ital. (Ossido Mercurico Giallo; Norw. (Oxidum Hydrargyricum Flavum); Mex. and Span. (Oxido Mercurico Amarillo); Swed. (Oxydum Hydrargyricum Præcipitatum); U.S. (Hyd. Oxid. Flav.).

Tests.—Yellow Mercuric Oxide when gently heated assumes a red colour, and at a dull red heat it is completely decomposed into metallic Mercury and Oxygen, the presence of the latter can be demonstrated by placing the glowing end of a match into the vessel in which it is being heated; the match immediately igniting. The Oxide is readily and completely soluble in diluted Hydrochloric Acid,

yielding a solution which answers the tests distinctive of Mercuric salts given under Hydrargyri Perchloridi. The *B.P.* requires that the proportion of metallic Mercury obtained, presumably when heated to incipient redness, should be 92 to 92·5 p.c., corresponding to 99·3 to 99·9 p.c. of pure Yellow Mercuric Oxide, but does not state how the Mercury is to be collected or determined. The *U.S.P.* states that it should contain not less than 99·5 p.c. of pure Yellow Mercuric Oxide, but does not give a method of determination. The *P.G.* gives neither a percentage nor method of determination.

It may be distinguished from the Red Oxide by digestion for 15 minutes on a water-bath with twice its weight of Oxalic Acid dissolved in a small quantity of Water, when it will be converted into white Mercuric Oxalate. The *P.G.* test directs agitation with a 1 in 10 Oxalic Acid Solution.

The more generally occurring impurities are fixed residue, Chlorides, foreign salts, Arsenic, and foreign metals. The *B.P.* examines only for fixed residue. It is required to yield only an insignificant amount when heated to incipient redness; the *U.S.P.* states that at a red heat it is finally volatilised, leaving not more than 0·1 p.c. of residue; the *P.G.* that 0·2 gramme shall leave at most a residue which cannot be weighed. The solution in diluted Nitric Acid should yield only the slightest opalescence with Silver Nitrate Solution, indicating the absence of Chlorides. Foreign salts, metals, and Arsenic may be detected by the tests given under Hydrargyri Subchloridum.

Oxalic Acid.—When it is agitated with Oxalic Acid Solution (1–10) it is gradually converted into a white crystalline powder, *P.G.*; when 0·5 gramme of Oxide and 1 gramme of Acid in 10 c.c. of Water is digested on a water-bath for 15 minutes the Oxide is converted into white Mercuric Oxalate (distinction from Red Mercuric Oxide), *U.S.P.*

Silver Nitrate.—A solution in dilute Nitric Acid (1–50) should be clear and should not afford more than slight opalescence with T.S. of Silver Nitrate, *P.G.*; 0·1 gramme of Oxide dissolved in 10 c.c. of diluted Nitric Acid should not afford more than a slight opalescence with Silver Nitrate Solution, *U.S.P.*

If 0·5 gramme of the Oxide be dissolved in a mixture of 2 c.c. of Hydrochloric Acid and 25 c.c. of Water, the solution should not respond to the *U.S.P.* tests for foreign salts, metals or Arsenic given under Hydrargyri Subchloridum, *U.S.P.*

Preparation.

UNGUENTUM HYDRARGYRI OXIDI FLAVI.—Yellow Mercuric Oxide Ointment.

Yellow Mercuric Oxide, in very fine powder, 10 grains; Yellow Soft Paraffin, 490 grains. (1 in 50)

Medicinal Properties.—Used in cases of chronic eczema, pityriasis, ringworm, chronic lichen, and syphilitic eruptions.

Diluted with an equal or twice the quantity of Vaseline, is a most valuable remedy for ophthalmia tarsi, corneal ulceration, and all forms of conjunctival inflammation.

A 4 p.c. Ointment of the Yellow Oxide in keratitis profunda.—*B.M.J.* '04, ii. 1303.

Several formulas are given in the Pharmacopœias of the London Hospitals containing from 2 to 60 grains to the oz.

Foreign Pharmacopœias.—Official in Belg., Yellow Oxide 1, Vaseline 49; Dutch, Yellow Oxide 1, White Vaseline 19; Fr. (Pommade d'Oxyde de Mercure Jaune), Yellow Oxide 1, Vaseline 19; Mex. (Pomada de Oxido Amarillo de Mercurio), Yellow Oxide 1, Vaseline 15; Ital. (Pomata di ossido giallo di mercurio), Yellow Oxide 1, Vaseline 15⅔; Jap., Yellow Oxide 1, Vaseline 9; Russ., Yellow Oxide 1, Lard 49; Span., Yellow Oxide 1, Vaseline 19; Swiss, Freshly precipitated Mercuric Oxide 5 in Water 15, Wool Fat 20, Vaseline 60; U.S., Yellow Mercuric Oxide 1, Water 1, Hydrous Wool Fat 4, Petrolatum, 4.

HYDRARGYRI OXIDUM RUBRUM.

RED MERCURIC OXIDE.

HgO, eq. 214·68.

Fr., Oxyde de Mercure Rouge; Ger., Quecksilberoxyd; Ital., Ossido Mercurico Rosso; Span., Oxido Mercurico Rojo.

Orange-red crystalline scales, or heavy crystalline orange-red powder, prepared from Mercurous Nitrate.

It should be kept in well-closed glass bottles of an amber tint and protected as far as possible from the light.

Solubility.—Insoluble in Water and Alcohol (90 p.c.); readily soluble in Hydrochloric Acid.

Medicinal Properties.—A powerful irritant, rarely used internally. Employed in form of ointment, *q.v.*

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Official Preparation.—Unguentum Hydrargyri Oxidi Rubri.

Foreign Pharmacopœias.—Official in U.S.; Belg. (Oxydum Hydrargyri Rubrum); Dan., Dutch and Norw. (Oxydum Hydrargyricum); Fr. (Oxyde de Mercure Rouge); Ger. and Swiss (Hydrargyrum Oxydatum); Ital. (Ossido Mercurico Rosso); Jap. (Hydrargyrum Oxydatum Rubrum); Mex. (Oxido Mercurico); Port. (Oxydo Mercurico); Russ. (Hydrargyrum Oxydatum Levigatum); Span. (Oxido Mercurico Rojo). Not in Austr. or Hung.

Tests.—Red Mercuric Oxide undergoes change of colour when heated, turning a dark violet or almost black, but regains its original orange-red colour on cooling. The *U.S.P.* specifies a temperature 400° C. (752° F.). At a red heat it is decomposed into metallic Mercury and Oxygen, the presence of the latter can be ascertained in the same way as described under Hydrargyri Oxidum Flavum. It is readily and completely soluble in diluted Hydrochloric Acid, yielding a faintly opalescent solution which answers the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. It is officially required to answer the tests given in the *B.P.* under Hydrargyrum Oxidum Flavum, consequently the same remarks as are there made respecting the requisite official percentage of Mercury apply also here. The *U.S.P.* requires it to contain not less than 99·5 p.c. of pure Red Mercuric Oxide, but gives no method of determination. The *P.G.* gives neither a percentage nor a method of determination. It may be distinguished from the Yellow Oxide by remaining unaltered when

treated with Oxalic Acid Solution. The *U.S.P.* digests the Oxide with Oxalic Acid and a small quantity of Water on a water-bath, requiring that it shall undergo no change in colour in 2 hours. The *P.G.* repeatedly agitates the Oxide with a 10 p.c. w/w Oxalic Acid Solution, when it should not undergo material change in 15 minutes. The *B.P.* does not include a similar test. The respective tests will be found in detail in small type below.

The more generally occurring impurities are fixed residue, Chlorides, Nitrates, metals, foreign salts, or Arsenic. The *B.P.* requires that it shall leave only an insignificant amount of fixed residue when heated to incipient redness; the *U.S.P.* that it leaves no appreciable residue at a red heat; the *P.G.* that 0·2 gramme shall at most leave a residue which cannot be weighed. Its solution in diluted Nitric Acid should yield only a slight opalescence at the most, with Silver Nitrate Solution. No test for Chlorides is included in the *B.P.* The *B.P.* test for Nitrates requires that it should not evolve orange fumes when heated in a dry test-tube; the *U.S.P.* and *P.G.* employ the Ferrous Sulphate and Sulphuric Acid Test. Metals, foreign salts, or Arsenic may be detected as described under Hydrargyri Subchloridum.

Oxalic Acid.—When Red Mercuric Oxide is repeatedly agitated with Oxalic Acid Solution (1–10) it should not undergo any material change in colour in 15 minutes, *P.G.*; 0·5 gramme of Oxide and 1 gramme of Oxalic Acid in 10 c.c. of Water, digested on a water-bath, the Mercuric Oxide should not change in colour in 2 hours, *U.S.P.*

Sulphuric Acid and Ferrous Sulphate.—If 1 gramme of Red Mercuric Oxide be mixed with 2 c.c. of Water and 2 c.c. of Sulphuric Acid added, on the further addition of 1 c.c. of Ferrous Sulphate T.S. poured carefully upon it, there should be no coloured zone at the junction of the liquids even after standing for some time, *P.G.*; 1 gramme mixed with 5 c.c. of Water and 2 c.c. of Sulphuric Acid, cooled, and 2 c.c. of Ferrous Sulphate T.S. carefully poured on it no brown-coloured zone should be developed at the line of contact on standing, *U.S.P.*

Silver Nitrate.—The solution of the Oxide (1–50) obtained by means of a dilute Nitric Acid should be clear and should only become slightly opalescent with T.S. of Silver Nitrate, *P.G.*; 0·1 gramme of the Oxide dissolved in 10 c.c. of diluted Nitric Acid should not produce more than a slight opalescence with T.S. of Silver Nitrate, *U.S.P.*

Preparations.

UNGUENTUM HYDRARGYRI OXIDI RUBRI. Red Mercuric Oxide Ointment. *B.P. Syn.*—Red Precipitate Ointment.

Red Mercuric Oxide, in very fine powder, $\frac{1}{4}$; Yellow Paraffin Ointment, $2\frac{1}{4}$. (1 in 10)

Medicinal Properties.—Stimulant for chronic ulcers and caustic for unhealthy granulations and soft warts; skin parasiticide. Much diluted, is used for ulcerations of the cornea and chronic ophthalmia, but the Ointment of the Yellow Oxide is preferred by many.

Foreign Pharmacopœias.—Official in Belg., 1 in 50; Dan., Dutch, Fr., Norw., Port. and Swiss, 1 in 20; Mex., Ger. and Ital., 1 in $16\frac{2}{3}$; Jap., Span. and U.S., 1 in 10; Russ., with Yellow Oxide (p. 619). Not in Austr., Hung. or Swed.

HYDRARGYRI PERCHLORIDUM.

MERCURIC CHLORIDE.

$HgCl_2$, eq. 269·18.

FR., BICHLORURE DE MERCURE; GER., QUECKSILBERCHLORID; ITAL., BICHLORURO DI MERCURIO; SPAN., CLORURO MERCURIO.

B.P.Syn.—BICHLORIDE OF MERCURY; CORROSIVE SUBLIMATE; PERCHLORIDE OF MERCURY.

N.O.Syn.—Chloretum Hydrargyricum, Hydrargyrum Bichloratum, Sublimatus Corrosivus.

Heavy, colourless, rhombic crystals, or in crystalline masses, or a heavy white crystalline powder.

Odourless, and possessing a particularly acrid and persistent metallic taste but should only be tasted with extreme caution.

Solubility.—1 in 19 of Water; 1 in 5 of Alcohol (90 p.c.); 1 in 3 of Absolute Alcohol; 1 in 6 of Ether, *B.P.* (0·735); 1 in 11 of Purified Ether (0·720); 8 in 13 of Glycerin.

Medicinal Properties.—A powerful antiseptic and very poisonous; disinfectant, escharotic, alterative; given in very small doses in syphilitic affections, and in syphilitic and non-syphilitic skin diseases. Externally as a **lotion,** 1 grain to the fl. oz., or **ointment,** 2 to 8 grains in the oz., in chronic and parasitic skin diseases, and in acne and freckles; a solution of 1 in 1000 is used for syphilitic ulcers; as an ordinary surgical dressing and in obstetric practice 1 in 2000 to 5000 is sufficient; as an **injection,** 1 grain to 8 fl. oz., for chronic discharges, such as leucorrhœa and gonorrhœa; and as a **gargle,** 1 grain in 4 fl. oz., for ulcerated and syphilitic sore throat; as a **collyrium,** 1 grain in 8 fl. oz. For syphilis by **hypodermic injection,** $\frac{1}{30}$ to $\frac{1}{10}$ grain (with Sodium Chloride), in divided portions in the course of the day. As a local application in diphtheria.

An aqueous solution of 1 in 1000 is employed for disinfecting the hands, towels, sponges, etc., in operative surgery; it corrodes surgical instruments. A solution of the same strength is used for washing infected rooms, furniture and other articles, and for soaking infected linen. The solution is often coloured with aniline blue or methyl violet to guard against its being mistaken for water or other harmless fluid.

The disadvantages of Mercuric Chloride as a disinfectant and antiseptic are due (1) to its forming with albumen an inert and insoluble compound, (2) to its corrosive action on metals, and (3) to its being a powerful poison.

To prevent its antiseptic value being destroyed by the formation of an albuminate, five parts of Tartaric or Hydrochloric Acid should be added to each part of Mercuric Chloride.

In France it is legal to supply registered nurses (for obstetric purposes) with a lotion containing 0·025 gramme Mercuric Chloride and 1 gramme Tartaric Acid per litre, also an ointment containing 1 p.c. in Vaseline.—*A.J.P.* '90, 180.

As a disinfectant of enteric or other infectious stools and urine, an equal quantity of a 1 in 500 acidulated solution should be used. They should be thoroughly mixed and left in contact for at least 2 hours before they are finally disposed of.

Recommended for dysentery in India, $\frac{1}{175}$ grain every 4 hours.—*L.* '89, ii. 901.

Injection of Corrosive Sublimate solution in hydrocele.—*L.* '97, ii. 594; in tetanus.—*B.M.J.* '97, i. 138; in lupus.—*B.M.J.E.* '96, i. 52; and in other forms of tuberculosis.—*B.M.J.E.* '96, i. 71.

A handy and trustworthy preparation for use as hypodermic injection in syphilis is:—Mercury Perchloride, 1 grain; Glycerin, 1 fl. drm.; Distilled Water, 1 fl. drm. A stable preparation which can be kept for several days or weeks. 10 minims of the solution = $\frac{1}{12}$ grain Mercuric Chloride.—*L.* '01, ii. 1038.

Mercuric Chloride and Sodium Chloride of each, 1·2 grammes; in 189 c.c. Water. 2 c.c. injected daily for 2 weeks, a day's interval after six injections (*Hillier*).—*M.A.* '02, 42. Great objection to the intramuscular injection of Perchloride is the pain caused by it, which is often considerable.—*L.* '01, ii. 522.

$\frac{1}{12}$ grain three times a day in the treatment of lichen planus.—*B.M.J.E.* '01, ii. 64.

Mercurial salts are the most efficient antiseptic agents we possess in surgical practice, and it may be argued that the therapeutic action of Mercury when administered internally is to be accounted for to a great extent by its antiseptic property. Mercuric Chloride is most valuable as a bactericide in the treatment of scarlet fever.—*B.M.J.* '03, ii. 231.

With regard to fluid disinfectants, a 1 in 1000 solution of corrosive sublimate with 24 hours' exposure, destroyed all microbes, including the spores of anthrax, and the tubercle bacilli. Anthrax spores were only destroyed with certainty by Mercuric Chloride. Report on the practical experiments on disinfection undertaken for the London County Council.—*L.* '02, i. 758; *B.M.J.* '02, i. 792.

$\frac{1}{4}$ grain dissolved in $2\frac{1}{2}$ oz. of Water, injected into the pleural cavity, after tapping, in a case of empyema.—*B.M.J.* '03, i. 78.

Experiments in intravascular antisepsis. That Mercury Perchloride, Mercury Oxycyanide and Protargol cannot be injected intravenously into rabbits in sufficient strength to produce an antiseptic effect lasting several days.—*L.* '03, i. 99.

Three to five injections of a 5 p.c. solution have been successfully given intramuscularly in infantile syphilis in 40 cases (*B.M.J.E.* '04, ii. 60). 3-minim doses of the Liquor can be given in syphilis to an infant one month old, 5 to 10 minims three times daily for an infant six months old (*L.* '04, ii. 1405).

In the sterilisation of the hands for surgical operations. A preliminary wash with soap and hot water, followed by rubbing the hands with Sublimate Alcohol 1 in 1000, and then polishing with a dry sterile cloth shown (*B.M.J.* '05, ii. 781) to be the most efficient.

One c.c. of a solution containing Mercury Perchloride, 1 gramme; Sodium Chloride pure, 10 grammes; Distilled Water, 100 grammes, representing a dose of 1 centigramme injected intramuscularly in syphilis (*M.P.* '06, i. 148); the dose may be increased to 2 centigrammes daily for 20 days.

Dose.—$\frac{1}{32}$ to $\frac{1}{16}$ grain = 0·002 to 0·004 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Generally prescribed in the form of the* **Liquor** *or given in* **pills** *well triturated with Milk Sugar and massed with 'Diluted Glucose.'*

Compressed Discs are prepared for making an antiseptic solution 1 in 1000, *see* Not Official.

Incompatibles.—Alkalis and their Carbonates, Lime Water, Tartar Emetic, Silver Nitrate, Lead Acetate, Albumen, Soaps, Decoction of Cinchona, Tannin, Alkaline Sulphides. Potassium Iodide converts it into Mercuric Iodide, soluble in excess.

Official Preparations.—Liquor Hydrargyri Perchloridi, and Lotio Hydrargyri Flava. Used in the preparation of Hydrargyri Oleas, Hydrargyri Oxidum Flavum, and Hydrargyrum Ammoniatum.

Not Official.—Corrosive Sublimate Discs, Sublimate Wood Wool, Sublimate Gauze, Sublimate Wool, Injectio Hydrargyri Hypodermica, Injectio Sal Alembroth Hypodermica, Liquor Hydrargyri et Ammonii Chloridi, Lotio Hydrargyri Acetica, Lotio Hydrargyri Perchloridi, Lotio Hydrargyri Perchloridi Acida, Preservative Solution, Poudre de Sublimé Corrosif et d'Acide Tartrique, Sal Alembroth.

Antidotes.—In poisoning by Corrosive Sublimate, raw eggs should be administered in large quantity; flour with milk may also be given; the stomach should then be washed out or an emetic employed.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Hydrargyrum Bichloratum Corrosivum); Belg. (Sublimatus Corrosivus); Dan., Norw. and Swed. (Chloretum Hydrargyricum Corrosivum); Dutch (Chloretum Hydrargyricum); Fr. (Bichlorure de Mercure); Ger., Jap., Russ. and Swiss (Hydrargyrum Bichloratum); Ital. (Bichloruro di Mercurio); Port. (Chloreto Mercurico); Mex. and Span. (Cloruro Mercurico); U.S. (Hydrargyri Chloridum Corrosivum).

Tests.—Mercuric Chloride dissolves in Water, forming a solution which yields with Ammonia Solution a white precipitate; with excess of Hydrogen Sulphide Solution a black precipitate insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid; with Potassium or Sodium Hydroxide Solution a yellow precipitate; with Potassium Iodide Solution a brilliant scarlet precipitate, soluble in an excess of the reagent or in a considerable excess of the Mercuric Chloride Solution. An aqueous solution, when boiled with Copper foil, gives a grey deposit, which assumes a silvery lustre on being rubbed. Potassium or Sodium Hydroxide Solution does not produce a precipitate in a Glycerin Solution; in solutions containing both Glycerin and Potassium or Sodium Hydroxide, Ammonium Hydrosulphide Solution produces no precipitate. With Silver Nitrate it affords a white precipitate, which when filtered and washed is insoluble in Nitric Acid but dissolves readily in Ammonia Solution.

It is officially required to yield 72·8 to 73·8 p.c. of metallic Mercury, corresponding to 98·57 to 99·92 p.c. of pure Mercuric Chloride, when heated with excess of Lime. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Mercuric Chloride, but gives no method for its quantitative determination. The *P.G.* gives neither a requisite percentage nor a method of determination. Mercuric Chloride contains theoretically 73·8 p.c. of metallic Mercury.

The more generally occurring impurities are fixed residue, foreign salts, Arsenic, and metals other than Mercury. The specimen should leave, after sublimation, according to the *B.P.* only a trace of fixed residue, according to the *U.S.P.* no appreciable residue, and according to the *P.G.* it first fuses and is then completely volatilised. Foreign salts may be detected in the filtrate after precipitation of the Mercury with Hydrogen Sulphide as described below under the Hydrogen Sulphide Test. Arsenic, if present, is also precipitated as Sulphide and may be extracted by digestion with Ammonia Solution, the filtered liquid being evaporated to dryness, moistened with 6 drops of Nitric Acid, dried and examined by the Modified Gutzeit's Test. Heavy metals other than Mercury may be detected by treating the Sulphide insoluble in Ammonia Solution with diluted Nitric Acid,

filtering, evaporating the filtrate to dryness, and igniting, when no weighable residue should remain. It should be readily and completely soluble in Ether.

Alcohol or Water.—If 1 gramme of the finely powdered salt be dissolved in 10 c.c. of Alcohol (94·9 p.c. by volume) or 20 c.c. of Water, it should leave not more than 0·005 gramme of residue, *U.S.P.*

Hydrogen Sulphide.—If to 0·5 gramme of the salt dissolved in 20 c.c. of Water, 5 c.c. of Hydrochloric Acid be added, and the solution be completely saturated with Hydrogen Sulphide, allowed to stand for several hours in a well-corked flask until the precipitate has subsided, and then filtered, the filtrate should be colourless, and leave no weighable residue upon evaporation, *U.S.P.*

Modified Gutzeit's Test.—The precipitate obtained in the preceding paragraph, after washing with about 100 c.c. of Water, and draining, is rinsed into a beaker with 20 c.c. of Water, and then 5 c.c. of stronger Ammonia Water (sp. gr. 0·897 at 25° C. (77° F.)) added. If, after covering and digesting this mixture for about 15 minutes on a bath of boiling Water, it be rinsed upon a filter, and washed with a little Water, the filtrate and washings, after evaporating to dryness, moistening with 6 drops of Nitric Acid, and again drying, should not respond to the Modified Gutzeit's Test for Arsenic, *U.S.P.*

Preparations.

LIQUOR HYDRARGYRI PERCHLORIDI. Solution of Mercuric Chloride.

1 grain of Mercuric Chloride, dissolved in 2 fl. oz. of Distilled Water. (1 in 875)

Contains $\frac{1}{16}$ grain in 1 fl. drm. Ammonium Chloride now omitted.

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

Ital. maximum single dose, 20 grammes; maximum daily dose, 100 grammes.

Foreign Pharmacopœias.—Official in Belg. (Liquor Sublimati Corrosivi (Van Swieten); Fr. (Soluté de Chlorure Mercurique); Ital. (Soluzione Idroalcoolica di Bicloruro di Mercurio); Port. (Soluto de Chloreto Mercurico); all 1 in 1000; Mex. (Solucion de Van-Swieten), 1 in 1000, containing 10 p.c. of Alcohol (80°); Span. (Solucion Hidro-Alcoholica de Cloruro Mercurico), 1 in 1000. Not in the others.

LOTIO HYDRARGYRI FLAVA. Yellow Mercurial Lotion. *B.P.Syn.*—Yellow Wash.

Mercuric Chloride, 20 grains; Solution of Lime, 10 fl. oz. (1 in 219)

Now 2 grains to the fl. oz.

This lotion owes its efficacy to the precipitated Mercuric Oxide, and is used for the same purposes as Mercuric Oxide Ointment.

Foreign Pharmacopœias.—Official in Mex. (Agua Fagédenica Roja), 1 in 600. Not in the others.

Not Official.

CORROSIVE SUBLIMATE DISCS.—Compressed discs containing 8¾ grains of Mercuric Chloride, with an equal weight of Sodium Chloride, and coloured with Methyl Violet.

One disc dissolved in a pint of Water forms a solution containing 1 of Mercuric Chloride in 1000.

One pint of London Water with 10 grains of Mercuric Chloride makes a clear solution, also with the addition of 10 grains of Sodium Chloride; but with 10 grains of Ammonium Chloride it is very turbid. The latter, therefore, should not be used in making the discs.

Foreign Pharmacopœias.—Official in Austr., Ger., Ital., Jap. and Sweden, 1 and 2 grammes, red. All made with a mixture of equal parts of Mercuric and Sodium Chlorides. Dutch, 1 gramme, blue.

POUDRE DE SUBLIMÉ CORROSIF ET D'ACIDE TARTRIQUE (*Fr.*).—Powdered Mercuric Chloride, 2·5 grammes; Powdered Tartaric Acid, 10 grammes; Solution of Soluble Indigo (5 p.c.), 10 drops. Mix to a uniform tint, dry, and divide into ten packets. The contents of each packet, when dissolved in a litre of Water, gives a solution 1 in 4000.

LIQUOR HYDRARGYRI ET AMMONII CHLORIDI.—Mercuric Chloride, 10; Ammonium Chloride, 10; Tartaric Acid, 10; Distilled Water, *q.s.* to make 100.—*B.P.C.*

The addition of Tartaric Acid is necessary to prevent precipitation on diluting the solution with ordinary Water.—*B.P.C.*

The two Chlorides dissolve in the Water, but immediately after the addition of the Tartaric Acid a precipitate is formed.

The addition of Tartaric Acid to solution of Mercuric Chloride to prevent the formation of insoluble albuminous compounds when applied to animal tissues.—*B.M.J.* '88, i. 148.

Dott called attention to the reduction of the Mercuric Chloride by Tartaric Acid in dilute solution.—*P.J.* '89, i. 841.

LOTIO HYDRARGYRI ACETICA.—Mercuric Chloride, 1; Acetic Acid, 75; Glycerin, 75; Alcohol (90 p.c.), 250; Rose Water, 500.—*Martindale.*

To destroy pediculi and detach their ova.

Mercuric Chloride, 0·20; Acetic Acid, 8; Glycerin, 8; Alcohol, 27·50; Rose Water, *q.s.* to produce 100.—*B.P.C.*

LOTIO HYDRARGYRI PERCHLORIDI (1 in 500).—Mercuric Chloride, 1 oz.; Water to 500 fl. oz. To be diluted with one to ten parts of Water as directed. Usually tinted with fuchsin or methylene blue.—*St. Thomas's.*

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

LOTIO HYDRARGYRI PERCHLORIDI ACIDA.—Mercuric Chloride, 1 oz.; Hydrochloric Acid (strong), 25 fl. oz.; Water to 500 fl. oz. This is used only as a disinfectant for excreta.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* under the title **Solutio Hydrargyri Perchloridi Acida.**

SUBLIMATE WOOD WOOL.—Pinewood almost in a state of powder, containing ½ p.c. of Corrosive Sublimate. It is highly absorbent.

SUBLIMATE WOOL (*Ital.*).—Absorbent Wool containing 1 of Mercuric Chloride in 400.

SUBLIMATE GAUZE (*Fr.*).—Prepared Gauze containing 0·1 to 0·5 p.c. of Corrosive Sublimate.

INJECTIO HYDRARGYRI HYPODERMICA.—Mercuric Chloride, ½ grain; Sodium Chloride, pure, 5 grains; Water to 1 drm.

Dose.—4 to 12 minims = $\frac{1}{30}$ to $\frac{1}{10}$ grain in divided portions in the course of one day.

PRESERVATIVE SOLUTION (for Anatomical subjects).—Corrosive Sublimate, 10 grains; Glycerin, 21 fl. oz.; Methylated Spirit, *q.s.* to make 80 fl. oz. For injection into the femoral artery.

SAL ALEMBROTH. — Mercuric Ammonium Chloride, $2NH_4Cl.HgCl_2.H_2O$, eq. 393·32. *Syn.* Ammonio-Mercuric Chloride, Salt of Wisdom, Sel de la Sagesse ou de la science.

White rhombic prisms or tabular crystals, which readily part with their Water of crystallisation when exposed to dry air.

It contains theoretically 50·5 p.c. of metallic Mercury.

Solubility.—2 in 1 of Water, 1 in 3½ of Alcohol (90 p.c.), 1 in 1 of Glycerin.

Medicinal Properties.—A powerful antiseptic, but it is not so irritating as Corrosive Sublimate. Used in the antiseptic treatment of wounds

For **Hypodermic** injection in syphilis, ½ grain dissolved in 10 minims of Water.—*B.M.J.* '88, i. 905.

Alembroth **Gauze**, 1 p.c.; **Wool**, 2 p.c.; they are tinted with aniline blue, and as the colour is bleached by purulent discharge, soakage of the dressing is readily noted.

Injectio Sal Alembroth Hypodermica.—Mercuric Chloride 32 grains Ammonium Chloride 16 grains, Distilled Water 2 fl. oz.—*Lock.*

Dose.—10 minims = ⅓ grain of Sal Alembroth to be used for an **injection.**

Tests.—Mercuric Ammonium Chloride volatilises when strongly heated. Its aqueous solution is neutral in reaction towards Litmus paper, whilst an aqueous solution of Mercuric Chloride possesses a faintly acid reaction towards that indicator of neutrality. Potassium or Sodium Hydroxide Solution produces a white precipitate in the aqueous solution. It should leave no weighable residue when ignited with free access of air.

HYDRARGYRI SUBCHLORIDUM.

MERCUROUS CHLORIDE.

B.P. Syn.—Calomel; Hydrargyri Chloridum. Subchloride of Mercury.

Hg_2Cl_2, eq. 467·98.

Fr., Protochlorure de Mercure; Ger., Quecksilberchlorür; Ital., Cloruro Mercuroso; Span., Cloruro Mercurioso.

A heavy, white or whitish, odourless, tasteless, impalpable powder which should be protected from the light.

Solubility.—Insoluble in Water, Alcohol (90 p.c.), or Ether.

Medicinal Properties.—Alterative, indirect cholagogue, purgative, antiseptic, and diuretic.

As an alterative it is used in syphilitic affections, chronic skin diseases, and glandular enlargements.

Useful in chronic hepatitis, catarrhal jaundice, and in chronic pharyngitis; repeated small doses of great benefit in obstinate vomiting; also, in the gastro-intestinal catarrh and diarrhœa of children, for whom the absence of taste renders it convenient.

As a purgative in biliousness, hepatic and cardiac dropsy, apoplexy, gout, cirrhosis, and in congested and torpid liver due to free living.

In enteric fever, the stupor, tremor, headache and coma, all of which may be due to intestinal sepsis and ptomaines, are removed, and the entire aspect of the case changed, by 1 to 3 grains of Calomel.—The late *Sir W. Broadbent.*

In hiccough, one grain every hour is often successful. Its *local uses* are numerous: as an **insufflation**, or as a **gargle** in syphilitic sore throat; as an **injection** with or without Lime Water in blenorrhagia. In a wide range of skin affections, but especially syphilitic, it is invaluable as an **ointment.**

For **fumigation**:—A spirit lamp underneath a metal cup containing 20 grains of Calomel is placed under a cane-seated chair, on which the patient remains seated for 20 minutes, his body being covered with a blanket; an apparatus contrived by Mr. Lee is still better.

It is probable that the cholagogue action of Calomel is due to its having a peculiar stimulant action on the duodenum and ileum, so as to hurry the bile along the intestine and prevent its re-absorption.—*Brunton.*

Should not be applied to the eye when a patient is taking Potassium Iodide, for it will cause severe inflammation.

On the treatment of acute diseases, particularly enteric fever and appendicitis, by a judicious use of Calomel, Water, Heat and Quinine.—*B.M.J.* '01, ii. 1054.

Although not a specific, is a most useful remedy in typhoid fever.—*B.M.J.E.* '99, i. 4.

Weekly injections of 0·05 gramme have proved successful (*B.M.J.E.* '04, ii. 72) in optic neuritis, after injections of the Cyanide and Biniodide have been tried without avail.

In enteric fever (*B.M.J.* '04, ii. 1450) it has been shown that, of the various drugs which are known to possess antiseptic properties, Calomel is undoubtedly one which has received earliest and widest recognition; 3 to 5 grains are given during the first week of the attack, before there is much diarrhœa.

Has been used in large doses in the treatment of dysentery (*I.M.G.* '05, ii. 280); 5 to 7 grains every five or six hours, or in smaller doses of 1 grain more frequently. Very frequently prescribed with drugs such as Ipecacuanha and Opium, or in ½ grain doses with 5 grains of Naphthalin 10 or 12 times in the 24 hours. Fractional doses have been given to children.

A valuable anthelmintic in ankylostomiasis (*L.* '05, i. 865).

As an intramuscular injection in syphilis, an emulsion made by the following formula is useful (*M.P.* '06, i. 149): sublimed Calomel, 1 gramme; pure liquid Vaseline, 10 c.c. The average weekly dose is 10 c.c.

A proteid or colloidal form of Calomel is known under the name of **Calomelol.** It forms a greyish-white odourless and tasteless powder, soluble in Water, but insoluble in Alcohol (90 p.c.).

Injections of Calomel the best method of treating syphilis.—*L.* '07, ii. 13.

Dose.—½ to 5 grains = 0·032 to 0·32 gramme.

Swiss, maximum single dose, 0·5 gramme; maximum daily dose, 2·0 grammes.

Prescribing Notes.—*Calomel can be made into* **pills** *with Glucose, and if the pills be too small, they can be made larger by the addition of Milk Sugar. It is frequently prescribed with Compound Rhubarb Pill or Compound Pill of Colocynth and Henbane.*

Incompatibles.—Bromides and Iodides, Nitro-Hydrochloric Acid, Hydrocyanic Acid, Chlorides of the Alkalis. Soap, even when neutral. Solutions of Lime, Potassium Hydroxide, or Sodium Hydroxide.

Official Preparations.—Lotio Hydrargyri Nigra, Pilula Hydrargyri Subchloridi Composita, and Unguentum Hydrargyri Subchloridi.

Not Official.—Calomel Cream (*Squire*), Emplastrum Calomelanos, Pastillus Hydrargyri Chlorati cum Talco, Pilula Calomelanos cum Coloc., Pilula Hydrargyri Subchloridi et Jalapæ, Pilula Hydrargyri Subchloridi et Scammonii, Pilula Zittmann, Pulvis Basilicus, Pulvis Rhei cum Hydrargyro, Pulvis Calomelanos et Acidi Borici, Pulvis Calomelanos et Amyli, and Pulvis Calomelanos et Zinci Oxidi.

Foreign Pharmacopœias.—Official in Belg. (Calomelas); Dan. and Norw. (Calomel); Fr. (Protochlorure de Mercure par volatilisation), also (Protochlorure de Mercure par Précipitation); Dutch (Chloretum Hydrargyrosum), also (Chloretum Hydrargyrosum ope Vaporis Aquæ paratum); Swed. (Chloretum Hydrargyrosum Precipitatum); Austr. and Hung. (Hydrargyrum Chloratum Mite), both the levigated and that sublimed in steam; Ger., Jap., and Swiss (Hydrargyrum Chloratum), also (Hydrargyrum Chloratum Vapore Paratum); Ital. (Chloruro Mercuroso); Mex. (Cloruro Mercurioso al Vapor), also (Precipitado); Port. (Chloreto Mercuroso), also (Mercurio Doce); Russ. (Hydrargyrum Chloratum Levigatum), also (Hydrargyrum Chloratum Vapore Præparatum); Span. (Cloruro Mercurioso) (Sublimado,

por el Vapor, and Precipitado); U.S. (Hydrargyri Chloridum Mite).

The following synonyms are applied to Calomel obtained by precipitation :— Fr., Précipité Blanc; Port. and Span., Precipitatum Album. These terms do not mean, as in England, Ammoniated Mercury.

Tests.—Mercurous Chloride volatilises when strongly heated. With Calcium, Potassium or Sodium Hydroxide Solution or with Ammonia Solution it yields a black precipitate, in the case of the three former solutions the precipitate consists of Mercurous Oxide, in the latter case it consists of a Mercurousamido salt. It is converted by Hydrocyanic Acid into a Mercuric salt and a black powder readily yielding metallic Mercury. When heated with alkali Carbonate in a dry test-tube it yields a sublimate of metallic Mercury. If the alkaline residue be dissolved in diluted Nitric Acid it affords with Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid. It is officially required to yield when heated with an excess of Lime, from 84·4 to 84·9 p.c. of metallic Mercury, corresponding to from 99·34 to 99·92 p.c. of pure Mercurous Chloride. The *U.S.P.* states that it should contain not less than 99·5 p.c. of pure Mercurous Chloride but gives no method of determination by which this percentage may be ensured. The *P.G.* gives neither the requisite percentage nor a method of determination. It contains theoretically 84·96 p.c. by weight of metallic Mercury.

The more generally occurring impurities are fixed residue, Mercuric Ammonium Chloride, Mercuric Chloride, foreign salts, *e.g.*, metals of the alkali earths, Arsenic, foreign metals. The *B.P.* requires that when volatilised it shall leave only a trace of fixed residue, the *U.S.P.* no appreciable residue, the *P.G.* that it completely volatilises.

The *B.P.* test for the absence of Mercuric Ammonium Chloride is that the specimen shall not evolve Ammonia when heated with Potassium Hydroxide Solution, the test is supplemented in the *U.S.P.* by the requirement that the filtered Acetic Acid extract shall not be affected by Hydrogen Sulphide or Silver Nitrate Solution. The official method of detecting Mercuric Chloride is by shaking the sample with warm Ether, which on filtration and evaporation should leave no residue. This evaporation must be performed at a low temperature, otherwise the Perchloride (if present) will volatilise in the Ether vapour. The *U.S.P.* requires that the residue remaining after the evaporation of the Ether when dissolved in water shall not yield more than a slight opalescence with Silver Nitrate T.S. and no change in colour with Ammonium Hydrosulphide Solution. The *P.G.* dispenses with an evaporation in testing for the presence of Mercuric Chloride, extracting the sample with Alcohol (60 p.c.), filtering, and requiring that the filtrate shall be unaffected by either Hydrogen Sulphide, or Silver Nitrate Solution. Foreign salts may be detected after the complete removal of the Mercury by Hydrogen Sulphide as described below, the filtrate should leave no weighable residue upon evaporation to dryness and gentle ignition. Arsenic, if present, would be precipitated along with the Mercury as Sulphide and may be extracted by digestion with stronger Ammonia Water and after

treating as described below, examined by the modified Gutzeit's test. The precipitated Mercuric Sulphide remaining after the Ammonia treatment may be warmed with diluted Nitric Acid and filtered, the filtrate when evaporated to dryness and ignited should leave no weighable residue.

Silver Nitrate.—If 1 gramme be shaken with 10 c.c. of dilute Alcohol and filtered, the filtrate should not be affected by T.S. of Silver Nitrate, *P.G.*; 2 grammes of the salt shaken with 20 c.c. of Ether, filtered, the filtrate evaporated and 10 c.c. of distilled Water added, 5 c.c. of the filtrate from this should yield not more than a slight opalescence with Silver Nitrate T.S. A portion of the salt shaken with Acetic Acid and filtered, the filtrated liquid should not be affected by T.S. of Silver Nitrate (distinction from and absence of Ammoniated Mercury), *U.S.P.*

Hydrogen Sulphide.—If 1 gramme of Mercurous Chloride be shaken with 10 c.c. of Alcohol, as above, the filtrate should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; 1 gramme of the salt shaken with 10 c.c. of Water or Alcohol, and the mixture filtered, the filtrate should not respond to the time-limit test for heavy metals, *U.S.P.* The filtrate obtained after shaking a portion of the salt with Acetic Acid and filtering should not be effected by T.S. of Hydrogen Sulphide, *U.S.P.* If to 0·5 gramme of Mercurous Chloride contained in a small beaker, 5 c.c. of Nitric Acid be added, and the mixture evaporated to dryness on a water-bath, and if, after dissolving the residue in about 25 c.c. of Distilled Water and 5 c.c. of Hydrochloric Acid, the solution be completely saturated with Hydrogen Sulphide and allowed to stand for several hours in a well-corked flask, until the precipitate has subsided, and then filtered, the filtrate should be colourless and leave no weighable residue upon evaporation and gentle ignition, *U.S.P.*

Gutzeit's Test.—The precipitate obtained in the preceding test should be washed with about 100 c.c. of Water, then drained and rinsed into a beaker with about 20 c.c. of Water, and then 5 c.c. of Ammonia Solution [sp. gr. 0·897 at 25° C. (77° F.)] added. After covering this mixture and digesting it for 15 minutes on a water-bath, it be rinsed upon a filter and washed with a little Water, the filtrate and washings after evaporating to dryness, moistening with 6 drops of Nitric Acid and again drying, should not respond to the Modified Gutzeit's test for Arsenic, *U.S.P.*; if the precipitated Sulphide remaining on the filter be treated with diluted Nitric Acid (1 in 4), warmed and then filtered, the filtrate should leave no weighable residue upon evaporation and gentle ignition, *U.S.P.*

Ammonium Sulphide.—If 2 grammes of the salt be shaken with 20 c.c. of Ether, filtered, the filtrate evaporated and 10 c.c. of Distilled Water added, 5 c.c. of the filtrate so obtained should not yield any change in colour on the addition of a few drops of T.S. of Ammonium Sulphide, *U.S.P.*

Preparations.

LOTIO HYDRARGYRI NIGRA. Black Mercurial Lotion. *B.P.Syn.*—Black Wash.

Triturate 30 grains of Mercurous Chloride with ½ fl. oz. of Glycerin and 1¼ fl. oz. of Mucilage of Tragacanth; transfer to a bottle; add 2 fl. oz. of the Solution of Lime; shake well; add sufficient Solution of Lime to produce 10 fl. oz. of the Lotion.

(about 1 in 146)

Useful application to syphilitic sores, and to relieve itching, as in prurigo senilis and urticaria.

Foreign Pharmacopœias.—Official in Mex. (Agua Fagedenica Negra), 1 in 600. Not in the others.

PILULA HYDRARGYRI SUBCHLORIDI COMPOSITA. Compound Pill of Mercurous Chloride. *B.P.Syn.*—Compound Calomel Pill; Plummer's Pill.

Mercurous Chloride, 1 oz.; Sulphurated Antimony, 1 oz.; Guaiacum Resin, in powder, 2 oz.; Castor Oil, 180 grains; Alcohol (90 p.c.), *q.s.* about 1 fl. drm. (1 in $4\frac{1}{2}$)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

UNGUENTUM HYDRARGYRI SUBCHLORIDI. Mercurous Chloride Ointment. *B.P.Syn.*—Calomel Ointment.

Mercurous Chloride, 1; Benzoated Lard, 9. (1 in 10)

Useful in the itching of some skin affections, psoriasis and eczema, also in pruritus ani. A good application to syphilitic sores.

Foreign Pharmacopœias.—Official in Fr. (Pommade de Calomel), Ital. (Pomata di precipitato bianco), 1 in 10; Port. (Pomada de Mercurio Doce), 1 in 10; Mex. (Pomada de Cloruro Mercurioso), 1 and 20; Span. (Pomada de Cloruro Mercurioso Precipitado), 1 in 10. Not in the others.

Not Official.

CALOMEL CREAM (*Squire*).—Pure hydrosublimed Calomel, 48 grains; sterilised anhydrous Lanolin, by weight, 160 grains; pure sterilised Olive Oil, q.s. to produce 1 oz.

10 minims = 1 grain of pure hydrosublimed Calomel.

Dose.—10 minims = 0·6 c.c. by intramuscular injection.

Calomel, 10 grains; Vaseline to 1 oz.—*Lock.*

See also Mercurial Cream, p. 604.

EMPLASTRUM CALOMELANOS. *Syn.* Emplastrum Album.—Contains 20 p.c. of Calomel, spread on silk or other suitable material.

PASTILLI HYDRARGYRI CHLORATI CUM TALCO (JAP.).—Each pastil contains 0·5 gramme of Mercurous Chloride.

PILULA CALOMELANOS C. COLOC.—Calomel, 1 grain; Compound Extract of Colocynth, $3\frac{1}{2}$ grains; Ipecacuanha, $\frac{1}{2}$ grain.—*Middlesex.*

Dose.—One or two pills.

PILULA HYDRARGYRI SUBCHLORIDI ET JALAPÆ (House Pill).—Calomel, 1 grain; Jalap, 3 grains; Syrup of Glucose, *q.s.*; in one pill.—*St. Bartholomew's.*

PILULA HYDRARGYRI SUBCHLORIDI ET SCAMMONII.—Calomel, 1 grain; Scammony, 3 grains; Syrup of Glucose, *q.s.*; in one pill.—*St. Bartholomew's.*

PILULA ZITTMANN.—Calomel, 2 grains; Compound Extract of Colocynth, 5 grains; Extract of Henbane, 2 grains. Make two pills.—*Lock.*

Pilulæ Calomelanos et Colocynthidis et Hyoscyami. *Syn.* Zittmann's Pills.—Mercurous Chloride, 1 grain; Compound Extract of Colocynth, 2 grains; Green Extract of Hyoscyamus, 1 grain; to make one pill.—*B.P.C.*

PULVIS BASILICUS.—Mercurous Chloride, 3; Scammony, 3; Acid Potassium Tartrate, 3; Jalap, 1; Ginger, 1; Antimonial Powder, 1. *Dose* for a child of two years, 4 grains (0·26 gramme); of six years or upwards, 8 grains (0·52 gramme).—*Martindale.*

This has been incorporated in the *B.P.C.* under the title **Pulvis Hydrargyri Subchloridi Compositus.**

PULVIS RHEI CUM HYDRARGYRO.—Rhubarb Root, in powder, 2 grains; Mercurous Chloride, ½ grain; Ginger, in powder, ½ grain. *Dose* for a child of twelve months.—*St. Thomas's.*

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

This form is given in *London Ophthalmic* under the title **Pulvis Calomelanos cum Rheo.**

PULVIS CALOMELANOS ET ACIDI BORICI.—Mercurous Chloride, 1; Boric Acid, in powder, 3. Used as a dusting powder.—*St. Thomas's.*

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

PULVIS CALOMELANOS ET AMYLI.—Mercurous Chloride, 1; Starch Powder, 3. Used as a dusting powder.—*St. Thomas's.*

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

Mercurous Chloride, 1; Starch, 1.—*King's* and *Lock.*

PULVIS CALOMELANOS ET ZINCI OXIDI.—Mercurous Chloride, 1; Zinc Oxide, 3. Used as a dusting powder.—*St. Thomas's* and *London.*

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

HYDRARGYRUM AMMONIATUM.

AMMONIATED MERCURY.

B.P.Syn.—Ammonio-Chloride of Mercury; Mercuric-Ammonium Chloride White Precipitate.

NH_2HgCl, eq. 249·93.

White pulverulent masses or a white odourless powder, possessing a somewhat earthy and subsequently metallic taste. It is converted into a yellow basic salt by prolonged contact with Water.

It is known as *infusible white precipitate.*

The *fusible* variety is obtained by adding a solution of Mercuric Chloride to a mixture of Ammonium Chloride and Ammonia till the precipitate ceases to redissolve. It has the formula $HgCl_2.2NH_3$.

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

Medicinal Properties.—Never given internally. Used in the form of ointment for chronic and parasitic skin diseases, impetigo, herpes, ringworm and scabies. The ointment is used for pediculi, but the powder can be used alone or mixed with Rose Water, and the unpleasantness of greasing the linen avoided.

Official Preparation.—Unguentum Hydrargyri Ammoniati.

Not Official.—Lowndes' Cream.

Antidotes.—Stomach-tube or an emetic, preceded by raw eggs and raw flour and water.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Hydrarg. Bichloratum Ammoniatum); Belg. (Præcipitatum Album); Dan., Norw. and Swed. (Chloretum Amido-Hydrargyricum); Dutch (Chloretum Hydrargyrico-ammonicum); Ger. and Jap. (Hydrargyrum Præcipitatum Album); Ital. (Cloramiduro di Mercurio); Russ. and Swiss (Hydrargyrum Amidato-bichloratum); U.S. (Hydrargyrum Ammoniatum); Ph. Lond. 1788 (Calx Hydrargyri Alba). Not in Fr., Port. or Span.

The synonyms, Fr., Précipité Blanc; Port. and Span., Precipitatum Album; apply to Calomel and *not* to Hydrargyrum Ammoniatum.

Tests.—Ammoniated Mercury volatilises when heated at a temperature below redness. When boiled with Stannous Chloride Solution it is reduced and turns grey, and produces globules of metallic Mercury. It is completely soluble in warm Acetic Acid and in Sodium Thiosulphate Solution. The solution in the latter reagent evolves Ammonia gas, and a precipitate of Red Mercuric Sulphide when boiled, which is converted into the black variety on prolonged boiling. Dissolved in diluted Nitric Acid it affords a scarlet precipitate with Potassium Iodide Solution. When heated with Potassium or Sodium Hydroxide Solution, it assumes a yellow colour and Ammonia gas is evolved. If the mixture be filtered, the filtrate, when acidified with diluted Nitric Acid, yields with Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid, readily soluble in Ammonia Solution. It is officially required to yield, when heated with an excess of Lime, from 78 to 79 p.c. of metallic Mercury, corresponding to 98·0 to 99·3 p.c. of pure Mercuric Ammonium Chloride. The *B.P.* 1885 required 77·5 p.c., corresponding to 97·4 p.c. of the pure salt. The *U.S.P.* requires that it should contain not less than 78 p.c. nor more than 80 p.c. of metallic Mercury, corresponding to not less than 98·0 p.c. nor more than 100·6 p.c. of the pure salt, but gives no method of determination. The *P.G.* does not refer to either a requisite percentage of metallic Mercury or to the methods of determination. It contains theoretically 79·5 p.c. w/w of metallic Mercury.

The more generally occurring impurities are fixed residue, Mercurous salts, Carbonate, foreign salts, Arsenic and other metals. The *B.P.* requires that it shall leave on volatilisation only an insignificant amount of fixed residue, both *U.S.P.* and *P.G.* require that it shall volatilise without residue. All three Pharmacopœias agree that it should not fuse. The absence of Mercurous salts and Carbonate is ensured by the specimen dissolving completely in Hydrochloric Acid without effervescence. Foreign salts may be detected by precipitating the Mercury as Sulphide with Hydrogen Sulphide, filtering and evaporating the filtrate to dryness, as described under Hydrargyri Subchloridum. The precipitated Mercury Sulphide contains any Arsenic which may have been present; the latter may be extracted by digestion with strong Ammonia Solution, and when treated as described under Hydrargyri Subchloridum may be detected by the modified Gutzeit's test. Metals other than Mercury, precipitable by Hydrogen Sulphide, may be detected by warming the precipitated Sulphide with diluted Nitric Acid and filtering, the filtrate on evaporation and ignition should leave no weighable residue.

Preparation.

UNGUENTUM HYDRARGYRI AMMONIATI. Ammoniated Mercury Ointment. *B.P.Syn.*—White Precipitate Ointment.

Ammoniated Mercury, 1; Paraffin Ointment, white, 9. (1 in 10)

Foreign Pharmacopœias.—Official in Dutch (Ung. Chloreti Hydrargyrico-ammonici), 1 in 10: Ger., Jap. and Swiss (Ung. Hydrar-

gyri Album); and Russ. (Ung. Hydrargyri Amidato-bichlorati), 1 in 10; U.S., 1 in 10. Not in the others.

Not Official.

LOWNDES' CREAM.—Ammoniated Mercury Ointment, 1; Zinc Ointment, 3; Glycerin, 2; form a cream.

HYDRARGYRUM CUM CRETA.

MERCURY WITH CHALK.

P.B.Syn.—Grey Powder.

A dull grey powder, free from grittiness, made by thoroughly mixing 1 of Mercury with 2 of Prepared Chalk.

Solubility.—Insoluble in Water; partially soluble in diluted Hydrochloric Acid, and in diluted Acetic Acid; leaving a greyish residue of finely-divided Mercury.

Medicinal Properties.—Chiefly given to children as a cathartic; suitable for the prolonged administration of Mercury in syphilis.

Half a grain, combined with aromatic chalk powder, can usually be given three times daily in infantile syphilis, and if there is any loosening of the bowels Dover's powder may be given with the grey powder in doses of $\frac{1}{8}$ grain for infants over three months of age, and $\frac{1}{4}$ grain at the age of six months (*L.* '04, ii. 1405).

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

Prescribing Notes.—*Best given as a* **powder** *by itself, or with Rhubarb; sometimes in* **cachets**; *but when required to be made into* **pills**, *'Diluted Glucose' is the best excipient.*

Not Official.—Pilula Hydrargyri cum Creta et Opio, Pilulæ Hydrargyri cum Creta et Ipecacuanhæ.

Foreign Pharmacopœias.—Official in Jap. and Swed., same as Brit.; Mex., Polvo de Mercurio Calçareo, 1 in $2\frac{2}{3}$; Port., Mercurio com Carbonato de Cal, 3 in 10; U.S., 3·8 in 10. Not in the others.

Tests.—Mercury with Chalk, when mixed with Water, acidified with diluted Hydrochloric Acid, and boiled with a bright strip of Copper foil, gives a grey deposit, which assumes a silvery lustre on being rubbed. It partially dissolves in Hydrochloric Acid with effervescence, and the evolved gas, if passed through Lime Water, yields a white precipitate; the resulting solution, when filtered from the deposit of Mercury, should not afford any white or grey precipitate on the addition of Stannous Chloride Solution, indicating the absence of Mercuric salts. The *U.S.P.* requires that the solution obtained by digesting 1 decigramme of the powder with 20 c.c. of warm diluted Hydrochloric Acid should yield a filtrate, which should be unaffected by Hydrogen Sulphide Solution. A limit of Mercurous oxide is fixed in the *U.S.P.* by the requirement that the filtrate obtained when the specimen is digested with warm Acetic Acid and filtered, should not become more than slightly opalescent on the addition of one or two drops of Hydrochloric Acid. The *B.P.* does not specify a necessary percentage of Mercury nor a method of determination.

Not Official.

PILULA HYDRARGYRI CUM CRETA ET OPIO.—*Syn.* Hutchinson's Pills. Mercury with Chalk, 1 grain: Compound Powder of Ipecacuanha, 1 grain.—*St. Thomas's.*

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

PILULÆ HYDRARGYRI CUM CRETA ET IPECACUANHÆ.—Mercury with Chalk, 1 grain; Compound Ipecacuanha Powder, 1 grain.—No. 1, *University.*

HYDRASTIS RHIZOMA.

HYDRASTIS RHIZOME.

Fr., Hydrastis; Ger., Hydrastisrhizom; Ital., Idraste; Span., Hidrastis del Canada.

The dried Rhizome and Roots of *Hydrastis Canadensis, L.*

Hydrastis contains the alkaloids—**Berberine** (3 to 4 p.c.), **Hydrastine** (2 to 3 p.c), and **Canadine.**

The Hydrastis of the *U.S.P.* is required to yield not less than 2·5 p.c. w/w of Hydrastine; neither that of *B.P.* nor the *P.G.* is required to yield a definite percentage of Hydrastine.

Medicinal Properties.—Hæmostatic, astringent. Useful in chronic catarrhal conditions of the mucous membranes, such as the gastro-intestinal, but especially that of the uterus. Recommended in menorrhagia.

The fluid extract is a sovereign remedy as a preventive in spontaneous epistaxis.—*M.A.* '95, 246. It may be used internally or as a 5 p.c. solution in water as a spray; internally also in aggravated cases of hyperidrosis.—*M.A.* '95, 322. Used locally in chronic pharyngitis.—*L.* '89, i. 549.

20 to 30 drops of the fluid extract for controlling night sweats.—*Pr.* lv. 624.

In chronic bronchitis.—*B.M.J.E.* '97, i. 84; '97, ii. 60; *Pr.* lx. 224.

Prescribing Notes.—*Equal parts of the Tincture and Water, or* 1 *of the Liquid Extract to* 19 *of Water forms a useful lotion.*

Official Preparations.—Extractum Hydrastis Liquidum and Tinctura Hydrastis.

Not Official.—Glyceritum Hydrastis, Hydrastin, Hydrastina, Hydrastinæ Hydrochloridum, Hydrastinina, Hydrastininæ Hydrochloridum.

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

Descriptive Notes.—Hydrastis Rhizome is of a yellowish-brown colour, and the transverse fracture is hard and short, exhibiting a greenish-yellow, resinous surface in which a row of bright yellow, narrow, distant wood bundles form a ring. It has a characteristic odour, and a bitter taste. It is tortuous, simple or branched, $\frac{1}{2}$ to $1\frac{1}{2}$ inches (12 to 38 mm.) long and $\frac{1}{8}$ to $\frac{1}{2}$ inch (3 to 12 mm.) in thickness, *B.P.*; sub-cylindrical, oblique, with thin brittle roots, 2 to 5 cm. long, and 3 to 6 mm. in diameter, with short stem remnants, or stem scars, and slightly annulate, *U.S.P.* It is furnished with numerous brittle slender rootlets, except on the upper surface, which presents short, nearly erect branches, each with terminal cup-shaped scars where a stem has been given off.

Tests.—A useful method for the separate determination of Berberine and Hydrastine is given (*Y.B.P.* '01, 408; *C.D.* '01, ii. 235). A weighed quantity of 10 grammes of the drug in a state of fine powder is exhausted with hot Alcohol, either in a Soxhlet or in a flask fitted with a reflux condenser. The liquid is cooled and the volume adjusted to 100 c.c. by the addition of Alcohol. A measured quantity of 25 c.c. of this liquid is placed in a flask of about 8 oz. capacity mixed with 1½ c.c. of Hydrochloric Acid (32 p.c.), ¼ c.c. of Sulphuric Acid, and 125 c.c. of Sulphuric Ether. The mixture is cooled, well shaken, allowed to stand 24 hours in a refrigerator for the crystals of Berberine Hydrochloride to separate, and filtered through a weighed filter paper, the filtrate being reserved. The crystals are washed with a mixture of equal volumes of Alcohol and Ether until the washings cease to give an acid reaction, the washings being added to the main filtrate. The crystals are dried at 105° C. (221° F.) and weighed. The weight multiplied by 0·9017 and then by 40 gives the percentage of Berberine present in the sample operated on.

The filtrate and washings from the Berberine Hydrochloride crystals are rendered very nearly neutral or only faintly acid, evaporated nearly to dryness on steam-bath, the residue treated with hot Water in small quantities, filtering into a stoppered separator, until the washings from the residue cease to give an alkaloidal reaction with the ordinary test reagents. Sufficient Ammonia Solution is added to the aqueous extract in the separator to render it alkaline and the liberated alkaloid extracted by agitation with Ether. The Ether extraction is repeated until the whole of the Hydrastine is removed, the excess of Ether is removed by evaporation and the alkaloid extracted from its ethereal solution by several agitations with successive portions of a 5 p.c. Sulphuric Acid Solution. The separated acid liquids are mixed, sufficient Ammonia Solution added to render them alkaline and the Hydrastine extracted by repeated agitation with successive quantities of Ether. The Ether is evaporated, the alkaloidal residue dissolved in an excess of Twentieth-normal Volumetric Sulphuric Acid Solution, and the excess of Volumetric Acid Solution titrated with Hundredth-normal Volumetric Sodium or Potassium Hydroxide Solution. The number of c.c. of Hundredth-normal Volumetric Sodium Hydroxide Solution used, divided by 5 and subtracted from the number of c.c. of Twentieth-normal Volumetric Sulphuric Acid Solution employed to dissolve the alkaloidal residue, the product multiplied by 0·019016 and then by 40, yields the percentage of Hydrastine present in the sample.

The above process has been tried in the author's laboratory and found to work well. A sample of the Rhizome gave 3·6 p.c. of Berberine and 3·20 p.c. of Hydrastine.

The *U.S.P.* adopts a method for the determination of Hydrastine, which may be briefly outlined as follows:—A weighed quantity of 15 grammes of Hydrastis in No. 60 powder is shaken during 10 minutes, in an Erlenmeyer flask, with 150 c.c. of Ether. 5 c.c. of Ammonia Solution is added and the flask again shaken at intervals

for half an hour. After the addition of 15 c.c. of Water to cause the drug to agglomerate, 100 c.c. of the clear Ether solution is removed to a separator and shaken with 15 c.c. of Normal Volumetric Sulphuric Acid Solution. The lower acid layer is removed to a second separator, and when the two liquids have separated, the Ether Solution is again shaken with 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 5 c.c. of Water, the acid solution being again drawn off, when the liquids have separated. The Ether solution is then shaken with 5 c.c. of Water, which is in turn removed. The mixed acid and aqueous liquids are mixed with sufficient Ammonia Water to render the liquid alkaline and the liberated alkaloid shaken out with 25 c.c. of Ether. After separation of the liquids, the lower alkaline portion is drawn off and the Ether solution transferred to a tared flask. The extraction is repeated with two successive portions each of 20 c.c. and 15 c.c. of Ether, the alkaline liquid being removed in each case and the ethereal solution transferred to the tared flask. The Ether is removed by evaporation, the alkaloidal residue dried till constant in weight at 100° C. (212° F.), cooled and weighed. This weight multiplied by 10 gives the percentage of Hydrastine.

The ash of Hydrastis varies from 5 to 8 p.c. and should not exceed 10 p.c.

Preparations.

EXTRACTUM HYDRASTIS LIQUIDUM. Liquid Extract of Hydrastis.

20 of Hydrastis Rhizome, exhausted by percolation with Alcohol (45 p.c.), reserving the first 17 and evaporating the remainder to a soft Extract which is dissolved in the first portion, and the whole made up with Alcohol (45 p.c.) to 20. (1 in 1)

The fluid extracts of the *U.S.P.*, *Fr.* and *P.G.* are standardised preparations, that of the *U.S.P.* is required to contain 2 p.c. w/v of Hydrastine, that of the two others 2 p.c. w/w.

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

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S., all 1 in 1; Fr. and Mex. have a solid extract. Not in the others.

Shoemaker has used the fluid extract as a stimulant and astringent application in skin diseases.—*L.* '85, ii. 87.

Tests.—Fluid Extract of Hydrastic has a sp. gr. of 1·025 to 1·048; contains about 22 p.c. w/v of total solids and about 40 p.c. w/v of Absolute Alcohol.

The method adopted by the *U.S.P.* for the determination of the Hydrastine is essentially as follows:—A measured quantity of 10 c.c. of the Fluid Extract is introduced into a measuring flask of 100 c.c. capacity, together with 85 c.c. of Water containing in solution 2 grammes of Potassium Iodide. After the addition of sufficient Water to bring the volume of the liquids to 100 c.c., they are shaken for several minutes. A filtered measured quantity of 50 c.c. is rendered alkaline with Ammonia Water, and the liberated alkaloid shaken out with 30 c.c. of Ether, repeating the extraction with a further quantity

of 20 c.c. of Ether. The lower alkaline liquid is in each case removed after complete separation, the Ether solution transferred to a tared flask, the mixed ethereal solutions evaporated at a gentle heat, the residue dried on the water-bath till constant in weight, cooled and weighed. This weight multiplied by 20 gives the percentage w/v of Hydrastine. The *U.S.P.* process works satisfactorily, and the alkaloid is obtained in a condition of purity. A sample of the *B.P.* liquid extract prepared and examined in the author's laboratory had a sp. gr. of 1·048; contained 22·2 p.c. w/v of total solids and 35·4 p.c. w/v of Absolute Alcohol. When assayed by the *U.S.P.* process it yielded 2·12 p.c. w/v of Hydrastine.

The essential details of the *P.G.* method for the determination of the Hydrastine content are as follows:—A weighed quantity of 15 grammes of the Fluid Extract is evaporated on a water-bath to about 5 grammes, the residue mixed with 10 c.c. of Water transferred to a flask, 10 grammes of Petroleum Ether, 50 grammes of Ether, and 5 grammes of Ammonia Solution added, and the mixture allowed to stand, with frequent intervals of shaking, for one hour. A weighed quantity of 50 grammes of the clear Ether solution is filtered into a separator, 10 c.c. of a mixture of 1 part of Hydrochloric Acid and 4 parts of Water added and the whole is shaken for a few minutes. After complete separation the acid layer is drawn off into a beaker, the ethereal solution is washed twice in succession with 5 c.c. of Water, to which a few drops of Hydrochloric Acid have been added, these washings being added to the main quantity in the beaker. The mixed acid liquids are rendered alkaline with Ammonia Solution, 50 grammes of Ether are added and the mixture allowed to stand for one hour, shaking frequently at intervals. A weighed quantity of 40 grammes is filtered through a dry filter paper into a dry tared flask, the Ether distilled off, and the residue dried at 100° C. (212° F.), cooled and weighed. It should amount to at least 0·2 gramme, corresponding to 2·0 p.c. w/w of Hydrastine.

TINCTURA HYDRASTIS. TINCTURE OF HYDRASTIS.

2 of Hydrastis Rhizome in No. 60 powder, percolated with Alcohol (60 p.c.) to yield 20.

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

Foreign Pharmacopœias.—Official in Fr. and Ital., 1 and 5; Span., 1 in 10; U.S., 1 in 5. Not in the others.

Tests.—Tincture of Hydrastis has a sp. gr. of 0·920 to 0·930; contains about 2·5 p.c. w/v of total solids and about 58·0 p.c. w/v of Absolute Alcohol. The *B.P.* Tincture is not a standardised preparation. The *U.S.P.* 1 in 10 Tincture is required to contain 0·40 p.c. w/v of Hydrastine. The *P.G.* does not include a Tincture. The method of determination of the Hydrastine adopted by the *U.S.P.* is essentially as follows:—A measured quantity of 100 c.c. is concentrated by evaporation to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) being added to dissolve any insoluble matter which may possibly have separated. The same method of determination is adopted for the assay of the resultant solution as for the assay of Fluidextractum

Hydrastis. In calculating the percentage of Hydrastine it must be taken into account that the weight of residue represents that from 50 c.c. of the Tincture, and must therefore be multiplied by 2 and not by 20 as in the case of the Fluid Extract.

A specimen of *B.P.* Tincture prepared in the author's laboratory yielded, when assayed by the *U.S.P.* process described above, 0·288 p.c. w/v of Hydrastine.

Not Official.

GLYCERITUM HYDRASTIS.—Moisten 100 of Hydrastis with 35 of Alcohol (95 p.c.)., pack it in a percolator, add enough Alcohol (95 p.c.) to saturate the powder and leave a stratum above it, macerating for 48 hours, continue percolation with more Alcohol until the Hydrastis is practically exhausted. Remove nearly all the Alcohol by distillation or evaporation, pour the thick concentrated liquid into 50 of ice-cold Water, and set it aside in a cold place for 24 hours, filter, pass enough cold Water through the filter to make the filtrate measure 50, add 50 of Glycerin and mix thoroughly. Average Dose, 30 minims.—*U.S.P.*

This has been incorporated in the *B.P.C.* under the title **Glycerinum Hydrastis,** with the *syn.* Glyceritum Hydrastis.

HYDRASTIN.—An eclectic remedy has been sold under this name for many years. It is an **extract** in fine powder, formerly prepared from Hydrastis Rhizome with Alcohol (60 p.c.), but now with Alcohol (90 p.c.). Care must be taken not to confound this with the alkaloid Hydrastine.

Dose.—2 to 6 grains = 0·13 to 0·4 gramme.

Considerable variation has been shown (*C.D.* '01, ii. 235) to exist among commercial specimens of Hydrastin. Six samples were examined, four American specimens, one manufactured by a reliable firm, by the *B.P.C.* (1901) process, and one from an unknown source. The percentage of Hydrastine varied from a trace in four of the preparations to 8·7 and 15·2 p.c. in the remaining two, and the Berberine from a trace in two of the preparations to 9·67, 16·53, 23·56, and 26·9 p.c. in the remaining four. The preparation made by the *B.P.C.* (1901) process contained traces of Hydrastine and Berberine. The following suggestions are made: that the name Hydrastin be changed to Extractum Hydrastis Siccum, that a stronger Alcohol be used for the extraction, and that the product be standardised to contain 10 p.c. of Hydrastine. The two former suggestions have been adopted in the *B.P.C.* (1907), but no standard is adopted, though a note at the end of the monograph mentions that it has been suggested that this extract should be standardised to contain 20 p.c. of total alkaloids, of which two-fifths should be Hydrastine.

HYDRASTINA. Hydrastine. $C_{21}H_{21}NO_6$, eq. 380·33.—An alkaloid crystallising in white glistening four-sided prisms.

It is obtained from the Rhizome and Roots of Hydrastis Canadensis.

A close relationship exists between Hydrastine and Narcotine. Schmidt considers that Narcotine contains three Methoxyl groups and Hydrastine only two. Both bases yield on oxidation Opianic Acid, which contains two Methoxyl groups. Cotarnine contains only one such group, it therefore follows that Hydrastine contains no Methoxyl, and that Cotarnine has the constitution of a Methyl-hydrastinine.

Solubility.—1 in 120 of Alcohol (90 p.c.); 1 in 83 of Ether; 1 in 2 of Chloroform; the last two solvents do not dissolve Berberine; insoluble in Water and Petroleum Ether.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ grain = 0·016 to 0·032 gramme.

Hydrastine with Mono-calcium Phosphate forms a soluble compound which can be made to contain 71 p.c. of Hydrastine.—*A.J.P.* '97, 604; *P.J.* '98, i. 94.

Foreign Pharmacopœias.—Official in Fr. and U.S.

Tests.—Hydrastine melts at 132° C. (269·6° F.). It possesses an alkaline reaction towards moistened red Litmus paper. Its solution in Chloroform is

lævogyrate, whilst the solution in diluted Sulphuric Acid is dextrogyrate. It dissolves in Sulphuric Acid without change of colour in the cold, but on heating a purple-violet colour is produced. Sulphuric Acid containing a trace of Molybdic Acid (Frohde's reagent) produces at first a green coloration, subsequently changing to brown. Sulphuric Acid containing a trace of Selenous Acid yields a yellowish-red colour, changing to a brown. Sulphuric Acid containing a trace of Nitric Acid gives a yellow to orange-red colour. Pure Nitric Acid yields an orange-coloured solution, depositing an insoluble substance on the addition of Water, the liquid exhibiting an intense blue fluorescence. When dissolved in Sulphuric Acid and brought into contact with a clear crystal of Potassium Bichromate a red colour changing to brownish is produced. The solution obtained by dissolving a crystal of the alkaloid in diluted Sulphuric Acid instantly decolorises Potassium Permanganate Solution, and an intense blue fluorescence is developed. An excess of Potassium Permanganate Solution must be avoided. It may be distinguished from Hydrastinine by the Potassium Permanganate Test described above. It may be distinguished from Berberine by giving no red coloration with Chlorine Water. It may be distinguished from Strychnine and Gelsemine by the instantaneous appearance of a bright red colour when a small portion of the precipitated Bichromate is touched with a drop of Sulphuric Acid. It should leave no weighable residue when ignited with free access of air.

HYDRASTINÆ HYDROCHLORIDUM. Hydrastine Hydrochloride. $C_{21}H_{21}NO_6 \cdot HCl$, eq. 416·52.—Pale yellow semi-crystalline powder.

It is very hygroscopic and should, therefore, be kept in well-closed glass bottles, preferably of an amber tint, in a cool atmosphere, and exposed as little as possible to contact with the air.

It contains theoretically 91·3 p.c. of Hydrastine.

Solubility.—About 1 in 1 of Water and about 1 in 1 of Alcohol (90 p.c.).

Dose.—$\frac{1}{2}$ to 1 grain = 0·032 to 0·065 gramme.

Has been used as an ecbolic to induce premature labour; maximum daily dose, $7\frac{1}{2}$ grains internally, 5 grains by hypodermic injection.—*L.* '86, i. 990; its physiological action.—*B.M.J.* '98, ii. 1052.

Tests.—Hydrastine Hydrochloride melts at about 116° C. (240·8° F.). Its aqueous solution is neutral in reaction towards Litmus. The aqueous solution yields with Potassio-mercuric Iodide (Mayer's) Solution an amorphous yellowish-white precipitate; with Iodo-potassium Iodide (Wagner's) Solution, a deep brown flocculent precipitate; with Picric Acid Solution, a yellow amorphous precipitate; with Potassium Bichromate Solution, a yellow precipitate, soluble in excess of the reagent; with Potassium Ferrocyanide, a yellow precipitate, soluble in excess of the reagent. Hydrastine may be obtained by shaking out the aqueous solution rendered alkaline with Ammonia Solution, with Ether. The residue left on the evaporation of the Ether should respond to the tests given under Hydrastina. It should leave no residue when ignited with free access of air.

HYDRASTININA. Hydrastinine. $C_{11}H_{13}NO_3$, eq. 205·59.—This formula is that given in the *Fr. Codex* and in the best known text-books. The formula $C_{11}H_{11}NO_2$ appears in the *B.P.C.*

An oxidation product of the natural alkaloid Hydrastine. Colourless or light yellow crystals. Not readily soluble in Water; but soluble in Alcohol, Ether and Chloroform.

Foreign Pharmacopœias.—Official in Fr. and Mex.

Tests.—Hydrastinine has a m.p. of 116° to 117° C. (240·8° to 242·6° F.). With the majority of the mineral acids it forms salts soluble in Water. Its solution in diluted Hydrochloric Acid is optically inactive; it possesses a faint fluorescence and a very bitter taste. It may be distinguished from most other alkaloids by its powerful reducing action upon Potassio-mercuric Iodide (Nessler's) Solution, an immediate black precipitate being thrown down. Among the alkaloids, Morphine and Apomorphine appear to be the only ones acting in a similar manner, and among the glucosides, Picrotoxin. It should leave no weighable residue when heated with free access of air.

HYDRASTININÆ HYDROCHLORIDUM. Hydrastinine Hydrochloride.

$C_{11}H_{11}NO_2 \cdot HCl$, eq. 223·90.—Light yellow needle-shaped crystals, or a pale yellow crystalline powder. Soluble in its own weight of Water; 1 in 3 of Alcohol (90 p.c.).

It should be kept in well-closed bottles.

It contains theoretically 83·8 p.c. of anhydrous Hydrastinine.

Medicinal Properties.—Useful in endometritis, and uterine fibroid, in which excessive bleeding is a prominent symptom.—*L.* '90, i. 712; *T.G.* '90, 86; '92, 539, 699; *Pr.* xlv. 373. Valuable in menorrhagia.—*L.* '92, ii. 1350; *L.* 94, i. 1521.

Checks uterine hæmorrhage, ameliorates night sweats in phthisis. During labour it undoubtedly strengthens feeble contractions and revives an inert uterus. —*B.M.J.E.* '98, i. 63.

Dose.—$\frac{1}{2}$ to $1\frac{1}{2}$ grains = 0·032 to 0·10 gramme, used **hypodermically** in a 10 p.c. aqueous solution.

Ph. Ger. maximum single dose, 0·03 gramme; maximum daily dose, 0·1 gramme.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Swiss and U.S. Not in the others.

Tests.—Hydrastinine Hydrochloride melts at 212° C. (413·6° F.). The aqueous solution is neutral in reaction towards Litmus paper; it exhibits a strong blue fluorescence, especially when highly diluted. An aqueous solution affords with Bromine Water a yellow precipitate soluble to a colourless solution in Ammonia Solution; with Potassium Bichromate a yellow precipitate soluble on warming the solution, but again separating in glistening crystals when the solution cools; Ammonia Solution produces no precipitate or turbidity. 4 or 5 drops of Sodium Hydroxide Solution (15 p.c.) added to a solution of 0·1 gramme of the salt dissolved in 3 c.c. of Water produce after each addition a white turbidity, disappearing on shaking; on continued shaking or on stirring with a glass rod, pure white crystalline Hydrastinine separates out, the supernatant liquid shall be perfectly clear and not more than of a pale yellow colour.

Sulphuric Acid produces a deep yellow colour, Sulphuric Acid with a trace of Nitric Acid a reddish-brown colour, and Nitric Acid produces a deep yellow colour with the salt. It should leave no weighable residue when ignited with free access of air.

Not Official.

HYDROGENII PEROXIDUM.

H_2O_2, eq. 33·76.

In its purest condition this is a colourless liquid, sp. gr. 1·452, evolving when heated 475 times its volume of Oxygen gas. It is obtained by decomposing Barium Peroxide with Sulphuric Acid, and concentrating the filtered liquid in vacuo over Sulphuric Acid. Commercially it is sold containing 10 or 20 volumes of available Oxygen.

Perhydrol is stated to be a chemically pure Hydrogen Peroxide which, although it reddens Litmus strongly, is free from Acids.

Official Preparation.

LIQUOR HYDROGENII PEROXIDI. Solution of Hydrogen Peroxide.

A colourless, almost odourless liquid, possessing a slightly acidulous taste, and producing a peculiar sensation and soapy froth in the mouth. It is an aqueous solution of Hydrogen Peroxide containing 9 to 11 volumes of available Oxygen, equivalent to about 3·0 p.c. by weight.

It may be prepared by the interaction at a temperature below 10° C. (50° F.) of Barium Peroxide, Water and a dilute mineral acid.

It appears as Aqua Hydrogenii Dioxidi in the *U.S.P.*

Medicinal Properties.—It parts with its Oxygen freely, and is a most powerful oxidising agent and disinfectant. It is a non-poisonous antiseptic. It does not precipitate albumen, and does not interfere with the action of Pepsin, Pancreatin, or Malt Extract. Used locally as a surgical dressing and for purulent discharges, and as a spray or swab in diphtheria. A spray of 10 volume strength is a good application to the throat in scarlet fever, and a 5 volume solution as a deodorising **gargle.** It is used for bleaching hair and delicate fabrics. It has been recommended internally in enteric fever, chronic bronchitis, and diabetes. It is not well adapted for hypodermic injection, because of the gas it evolves, although in cases of cyanide poisoning it is worth the risk of emboli.

Rapid healing of chancres by spray.—*M.A.* '95, 168.

As a spray in the treatment of lupus vulgaris and tubercular abscess.—*B.M.J.* '02, i. 448.

As a wash in the treatment of suppurative lesions of the skin.—*T.G.* '01, 639.

Injections of Oxygenated Water diluted with five times its volume of warm sterilised Water, and preceded by an evacuant injection, in the treatment of infantile dysentery.—*L.* '02, i. 392.

A bandage soaked with solution of Hydrogen Peroxide and allowed to dry on the wrist gave rise to spontaneous combustion. This was, no doubt, due to the solution containing Sulphuric Acid. The acid now used for its preservation is Phosphoric.

Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 c.c. to 7·1 c.c.

Should be well diluted.

Prescribing Notes.—*Solution of Hydrogen Peroxide does not keep well, but is liable to lose Oxygen even to the extent of half its strength in a year. Phosphoric Acid is the best preservative and is now generally added for that purpose. When gently warmed it gives off Oxygen very readily. Alcohol and Ether have been used to preserve it, and a solution in Ether is sold under the name* **Ozonic Ether,** *the usual strength of which is about equal to 4 volumes of Oxygen.*

Foreign Pharmacopœias.— Official in Austr. and Swiss (Hydrogenium hyperoxydatum Solutum); Belg. and Mex. (Agua Oxigenada), sp. gr. 1·452; Span. (Agua Oxigenada); U.S. (Aqua Hydrogenii Dioxidi). All contain 10 volumes of available Oxygen. Fr. (Soluté Officinal d'Eau Oxygénée); Ital. (Acqua Ossigenata), 12 volumes.

Tests.—Hydrogen Peroxide Solution has a sp. gr. of 1·014. At the ordinary temperature or more quickly when heated it evolves Oxygen. When mixed with an acidified Solution of Potassium Iodide, Iodine is instantly liberated. When mixed with Potassium Permanganate Solution acidified with Diluted Sulphuric Acid a brisk evolution of Oxygen ensues, the Permanganate at the same time being decolorised. A blue coloration appears at the junction of the two fluids, when a few drops of the Peroxide Solution are agitated with 10 c.c. of Water containing 10 drops of diluted Sulphuric Acid Solution and a drop of Potassium Chromate Solution and a few drops of Ether, the Ether also, after shaking, assuming a blue colour. It is officially required to afford at normal temperature and pressure not less than 18 nor more than 22 volumes of Oxygen, corresponding to about 3·0 p.c. w/w of absolute Hydrogen Peroxide. The *B.P.* method of determination is a gasometric one, carried out with a mixture of 2 volumes of 5 p.c. Potassium Permanganate Solution,

one volume of Sulphuric Acid and 7 of Water. When 1 volume of the Peroxide Solution is shaken with 10 to 12 volumes of such a mixture the quantity of Oxygen indicated above should be liberated, the gas is measured at the normal temperature and pressure. In the reaction which ensues, double the volume of Oxygen is evolved, half being derived from the Permanganate and half from the Peroxide Solution. The Permanganate method, gasometrically applied, has been subject to some unfavourable criticism and is generally considered as in all cases unreliable.

A suggestion has been made (*C.D.* '01, ii. 222; *P.J.* '01, ii. 131; *J.C.S. Abs.*, '01, ii. 686) to use a saturated Magnesium Sulphate Solution in the place of the Brine Solution, officially recommended, the latter having been proved to evolve Chlorine in the presence of Sulphuric Acid and Potassium Permanganate Solution, and to thus account for the discordant results obtained by the official process. Confirmation of the accuracy of the Kingzett Thiosulphate process given below is also yielded.

The *U.S.P.* employs the Potassium Permanganate method volumetrically as mentioned below. Each c.c of Tenth-normal Volumetric Potassium Permanganate Solution corresponding to 0·1 p.c. w/w of absolute Hydrogen Dioxide or 0·329 volume of Oxygen. The *U.S.P.* requirements are that to be of full strength it shall contain 9·87 volumes of Oxygen, corresponding to 3·0 p.c. w/w of absolute Hydrogen Peroxide. A method simple, rapid and accurate, which has been used extensively in the author's laboratory, is that of Kingzett. Its accuracy is, moreover, not lessened by the presence of the usual preservative agents. A measured quantity of 10 c.c. of the Peroxide is mixed with 40 c.c of a diluted Sulphuric Acid (1·3 sp. gr.) and made up to 100 c.c. with Water. A measured quantity of 10 c.c. of this solution is then run into 10 c.c. of a 10 p.c. Potassium Iodide Solution; the mixture allowed to stand for 5 minutes and titrated with Volumetric Sodium Thiosulphate Solution. 1 c.c. of the Volumetric Thiosulphate Solution is equivalent to 1·118 c.c. of Oxygen, but the figure must be divided by 2 to ascertain the number of volumes of available Oxygen.

The more generally occurring impurities are Barium, solid residue, excess of free acid, Arsenic, heavy metals, Hydrofluoric Acid. The *B.P.* recognises Barium and solid residue as likely impurities, but includes no tests for the remaining substances. It is officially required to yield no characteristic reaction with the tests for Barium, and to yield when evaporated to dryness on a water-bath not more than 0·5 p.c. of solid residue. The *U.S.P.* requires that no turbidity or precipitate should be produced on the addition of a few drops of diluted Sulphuric Acid to 10 c.c. of the Peroxide Solution; that it shall leave not more than 0·15 p.c. w/v of total solids as determined by evaporating 20 c.c. to dryness upon a water-bath and drying the residue at 120° C. (248° F.). The *U.S.P.* fixes the limit of free acids at 0·048 p.c. w/v calculated as Sulphuric Acid. Solutions which have been held in stock some time show a marked increase in the percentage w/v of acidity. Arsenic may be detected by evaporating

the Peroxide Solution with an equal volume of Ammonia Solution and applying the modified Gutzeit's test; heavy metals and Hydrofluoric Acid by the tests described below. The inclusion of a test for the latter acid in the *B.P.* has been recommended.

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

An investigation (*C.D.* '99, ii. 213, 240; *P.J.* '99, ii. 100, 115) showed that the most suitable bottles for the preservation of Hydrogen Peroxide Solution were champagne bottles and soda-water bottles. The effect of such shaking and vibration as specimens would be subjected to in daily transit is also reported upon. Any angular inequality of a bottle hastens decomposition, as also do the small rough patches of Iron Oxide frequently found on stone bottles. If kept in corked bottles, care should be taken that the bottles are not laid on their side, as contact with the cork hastens decomposition.

Gutzeit's Test.—The residue obtained on evaporating to dryness on a water-bath a mixture of 1 c.c. of the solution and 1 c.c. of Ammonia Water should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Time-limit Test.—The residue obtained by evaporating 1 c.c. to dryness on a water-bath, when dissolved in a mixture of 9 c.c. of Water and 1 c.c. of diluted Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Sodium Hydroxide and Sulphuric Acid.—If 50 c.c. of the solution be rendered alkaline by Sodium Hydroxide T.S. and evaporated to dryness on a water-bath, and the residue transferred to a watch-glass, moistened with Sulphuric Acid, and allowed to stand for a few hours in a moderately warm place, the surface of the glass after being washed should show no sign of corrosion, indicating the absence of Hydrofluoric Acid, *U.S.P.*

Volumetric Determination of Free Acid.—If to 25 c.c. of the solution 5 c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution be added and the mixture be evaporated to about 10 c.c. and 3 drops of Phenolphthalein T.S. be added, not less than 2·5 c.c. of Tenth-normal Volumetric Solution of Sulphuric Acid should be required to discharge the red colour of the solution after continued boiling, *U.S.P.*

Volumetric Determination.—A measured quantity of 10 c.c. of the solution is diluted with sufficient Distilled Water to measure 100 c.c. A measured quantity of 16·9 c.c. of this liquid is transferred to a beaker, mixed with 5 c.c. of diluted Sulphuric Acid, and Tenth-normal Volumetric Potassium Permanganate Solution added from a burette with constant stirring until a faint pink tint is just retained. Each c.c. of the Tenth-normal Volumetric Solution represents 0·1 p.c. absolute Hydrogen Dioxide or 0·329 volume of Oxygen. If the solution be of full strength, 30 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution will be required, *U.S.P.*

Not Official.

GUTTÆ HYDROGENII PEROXIDI.—Hydrogen Peroxide 10 volumes.—*Throat.* Two or three drops to be poured into the ear, for fetid discharges.

Not Official.

HYGROPHILA.

The dried Herb and Root of *Hygrophila spinosa*, T. And., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

HYOSCYAMI FOLIA.

HYOSCYAMUS LEAVES.

B.P.Syn.—Henbane Leaves.

Fr., Jusquiame Noire; Ger., Bilsenkrautblatter; Ital., Giusquiamo; Span., Beleno.

The fresh Leaves, Flowers and Branches of *Hyoscyamus niger*, L.; also the Leaves and the Flowering Tops, separated from the branches and carefully dried. Collected from the flowering biennial plants.

The dried leaves and flowering tops collected from plants of the second year's growth are alone official in the *U.S.P.* The official leaves are not required to yield a definite percentage of mydriatic alkaloids; those of the *U.S.P.* are required to yield not less than 0·08 p.c. The herb is official in the *P.G.*, but no definite percentage of mydriatic alkaloids is required.

Medicinal Properties.—Sedative, antispasmodic. Similar in action to Belladonna and Stramonium, but milder. Used in insomnia when Opium, from its constipating and other objectionable properties, is not advisable. It is employed to diminish pain and allay irritability of the bladder, and to prevent the griping of purgative medicines, whilst it increases the peristaltic action; in visceral neuralgias and in asthma and all spasmodic affections; to allay the irritation of teething and prevent convulsions. Children bear Hyoscyamus well, the aged not so. In large doses it dilates the pupil. **Hyoscine** is much employed in maniacal delirium.

As a hypnotic Hyoscyamus has largely given way (*B.M.J.* '05, ii. 1005) to its alkaloid Hyoscine. Hyoscyamine is practically devoid of sleep-bringing properties.

Ph. Ger. maximum single dose, 0·4 gramme; maximum daily dose, 1·2 grammes.

Incompatibles.—Vegetable Acids, Silver Nitrate, Lead Acetate, Liquor Potassæ or Sodæ.

Official Preparations.—Extractum Hyoscyami Viride, Succus Hyoscyami, and Tinctura Hyoscyami; used in the preparation of Hyoscinæ Hydrobromidum, and Hyoscyaminæ Sulphas. The **extract** is contained in Pilula Colocynthidis et Hyoscyami.

Not Official.—Hyoscyami Radix, Chloroformum Hyoscyami, Huile de Jusquiame Composée, Linimentum Hyoscyami, Oleum Hyoscyami, Oleum Hyoscyami Compositum, Oleum Hyoscyami Infusum, Constant Tincture of Hyoscyamus (*Squire*), Tinctura Hyoscyami Radicis, Hyoscyamina, and Hyoscina (Scopolamine).

Antidotes.—The same as for Belladonna.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung., Ital. (Giusquiamo), Jap., Russ., Swed., Swiss and U.S., **Leaves**; Ger. **Herb**; Belg., Dan., Fr. (Jusquiame noire), Norw., Port. (Meimendro), Mex. (Beleno Negro), and Span. (Beleno), **Leaves** and **Seeds**.

The *Brussels Conference* agreed to use only the leaf.

Descriptive Notes.—Henbane Leaves occur in commerce in various forms. The dried flowering shoots are known as biennial Henbane, and the first year's large autumnal leaves are sold as annual Henbane. German Henbane consists of the flowering tops of

the small annual form of the plant, which is usually produced from the last formed seeds, and a certain amount of it is usually found in fields of the biennial form. These seeds produce weak plants which flower the first year. It has small leaves, and usually flowers are present, but the drug is less carefully dried than the English plant. Formerly a very superior preparation of the dried flower and leaves of the flowering shoots, with the stalks and mid-ribs removed, was sold, but is not at present obtainable. The official drug consists both of fresh leaves and flowers with the branches to which they are attached, and also of the leaves and the flowering tops separated from the branches, collected from the biennial plant, carefully dried. The leaves of the biennial plant are sessile or nearly so, the stalked root leaves decaying as a rule before the plant flowers. The sessile flowers are cup-shaped or irregularly rotate, yellowish with purple veins, and are subtended by large leafy bracts. The fruits open transversely and are two-celled, with numerous seeds attached to axile placentæ. The leaves are oblong ovate or triangular ovate, and sinuate in the broad-leaved form of the plant and oblong and pinnatifid in the narrow-leaved form. The stout veins and the under surface are furnished with long, clammy, glandular hairs, and the whole plant when fresh has a strong, somewhat unpleasant, but characteristic odour and a slightly acrid taste. Recently the leaves and stalks of *Hyoscyamus muticus*, L., have been imported from Egypt. They contain more Hyoscyamine than those of *H. niger*, for which they should therefore not be substituted, but the plant will not flourish in this country. Henbane Leaves in fragments or in powder may be recognised by the small prismatic crystals of Calcium Oxalate (0·010 mm. in diameter, *U.S.P.*), the 3 to 4 celled hairs with a bicellular or pluri-cellular gland at the apex, and by the stomata being surrounded by 3 to 4 cells, of which one is smaller than the others.

Tests.—Hyoscyamus Leaves dried at 100° C. (212° F.) contain from 0·06 to 0·15 p.c. of mydriatic alkaloids. The *U.S.P.* method of determination resembles that given under Belladonna Folia, except that in the place of 10 grammes of the powdered Belladonna Leaves, 25 grammes of Hyoscyamus Leaves in No. 60 powder are employed, and instead of 50 c.c. of a mixture containing 4 parts by volume of Ether and 1 part by volume of Chloroform, a measured quantity of 100 c.c. of a mixture of similar composition is employed. No method of determination is given in the *P.G.* The ash of the Leaves varies from 8 to 12 p.c. and should not exceed the latter figure.

Preparations.

EXTRACTUM HYOSCYAMI VIRIDE. GREEN EXTRACT OF HYOSCYAMUS.

A soft Extract, prepared from the juice expressed from fresh Henbane, the albuminous matters being separated at 93·3° C. (200° F.) and rejected.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

It is generally used in smaller doses in **pills** to prevent the griping action of aperients.

Foreign Pharmacopœias.—Official in Austr. and Belg., alcoholic from **dried Leaves**; Dan., Norw. and Swed., made from **Leaves** with weak spirit; Dutch and Fr., alcoholic from **dried Leaves**; Ger. and Jap., made with Water and Spirit from **fresh Herb**; Hung., juice from **fresh Leaves**, freed from Albumen and evaporated to a thick fluid, equal parts of Spirit added, filtered and again evaporated; Ital., from **dried Leaves** with dilute Alcohol; Mex., from **dried Leaves** and dilute Alcohol, also **Fluid Extract**; Port., aqueous from **dried Leaves**, also from **fresh Leaves** with Alcohol; Russ., made from **Leaves** with Water and Spirit; Span., alcoholic from **dried Leaves**; Swiss, from **dried Leaves** with dilute Spirit; U.S., alcoholic extract from the **dried Leaves**, also **Fluid Extract** from the same.

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

Tests.—The Green Extract of Hyoscyamus of the *B.P.* is not a standardised preparation. The *U.S.P.* Extract is required to contain not less than 0·3 p.c. of mydriatic alkaloids, the Extract, if stronger than this, being diluted with powdered Milk Sugar. The *P.G.* Extract is required to yield at least 0·7 p.c. of alkaloids. The method adopted by the *U.S.P.* is similar to their method for the determination given under Extractum Belladonnæ Viride, with the exception that, in this instance, a weighed quantity of 10 grammes of the Extract is employed instead of the 5 grammes used in the case of the Belladonna Extract. In calculating the percentage of mydriatic alkaloids the result of the volumetric test is multiplied by 10 instead of by 20.

The *P.G.* method of determination is essentially as follows:—A weighed quantity of 2 grammes of the Extract is dissolved in a beaker in 5 grammes of Water and 5 grammes of Absolute Alcohol. 50 grammes of Ether and 20 grammes of Chloroform are added to this solution and, after a vigorous shaking, 10 c.c. of a 1 in 3 w/w Sodium Carbonate Solution. The mixture is allowed to stand for one hour, with frequent intervals of vigorous shaking. A weighed quantity of 50 grammes is then filtered through a dry, well-covered filter paper into a flask and about half is distilled. The remaining Ether-Chloroform solution is transferred to a separator. The flask washed with 3 successive portions each of 5 c.c. of Ether and the combined fluids shaken with 10 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. When the liquids have completely separated sufficient Ether is added to cause the Chloroform-Ether solution to float on the surface of the acid liquid, and the latter is filtered through a filter paper moistened with Water into a white glass flask of about 200 c.c. capacity. The Chloroform-Ether solution is shaken with three successive quantities each of 10 c.c. of Water, the washings being filtered through the same filter, the latter is washed with Water and the combined fluids are diluted with Water to 100 c.c. After the addition of sufficient Ether to form a layer of about 1 cm., 5 drops of Iodeosin Solution are added and Hundredth-normal Volumetric Potassium Hydroxide Solution added until the lower aqueous layer assumes a pale rose coloration, the mixture being shaken after each

addition. To produce this colour not more than 6·5 c.c. of the Volumetric Potassium Hydroxide Solution should be necessary.

SUCCUS HYOSCYAMI. JUICE OF HYOSCYAMUS.

3 of the juice, expressed from fresh Henbane, mixed with 1 of Alcohol (90 p.c.) to preserve it.

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

TINCTURA HYOSCYAMI. TINCTURE OF HYOSCYAMUS.

1 of Hyoscyamus Leaves and Flowering Tops in No. 20 powder, percolated with Alcohol (45 p.c.), to yield 10. (1 in 10)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Much larger doses, 4 fl. drm. = 14·2 c.c., have been given in insomnia.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Span. and U.S., 1 in 10; Port., 1 and 5, also fresh Herb and Alcohol, equal weights; Mex., 1 in 5 from Leaves, also 1 in 5 from Seeds; also Ethereal, 1 in 5. All by weight except U.S.

The *Brussels Conference* agreed to a strength of 10 p.c., prepared by percolation with Alcohol (70 p.c.).

Tests.—Tincture of Hyoscyamus has a sp. gr. of 0·950 to 0·955, contains from about 2·5 p.c. w/v of total solids and about 45 p.c. w/v of Absolute Alcohol. The *B.P.* is not a standardised preparation. The *U.S.P.* Tincture is required to contain 0·007 p.c. w/v of mydriatic alkaloids. The method of determination adopted by the *U.S.P.* is virtually that employed for the assay of the Fluid Extract of Belladonna. A measured quantity of 100 c.c. of the Tincture is evaporated on a water-bath to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) is added to dissolve any separated substance and the resulting liquid is assayed by the process described under Extractum Belladonnæ Liquidum. In calculating the result of the volumetric determination the final multiplication by 10 is unnecessary.

Constant Tincture of Hyoscyamus (*Squire*).—A Tincture of Hyoscyamus standardised to contain 0·01 p.c. w/v of mydriatic alkaloids, and forming one of the series of Constant Tinctures introduced by Squire in 1883. It has a sp. gr. of about 0·960, contains about 2·5 p.c. w/v of total solids and about 44·5 p.c. w/v of Absolute Alcohol. A sample of *B.P.* '98 Tincture prepared and assayed in the author's laboratory had a sp. gr. of 0·955, contained 2·64 p.c. w/v of total solids, 44·5 p.c. w/v of Absolute Alcohol, and yielded 0·01 p.c. w/v of mydriatic alkaloids.

HYOSCINÆ HYDROBROMIDUM and **HYOSCYAMINÆ SULPHAS.** *See* separate headings.

Not Official.

HYOSCYAMI RADIX.—The dried Root of *Hyoscyamus niger* (biennial) collected in the spring. Introduced by Peter Squire in 1878. Contains on the average about 0·15 p.c. of total alkaloid.

Chloroformum Hyoscyami, Linimentum Hyoscyami, and **Tinctura Hyoscyami Radicis,** are prepared on similar lines to the corresponding preparations of Belladonna.

OLEUM HYOSCYAMI.—Hyoscyamus Leaves, 4; Alcohol (90 p.c.), 3; Olive Oil, 40. The leaves are macerated several hours with the Alcohol, then mixed with the Olive Oil and warmed on the water-bath till the Alcohol is dissipated.—*Ger.*

Foreign Pharmacopœias.—Official in Austr. (Oleum Hyoscyami foliorum coctum), Leaves 100, Alcohol 75, Ammonia 2, Sesame Oil 1000; Belg. (Hyoscyami Oleum), Leaves 100, Alcohol 200, Oleum Officinale 1000; also (Hyoscyami Oleum Compositum), Lavender Oil 1, Peppermint Oil 1, Oil of Rosemary 1, Oil of Thyme 1, Hyoscyamus Oil 996. Dutch (Infusum Hyoscyami Oleosum), Leaves 25, Alcohol 50, Ammonia 1, Sesame Oil 250. Fr. (Huile de Jusquiame), dried Leaves 1, Alcohol (95 p.c.) 1, Poppy Oil 10; Jap. (Oleum Hyoscyami), Leaves 4, Alcohol 3, Olive Oil 40. Norw. and Swed. (Oleum Hyoscyami Infusum), Leaves 50, Alcohol 100, Ammonia 1, Sesame Oil 250. Russ. (Oleum Hyoscyami), dried Leaves 4, Alcohol (90 p.c.) 3, Sesame Oil 24. Span. (Aceite de Beleno), fresh Leaves 5, Olive Oil 10. Swiss (Oleum Hyoscyami), Leaves 10, Alcohol 10, Ammonia 2, Sesame Oil 100; also (Oleum Hyoscyami Compositum) (*Syn.* Balsamum Tranquilli) same as Belg.

The majority of the above work out about 1 of Leaves in 10 of product.

HUILE DE JUSQUIAME COMPOSÉE. (Baume Tranquille. (Fr.).—Dried Leaves of Belladonna, Henbane, Black Nightshade, Poppy and Stramonium, of each 5; Oils of Lavender, Peppermint, Rosemary and Thyme, of each 1; Alcohol (95 p.c.), 200; Poppy Oil, 5000.

Moisten the powdered leaves with the Alcohol, and digest on a water-bath for 24 hours, add the Poppy Oil and heat for 6 hours at 60° to 70° C., stirring occasionally; express; allow to settle, and decant; add the Oils and filter.

Oleum Hyoscyami Infusum.—Hyoscyamus Leaves, in No. 40 powder, 20; Alcohol (95 p.c.), 15; Ammonia Water (*U.S.P.*), 0·4; Lard Oil, 50; Cotton Seed Oil, 50.

Moisten the powder with Alcohol and Ammonia previously mixed, pack tightly and cover well, and macerate for 24 hours; add 12 of mixed oils, digest with agitation for 12 hours at a temperature between 50° and 60° C., strain and express. To the residue add the remainder of the Oils, digest and express as before and mix the expressed portions.—*U.S.N.F.*

This process is a modification of that prescribed by the *Ger. Ph.* and may be used for similar Infused Oils.

Oleum Hyoscyami Compositum. *Syn.* Balsamum Tranquillans.—Oils of Absinth, Lavender, Rosemary, Sage, Thyme, of each 2 drops; Infused Oil of Hyoscyamus (*N.F.*) 100 c.c.—*U.S.N.F.*

HYOSCYAMINA. Hyoscyamine. $C_{17}H_{23}NO_3$, eq. 287·05.—A crystalline alkaloid obtained from the Seeds of *Hyoscyamus niger*, the Root of *Scopola carniolica*, and probably other allied plants, isomeric with Atropine but not identical with it.

It occurs as white needle-shaped crystals. Only slightly soluble in Water, but freely in Alcohol (90 p.c.), in Chloroform, and in Ether. Probably constitutes the greater portion of the crystallisable alkaloid naturally existing in all the mydriatic drugs, and best obtained from the Root of Scopola or Belladonna. Most of the commercial 'Atropine' consists principally of Hyoscyamine.

The salts used in medicine are the **Hydrobomide** and **Sulphate.**

Dose.—$\frac{1}{120}$ to $\frac{1}{60}$ grain = 0·0005 to 0·001 gramme.

Hager, maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Tests.—Hyoscyamine melts at 108·5° C. (227·3° F.). Its solutions in neutral solvents are alkaline in reaction towards Litmus Solution and lævogyrate. It forms with Auric Chloride Solution a Gold double salt melting at 160° to 162° C. (320° to 323·6° F.). It dissolves in Sulphuric Acid without change of colour, and no alteration in colour should occur on the addition of one or two drops of Nitric Acid. It should leave no residue when ignited with free access of air.

HYOSCINA. Scopolamine, Hyoscine. $C_{17}H_{21}NO_4H_2O$, eq. 318·81.—An alkaloid which is found in *Hyoscyamus niger*, and various species of *Scopola*. It now represents what was formerly used in medicine under the name 'Amorphous Hyoscyamine.' It is usually employed medicinally in the form of **Hydrobromide, Hydrochloride,** and **Hydriodide.**

Foreign Pharmacopœias.—Official in Mex.

It forms transparent moderate-sized crystals or a colourless transparent glassy mass. It is slightly soluble in Water, readily soluble in Alcohol (90 p.c.), Ether, Chloroform and diluted acids.

Tests.—Crystalline Hyoscine, when dry, melts at 59° C. (138·2° F.). When dried over Sulphuric Acid the crystals lose in weight and change to a colourless amorphous glassy-looking mass which will not recrystallise. Its faintly acidified solution gives with Potassio-mercuric Iodide (Mayer's) Solution a yellowish-white precipitate; with Mercuric Chloride Solution a white precipitate; with Picric Acid a yellow crystalline precipitate. Tannic Acid produces no precipitate. Auric Chloride Solution added to a solution of Hyoscine faintly acidified with Hydrochloric Acid yields a yellow precipitate which, recrystallised from Water, yields brilliant yellow, glistening needles, which melt at 212° to 214° C. (413·6° to 417·2° F.). It leaves no weighable residue when ignited with free access of air.

HYOSCINÆ HYDROBROMIDUM.

HYOSCINE HYDROBOMIDE.

B.P.Syn.—Hydrobromate of Hyoscine; Scopolamine Hydrobromide.

$C_{17}H_{21}NO_4$, HBr, $3H_2O$, eq. 434·92.

Fr., Bromhydrate d'Hyoscine; Ger., Scopalaminhydrobromid; Ital., Bromhidrato de Scopolamina.

Colourless, transparent, rhombic crystals, permanent in the air.

A similar description is common to the *B.P.* and *U.S.P.*

It is the Hydrobromide of an alkaloid, Hyoscine (Scopolamine) obtained from Hyoscyamus, various species of Scopola and other plants of the Solanaceæ.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light.

Atroscine, the crystalline variety of Hyoscine, forms a crystalline **Hydrobromide.**

Solubility.—1 in 4 of Water; 1 in 14 of Alcohol (90 p.c.); very slightly soluble in Chloroform or Ether.

B.P. states it is 'soluble in one part of cold Water,' which is incorrect; 1 in 4 is more nearly so.

Medicinal Properties.—Hypnotic and sedative. Highly recommended in all forms of violent mania and cerebral excitement.

Given by the mouth it appeared (*M.P.* '05, i. 645) to be of great benefit in acute mania, giving quiet sleep, whereas by hypodermic injection it caused an alarming degree of depression.

In paralysis agitans (*B.M.J.E.* '05, ii. 44), 0·2 to 0·3 mgr., either in pill or in solution. In certain cases of senile pruritus it was of value in doses of 0·3 to 0·5 mgr. daily. In spasmodic asthma it was administered in large doses (0·25 to 0·5 centigramme) subcutaneously with Caffeine, with very great relief. In acute mania hypodermic injection resulted in eight or nine hours' sleep, with consequent inprovement in the general mental state.

The racemic form seemed (*B.M.J.* '05, ii. 250) to be less liable to produce untoward effects as a hypnotic, and was of equal hypnotic value, but Hyoscyamine and Hyoscine should be used with caution.

Exists in two forms (*B.M.J.* '05, ii. 1005), one of which is optically active (lævorotatory), whilst the other is indifferent to the ray of polarised light or racemic. The two have the same effect as hypnotics, but the racemic form has only half the action of the lævorotatory base on the pupil, glands and heart.

Scopolamine the best of all sedatives in the vomiting of pregnancy.—*B.M.J.E.* '07, ii. 27.

1000 confinements conducted with its assistance.—*B.M.J.E.* '07, ii. 10.

In epileptic attacks of an hysterical form.—*M.A.* '95, 244.

As a mydriatic (1 grain to 1 oz.), in cases where Atropine is undesirable.—*B.M.J.* '94, ii. 598.

Incipient acute mania arrested by a single injection of $\frac{1}{100}$ grain.—*B.M.J.* '97, ii. 652.

In mania, $\frac{1}{100}$ grain hypodermically and after forty minutes $\frac{1}{200}$ grain by the mouth to procure seven hours' sleep, followed after an interval of two days by a dose of $\frac{1}{60}$ grain hypodermically to induce a ten hours' sleep; Sodium Bromide in drm. doses being administered during the interval and for two days after the second sleep until 2 oz. in all had been taken.—*B.M.J.* '03, i. 74.

In the palliative treatment of paralysis agitans, it is probably the most useful drug that has hitherto been tried, $\frac{1}{200}$ to $\frac{1}{150}$ grain in solution in Chloroform Water, administered by the mouth. Great caution required as regards the dose, and it is well not to begin with more than $\frac{1}{150}$ or $\frac{1}{100}$ grain. $\frac{1}{75}$ grain given two or three times a day (by the mouth), for long periods without noting any bad effects.—*Pr.* lxiv. 410.

In exophthalmic goitre, $\frac{1}{800}$ grain.—*M.A.* '02, 280.

Two cases of paralysis agitans treated with Hydrobromide, at first hypodermically, the dose being gradually increased from $\frac{1}{250}$ to $\frac{1}{120}$ grain, injected once a day. Subsequently administered in $\frac{1}{150}$ grain doses dissolved in Chloroform Water, given twice daily by the mouth, gradually increasing the dose up to $\frac{1}{30}$ grain.—*L.* '02, i. 1907.

Hyoscine is more sedative and more reliable as a hypnotic than Hyoscyamine; indeed, it has almost totally replaced it for this purpose. There can be little doubt, moreover, notwithstanding the many ill effects attributed to the use of Hyoscine (Scopolamine), and to its variable action, that as a hypnotic it has come to stay. Its solubility in Water and its applicability to hypodermic medication make it of extreme value in many conditions, particularly in the insane.—*L.* '99, ii. 142.

$\frac{1}{100}$ grain, and subsequently $\frac{1}{200}$ grain, every thirty minutes to one hour, for from twenty-four to forty-eight hours, until the patient has taken from forty to sixty doses; in the treatment of the drug habit.—*T.G.* '02, 41, 71.

Morphine-Scopolamine Anæsthesia.—Hypodermic injection of $\frac{1}{200}$ to $\frac{1}{150}$ or even $\frac{1}{64}$ grain of Scopolamine Hydrobromate with $\frac{1}{4}$ grain of Morphine, to be repeated after one or two hours, previous to an operation. Very little Chloroform is required, and the patients sleep for hours after the operation, and do not complain of any pain.—*B.M.J.E.* '01, ii. 44.

Morphine-Scopolamine anæsthesia would be found useful in those cases where Chloroform and Ether are both contra-indicated, but that its action is not narcotic enough to admit of its taking the place of the general inhalation anæsthetics.—*B.M.J.E.* '03, i. 14.

G. Volkmann found it advisable to give 12 milligrammes (about $\frac{1}{5}$ grain) of Scopolamine and 1·5 centigramme (about $\frac{1}{4}$ grain) of Morphine four hours before the operation and repeat the doses two hours later, and $\frac{1}{4}$ hour before the operation he gives 3 mg. (about $\frac{1}{20}$ grain) of Scopolamine and 5 mg. (about $\frac{1}{12}$ grain) of Morphine. In the case of old people, or patients suffering from diseases of the internal organs, he employed smaller doses. In some cases the anæsthesia had to be deepened by Ether inhalation (given drop by drop).—*B.M.J.E.* '04, 1. 21.

Administered hypodermically in repeated doses of $\frac{1}{64}$ grain accompanied by $\frac{1}{6}$ grain Morphine Sulphate, four hours, two hours, and one hour before the time fixed for operation, it produces (*M.P.* '05, ii. 575) a quite restful sleep, giving two or three hours good anæsthesia. It does not, however, give complete muscular relaxation, and therefore ought not to be given in operations where complete relaxation is required, *e.g.*, abdominal operations.

As a general anæsthetic, solution of 1 milligramme ($\frac{1}{4}$ grain) with a centigramme ($\frac{1}{6}$ grain) of Morphine in 1 c.c. of Distilled Water injected subcutaneously four hours before the surgical operation, followed by a second injection after an interval of one hour (*B.M.J.E.* '05, i. 48).

Scopolamine-morphine is recommended (*Glasgow Med. Jour.* '06, 298) as a preparative to Chloroform, and not as a means of inducing full narcosis;

this is supported by Korff, Kümmel, Krönig, and others. For this purpose, small doses, $\frac{1}{2}$ milligramme ($\frac{1}{120}$ grain) of Scopolamine with $\frac{1}{2}$ to $1\frac{1}{2}$ centigrammes ($\frac{1}{12}$ to $\frac{1}{4}$ grain) of Morphine, should be given half to one hour before the operation; or better still, if time allows, half this dose should be given an hour and a half before operation, and repeated in an hour. Chloroform must be given in very small quantities, drop by drop, and should not be pushed to the point of abolishing the reflexes. This persistence of the reflexes, indeed, is one of the disadvantages, and the limbs should be mechanically controlled. Ether is still less satisfactory in this respect. In old people, however, even the small dose of Scopolamine is sometimes sufficient to induce anæsthesia without the addition of Chloroform. At the end of the operation, the patient should be given an infusion or enema of 1 to 2 pints of warm Saline Solution, in order to obviate the thirst which in these cases is sometimes distressing; and when he awakes some hours after he may be given a little food. Special care must be taken with children and patients suffering from diseases of the heart or kidneys. *See* also *B.M.J.* '05, ii. 185, and *B.M.J.E.* '07, i. 47.

Two cases in which the subcutaneous injection of 1 mg., along with 1 cg. of Morphine, one hour before the administration of chloroform was followed by death on the operation table.—*B.M.J.E.* '07, ii. 68.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Prescribing Notes. *Best given by hypodermic injection. When given by the mouth it may be conveniently dissolved in Chloroform Water.*

Not Official.—Guttæ Hyoscinæ, Guttæ Hyoscinæ et Cocainæ, Hyoscine Discs, Injectio Hyoscinæ Hypodermica, Hyoscinæ Hydrochloridum (Scopolamine Hydrochloride), and Hyoscinæ Hydriodidum (Scopolamine Hydriodide).

Antidotes.—Pilocarpine Nitrate, half a grain hypodermically, or $\frac{1}{3}$ grain Morphine; then stomach-tube or emetics, followed by stimulants and artificial respiration.

Foreign Pharmacopœias.—Official in Dan., Dutch, Ger., Jap., Swiss and U.S. (Scopolaminum Hydrobromidum); Ital. (Bromhidrato di Scopolamina). Not in the others. The title 'Hyoscine Hydrobromide,' introduced into *Ph. Ger.* iii., has been replaced in *Ph. Ger.* iv. by 'Scopolamine Hydrobromide.'

Tests.—Hyoscine Hydrobromide contains theoretically 12·33 p.c. of Water. It is officially required to lose rather more than 12·0 p.c. of its weight at a temperature of 100° C. (212° F.); the *P.G.* gives 12·3 p.c.; the *U.S.P.* states that it loses its Water of crystallisation at 110° C. (230° F.). The anhydrous salt melts, according to Hesse, at 181° C. (357·8° F.), and not as officially stated at 193° to 194° C. (379·4° to 381·2° F.). Jowett confirms Hesse's melting point, and states that the purified lævo salt melts at 193° C. (279·4° F.), and the inactive modification at 180° C. (356° F.). The tests and characters of the official salt should therefore be given for the pure product as it appears in commerce, which is a mixture of stereo-isomers melting at 181° C. (357·8° F.). The *U.S.P.* gives the melting point as 191° to 192° C. (375·8° to 377·6° F.); the *P.G.* at about 180° C. (356° F.). Its aqueous solution is stated in all three Pharmacopœias to be slightly acid in reaction towards Litmus, though Jowett states (*P.J.* '98, ii. 196) that there is no reason why the salt should not be neutral to Litmus. Its aqueous solution slightly acidified with Hydrochloric Acid yields with Potassio-mercuric Iodide (Mayer's) Solution, a yellowish-white precipitate.

Its aqueous solution yields with Mercuric Chloride T.S. a white precipitate, with Phospho-tungstic Acid Solution a white precipitate; when in sufficiently concentrated solution it yields with Picric Acid a yellow precipitate; with Iodine Solution a brown precipitate; and with Platinum Chloride Solution a yellow precipitate. The aqueous solution yields a whitish precipitate with Potassium Hydroxide Solution. The turbidity is only produced on the addition of a considerable excess of Sodium Hydroxide Solution and disappears quickly. The aqueous solution is not precipitated by Ammonia Solution, or by Potassium Bichromate Solution. It is officially stated to form a crystalline salt with Auric Chloride having a m.p. of 198° C. (388·4° F.); Jowett (*J.C.S. Trans.*, '97, 679) has shown that under the *B.P.* conditions an additive compound Hyoscine Hydrobromide Gold Chloride melting at 215° C. (419° F.) is formed, but that when prepared in the usual manner the Aurichloride melts sharply at 198° C. (388·4° F.). The *U.S.P.* gives the m.p. of the pure Chloraurate at 197° C. (386·6° F.). When Hyoscine Hydrobromide is dissolved in Water it yields with Silver Nitrate Solution a yellowish curdy precipitate, insoluble in Nitric Acid, and when washed, practically insoluble in Ammonia Solution. One or two drops of Chlorine Water added to a small quantity of a 1 in 10 aqueous solution yield a reddish-brown solution, and when shaken with Chloroform the brownish-red colour passes into the chloroformic layer. A small crystal of the salt evaporated to dryness in a white porcelain dish on a water-bath, leaves a yellowish residue, which upon the addition of an Alcoholic Potassium Hydroxide Solution yields a violet coloration. Its freedom from readily charred organic impurities may be ascertained by the Sulphuric Acid test, the salt should yield but a pale yellow coloration when treated with this Acid, and if after the addition of Nitric Acid no colour is developed the absence of Morphine may be inferred. The salt should leave no weighable residue when ignited with free access of air.

Commercial samples may contain in addition to inactive Scopolamine (Atrosine) Apoatropine. Apoatropine is, according to Kobert (*P.J.* '05, i. 442), a dangerous impurity and one to be rigidly excluded. Absolutely necessary for the official description to require a rotatory power not less than that shown by the pure salt −25·45° for a 6·5 p.c. solution at 15·8° C. (60·5° F.).

Sulphuric Acid.—Only a faint yellow colour should be developed on the addition of Sulphuric Acid to Hyoscine Hydrobromide.

Nitric Acid.—On the subsequent addition of a drop of Nitric Acid to the above mixture no coloration should be developed, *U.S.P.*

Not Official.

GUTTÆ HYOSCINÆ. *Syn.* Guttæ Scopolaminæ.—Hyoscine Hydrobromide, 2 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic* and *Charing Cross.*

Hyoscine Hydrobromide 0·5 or 1 p.c.—*St. Thomas's* and *B.P.C.*

GUTTÆ HYOSCINÆ ET COCAINÆ.—Hyoscine Hydrobromide, 0·5 p.c.; Cocaine Hydrochloride, 1·0 p.c.—*St. Thomas's* and *B.P.C.*

INJECTIO HYOSCINÆ HYPODERMICA.—A convenient solution is made by dissolving Hyoscine Hydrobromide, 1 grain, in sterilised Distilled Water, 500 minims, but the strength should always be indicated by the prescriber.

Dose.—2 to 5 minims = 0·12 to 0·3 c.c. as a sedative in nervous diseases, especially where there is much violence and excitement. When given by the mouth at least double the dose is required to produce the same effect.—*L.* '89, ii. 736.

Hyoscine Discs.—$\frac{1}{200}$ and $\frac{1}{75}$ grain, *St. Bartholomew's*; $\frac{1}{200}$ grain, *Guy's*.

HYOSCINÆ HYDROCHLORIDUM (Hyoscine Hydrochloride, Scopolamine Hydrochloride).—Large, colourless, prismatic crystals, or as a colourless crystalline powder, readily soluble in Water, and in Alcohol (90 p.c.).

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Tests.—Hyoscine Hydrochloride answers to the tests distinctive of Hyoscine given under Hyoscina and Hyoscinæ Hydrobromidum. The aqueous solution yields with Silver Nitrate Solution a white curdy precipitate, which, when filtered and washed, is insoluble in Nitric Acid but readily dissolves in Ammonia Solution. The salt when ignited with free access of air leaves no weighable residue.

HYOSCINÆ HYDRIODIDUM (Hyoscine Hydriodide, Scopolamine Hydriodide).—Colourless, transparent prismatic crystals. Soluble in Water, and in Alcohol (90 p.c.).

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

HYOSCYAMINÆ SULPHAS.

HYOSCYAMINE SULPHATE.

$(C_{17}H_{23}NO_3)_2,H_2SO_4,2H_2O$, eq. 707·20.

White, slender, crystalline, hygroscopic needles, or an odourless, white, granular, hygroscopic powder.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, especially moist air.

Solubility.—2 in 1 of Water; 1 in 4½ of Alcohol (90 p.c.); very slightly soluble in Chloroform or Ether.

Medicinal Properties.—In small doses it is a sedative for mental excitement and insomnia, and in large doses it has been used for calming the excitement of delirium tremens and acute mania, but for this purpose it is superseded by the salts of Hyoscine.

Taken for sea-sickness in $\frac{1}{100}$ grain doses three or four times a day, two or three days before embarking, and for the first days on board ship, until nausea has disappeared.—*B.M.J.* '93, ii. 596.

These are conveniently carried as half-grain pilules, made with 'Diluting Mixture,' p. 897.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Hager, maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Not Official.—Hyoscyaminæ Hydrobromidum, Hyoscyamine Discs.

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

Tests.—Pure Hyoscyamine Sulphate melts at 204° C. (399·2° F.); the commercial Hyoscyamine Sulphate melts at about 200° C. (392° F.); the official melting point is 206° C. (402·8° F.). The *U.S.P.* m.p. is 198·9° C. (390·1° F.). Jowett suggests (*P.J.* '98, ii. 196) that an official m.p. should be given not lower than 200° C. (392° F.). Its aqueous solution is neutral in reaction

towards Litmus paper and is lævogyrate. It affords a yellow precipitate with Auric Chloride. Both the *B.P.* and *U.S.P.* state that the yellow precipitate is soluble in boiling Water acidified with Hydrochloric Acid, and again deposited in the form of brilliant golden yellow scales on cooling the solution. A small crystal evaporated to dryness in a porcelain dish on a water-bath, with 5 drops of Nitric Acid, leaves a yellowish residue which, when moistened with Alcoholic Potassium Hydroxide Solution, affords a purple-violet coloration. The m.p. of the Aurichloride is 160° C. (320° F.). The *U.S.P.* gives this figure for the m.p., but *B.P.* gives no figure. The *U.S.P.* also gives a figure for m.p. of the Picrate. The aqueous solution of the salt yields with Barium Chloride Solution, a white precipitate insoluble in Hydrochloric Acid.

The more generally occurring impurities are fixed residue, alkaloids other than Hyoscyamine, readily charred organic impurities.

The salt should leave no weighable residue when ignited with free access of air. Most alkaloids other than Hyoscyamine may be detected by the behaviour with Platinic Chloride Solution as described in the small type below; readily charred organic impurities are revealed by the Sulphuric Acid test. Hyoscyamine may be distinguished from Atropine by its optical activity and by the m.p. of its Aurichloride. Compare Atropine, p. 199.

Picric Acid.—Hyoscyamine Picrate melts at 162° C. (323·6° F.). Atropine Picrate melts at 175° C. (347° F.), *U.S.P.*

Platinic Chloride.—No precipitate is formed in solutions of the salt on the addition of T.S. of Platinic Chloride, *U.S.P.*; a solution in Water acidulated with Hydrochloric Acid yields no precipitate with Platinic Chloride Solution, *B.P.*

Sulphuric Acid.—No colour should be produced when Sulphuric Acid is added to Hyoscyamine Sulphate, *U.S.P.*

Not Official.

HYOSCYAMINÆ HYDROBROMIDUM.—Short white or yellowish-white prismatic crystals, readily soluble in Water, and in Alcohol (90 p.c.).

On account of its deliquescent nature it should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from exposure to air.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Official in U.S.

Tests.—Hyoscyamine Hydrobromide melts at 151·8° C. (305·3° F.) Its aqueous solution is neutral in reaction towards Litmus and is lævogyrate. It answers the tests distinctive of Hyoscyamine given under Hyoscyaminæ Sulphas, with the exception of the test with Gold Chloride Solution. The *U.S.P.* 1890 stated that with Gold Chloride Solution an aqueous solution of the salt yields a precipitate which when recrystallised from a small quantity of boiling Water acidulated with Hydrochloric Acid, is deposited on cooling in minute, lustrous golden yellow scales.

Jowett has shown (*J.C.S. Trans.*, '97, 679) that under the above conditions a Hyoscyamine Hydrobromide Gold Chloride is produced, it forms a yellowish-red salt which crystallises from boiling acidified Water in scales, melting sharply at 164° C. (327·2° F.), and suggested that the *U.S.P.* description required modification. The description of the test appearing in the 8th Decennial Revision of the *U.S.P.* is, however, the same as that given in the 1890 Edition. The aqueous solution yields with Silver Nitrate Solution a yellowish-white curdy precipitate which is insoluble in Nitric Acid; when filtered and washed it is practically

insoluble in Ammonia Solution, but readily soluble in Potassium Cyanide. It is liable to contain the same impurities as the Sulphate, and the methods adopted for their detection in the latter may be also applied here. The *U.S.P.* includes a test for Morphine; no colour should be produced on the addition of Nitric Acid to a mixture of Hyoscyamine Hydrobromide and Sulphuric Acid.

Hyoscyamine Discs (for hypodermic injection).—$\frac{1}{80}$ and $\frac{1}{20}$ grain of Hyoscyamine Sulphate.—*St. Bartholomew's.*

Not Official.

ICHTHYOCOLLA.

ISINGLASS.

Fr., Colle de Poisson; Ger., Hausenblase; Ital., Colle di Pesce; Span., Ictiocola.

The swimming bladder or sound of various species of *Acipenser*, prepared and cut into fine shreds.

This well-known substance was in the early London Pharmacopœias, and called Ichthyocolla or Fish Glue; it was used in medicine as a nutrient. It is still to be found in most of the Continental Pharmacopœias. It is used for fining Wine, for which purpose Gelatin does not answer. Russian Isinglass is reckoned the best quality. Isinglass is used for Court Plaster and Gold-beater's Skin.

Isinglass, 15 grains to the fl. oz. of Glycerin is useful in some skin diseases.

This is included among the Tests of the *B.P.*, its solution being used for Tannic Acid, with which it forms an insoluble compound.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Hung., Jap., Norw. and Russ. (Colla Piscium); Ital. (Colla de Pesce); Mex. (Cola de Pescada); Port. (Gelatina de Peixe); Span. (Ictiocola). Not in the others.

Descriptive Notes.—There are many varieties of Isinglass in commerce differing in shape and quality. It consists of the swimming bladder of various fishes washed and freed more or less from the lining membranes. The kind preferred for use in medicine is derived from various species of Sturgeon (*Acipenser Huso*, etc.) and is imported from Russia. It is prepared in the form of leaf Isinglass, *i.e.*, the swimming bladder is cut open, cleaned and pressed flat, or twisted when soft into various shapes or folded and known as long and short staple or book Isinglass, but in retail commerce is offered cut up into slender threads, which can be distinguished from Gelatin by its laminated structure.

Tests.—Isinglass is not soluble in cold Water, but the best qualities dissolve almost entirely in boiling Water. On treating Russian Isinglass with hot Water the substance swells uniformly, producing a whitish opaline jelly which gradually dissolves entirely; Gelatin, under similar conditions, swells irregularly and gives a nearly transparent solution. The best Russian Isinglass usually leaves from 0·4 to 1·0 p.c. of ash.

Not Official.

ICHTHYOL.

AMMONIUM ICHTHYOLSULPHONATE.

A reddish-brown, syrupy liquid, with igneous bituminous odour and taste. Obtained by the action of Sulphuric Acid on a Sulphur-containing mineral oil distilled from peculiar fossil deposits, principally fish, and subsequent neutralisation with Ammonia.

Solubility.—Entirely soluble in Water, partly soluble in Alcohol (90 p.c.) and Ether, entirely in a mixture of both.

It mixes readily with Glycerin, Fats, Oils, Soft Paraffin, and Lanolin.