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

**Tests.**—Lycopodium, when examined under the microscope, should not exhibit Pollen or Starch grains, or particles of sand. It should not leave more than 5 p.c. of ash when ignited with free access of air.

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**Not Official.**

## MAGNESIUM.

MAGNESIUM.

$\mathrm{Mg}$, eq. 24·18.

Magnesium, the metallic base of Magnesium salts, does not occur naturally; it is a product of manufacture.

**Tests.**—Magnesium is a brilliant grey metal, slightly resembling Silver in appearance, malleable, fusible at a low temperature, and convertible into Magnesium Oxide by the combined action of air and moisture. It has a sp. gr. of 1·750; when strongly heated it takes fire and burns, emitting a powerful actinic light and leaving a residue of Magnesium Oxide.

It dissolves readily in diluted mineral acids, yielding solutions which, when neutralised with Ammonia Solution, afford with Sodium or Ammonium Phosphate Solution a white crystalline precipitate, insoluble in Ammonia Solution and in Solution of Ammonium salts, soluble in diluted Hydrochloric Acid. Ammonia Solution, Calcium Potassium or Sodium Hydroxide Solution, affords a white precipitate, insoluble in excess of the reagent but soluble in excess of Ammonium Chloride Solution. Ammonium Carbonate Solution affords no precipitate in the presence of Ammonium Chloride Solution.

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# MAGNESIA LEVIS.

LIGHT MAGNESIA.

$\mathrm{MgO}$, eq. 40·06.

Fr., Oxyde de Magnésium; Ger., Gebrannte Magnesia;
Ital., Ossido di Magnesio; Span., Oxido Magnesico.

*B.P.Syn.*—Light Calcined Magnesia; Light Magnesium Oxide.

An extremely light, white, inodorous powder, possessing a faintly alkaline taste; prepared from light Magnesium Carbonate by ignition at a dull red heat.

It differs from Heavy Magnesia in that it is about 3½ times lighter.

It is liable to absorb both moisture and Carbonic Anhydride from the air, and should therefore be kept in well-closed glass bottles or jars.

**Medicinal Properties.**—Same as Magnesia Ponderosa.

**Dose.**—5 to 30 grains = 0·32 to 2 grammes, if repeated; 30 to 60 grains = 2 to 4 grammes, for a single dose.

**Prescribing Notes.**—*In* **cachets** *or* **mixtures**, *also taken in Milk. When mixing it with Water, it is desirable to add 5 or 6 times its weight of Water all at once, to prevent the formation of lumps, which would be difficult to rub down.*

**Official Preparation.**—Contained in Pulvis Rhei Compositus.

**Foreign Pharmacopœias.**—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.; Fr. has also Hydroxide de Magnesium.

**Tests.**—Light Magnesia when dissolved in diluted Sulphuric Acid affords a solution which answers the tests distinctive of Magnesium given under that heading. According to the *U.S.P.* it may be distinguished from Heavy Magnesia by its power of forming a gelatinous Hydroxide when 1 part of the Oxide is mixed with 15 parts of Water. It is not officially required to contain any definite percentage of pure Magnesium Oxide. The *U.S.P.* requires that the recently ignited and cooled Oxide shall contain not less than 96·0 p.c. of pure Magnesium Oxide, as volumetrically determined by the method indicated below. The *P.G.* gives no method of determination.

The more generally occurring impurities are foreign soluble salts, excess of moisture, Aluminium, Calcium, Iron, Carbonates, Chlorides, and Sulphates. The presence of foreign soluble salts may be detected by the test with Litmus and the residue test given in the small type below. Excess of moisture by the loss of weight when the sample is heated to a dull red heat. The *B.P.* states that it should lose little or no weight; the *U.S.P.* allows not more than 15 p.c. as Water of hydration. Aluminium and Iron are indicated by the formation of a precipitate on the addition of Ammonia Solution to a neutralised solution of the Oxide in diluted Hydrochloric Acid, containing an excess of Ammonium Chloride. The *U.S.P.* and *P.G.* give a separate test for Iron with Potassium Ferrocyanide Solution. Calcium is shown by the Ammonium Oxalate test, Carbonates, Chlorides, and Sulphates by the Acetic Acid, Barium Nitrate and Silver Nitrate tests respectively. The *U.S.P.* includes also a test for Arsenic, Copper, Iron, Lead and Zinc with Hydrogen Sulphide, adopting the time-limit test. The omission of tests for both Arsenic and Lead from the official monographs on Magnesium Oxide and Magnesium Carbonate is considered (*C.D.* '08, i. 796) to be really remarkable, highly objectionable quantities of both impurities having been found.

Standards of 4 parts per million for Arsenic and 20 parts per million for Lead have been suggested in this same reference, but it is mentioned that many samples will not pass these standards, and especially is this true of the 'heavy' Oxide. This is the only instance in the paper where standards not readily obtainable are suggested.

**Litmus.**—If 1 gramme of Magnesium Oxide and 50 c.c. of Water be heated to boiling, cooled and filtered, a filtrate is obtained which should not show more than a faintly alkaline reaction with red Litmus paper, *U.S.P.*

0·2 gramme of Magnesia boiled with 10 c.c. of Water, cooled and filtered, yields a filtrate at most but feebly alkaline in reaction, *P.G.*

**Residue.**—The filtrate obtained in the preceding *U.S.P.* test when evaporated to dryness should not leave more than 0·04 gramme of residue, *U.S.P.*; 5 c.c. of the filtrate obtained in the preceding *P.G.* test when evaporated should leave only a very insignificant residue, *P.G.*

**Acetic Acid.**—0·1 gramme of Magnesium Oxide heated to boiling with 5 c.c. of Water, then cooled and poured into 5 c.c. of Acetic Acid, should afford a solution without evolution of more than a few isolated gas bubbles, *U.S.P.*

**Ammonium Oxalate.**—10 c.c. of a solution of Magnesium Oxide (1–50) prepared by the addition of sufficient Acetic Acid for solution, should not be rendered more than slightly opalescent within 5 minutes by T.S. of Ammonium Oxalate, *U.S.P.*; the filtrate from a mixture of 0·2 gramme of Magnesia and 20 c.c. of water should not become more than opalescent within 5 minutes with T.S. of Ammonium Oxalate, *P.G.*

**Potassium Ferrocyanide.**—A solution of 1 gramme of Magnesia in 50 c.c. of diluted Hydrochloric Acid and 100 c.c. of Water should be colourless and not give an immediate blue coloration with T.S. of Potassium Ferrocyanide, *U.S.P.* 20 c.c. of an aqueous solution (1–20) prepared with Hydrochloric Acid should not give an immediate blue coloration with T.S. of Potassium Ferrocyanide, *P.G.*

**Hydrogen Sulphide.**—A solution of 0·4 gramme of Magnesia in 10 c.c. of diluted Acetic Acid should be unaffected by T.S. of Hydrogen Sulphide, *P.G.* A solution (1–20) in diluted Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

**Barium Nitrate.**—A solution in diluted Acetic Acid as above should not become more than opalescent with T.S. of Barium Nitrate, *P.G.*

**Silver Nitrate.**—A similar solution should not, after the addition of Nitric Acid, become turbid more than opalescent with Silver Nitrate T.S. within 5 minutes, *P.G.*

**Volumetric Determination.**—If 0·400 gramme of recently ignited and cooled Magnesia be dissolved in 25 c.c. of Normal Volumetric Sulphuric Acid Solution, not more than 5·8 c.c. of Normal Volumetric Potassium Hydroxide Solution should be required for neutralisation, using Methyl Orange T.S. as indicator. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 5 p.c. of pure Magnesium Oxide, *U.S.P.*

**Water.**—On stirring 1 part of Magnesia with 15 parts of Water in a beaker and allowing the mixture to stand for about half an hour, it will form a gelatinous mass of sufficient consistence to prevent it dropping out when the beaker is inverted. Heavy Magnesia does not readily unite with Water to form a gelatinous Hydroxide, *U.S.P.*

## MAGNESIA PONDEROSA.

HEAVY MAGNESIA.

$MgO$, eq. 40·06.

FR., MAGNÉSIE CALCINÉE PESANTE; GER., SCHWERE GEBRANNTE MAGNESIA.

*B.P.Syn.*—HEAVY CALCINED MAGNESIA; HEAVY MAGNESIUM OXIDE.

A fine, white powder, without odour, and having an earthy and faintly alkaline taste, prepared by igniting heavy Magnesium Carbonate at a dull red heat; it is specifically heavier than the above.

It is liable to absorb both moisture and Carbonic Anhydride from the air, and should therefore be kept in well-closed glass bottles or jars.

**Solubility.**—1 in about 6000 of cold Water, 1 in about 36,000 of hot Water; like Lime, it is more soluble in cold than in hot Water.

**Medicinal Properties.**—Antacid, laxative. Much used in dyspepsia, and to relieve vomiting, heartburn, sick headache, rheumatic and gouty conditions, and other complaints attended with acidity, and in larger doses for constipation. As a laxative, it may often be used with advantage when other medicines occasion nausea; generally combined with other purgatives. It is an excellent and mild purgative for children.

**Prescribing Notes.**—*It frequently becomes aggregated (on standing) into a solid mass when prescribed in mixtures, especially when given with the Sulphate. Magnesium Carbonate is not open to the same objection.*

*Although the heavy powder is preferred by many for its smoothness, the light powder is said to be quicker in its action.*

*It may be given in Water or in Milk, about twice its weight of either should be added at once, so as to form a smooth paste, before adding the remainder.*

**Dose.**—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

**Incompatibles.**—All acids.

**Official Preparation.**—Permitted in Pulvis Rhei Compositus.

**Foreign Pharmacopœias.** — Official in Jap., (Magnesia Usta Ponderosa); Norw. and Swed. (Oxydum Magnesicum Ponderosum); U.S. Not in the others.

**Tests.**—Heavy Magnesium Oxide dissolves readily in diluted Sulphuric Acid forming a solution which answers the tests distinctive of Magnesium given under that heading. It is distinguished from Light Magnesium Oxide by not forming a gelatinous Hydroxide when 1 part of the sample is mixed with 15 parts of Water. It should otherwise conform to the tests given under 'Magnesia Levis.' It is liable to contain the same impurities as the Light Carbonate, and the same methods may be employed for detecting their presence as are described under the Light Oxide.

## MAGNESII CARBONAS LEVIS.

LIGHT MAGNESIUM CARBONATE.

$3(\mathbf{MgCO_3}), \mathbf{Mg(HO)_2}, 4\mathbf{H_2O}$, eq. 380·65.

FR., HYDROCARBONATE DE MAGNÉSIUM; GER., MAGNESIUMCARBONAT; ITAL., CARBONATO DI MAGNESIO; SPAN., CARBONATO MAGNESICO.

A very light, white, odourless, micro-crystalline powder.

It has been stated that the composition of the substance varies within certain limits and cannot be represented by a definite formula. The Light Carbonate alone is official in the *U.S.P.*, and is stated to have a formula 'approximately' $(MgCO_3), 4Mg\ (OH)_2 + 5H_2O$, eq. 482·26. It is required upon ignition to yield not less than 40 p.c. of residue, of which not less than 96 p.c. should consist of pure Magnesium Oxide.

1 oz. occupies about the space of 6 fl. oz. of Water.

**Solubility.**—1 in 2500 of cold Water, 1 in 9000 of hot Water.

**Medicinal Properties.**—Same as Magnesia Ponderosa.

**Prescribing Notes.**—Same as given under Magnesia Levis.

**Dose.**—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

**Official Preparation.**—Used to prepare Magnesia Levis.

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

1 oz. occupies about the space of 6 fl. oz. of Water.

**Tests.**—Light Magnesium Carbonate dissolves readily in diluted mineral acids yielding solutions which afford the tests distinctive of Magnesium given under that heading, and evolving a colourless gas which, when passed into Lime Water, produces a white precipitate, redissolving with effervescence in dilute Hydrochloric Acid, and also soluble in a sufficient excess of the gas. When strongly ignited it is decomposed, yielding Carbonic Anhydride and Water and leaving a residue of Magnesium Oxide. The *B.P.* requirements are that when calcined at a red heat it should leave 42·0 p.c. of residue; the *U.S.P.* and *P.G.* that, when ignited, the residue should amount to not less than 40 p.c. It is not officially required to contain a definite percentage of Magnesium Oxide, and no method is given for the determination, nor is a process given in the *P.G.* The *U.S.P.* requires that it shall contain not less than 96·0 p.c. of pure Magnesium Oxide as determined by the method given in the small type below.

The more generally occurring impurities are foreign soluble salts, Aluminium, Calcium, Iron, other heavy metals, Chlorides and Sulphates. The *B.P.* does not include tests for foreign soluble salts or heavy metals, but includes the rest. The presence of foreign soluble salts may be detected by treating a weighed quantity of 1 gramme of the sample with 50 c.c. of Water and testing its reaction towards Litmus and determining the amount of residue left after filtration and evaporation to dryness, as described in the small type below. The presence of heavy metals, Arsenic, Copper, Lead and Zinc may be shown by Hydrogen Sulphide. Standards of 4 parts per million for Arsenic and 20 parts per million for Lead have been suggested (*C.D.* '08, i.796), but it is mentioned that many samples will not pass these standards. When dissolved in diluted Hydrochloric Acid and a sufficiency of Ammonium Chloride is added, it should yield no flocculent precipitate on the addition of Ammonia Solution in excess indicating the absence of Aluminium. The *U.S.P.* and *P.G.* include a test for Iron with Potassium Ferrocyanide, *see* below. The presence of Calcium, Sulphates and Chlorides, may be shown by the Ammonium Oxalate, Barium Nitrate and Silver Nitrate tests given in the small type below. Commercial samples sometimes contain a considerable proportion of Chlorides.

**Residue.**—Boiled with Water it gives a liquid which, after filtration and evaporation to dryness, leaves only an insignificant residue, *P.G.* 1 gramme of Magnesium Carbonate when heated to boiling with 50 c.c. of Water should, after cooling and filtering, yield a filtrate which, if evaporated to dryness on a water-bath, should leave a residue of not more than 0·01 gramme, *U.S.P.*

**Residue after ignition.**—0·5 gramme should, after ignition, yield not less than 0·2 gramme, *P.G.*; 1 gramme should yield 0·40 gramme, *U.S.P.*

**Ammonium Oxalate.**—10 c.c. of a solution of the salt (1–50) prepared by the addition of sufficient Acetic Acid for solution, should not be rendered more than slightly opalescent within 5 minutes by T.S. of Ammonium Oxalate, *U.S.P.* The residue after ignition of 0·5 gramme of the salt when shaken with

20 c.c. of Water gives a liquid which, after filtration, should not be rendered turbid more than opalescent with Ammonium Oxalate T.S. within 5 minutes, *P.G.*

**Potassium Ferrocyanide.**—1 gramme dissolved in 20 c.c. of diluted Hydrochloric Acid and 130 c.c. of Water the solution should be colourless, and should not give an immediate blue coloration on the addition of T.S. of Potassium Ferrocyanide, *U.S.P.*

**Hydrogen Sulphide.**—An aqueous solution (1–20) obtained by means of sufficient Acetic Acid should not be affected by T.S. of Hydrogen Sulphide, *P.G.* A solution obtained by dissolving 1 gramme in 20 c.c. of diluted Hydrochloric Acid and 130 c.c. of Water should not respond to the time-limit test for heavy metals, *U.S.P.*

**Barium Nitrate.**—An aqueous solution (1–20) as above should not become turbid more than opalescent within 5 minutes with T.S. of Barium Nitrate, *P.G.*

**Silver Nitrate.**—An aqueous solution (1–20) as above should not, after the addition of Nitric Acid, become turbid more than opalescent within 5 minutes with T.S. of Silver Nitrate, *P.G.*

**Volumetric Determination.**—If 0·400 gramme of recently ignited and cooled Magnesium Carbonate be dissolved in 25 c.c. of Normal Volumetric Sulphuric Acid Solution, not more than 5·8 c.c. of Normal Volumetric Potassium Hydroxide Solution should be required for neutralisation, Methyl Orange T.S. being used as indicator. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 5 p.c. of pure Magnesium Oxide, *U.S.P.*

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## MAGNESII CARBONAS PONDEROSUS.

HEAVY MAGNESIUM CARBONATE.

**$3(MgCO_3)$, $Mg(HO)_2$, $4H_2O$, eq. 380·65.**

FR., CARBONATE DE MAGNÉSIUM; GER., WEISSE MAGNESIA; ITAL., CARBONATO DI MAGNESIO; SPAN., CARBONATO MAGNESICO.

An odourless, white, granular powder.

**Medicinal Properties.**—Same as Magnesia Ponderosa.

Increases blood coagulability.—*L.* '08, i. 96.

**Dose.**—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

**Prescribing Notes.**—*In* **cachets, lozenges** *or* **mixture,** *or as Liquor Magnesii Carbonatis. Also given with Magnesium Sulphate as Mistura Alba. When mixing it with Water add at once about twice its weight of Water.*

**Official Preparation.**—Liquor Magnesii Carbonatis. Used in the preparation of Magnesia Ponderosa and Trochiscus Bismuthi Compositus.

**Not Official.**—Mistura Alba, Mistura Magnesiæ c. Rheo, Magnesii Bromidi Liquor, and Magnesii Citratis Liquor.

**Foreign Pharmacopœias.**—Official in Jap.

**Tests.**—Heavy Magnesium Carbonate dissolves with effervescence in diluted mineral acids yielding solutions which afford the tests distinctive of Magnesium given under that heading, and evolving a colourless gas which produces, when passed into Lime Water, a white precipitate soluble with effervescence in diluted Hydrochloric Acid, and in a sufficient excess of the gas. It should answer the tests given under 'Magnesii Carbonas Levis' and is liable to contain the same impurities. The methods there given for their detection may also be employed in this instance.

### Preparation.

**LIQUOR MAGNESII CARBONATIS.** Solution of Magnesium Carbonate. *B.P.Syn.*—Fluid Magnesia.

Contains 10 grains of Magnesium Carbonate in 1 fl. oz. of Carbonic Acid Water.

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

*Swed.*, Solutio Sulfatis Magnesici Carbonica.

**Tests.**—Magnesium Carbonate Solution effervesces very slightly when the vessel containing it is first opened. It evolves Carbonic Anhydride when gently warmed, and if the resulting gas be passed into Lime Water it produces a white precipitate. It is officially required to yield upon evaporation to dryness a white residue of pure Hydrous Magnesium Carbonate, which, when calcined, amounts to between 0·80 p.c. and 0·95 p.c. w/v. If this residue be dissolved in diluted Acetic Acid it should answer the tests distinctive of Magnesium given under that heading, and should be free from the impurities mentioned under 'Magnesii Carbonas Levis.' The latter requirement is not contained in the *B.P.*, but it is required to yield no characteristic reaction with the test for Sulphate. The alkalinity of the liquor may be readily determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 10 c.c. should not require less than 4·6 c.c. equivalent to 0·921 p.c. of MgO, the equivalent of 4 grains of Magnesium Oxide to the oz.

Notwithstanding the above official requirements, commercial samples of the Liquor do not always answer to the official requirements; thus two commercial samples, obtained from well-known makers, yielded the following figures when examined in the author's laboratory:—Specific gravity, 1·022 and 1·024; total solids, 2·07 and 2·34; residue after ignition, 0·94 and 0·93; alkalinity, calculated as Magnesium Oxide, 1·78 and 1·64. The residue from one sample was white, but that from the second sample was distinctly red in colour, due to the presence of Iron.

### Not Official.

**MISTURA ALBA.**—Magnesium Carbonate, 10 grains; Magnesium Sulphate, 1 drm.; Peppermint Water, to 1 fl. oz.—*Given in several Hospital Pharmacopœias.*

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

**MISTURA MAGNESIÆ C. RHEO.**—Rhubarb, 5 grains; Magnesium Carbonate, 15 grains; Peppermint Water, 1 fl. oz.

**MAGNESII BROMIDI LIQUOR.**—Neutralise 20 fl. oz. of Dilute Hydrobromic Acid (10 p.c.) with about 1 oz. of Magnesium Carbonate; filter. Each teaspoonful contains nearly 7 grains of Anhydrous Magnesium Bromide.

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

**MAGNESII CITRATIS LIQUOR.**—Solution of Magnesium Citrate. *Syn.* Limonade Purgative.—Dissolve 200 grains of Citric Acid in 2 fl. oz. of

Water, and, having added 100 grains of Magnesium Carbonate, stir until it is dissolved. Filter the solution into a strong half-pint bottle, add ½ fl. oz. of Syrup of Lemons and sufficient Distilled Water to nearly fill the bottle, then introduce 40 grains of Potassium Bicarbonate in crystals, and immediately close the bottle with a cork, which should be secured with string or wire; afterwards shake the bottle until the Potassium Bicarbonate is dissolved.

A pleasant saline aperient and refrigerant draught.

**Dose.**—5 to 10 fl. oz. = 142 to 284 c.c.

Magnesium Carbonate, 15; Citric Acid, 33; Syrup of Citric Acid,* 60; Potassium Bicarbonate, 2·5; Water, *q.s.* to make about 360.—*U.S.P.*

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

* **Syrup Acidi Citrici.**—Citric Acid, 1; Distilled Water, 1; Tincture of Fresh Lemon Peel, 1; Syrup, *q.s.* to produce 100.—*U.S.P.*

**Foreign Pharmacopœias.**—Official in the U.S. formula modified. Austr. and Hung. (Potio Magnesiæ Citricæ Effervescens); Austr. has also Magnesium Citricum Effervescens; Belg. (Magnesii Citrici Potio); Dutch (Solutio Citratis Magnesici); Fr. (Limonade Citro-Magnésienne); Ital. (Limonata Magnesiaca); Mex. (Solucion de Citrato de Magnesia); Port. (Limonada Citro-Magnesica); Russ. (Potio Magnesii Citrici Aërophora); Span. (Pocion de Citrato Magnesico Gaseosa), also Pocion de Citrato de Magnesia; Ger., Jap. and Swiss (Magnesium Citricum Effervescens). Swiss has also Limonata aerata laxans. Not in the others. Fr. has also Citrate de Magnesie desséché.

**MAGNESIUM LACTATE.**—Valuable for combating the accidents of hæmophilia in cases where the Calcium salts do not seem to act. Dose, 40 to 60 grains once or twice repeated. The large dose unfits it for delivery in a mixture; it should be dissolved in hot Water by the patient himself.—*L.* '08, i. 96.

# MAGNESII SULPHAS.

MAGNESIUM SULPHATE.

*B.P.Syn.*—EPSOM SALT.

$MgSO_4, 7H_2O$, eq. 244·68.

FR., SULFATE DE MAGNÉSIUM; GER., MAGNESIUMSULFAT; ITAL., SOLFATO DI MAGNESIO; SPAN., SULFATO MAGNESICO.

Small, colourless, odourless, translucent, rhombic prisms or acicular crystals, having a bitter, saline taste.

It is generally obtained by purification of native Magnesium Sulphate (Kieserite) or from native Magnesium Carbonates (Magnesite or Dolomite) by decomposition with Sulphuric Acid and recrystallisation.

It is liable to effloresce on exposure to dry air, and should therefore be kept in well-closed bottles or jars.

**Solubility.**—10 in 13 of Water, measures 18; 20 in 3 of boiling Water; insoluble in Alcohol (90 p.c.).

**Medicinal Properties.**—A mild and safe hydragogue purgative, operating with little pain or nausea. Used in portal congestion and chronic constipation and that of lead poisoning, in inflammatory affections in robust people, in dropsies, and in congestion of brain;

by reducing blood pressure, it wards off apoplectic attacks; along with Ferrous Sulphate it is given in anæmia. It is an important ingredient in Mistura Alba. In the acute form of either the bacillary or the amœbic variety of dysentery, drm. doses are given every hour.

When given in conjunction with Diluted Sulphuric Acid the dose may be reduced; the Acid also helps to cover the nauseous taste.

Successful treatment of tetanus by intraspinal injections of a 25 p.c. solution. —*L.* '07, ii. 910.

**Dose.**—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ oz. = 7·1 to 14·2 grammes.

**Prescribing Notes.**—*Usually given in solution. It has a very unpleasant bitter taste which is difficult to mask; Sodium Sulphate is much more palatable. It is usually prescribed with Cinnamon Water or Peppermint Water, and Spirit of Chloroform.*

Mixtures containing Magnesium Sulphate, Phenazone, and a Salicylate throw down a bulky crystalline deposit, which has been stated to consist of Phenazone Salicylate, but has also been shown to yield a fairly definite percentage of Magnesium Oxide on ignition.—*P.J.* '99, ii. 332; '02, i. 22, 50, 143.

**Incompatibles.**—Potassium and Sodium Carbonates and Bicarbonates, Lime Water, Lead Acetate. Magnesium Sulphate should not be prescribed with Tartarated Soda, for after some time Magnesium Tartrate will precipitate. The following prescription is an example: ℞ Sodæ Tartaratæ, ʒj; Magnes. Sulph., ʒij; Aquæ ad. fl. ℥iss.

**Official Preparation.**—Magnesii Sulphas Effervescens. Contained in Mistura Sennæ Composita. Used in the preparation of Magnesii Carbonas Levis, Magnesii Carbonas Ponderosa, and Liquor Magnesii Carbonatis.

**Not Official.**—Eau Saline Purgative, Eau Saline Purgative Gazeuse, Enema Magnesiæ Sulphatis, Magma Magnesiæ, Mistura Salina Laxans, Magnesii Benzoas, Magnesii Salicylas and Magnesii Sulphis.

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

**Tests.**—Magnesium Sulphate when exposed to warm air loses a portion of its Water of crystallisation and is converted into a white powder. At a temperature of 50° to 52° C. (122° to 125·6° F.) it loses one of its seven molecules of Water of crystallisation, equivalent to a loss of weight of 7·3 p.c. At a temperature between 120° to 130° C. (248° and 266° F.) it loses six molecules of Water, equivalent to a loss of weight of 43·8 p.c., and at a temperature of 200° to 230° C. (392° to 446° F.) it loses the remaining molecule of Water, equivalent to a total loss of weight of 51·1 p.c., the salt being rendered anhydrous. 244·68 parts of crystallised Magnesium Sulphate yielding 119·52 parts of anhydrous Magnesium Sulphate or 100 parts of the crystalline yield 48·9 parts of the anhydrous salt.

It dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper, and which affords the tests distinctive of Magnesium given under that heading. Its aqueous solution gives on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It is officially required to indicate 97·36 p.c. of pure crystallised Magnesium Sulphate, as determined by precipitating the Magnesium as Magnesium Ammonium Phosphate from a solution of 0·5 gramme of the salt in 250 c.c. of Water, by the addition of a mixture of Ammonium Chloride, Ammonia and Ammonium Phosphate Solutions. The mixture is allowed to remain at rest for 12 hours, the precipitate is then filtered off, washed, dried, ignited, and when cool weighed as Magnesium Pyrophosphate. It should weigh 0·22 gramme. The *U.S.P.* requires that the salt shall contain not less than 99·7 p.c. of pure crystalline Magnesium Sulphate, but gives no method of determination. The *P.G.* does not give either a requisite percentage or a method of determination.

The more generally occurring impurities are Aluminium, Ammonium, Arsenic, Calcium, Iron, Potassium, Sodium and Zinc, Chlorides and Nitrates. Ammonium salts may be detected by boiling the sample with Liquor Potassæ, when no odour of Ammonia should be evolved. Aluminium and Iron may be detected by the formation of a gelatinous precipitate when the aqueous solution is mixed with a sufficient quantity of Ammonium Chloride and Ammonia Solution is added to the mixture. The *P.G.* gives a separate test for Iron with Potassium Ferrocyanide. The *P.G.* employs the Bettendorf's test for Arsenic with Stannous Chloride Solution, the *U.S.P.* the modified Gutzeit's test. The *B.P.* does not admit Arsenic as a possible impurity, notwithstanding its probable presence in Sulphuric Acid. Copper, Lead, and Zinc, the two former of which are not included in the *B.P.*, may be recognised by Hydrogen Sulphide in either acid or alkaline solution. Potassium and Sodium may be tested for in the filtrate after the removal of other metals. Chlorides and Nitrates are examined for by the usual tests.

**Stannous Chloride.**—A mixture of 1 gramme of powdered Magnesium Sulphate and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

**Hydrogen Sulphide.**—An aqueous solution (1–20) should be unaffected by T.S. of Hydrogen Sulphide, *P.G.* 10 c.c. of a 1 in 20 aqueous solution should not respond to the time-limit test for heavy metals, *U.S.P.*

**Gutzeit's Test.**—5 c.c. of an aqueous solution (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

**Silver Nitrate.**—An aqueous solution (1–20) should not become more than opalescent within 5 minutes with T.S. of Silver Nitrate, *P.G.*

**Potassium Ferrocyanide.**—20 c.c. of an aqueous solution (1–20) should not give a blue colour with 0·5 c.c. T.S. of Potassium Ferrocyanide, *P.G.*

**Turmeric.**—Let 2 grammes of Magnesium Sulphate be finely rubbed down with 2 grammes of Calcined Marble which has been previously slaked. Introduce the powder into a mixture of 10 c.c. of Alcohol and 10 c.c. of Water, and set aside for two hours with frequent agitation. Then let 40 c.c. of Absolute Alcohol be added, and filter. 20 c.c. of the filtrate should not give any red coloration on the addition of 2 c.c. of Tumeric Tincture, *P.G.*

### Preparation.

**MAGNESII SULPHAS EFFERVESCENS.** Effervescent Magnesium Sulphate. *B.P. Syn.*—Effervescent Epsom Salt.

Magnesium Sulphate, dried at 130° F. (54·4° C.), 77; Sodium Bicarbonate, in powder, 72; Tartaric Acid, in powder, 38; Citric Acid, in powder, 25; Refined Sugar, in powder, 21; make into granules. (about 1 in 2)

**Dose.**—60 to 240 grains = 4 to 16 grammes, for repeated administration; for a single administration, $\frac{1}{2}$ to 1 oz. = 14·2 to 28·4 grammes.

**Foreign Pharmacopœias.**—U.S., Magnesium Sulphate, crystals, 50; Dried Sodium Bicarbonate, 40·3; Dried Tartaric Acid, 21·1; Citric Acid, in crystals, 13·6. A granular, effervescent **citrate** is Official in Belg., Ital., Russ. and Span.

### Not Official.

**EAU SALINE PURGATIVE** (Fr.).—Magnesium Sulphate, 1; Sodium Sulphate, 1; Distilled Water, 65. Dissolve and filter.

**EAU SALINE PURGATIVE GAZEUSE.** Eau dite de Sedlitz (Fr.).—Dissolve 30 of Magnesium Sulphate and 4 of Sodium Bicarbonate in 650 of Water, filter the solution into a bottle, add 4 of Tartaric Acid in crystals, cork, and tie over. This preparation is also made with 45 and with 60 of Magnesium Sulphate, but when no quantity is indicated, the 30 as above should be used.

**ENEMA MAGNESII SULPHATIS.**—Magnesium Sulphate, 1; Olive Oil, 1; Mucilage of Starch, 15. Dissolve the Magnesium Sulphate in the Mucilage, add the Oil and mix.—*B.P.* 1885, omitted in *B.P.* 1898.

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

**MAGMA MAGNESIÆ.**—Magnesium Sulphate, 25; Sodium Hydroxide, 8·1; Water, *q.s.* to produce 100. Dissolve the Magnesium Sulphate in 400 of Water and Sodium Hydroxide in another portion of 400 of Water, and filter the solutions. Pour the Sodium Hydroxide Solution slowly, in a thin stream, into the Magnesium Sulphate Solution, with constant stirring. Allow the precipitate to subside and decant the clear fluid. Wash the Magma several times with Water by decantation until the washings are free from saline taste. Transfer the Magma to a muslin strainer and allow to strain without pressing. Then re-transfer it to suitable vessels and add sufficient Water to make 100 of fluid, and mix thoroughly by stirring. One teaspoonful contains about 3 grains of Magnesium Hydroxide. Average Dose.—2 fl. drm. = 7·1 c.c.—*U.S.N.F.*

*Note.*—The Water used in preparing this must be free from organic matter or the Magma will become discoloured.

A similar preparation with directions closely resembling the above appears in the *B.P.C.* under the title **Emulsio Magnesiæ** (Magnesia Milk), but Solution of Potassium Hydroxide is used in place of Sodium Hydroxide, and it is about half the strength of Magnesia; there is also a note to the effect that a more concentrated preparation, **Magma Magnesiæ** or Cremor Magnesiæ, may be prepared by doubling the proportion of Magnesium Sulphate which is the strength of the **Magma Magnesiæ** of the *U.S.N.F.*; the form given below is incorporated in the *B.P.C.*

Magnesium Sulphate, 12·50; Solution of Potassium Hydroxide, 114; Distilled Water, *q.s.* to make 100. General directions are the same as above.

**MISTURA SALINA LAXANS.**—Magnesium Sulphate, 30 grains; Potassium Citrate, 20 grains; Tincture of Hyoscyamus, 15 minims; Chloroform Water, to 1 fl. oz.—*St. Thomas's.*

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

**MAGNESII BENZOAS** $Mg(C_7H_5O_2)_2,3H_2O$, eq. 318·08.—A white, crystalline powder, soluble 1 in 30 of Water; sparingly in Alcohol (90 p.c.). Introduced as an antipyretic.

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

**Tests.**—Magnesium Benzoate dissolves in Water, yielding a solution which is neutral or only faintly acid towards Litmus paper. It yields on the addition of Ferric Chloride T.S. a buff-coloured precipitate. The concentrated aqueous solution affords when acidified with Hydrochloric Acid a white crystalline precipitate, which, when separated, washed free from mineral acid and carefully dried, should possess the m.p. and answer the tests given under 'Acidum Benzoicum.' The filtrate after the removal of the Benzoic Acid should respond to the tests for Magnesium given under that heading and should be free from the impurities given under 'Magnesia Levis.'

**MAGNESII SALICYLAS** $Mg(C_7H_5O_3)_2,4H_2O$, eq. 367·72.—Colourless, silky needles, or as a white, crystalline powder. Soluble 1 in 6 of Water; 1 in 167 of Alcohol (90 p.c.).

It should be kept in well-closed glass bottles of a dark amber tint.

**Dose.**—50 to 100 grains = 3·24 to 6·48 grammes daily have been given with advantage in typhoid fever.—*L.M.R.* '88, 62; *P.J.* (3) xviii. 823; *T.G.* '88, 390.

Frequently of a pink colour, due to a trace of Iron, which may be removed by the previous treatment of the Magnesium Sulphate, as described.—*P.J.* '95, ii. 178; *C.D.* '95, ii. 356.

**Official** in Mex.

**Tests.**—Magnesium Salicylate dissolves in Water, forming a solution which is acid in reaction towards blue Litmus paper. The aqueous solution of the salt yields on the addition of Ferric Chloride T.S. a deep violet coloration. A sufficiently concentrated solution yields on the addition of Hydrochloric or Sulphuric Acid a white crystalline precipitate, which, when separated, washed free from mineral acid and carefully dried, possesses the m.p. and answers the tests given under 'Acidum Salicylicum.' The filtrate after the removal of the Salicylic Acid should answer the tests characteristic of Magnesium given under that heading; it should also be free from the impurities given under 'Magnesii Carbonas Ponderosus.' When a measured quantity of 10 c.c. of a 10 p.c. aqueous solution of the salt is shaken with an equal quantity of Ether, and the ethereal solution is separated and allowed to evaporate spontaneously, only an infinitesimal residue should remain.

**MAGNESII SULPHIS** $MgSO_3,6H_2O$, eq. 210·92.—A white, crystalline powder.

As it is liable to become oxidised on exposure to the air it should be kept in well-stoppered bottles. It should also be kept in a cool atmosphere.

**Solubility.**—1 in 100 of Water; insoluble in Alcohol (90 p.c.). Given in the place of Sodium Sulphite.

**Dose.**—20 to 30 grains = 1·3 to 2 grammes.

**Tests.**—Magnesium Sulphite loses its Water of crystallisation when heated to a temperature of 200° C. (392° F.), and when more strongly heated it is converted into a mixture of Magnesium Sulphate and Oxide. The aqueous solution yields on the addition of Barium Chloride Solution a white precipitate partially soluble in Hydrochloric Acid, with evolution of the characteristic odour of Sulphur Dioxide, and leaving a small quantity of white deposit quite insoluble in Hydrochloric Acid. It should answer the tests distinctive of Magnesium given under that heading. The aqueous solution readily decolorises Iodine Solution. If a weighed quantity of 1 gramme of the salt dissolved in 100 c.c. of Water be mixed with 1 gramme of Iodine dissolved in Potassium Iodide Solution, and 5 c.c. of diluted Sulphuric Acid be gradually added, shaking after each addition, the liquid obtained on filtration should be free from yellow colour.

It should be free from the impurities mentioned under 'Magnesii Carbonas Levis,' and when dissolved in four times its volume of diluted Sulphuric Acid it should form a clear solution not becoming turbid for some time, indicating the absence of Thiosulphate as an impurity.

### Not Official.

## MANGANESII OXIDUM PRÆPARATUM.

Digest finely-powdered commercial Black Oxide in Diluted Hydrochloric Acid for 24 hours, frequently shaking the bottle containing them; then pour off the Acid; wash the Oxide thoroughly with Water, pouring off the lighter portions each time for use, and rejecting the heavier and coarser particles; finally dry on a water-bath.

Precipitated Manganese Dioxide is official in the 8th Decennial Revision of the *U.S.P.*, replacing the native Black Manganese Oxide of the *U.S.P.* 1890. It is stated to consist mainly of Manganese Dioxide, with small amounts of other Manganese Oxides, and corresponding to not less than 80 p.c. of Manganese Dioxide. It forms a fine, heavy, black, odourless and tasteless powder, insoluble in Water and in Alcohol (90 p.c.); insoluble in cold Sulphuric Acid, but undergoing conversion into Manganous Sulphate when heated, with simultaneous evolution of Oxygen.

Used for gastrodynia, pyrosis, and as an emmenagogue.

**Dose.**—10 to 30 grains = 0·65 to 2 grammes.

**Foreign Pharmacopœias.**—Official in Fr. (Bioxyde de Mangenèse); Mex. (Manganesa); Russ.; Span. (Manganesa); Swiss (Manganum Hyperoxydatum); and U.S. (Mangani Dioxidum Præcipitatum. Fr. and Mex. have also Carbonato de Manganeso.

**Tests.**—Manganese Dioxide, when heated with Hydrochloric Acid, evolves a greenish-yellow gas, which first reddens, and then bleaches, blue Litmus paper, and which immediately liberates Iodine from Potassium Iodide Solution. When heated to a strong red heat it evolves Oxygen, which may be recognised by its rekindling the glowing end of a strip of wood when inserted in the containing vessel. When fused with a mixture of Potassium Hydroxide and Chlorate it yields a dark green mass which affords a green solution in water; this solution changes to purplish-red on boiling or on the addition of diluted Sulphuric Acid. The *U.S.P.* requires that it shall indicate not less than 80 p.c. of pure Manganese Dioxide as volumetrically determined by dissolving a weighed quantity of 0·2 gramme of the Oxide in a mixture of 50 c.c. of Tenth-normal Volumetric Oxalic Acid and 3 c.c. of Sulphuric Acid. When this solution is diluted with warm Water to 100 c.c. it should not require more than 13 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution to produce a pink tint.

It should not evolve an odour of Hydrogen Sulphide when mixed with Hydrochloric Acid, nor should filter paper moistened with Lead Acetate Solution be blackened when held over the tube in which the mixture is contained. If a small quantity of the Oxide be boiled with a sufficiency of Hydrochloric Acid, cooled and filtered, the filtrate should yield no orange-coloured precipitate on the addition of Hydrogen Sulphide.

**MANGANESII HYPOPHOSPHIS** $MnP_2H_4O_4,H_2O$, eq. 201·52.—A pale pink granular powder, soluble 1 in 7 of Water.

The salt is official in the *U.S.P.*, and is required to contain not less than 97 p.c. of pure Manganous Hypophosphite.

Used in the preparation of Syrupus Hypophosphitum Compositus.

**Tests.**—Manganese Hypophosphite, when strongly heated, evolves spontaneously inflammable Hydrogen Phosphide gas, and leaves a residue of Manganese Pyrophosphate. The salt dissolves in Water, forming a solution which is acid in reaction towards blue Litmus paper, and which affords the tests distinctive of Manganese given under 'Manganesii Sulphas.' A 5 p.c. aqueous solution of the salt acidified with Hydrochloric Acid yields, on the addition of Mercuric Chloride Solution, first a white precipitate of Mercurous Chloride, changing on further addition to a greyish precipitate of metallic Mercury.

The more generally occurring impurities are Arsenic, Calcium, Carbonate, Phosphate and Sulphate. It should not respond to the modified Gutzeit's test for Arsenic. If, after separation of the Manganese by boiling with Potassium Hydroxide Solution, the filtered liquid be first acidified with Hydrochloric Acid and then made alkaline by the addition of Ammonia Solution, it should afford no precipitate with either Magnesium Ammonio-sulphate Solution or with Ammonium Oxalate Solution indicating the absence of Phosphate and Calcium. The aqueous solution should not effervesce on the addition of diluted Hydrochloric Acid, and Barium Chloride Solution should not cause more than an opalescence indicating the absence of Carbonate and of more than a trace of Sulphate.

**MANGANESII PHOSPHAS** $Mn_3P_2O_8,7H_2O$, eq. 477·36.—A whitish powder, prepared by precipitating a Manganous salt with Sodium Phosphate.

Used to replace part of the Iron of Ferrous Syrups to form a compound Syrup.

**Tests.**—Manganese Phosphate when fused with a mixture of Potassium and Sodium Carbonates and some Potassium Nitrate, yields a dark green residue, which gives a green-coloured solution when dissolved in Water. When dissolved in diluted Hydrochloric Acid it answers the tests distinctive of Manganese given under that heading. When acidified with Nitric Acid it yields, on the addition of Ammonium Molybdate Solution, a yellow precipitate.

The freshly precipitated salt which has been dried without heat corresponds with the formula given, which is equivalent to a theoretical loss on ignition of 26 p.c., but commercial samples seldom lose on ignition more than 20 p.c.

**MANGANESII SULPHAS** $MnSO_4 \cdot 4H_2O$, eq. 221·38.—Colourless or pale rose coloured, right rhombic prisms, possessing a somewhat bitter and an astringent taste.

As it is slightly efflorescent it should be kept in well-closed glass bottles and in a cool atmosphere.

It is official in the *U.S.P.*, and is required to contain not less than 99·5 p.c. of pure crytallised Manganous Sulphate.

**Solubility.**—7 in 10 of Water; insoluble in Alcohol (90 p.c.).

**Medicinal Properties.**—Purgative; it is, however, little used, being uncertain in its action and apt to cause vomiting; its taste is disagreeably styptic.

**Dose.**—1 to 5 grains = 0·065 to 0·32 gramme, as a tonic; 30 to 60 grains = 2 to 4 grammes, as a purgative.

**Foreign Pharmacopœias.**—Official in Fr., Mex., Port., Span. and U.S. Not in the others. Fr. has also Protochlorure de Manganese.

**Tests.**—Manganese Sulphate when heated loses its Water of crystallisation and is converted into the anhydrous salt. When fused with a mixture of Potassium and Sodium Carbonates and some Potassium Nitrate it leaves a dark green residue, which yields a green-coloured solution when dissolved in Water. It dissolves readily in Water, yielding a solution which is neutral or only faintly acid in reaction towards Litmus paper. This solution affords with Ammonium Hydrosulphide Solution a pale pinkish-coloured precipitate, soluble in diluted mineral acids with evolution of Hydrogen Sulphide; with Potassium Ferrocyanide Solution it yields a reddish-white precipitate; and with Barium Chloride Solution a white precipitate insoluble in diluted Hydrochloric Acid. When gently ignited in a porcelain crucible it should leave not less than 67·35 p.c. of residue, indicating not less than 99·5 p.c. of pure crystallised Manganous Sulphate.

The more generally occurring impurities are Iron, Arsenic, Copper, Lead and Zinc, salts of the alkali metals, Magnesium, and excess of Water. The aqueous solution should not be coloured distinctly blue by Potassium Ferrocyanide Solution. The *U.S.P.* employs Potassium Sulphocyanate Solution as a test for Iron, previously boiling with a few drops of Hydrochloric Acid and a few drops of Chlorine Water. Hydrogen Sulphide should produce no dark coloration nor a precipitate in the aqueous solution acidified with Hydrochloric Acid, nor should the same reagent affect a solution of 1 gramme of the salt, 1 gramme of Sodium Acetate and a few drops of Acetic Acid. If the aqueous solution be completely precipitated by the addition of Ammonium Carbonate Solution and the filtrate be carefully evaporated to dryness and ignited, no weighable residue should remain. The salt loses when gently ignited not more than 32·65 p.c. of moisture. The *U.S.P.* figure is equivalent to 32·3 p.c., which corresponds with a salt containing 100 p.c. of pure Manganous Sulphate, and not with the *U.S.* official requirements of not less than 99·5 p.c. of the pure salt.

**Manganesii et Sodii Citras** and **Manganesii et Ferri Citras** are salts readily soluble in Water, and have been used as tonics in doses of 1 to 5 grains = 0·06 to 0·32 gramme.

Not Official.

## MANNA.

A concrete saccharine exudation, obtained by transverse incision from the Stems of *Fraxinus Ornus*, L., and *F. rotundifolia*, Lam., and probably other forms of this; cultivated chiefly in Sicily.

Manna is official in the *U.S.P.* and in *P.G.*

**Solubility.**—1 in 5 of Water; 1 in 150 of Alcohol (90 p.c.).

**Medicinal Properties.**—A mild laxative; in large doses apt to cause flatulence and griping pain; useful for children and delicate females, given in hot milk or in combination with other purgatives, such as Senna.

**Dose.**—As a laxative, 60 grains to 1 oz. = 4 to 28·4 grammes.

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

**Descriptive Notes.**—The best manna is known as Flake Manna. It occurs in pieces 3 inches (75 mm.) or more in length, about an inch (25 mm.) in diameter and ¼ inch (6 mm.) or more in thickness, concave on the inner side and rough or coarsely striated and tuberculated on the outer surface; it is of a yellowish, pale brownish, or nearly white colour, of a sweet taste, with a very faint acridity and bitterness, porous and crystalline in fracture. Inferior qualities, known as "Small flake" or "Sorts," are much smaller, darker in colour, softer and more glutinous, especially if obtained from older trees.

The larger and better kinds are called Flake Manna, and consist principally (60 to 80 p.c.) of Mannite, $C_6H_8(HO)_6$, eq. 180·74, together with Sugar and extractive matter. Contains about 10 p.c. of moisture.

**Pure Mannite** is easily crystallised from an alcoholic Solution. It cannot be fermented by Yeast. It does not reduce Fehling's Solution, and gives no brown colour with boiling Solution of Potash.

**Official in** Dutch and Ital.

**Tests.**—Manna, when boiled with 20 volumes of Alcohol (94·9 p.c.) and filtered, yields a filtrate which rapidly deposits crystals of Mannite on cooling. The *P.G.* requires that a solution of 2 grammes of Manna in an equal weight of Water, when mixed with 10 times its weight of Absolute Alcohol, raised to the boiling point and filtered through a pledget of Cotton-Wool, shall leave at least 1·5 gramme of residue after evaporation of the Alcohol.

**MANNA DEPURATA.**—Dissolve Manna, 10, in sufficient Water; strain and evaporate to 10. It is convenient for dispensing, and keeps good for a long time.

**SYRUPUS MANNÆ.**—Dissolve 10 of Manna in 2 of Alcohol (90 p.c.) and 33 of Water previously mixed together; filter, and to the filtrate add 25 of Sugar to make 100 of Syrup; all by weight.—*Ger.* and *Jap.*

This has been incorporated in the *B.P.C.*, which, however, uses 2·5 (by weight) of Alcohol (90 p.c.) in place of 2 in the formula given above.

**Official in** Mex. and Russ. with different proportions.

**SYRUPUS MANNÆ COMPOSITUS.**—10 of Senna and 1 of Fennel, macerate in 60 of Water for 24 hours; strain and evaporate the fluid to 40, and dissolve in it, whilst hot, 10 of Manna; when cold add 5 of Alcohol (90 p.c.). After 24 hours pour off the clear fluid, add an equal weight of Sugar, and boil to form a syrup.—*Swiss.*

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

**Syrupus Mannæ Compositus.**—Macerate 10 of Senna leaves and 1 of Fennel in 60 of the Water for 24 hours, press; filter, and evaporate to 30, then add 6 of Alcohol (90 p.c.). Allow to stand for 6 hours, filter, and dissolve in the filtrate then 10 of Manna and 55 of Sugar, finally making up to the required weight with Water if necessary.

**MANNITOL HEXANITRATE** (Hexanitrin).—Odourless, crystalline, white needles, slightly soluble in Water, soluble in Alcohol and Ether. The nitrate of the hexatomic alcohol, Mannite. It explodes violently on being triturated or struck, and therefore requires great care in handling. Introduced as a vasodilator, stated to possess same action as the Erythrol compound, though not so powerful.—*B.M.J.* '95, ii. 1213; '98, i. 529, 893.

**Dose.**—1½ to 2 fl. drm. = 5·4 to 7·1 c.c. of a 1 p.c. alcoholic Solution.

Not Official.

## MARANTA.

ARROW-ROOT.

The Starch obtained from the Roots of *Maranta arundinacea*, L., a native of the tropical parts of America and the West Indies; that from Bermuda being considered the best.

A light, white powder, or small pulverulent masses, free from unpleasant odour and taste.

**Medicinal Properties.**—Nutrient and demulcent, frequently taken with Milk. It should be first made into a thin paste with cold Milk, and boiling Milk added to make a thick mucilage.

**Foreign Pharmacopœias.**—Official in Mex. (Arroru) and Port. (Araruta).

Not Official.

## MASTICHE.

MASTICH.

A concrete, resinous exudation, obtained by incisions in the bark of the stem and large branches of *Pistacia Lentiscus*, L., occurring as small, irregular, pale yellow tears, brittle, and either opaque or, far more frequently, transparent. Sp. gr. 1·06 to 1·07.

Produced in the Island of Scio.

**Solubility.**—Insoluble in Water; partly soluble in Alcohol (90 p.c.) and Oil of Turpentine; 2 in 1 of Ether; 2 in 1 of Chloroform.

**Medicinal Properties.**—Used in solution as a temporary stopping for teeth.

**Foreign Pharmacopœias.**—Official in Belg., Norw., Swed. (Resina Mastix), Dutch, Hung., Port., Mex. and Span. (Almaciga) and U.S.

**MASTIC DENTAIRE.**—Mastic 2, Ether 1. Dissolve.

Cotton saturated in this solution is a good stopping for decayed teeth.

**MASTIC AND CHLOROFORM.**—Mastic 2, Chloroform 1. Dissolve. Used for the same purpose as above.

Not Official.

## MATICO.

The dried Leaves of *Piper angustifolium*, Ruiz and Pavon. Imported from South America.

**Medicinal Properties.**—An agreeable aromatic astringent, used in all forms of inflammation of the urinary passages, and especially in catarrh of the bladder of the aged. The Volatile Oil has a powerful styptic property, and a solution of it is applied to leech-bites and other small bleeding wounds.

**Dose.**—Of the powder, 30 to 120 grains = 2 to 8 grammes, three times daily.

**Foreign Pharmacopœias.**—Official in Belg., Mex., Port. and U.S. Not in the others.

**Descriptive Notes.**—The dried leaves as imported from Panama are usually much bent and broken, but in the perfect state are elongate lanceolate, with a rounded, cordate, oblique base, 3½ to 6 inches (9 to 15 cm.) long and 1¼ to 1½ inches (31 to 37 mm.) broad, entire at the margins, with a short leafstalk about ½ inch (12 mm.) long, brittle. The veins and veinlets are deeply sunk on the upper surface so as to give a tesselated appearance, and are prominent below, where they form a reticulated network, and densely hairy. The odour is faintly aromatic, and the taste gritty and bitterish. A much larger and broader leaf is occasionally received from Columbia, which possesses a similar surface, but the species that yields it has not been determined. The microscopic features are the short rough hairs, the hypodermal cells of the upper surface, the oil glands and the hypodermal collenchyma above and below the nerve.

The leaves of other species of *Piper*, *e.g.* (*Piper aduncum*, L., and *P. anisatum*, H. B. and K.) are sometimes mixed with those of true Matico, but neither of these possesses the tesselated nervation of the leaves.

**INFUSUM MATICO.**—Matico Leaves, cut small, 1; boiling Distilled Water, 20. Infuse half an hour and strain.

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

**FLUIDEXTRACTUM MATICO.**—100 of Matico in No. 40 powder is moistened with 30 of a mixture of Alcohol (95 p.c.) 75 and Water 25; packed in a percolator and macerated for 48 hours, then gradually exhausted with the menstruum. Reserve the first 85, and evaporate the remainder to a soft extract, which dissolve in the reserved portion, and make up with the menstruum to 100. —*U.S.P.*

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

**Official in** Mex., 1 in 1.

**TINCTURA MATICO.**—Matico Leaves, in coarse powder, 1; Alcohol (60 p.c.), 5. Macerate 14 days, strain, express, and filter. (1 in 5)

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

**Foreign Pharmacopœias.**—Official in Mex., 1 in 5. Not in the others.

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### Not Official.

## MEDULLA RUBRA.

RED BONE-MARROW.

The Marrow of ox-bones, being a seat of formation of blood corpuscles, has been introduced in the treatment of pernicious anæmia, chlorosis, and hæmoglobinuria. It may be given fresh or raw, spread as a sandwich, also in the form of '**Glycerin Extract**,' in gelatin **capsules**, or as **tablets**.—*B.M.J.* '94, i. 1172; '95, i. 1084.

Red Marrow did not have the slightest effect in three cases of pernicious anæmia, one of which began rapidly to improve on treatment with arsenic.—*L.* '96, i. 285.

Good results in splenic leucocythemia.—*B.M.J.* '96, i. 840, 956.

Fr. has Moelle de Bœuf purifiée, Medulla Bovis depurata.

**GLYCERIN EXTRACT OF RED BONE-MARROW.**—Veal Marrow, 1; Chloroform Water, 2; Glycerin, 2. Beat up the Marrow with the Glycerin, and add the Chloroform Water, beating the whole together frequently during 1 hour; then strain, and make up to 4 with a mixture of Chloroform Water and Glycerin in equal parts. 4 fluid parts equal 1 part of Marrow.—*P.J.F.*

**Extractum Medullæ Rubræ.** *Syn.* Medullary Glyceride; Glycerin Extract of Red Bone-Marrow.—Red Bone-Marrow, 25; Chloroform Water, 50; Glycerin, 50.—*B.P.C.*

# MEL DEPURATUM.

CLARIFIED HONEY.

Fr., Miel blanc; Ger., Gereinigter Honig; Ital., Miele depurato;
Span., Miel depurada.

Honey of commerce, melted in a water-bath, and strained, while hot, through flannel previously moistened with warm Water.

**Medicinal Properties.**—Demulcent, laxative, and nutritive, but apt to gripe and occasion flatulence when given in large doses. In the form of **Oxymel** it is a useful addition to gargles and cough-mixtures, as it relieves the pain and dryness of the throat and also dysphagia.

**Official Preparations.**—Mel Boracis, Oxymel, Oxymel Scillæ. Contained in Confectio Piperis.

**Not Official.**—Aqua Mellis.

**Foreign Pharmacopœias.**—Official in all; Port., Mellito Simples; Span., Miel Depurado.

**Descriptive Notes.**—Honey is largely imported from California, Chili and Jamaica, and to a less extent from France, Italy, New Zealand, and other countries. Formerly the white, delicately-flavoured Narbonne Honey imported from France was considered the best, but very white and good-flavoured Honey is now imported from California and Chili. The flavour depends largely upon the flowers from which it is derived; thus heather, linden and clover honey are prepared and sold in Canada. Dark coloured Honey, although often highly flavoured, as is the case with Jamaica Honey, obtains a lower price than paler and weaker-flavoured kinds. During dry summers bees often feed upon the honey-dew or aphis excrement on leaves, which gives it a dark colour; hence, perhaps, the popular prejudice against dark Honey. Pure Honey will always become more or less solid when kept and will contain numerous pollen grains, and by the character of the pollen grains present it is possible to guess at the country from which it was imported. Artificial Honey usually contains glucose prepared from Starch; in the United States 'corn syrup,' prepared from Maize Starch, is used, but such Honey usually contains traces of Sulphuric Acid and of Starch; hence the *P.B.* test for Sulphates and Starch. Australian Honey, derived largely from species of Eucalypti, has frequently a flavour objectionable to Europeans; Trebizonde Honey, and sometimes North American Honey, has proved to be poisonous or intoxicating, due apparently to the presence of Andromedotoxin derived from flowers of *Rhododendron* and *Azalea*, but these kinds of Honey are rarely met with in English commerce. The term " Virgin " Honey is applied to Honey of light colour produced by a new swarm, or to clear Honey that first runs from the comb of older hives.

Clarified Honey is alone official in the *B.P.*, and is directed to be prepared by straining Honey melted in a water-bath through flannel previously moistened with warm Water. In the *U.S.P.* 2 p.c. of paper pulp in shreds is directed to be boiled with the Honey and the scum which rises removed, the loss incurred being made up with Distilled Water and 5 p.c. Glycerin by weight added after straining. No sp. gr. is mentioned, but Vogl states that pure Honey should have a sp. gr. of 1·410 to 1·445.

The directions for clarification are very necessary for Honey derived from ordinary bee-hives, which may contain debris of immature insects and other impurities, but the Honey derived from frame hives is usually clean and pure, except for pollen derived from bee-bread, which is deposited in some of the cells.

**Tests.**—Clarified Honey is officially required to yield no characteristic reaction for Starch when tested by the Iodine Solution test; the *U.S.P.* directs 1 part of Honey to be boiled with 5 of Water, cools the resulting solution and adds Iodine Test-solution, when no blue or green coloration should be yielded; the *P.G.* does not include a test for Starch. It should be free from more than traces of Sulphates as ascertained by dissolving the ash (left on ignition) in Water, acidifying with Nitric Acid and adding Barium Chloride Solution. The *U.S.P.* and *P.G.* test for Sulphates as well as Chlorides in the Clarified Honey diluted with Water. The ash should not exceed 0·25 p.c.; the *U.S.P.* ash limit is 0·3 p.c.; the *P.G.* 0·4 p.c. The *U.S.P.* requires that unclarified Honey, when diluted with twice its weight of Water, should yield a liquid having a sp. gr. not lower than 1·099, presumably at 25° C. (77° F.), though in this instance the *U.S.P.* does not state so; the *P.G.* gravity for a similarly-prepared liquid is at least 1·111. Clarified Honey is almost invariably lævogyrate. It is slightly acid in reaction towards blue Litmus paper. The *P.G.* requires that it shall contain not more than 0·18 p.c. w/w of Formic Acid as ascertained by titration with Normal Volumetric Potassium Hydroxide Solution. The *U.S.P.* requires that when 1 c.c. of Absolute Alcohol is carefully run on to the surface of 2 c.c. of a 25 p.c. aqueous filtered solution no permanent milky zone should be produced at the junction of the two liquids, indicating the absence of Starch Sugar. The *P.G.* states that Clarified Honey shall not be rendered turbid by the addition of 2 parts by weight of Alcohol (90 p.c.), nor should any alteration in colour be manifest when mixed with 1 part by weight of Ammonia Solution. The *U.S.P.* includes a test for Cane Sugar with Sulphuric Acid, requiring that when 0·5 c.c. of a 25 p.c. aqueous solution is floated carefully on the surface of 2 c.c. of Sulphuric Acid no coloured line should be immediately produced at the point of contact, the coloration at the end of one hour should amount at most to a yellowish-brown, but no brown or nearly black colour should be developed.

### Preparation.

### OXYMEL. Oxymel.

Clarified Honey, liquefied (by weight), 40; Acetic Acid, 5; Distilled Water, *q.s.* to yield a product of the sp. gr. 1·320.

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

**Foreign Pharmacopœias.**—Official in Austr., Clarified Honey, 99, Acetic Acid (96 p.c.), 1; Dutch, Honey, 19, Acetic Acid (30 p.c.), 1; Hung., Honey, 50, Acetic Acid (96 p.c.), 1; Jap., Refined Honey, 8, Acetic Acid, 1, Distilled Water, 1; Port., Honey, 197, Acetic Acid (98 p.c.), 3; Russ., Honey, 49, Acetic Acid (95 p.c.), 1; Span., Clarified Honey, 2, White Vinegar, 7, evaporate to 2; Mex., Honey, 100, Acetic Acid, 6. Not in the others.

### Not Official.

**AQUA MELLIS.**—Oil of Bergamot, 2 fl. oz.; Oil of Lavender, 4 fl. drm.; Oil of Cloves, 4 fl. drm.; Oil of Sandal Wood, 1 fl. drm.; Musk, 10 grains; Tincture of Saffron, 1 fl. oz. (or q. s.); Rose Water, 2 pints; Orange Flower Water, 2 pints; Honey, 1 oz.; Rectified Spirit, 8 pints.—*Gray's Supplement.*

Oil of Bergamot, 0·75; Oil of Lavender, 0·25; Oil of Cloves, 0·25; Oil of Sandal Wood, 0·05; Tincture of Musk, 1·50; Tincture of Saffron, 0·75; Rose Water (undiluted), 16; Orange Flower Water (undiluted), 16; Honey, 0·50; Alcohol q.s. to produce 100.—*B.P.C.*

# MENTHÆ PIPERITÆ OLEUM.

## OIL OF PEPPERMINT.

FR., ESSENCE DE MENTHE POIVRÉE; GER., PFEFFERMINZÖL;
ITAL., ESSENZA DI MENTA; SPAN., ESENCIA DE MENTA PIPERITA.

A volatile oil distilled from fresh flowering Peppermint, *Mentha piperita*, Sm.

A clear, colourless, pale yellow or greenish-yellow, oily liquid, possessing a peculiar refreshing odour and a characteristic taste, subsequently producing a sensation of coldness in the mouth. The principal constituent of the Oil is Menthol.

The Oil official in the *U.S.P.* is required to contain not less than 6 p.c. of Ester calculated as Menthyl Acetate and not less than 50 p.c. of total Menthol, representing that both free and combined as Ester.

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

The variations in quality of the English oils depend (1) upon whether they have been obtained from 'Black Mint' (the ordinary plant) or from 'White Mint'; (2) upon the subsequent rectification; so that from the finest double-rectified White Mint to the first crude distillate from the Black Mint there are all manner of gradations, each of them sold as 'Ol. Menth. Pip. Ang.'

Dementholised Oil of Peppermint is commonly known as 'Menthene,' and is used for purposes of adulteration. A pure Peppermint Oil, cooled in a mixture of Ice and Salt, should, on the addition of one or two Menthol crystals, set to a more or less solid crystalline mass.

**American Oil of Peppermint** is also the product of *Mentha piperita*, but contains less Menthol.

**Japanese Oil of Peppermint** is obtained from *Mentha arvensis* var. *piperascens*, and is rich in Menthol.

**Solubility.**—In all proportions of Absolute Alcohol; 2 in 1 (*or less*) of Alcohol (90 p.c.), becomes turbid on adding more Alcohol.

**Medicinal Properties.**—An aromatic stomachic and carminative; antiseptic. Allays nausea, relieves spasmodic pains in the stomach. Useful in the flatulent colic of children. Covers the taste of nauseous medicines, such as Rhubarb, and mitigates the griping effect of purgatives. Externally applied it acts as a local anæsthetic and relieves neuralgic pain; *see* also Menthol.

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

**Prescribing Notes.**—*The Oil is taken on* **sugar,** *or in* **pill.** *See* p. 897.

**Official Preparations.**—Aqua Menthæ Piperitæ and Spiritus Menthæ Piperitæ. Contained in Pilula Rhei Composita and Tinctura Chloroformi et Morphinæ Composita.

**Not Official.**—Essentia Menthæ Piperitæ, Syrupus Menthæ Piperitæ.

**Foreign Pharmacopœias.**—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Essenza di Menta), Jap. (Oleum Menthæ), Mex. (Aceite Volatil de Menta Piperita), Norw., Port. (Essencia de Hortela Pimenta), Russ., Span., Swed., Swiss, and U.S.

The **herb** is Official in Dan., Fr., Ital., Norw., Swed., and U.S.

**Tests.**—Peppermint Oil has a sp. gr. of 0·900 to 0·920, the official figures are 0·900 to 0·910; the *P.G.* says 0·900 to 0·910, the *U.S.P.* 0·894 to 0·914 at 25° C. (77° F.). It is lævogyrate, the optical rotation being from −20° to −33° in a 100 mm. tube. No figures for optical rotation are given in the *B.P.* It is officially required to dissolve in four times its volume of Alcohol (70 p.c.). The *U.S.P.* adds "the solution showing not more than a slight opalescence." The *U.S.P.* requires it to also form with an equal volume of Alcohol (94·9 p.c.) a clear solution neutral in reaction towards Litmus paper. The *B.P.* requires that when a portion of the Oil is cooled to −8·3° C. (17° F.) and a few crystals of Menthol are added, a considerable separation of Menthol should take place. This test has been adversely criticised and its deletion from the Pharmacopœia has been recommended. The *B.P.* does not require a definite yield of Menthol nor suggest a method of determination. It has been recommended that the Menthol, both free and combined, should be determined by the usual methods.

The *U.S.P.* requires that the Oil shall contain not less than 6 p.c. of Ester calculated as Menthyl Acetate, and not less than 50 p.c. of total Menthol (both free and combined as Ester), as determined by weighing 10 c.c. of the oil in a flask and saponifying it by boiling under a reflux condenser with 25 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution, and titrating the excess of Volumetric Hydroxide Solution, with Semi-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Sulphuric Acid Solution required, subtracted from the 25 c.c. of Semi-normal Potassium Hydroxide Solution used and the difference first multiplied by 9·834 and then divided by the weight of the Oil yields the percentage w/w of Menthyl Acetate present in the sample. The Oil remaining after saponification is then washed repeatedly with Water and transferred to an acetylisation flask, and the Menthol converted into an Acetyl derivative by boiling for one hour with 10 c.c. of Acetic Acid Anhydride and about 1 gramme of anhydrous Sodium Acetate. It is allowed to cool, freed from excess of Acid by washing first with Water and then with Sodium Hydroxide T.S. until the mixture is slightly alkaline in reaction towards Phenolphthalein Solution and dried by fused Calcium Chloride.

A measured quantity of 5 c.c. of the acetylised product is transferred to a flask and its weight accurately recorded. It is then saponified for one hour under a reflux condenser, with 50 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, the excess of Volumetric Alkali being titrated with Semi-normal Volumetric Sulphuric Acid Solution, Phenolphthalein Solution being employed as an indicator of neutrality. The number of c.c. of Volumetric Acid Solution required is subtracted from 50, the difference is multiplied by 7·749 and the product divided by the weight of acetylised product employed for the determination less the difference (between the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution employed for the determination and the number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required to neutralise the excess of Volumetric Alkali Solution multiplied by 0·021), the quotient will represent the percentage of Menthol present in the Oil of Peppermint. The percentage of combined Menthol varies from 3 to 14 p.c. and the total Menthol from 30 to 70 p.c. In addition to a determination of the combined and total Menthol, a determination of the amount of Menthone is often useful. It may be carried out on a separate portion of the saponified Oil by diluting it with twice its volume of Alcohol and boiling it with metallic Sodium. The Menthone is reduced to Menthol, and the amount of Menthol produced may be determined by acetylisation.

The Oil of Mentha piperita is, as a rule, distinguished from that of Mentha arvensis by developing a blue colour or red fluorescence when mixed with 4 volumes of Glacial Acetic Acid; this colour is not developed if air be excluded, and, depending as it does upon some minor constituent destroyed by prolonged exposure to sunlight, it may not be given by some old samples. Two varieties of the Oil, black and white Peppermint respectively, are grown in and about Mitcham. It is stated (*P.J.* '96, i. 125) that the white Oil of Peppermint may be distinguished from the black by its having greater optical activity, and not depositing Menthol at a low temperature, and containing a greater proportion of Esters of Menthol, and in giving an intense blue coloration, with red fluorescence, with Glacial Acetic Acid.

The more generally occurring sophistications of the Oil are abstraction of Menthol, adulteration with Turpentine Oil, Cedar Wood Oil, and the addition of other compound esters. The presence of dementholated Oil is indicated by the decrease in the sp. gr. and optical rotation and by the diminution in the total Menthol content. Turpentine Oil may be detected by its effect on the optical rotation, and by the optical rotation of the various fractions obtained on distilling the Oil. It may also be detected by its effect on the solubility of the Oil in Alcohol (70 p.c.). The figures given by Parry and Bennett in an examination of some Peppermint Oils (*C.D.* '04, i. 854) clearly point to adulteration of the Oil with a substance having the nature of a sesquiterpene, which led them to the opinion that the adulterant was Cedar Wood Oil. The Oils were insoluble in

Alcohol (70 p.c.), and the later fractions of the various distillates, in addition to being much less soluble than the distillate from pure Peppermint Oil, had in some cases a distinct taste of Cedar Wood Oil.

The presence of Acetin, a Glycerin Acetic ester, has been detected as an adulterant by Bennett (*C.D.* '03, i. 591). Oils containing the adulterant are distinguished by a higher sp. gr., the decrease in the optical rotation, the insolubility in Alcohol (70 p.c.), and the exceptional high ester figure obtained in the determination of the combined Menthol. A comparison of the distillates obtained on fractionating the Oil also readily reveals the presence of the adulterant. The production of the odour of Ethyl Acetate in the cold on the addition of Potassium Hydroxide is suggested as a characteristic, but hardly conclusive, test. Parry and Bennett (*C.D.* '03, ii. 154) have detected the presence of African Copaiba Oil in some adulterated samples of Peppermint Oil, by the isolation of a fraction of high boiling-point, which contained a body having a sp. gr. within the limits of Peppermint Oil, but with a strongly positive optical rotation and a high refractive index, which, from its physical characters and chemical reactions, was a substance belonging to the sesquiterpene series. Messrs. Schimmel and Co. have not met with Oils containing this adulteration. The Oil consists principally of Menthol, together with Acetic and Valerianic Acid esters of Menthol, Menthone, 2 lævogyrate terpenes, a dextrogyrate sesquiterpene and Phellandrene.

**Alcohol.**—It should be soluble in 4 volumes of Alcohol (70 p.c.), *B.P.* and *U.S.P.*; in 4 to 5 parts by weight of Alcohol (68 to 69 p.c.), *P.G.* The solution should not show more than a slight opalescence, *U.S.P.*

**Optical Rotation.**—It is lævogyrate, the angle of rotation varying from − 25° to − 33° in a 100 mm. tube at 25° C. (77° F.), *U.S.P.*

**Mercuric Chloride.**—If from 25 c.c. of the Oil the 1st 1 c.c. of distillate be collected and poured on an aqueous Mercuric Chloride Solution, a white film should not form at the zone of contact after a short time (absence of Dimethyl sulphide found in non-rectified oils), *U.S.P.*

### Preparations.

## AQUA MENTHÆ PIPERITÆ. PEPPERMINT WATER.

Oil of Peppermint, 77 minims; Water, 1½ galls.; distil ⅔.
(Oil about 1 in 1000)

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

**Foreign Pharmacopœias.**—Official in Belg., Spirit of Peppermint, 30 in 1000; Dan. and Russ., 1 of Oil in 2000; U.S., 1 of Oil in 500; Austr. and Hung., 1 of fresh leaves to produce 5 of distillate; Dutch, Ger., Swed. and Swiss, 1 to produce 10; Fr., Port. and Span., 1 to produce 1; Ital, 1 to produce 2; Jap., 1 to produce 30; Mex., 1 of fresh plant to produce 4.

## SPIRITUS MENTHÆ PIPERITÆ. SPIRIT OF PEPPERMINT.

Oil of Peppermint, 1; Alcohol (90 p.c.), *q.s.* to yield 10.

*B.P.* '85 was 1 in 50.

**Dose.**—5 to 20 minims = 0·3 to 1·2 c.c.

**Foreign Pharmacopœias.**—Official in Austr.; Oil, 1, Alcohol (90 p.c), 19; Belg. (Spiritus Menthæ), Oil, 1, Alcohol, 99; Fr. (Teinture d'Essence de Menthe), Oil, 2, Alcohol, 98; Ger. and Jap. (Spiritus

Menthæ), 1 in 10; Swiss, 3 Oil in 100; U.S., from the **leaves** and **oil,** about 1 in 10; Mex. (Alcoholatura de Menta), 1 of fresh plant macerated in 3 of Alcohol (80 p.c.) for 8 days; Span. (Alcohol de Menta Piperita), 10 of the fresh leaves and tops macerated in 20 of Alcohol (60 p.c.) for 2 days; distil 10. Not in the others.

**Not Official.**

**ESSENTIA MENTHÆ PIPERITÆ.**—Oil of Peppermint, 1; Rectified Spirit, 4.—*B.P.* 1885, omitted in *B.P.* 1898, but now incorporated in the *B.P.C.*

**SYRUPUS MENTHÆ PIPERITÆ.**—Spirit of Peppermint, 1; Simple Syrup, *q.s.* to yield 8.

A good flavouring for nauseous medicines.

**Foreign Pharmacopœias.**—Official in Austr., Peppermint Water, 2, Sugar, 3; Belg., Spirit of Peppermint, 3, Syrup, 97; Ger. and Jap., Peppermint Leaves, 2, Alcohol, 1, Distilled Water, 10; macerate for 24 hours, press, filter, and in 7 of the filtrate dissolve 13 of Sugar to make 20 of Syrup by weight.

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# MENTHÆ VIRIDIS OLEUM.

## OIL OF SPEARMINT.

*N.O.Syn.*—MENTHÆ CRISPÆ OLEUM.

FR., HUILE VOLATILE DE MENTHE VERTE; GER., RÖMISCHMINZÖL;
ITAL., ESSENZA DI MENTA; SPAN., ESENCIA DE MENTA.

A colourless, pale-yellow, or greenish-yellow, limpid liquid, having a characteristic odour and taste, distilled from fresh flowering Spearmint, *Mentha viridis*, L.

The principal constituent of the oil is Carvone, it also contains Linalool, lævo-limonene and possibly lævo-pinene. It is liable to become darker in colour with age and exposure to light and air, and should therefore be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as much as possible from the light and from contact with the air.

**Solubility.**—In all proportions of Absolute Alcohol; 1 in 1 (*or less*) of Alcohol (90 p.c.), becomes milky on adding more Alcohol.

**Medicinal Properties.**—Similar to those of Oleum Menthæ Piperitæ.

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

**Prescribing Notes.**—*The* **oil** *is given on* **sugar,** *or made into* **pills** *with Liquorice Powder and Soap. See p.* 897.

**Official Preparation.**—Aqua Menthæ Viridis.

**Not Official.**—Spiritus Menthæ Viridis.

**Foreign Pharmacopœias.**—Official in Hung., Port. (Essencia de Hortela), Russ. and U.S. (sp. gr. 0·914 to 0·934 at 25° C. (77° F.)). Not in the others.

**Tests.**—It is officially required to have a sp. gr. of 0·920 to 0·940; the *U.S.P.* says 0·914 to 0·934 at 25° C. (77° F.). It is lævogyrate, possessing an optical rotation from 35° to 48° in a tube of 100 mm., it should form a clear solution when mixed with an equal volume of a mixture of equal parts of Absolute Alcohol and Alcohol (90 p.c.). The *U.S.P.* states that it should form a clear solution when mixed with an equal volume of Alcohol (80 p.c.), the solution becoming turbid upon further dilution. The Oil is not official in the German Pharmacopœia.

**AQUA MENTHÆ VIRIDIS.** Spearmint Water.
Oil of Spearmint, 77 minims; Water, 1½ galls.; distil ⅔.
(Oil about 1 in 1000)

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

**Official in** U.S., 1 in 500; Port. (Agua de Hortela).

**Not Official.**

**SPIRITUS MENTHÆ VIRIDIS.**—Spearmint, 1; Oil of Spearmint, 10; Alcohol (95 p.c.), to yield 100; macerate for 24 hours and filter.—*U.S.P.*

Oil of Spearmint, 1; Alcohol (90 p.c.), to make 10.—*B.P.C.*

# MENTHOL.

MENTHOL.

$C_{10}H_{20}O$, eq. 154·98.

Fr., Menthol; Ger., Menthol; Ital., Mentolo; Span., Mentol.

Large, colourless, acicular, or prismatic crystals, obtained from the Volatile Oil distilled from the fresh Herb of *Mentha arvensis*, L., vars. *piperascens et glabrata*, Holmes, and of *Mentha piperita*, Sm.

It possesses the strong characteristic odour and taste of Peppermint, subsequently producing a sensation of warmth on the tongue, and upon inspiration of air a sensation of coldness.

It should be kept in well-stoppered glass bottles in a cool atmosphere.

**Solubility.**—Almost insoluble in Water and Glycerin; soluble 5 in 1 of Alcohol (90 p.c.); 4 in 1 (nearly) of Chloroform; 8 in 3 of Ether; 10 in 7 of Petroleum Spirit; 1 in 4 of Olive Oil.

Menthol forms a liquid when rubbed with equal parts of either Carbolic Acid, Chloral Hydrate, or Thymol; 3 of Menthol and 2 Camphor form a liquid at ordinary temperatures, but when in equal parts is liquid only whilst warmed.

**Medicinal Properties.**—Antiseptic, stimulant, carminative, local anæsthetic. Applied externally as a local analgesic in some forms of neuralgia and headache, also in rheumatism, in pruritus and in pleurodynia and toothache.

Used as a **snuff**, along with Boric Acid 2 parts, and Ammonium Chloride 3 parts; also dissolved in oil as a spray for influenza, hay-fever, coryza and ozœna.

Menthol and Eucalyptus Oil dissolved in Alcohol (90 p.c.) is used with an oro-nasal inhaler for cold in the head.

10 minims of a 20 p.c. alcohol solution of Menthol used for an hour or so on the sponge of an inhaler is useful in the troublesome cough of phthisis.—*Edin. Med. Jour.* '05, 465.

A 20 p.c. solution in Olive Oil (with 3 p.c. Guaiacol) as an intralaryngeal injection (20 to 30 minims) in phthisis and bronchiectasis.—*Pr.* liii. 276.

Intralaryngeal injection of a 10 p.c. solution in Olive Oil, along with Boric Acid and Quinine Sulphate internally in gangrene of the lung.—*B.M.J.* '99, i. 71.

A good remedy in painful enteritis with mucous diarrhœa.—*M.A.* '95, 239; and in gastralgia and vomiting.—*B.M.J.E.* '07, i. 36; *Pr.* '07, i. 717.

**Spray** containing 5 to 20 p.c. of Menthol recommended in tubercular laryngitis.—*T.G.* '87, 762.

Menthol and Iodoform equal parts as a **surgical dressing.**—*B.M.J.* '88, i. 933.

**Dose.**—$\frac{1}{2}$ to 2 grains = 0·032 to 0·13 gramme.

**Prescribing Notes.**—*It is best made into* **pills** *by the addition of Soap and Dispensing Syrup. Usually employed externally. Largely used in the form of* **cones** *and* **pencils;** *also by* **insufflation,** *or as an* **ointment, pigment** *or* **plaster.**

**Pastilles** may be obtained containing Menthol $\frac{1}{20}$ or $\frac{1}{10}$ grain in each; also Menthol and Cocaine $\frac{1}{20}$ grain of each; Menthol $\frac{1}{20}$, Extract of Rhatany, 2 grains; Menthol, $\frac{1}{20}$ grain, and Bromide of Ammonium, 1 grain; Menthol, $\frac{1}{20}$ grain, and Codeia, $\frac{1}{8}$ grain; Menthol, $\frac{1}{10}$ grain, and Caffein, $\frac{1}{2}$ grain; Menthol, $\frac{1}{20}$, Cocaine, $\frac{1}{20}$ grain, and Red Gum, 2 grains; Menthol, $\frac{1}{20}$ grain, Eucalyptus, 1 minim, and Cocaine, $\frac{1}{20}$ grain; Menthol, $\frac{1}{20}$, and Heroin, $\frac{1}{20}$ grain: Menthol, $\frac{1}{20}$, and Terpine, $\frac{1}{2}$ grain. **Tablets** containing $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{2}$ grain, also in combination with other drugs.

**Official Preparation.**—Emplastrum Menthol.

**Not Official.**—Applicatio Menthol, Aqua Menthol, Gossypium Menthol, Insufflatio Menthol, Insufflatio Menthol Composita, Nebula Menthol, Nebula Menthol Composita, Nebula Menthol cum Cocaina, Linimentum Menthol, Pastillus Menthol, Pigmentum Menthol, Pigmentum Mentholis Compositum, Mentholeate, Vasolimentum Mentholi, Parogenum Mentholis, Poudre Contre le Coryza, Unguentum Menthol, Menthol Valerianate, Validol, Menthosol and Menthoxol.

**Foreign Pharmacopœias.**—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Russ., Swed., Span. and Swiss (Mentholum), Ital. (Mentolo), Mex. (Mentol), U.S. (Menthol). Not in the others.

**Tests.**—Menthol when pure has a m.p. from 43·5° to 44·5° C. (110·3° to 112·1° F.), the *B.P.* gives the m.p. as 42° C. (107·6° F.) and that it should not exceed 43° C. (109·4° F.).

Tyrer has shown that commercial Menthol melts at 39·02° C. (102·23° F.), dried Menthol at 41·57° C. (106·82° F.) and purified Menthol 42·78° C. (109° F.), and is of opinion (*Y.B.P.* '00, 453) that only dried and purified Menthol agrees with the Pharmacopœia requirements; the *U.S.P.* and the *P.G.* both give 43° C. (109·4° F.). It boils at about 217° C. (422·6° F.) when the mercury thread of the thermometer is immersed entirely in the vapour; the *B.P.* does not refer to the boiling point; both *U.S.P.* and *P.G.* give 212° C. (413·6° F.). It dissolves readily in Alcohol, forming a clear solution which should be neutral in reaction towards Litmus paper, and which is lævogyrate. It volatilises at ordinary temperatures and rapidly on heating; the Pharmacopœia states that when boiled with Sulphuric Acid diluted with half its volume of Water it acquires an indigo blue or ultramarine colour, the acid becoming brown; this colour reaction is considered (*Y.B.P.* '00, 338) of extremely doubtful value.

The *P.G.* states that it yields with 40 parts (by weight) of Sulphuric Acid a brownish-red, turbid fluid which clears in the course of a day, and shows on its surface a colourless layer which no longer possesses an odour of Menthol. No method of determination is given in either of the three Pharmacopœias, but it may be determined as described under Oleum Menthæ Piperitæ by acetylisation with Acetic Anhydride.

The more generally occurring impurities are Wax, Paraffin, or inorganic substances. All three substances may be immediately detected by any residue remaining after the volatilisation of the Menthol. The *U.S.P.* and the *P.G.* include a test for Thymol, requiring that no green coloration shall be produced when a few drops of Sulphuric Acid containing a drop of Nitric Acid are added to a solution of a few crystals of Menthol in Glacial Acetic Acid. The Pharmacopœia states that Menthol crystals are usually more or less moist from adhering oil, and Schimmel and Co. have pointed out in their *Semi-Annual Report* for October 1907 that by this statement the *B.P.* admits an adulterated article.

**Heat.**—It volatilises slowly at ordinary temperatures, *U.S.P.* It is completely volatilised when heated at the temperature of a water-bath, *B.P.* 0·1 gramme should not leave a weighable residue when so heated, *P.G.* Heated in an open dish it should volatilise without residue, *U.S.P.*

**Sulphuric Acid.**—If Menthol be boiled with a mixture of Sulphuric Acid 2 volumes and Water 1 volume, the Menthol becomes indigo blue or ultramarine in colour, and the Acid turns brown, *B.P.* It gives with 40 parts of Sulphuric Acid a brownish-red turbid liquid which clarifies in the course of a day, and on its surface shows a layer which does not smell of Menthol, *P.G.*

**Sulphur, Nitric and Acetic Acids.**—If Menthol be added to a mixture of Acetic Acid 1 c.c., Sulphuric Acid 6 drops, and Nitric Acid 1 drop, no coloration should appear, *P.G.* 3 drops of Sulphuric Acid and 1 drop of Nitric Acid added to a solution of a few crystals of Menthol in 1 c.c. of Glacial Acetic Acid should produce no green colour, *U.S.P.*

## Preparation.

### EMPLASTRUM MENTHOL. MENTHOL PLASTER.

Menthol, 1½; Yellow Beeswax, 1; Resin, 7½. Mix in the Menthol when the melted Resin and Beeswax have cooled to 160° or 170° F. (71·1° or 76·7° C.).

The quantity of Menthol is reduced and that of the Resin slightly increased to that of *B.P.* 1885.

## Not Official.

**APPLICATIO MENTHOL.**—Menthol, 2; Chloroform, 8; Pure Ether (sp. gr. 0·720), 8; Eau de Cologne, 4. A good external application for neuralgia.

**AQUA MENTHOL.**—Menthol, 8 grains; Alcohol (90 p.c.), 2 fl. drm.; Distilled Water, 20 fl. oz.—*Bournemouth Formulary.*

Menthol, 0·10; Alcohol, 0·15; Distilled Water, 100.—*B.P.C.*

**GOSSYPIUM MENTHOL.**—Menthol, 7 grains; White Adepsine Oil, 3 minims; Pure Ether, 6 fl. drm.; Cotton-Wool, in a thin sheet, 60 grains.

**INSUFFLATIO MENTHOL** (Nasal).—Menthol, in powder, 5 grains; Bismuth Oxychloride, ½ oz.; Dried Starch, in fine powder, to 1 oz.

**INSUFFLATIO MENTHOL COMPOSITA.**—Menthol, 2 drm.; Ammonium Chloride, 3 drm.; Boric Acid, to 1 oz.—*Central Throat.*

Pulvis Menthol Compositus.—Menthol, 2; Boric Acid, in powder, 3; Ammonium Chloride, in powder, 3.—*St. Thomas's.*

For insufflation.

Insufflatio Mentholis.—Menthol, in powder, 5; Ammonium Chloride, in fine powder, 45; Boric Acid, in powder, 50.—*B.P.C.*

Insufflatio Menthol. *Syn.* Menthol Snuff.—Menthol, 1; Ammonium Chloride, 3; Boric Acid, 2; Lycopodium, 6.—***Martindale.***

Pulvis Mentholis Compositus. *Syn.* Compound Menthol Snuff.—Menthol, 5; Ammonium Chloride, 10; Boric Acid, 20; Lycopodium, 65.—*B.P.C.*

Insufflatio Menthol Composita.—Ammonium Chloride, 10; Camphor, 4; Cocaine Hydrochloride, ⅛; Lycopodium, 35; Menthol, 2; Oxychloride of Bismuth, 10; Starch, in fine powder, *q.s.* to 100.—*Throat.*

Insufflatio Mentholis et Cocainæ.—Menthol, 2·50; Cocaine Hydrochloride, 0·15; Ammonium Chloride, 25; Camphor, 5; Lycopodium, *q.s.* to produce 100.—*B.P.C.*

**NEBULA MENTHOL.**—Menthol, 4; Paraffinum Liquidum, 100.—*Charing Cross.*

Menthol, 5; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

**NEBULA MENTHOLIS COMPOSITA.**—Menthol, 30 grains; Cocaine Hydrochloride, 5 grains; Compound Tincture of Benzoin, 1 fl. oz.; Glycerin, to 2 fl. oz.—*A.Ph.F.*

Menthol, 3; Cocaine Hydrochloride, 0·50; Simple Tincture of Benzoin, 50; Glycerin, *q.s.* to produce 100.—*B.P.C.*

**NEBULA MENTHOL CUM COCAINA.**—Menthol, 10 grains; Cocaine, 5 grains; Oleic Acid, 15 minims; Liquid Paraffin, to 1 fl. oz.—*Throat.*

Menthol, 5; Cocaine, 2; Almond Oil, 25; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

**LINIMENTUM MENTHOL.**—Menthol, 3; Chloroform, 4; Olive Oil, *q.s.* to produce 16; is useful in lumbago, neuralgia, sciatica, and ringworm.—*Martindale.*

Menthol, 20; Chloroform, 25; Olive Oil, *q.s.* to produce 100.—*B.P.C.*

**PASTILLUS MENTHOL.**—Menthol, ⅙ grain; Glyco-gelatin, 20 grains.—*Throat.*

**PIGMENTUM MENTHOLIS COMPOSITUM.**—Menthol, 1 grain; Thymol, 1 grain; Oil of Eucalyptus, 1 drm.; Liquid Paraffin, *q.s.* to produce 1 oz.—*St. George's, 3rd edit.*

Menthol, 0·25; Thymol, 0·25; Oil of Eucalyptus, 12·50; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

**PIGMENTUM MENTHOL.**—Menthol, 1; Olive Oil, 4.—*Guy's.*

Menthol, 60 grains; Liquid Paraffin, to 1 oz.—*Throat.*

Mentholeate.—A name given to a solution of Menthol in Oleic Acid. Menthol, 200 grains, Oleic Acid, ½ fl. oz.; heat gently in a test-tube till dissolved. It is recommended as the best form for external application.

**POUDRE CONTRE LE CORYZA** (Fr.).—Beta-naphthol Salicylate, 30; Phenyl Salicylate, 15; Menthol, 4; Cocaine Hydrochloride, 0·5; Boric Acid, 50·5.

**VASOLIMENTUM MENTHOLI.**—Menthol, 2; Liquid Vasoliment, 98.—*Hager.*

Parogenum Mentholis. *Syn.* Menthol Vasoliment.—Menthol, 2; Parogen, *q.s.* to produce 100.—*B.P.C.*

**UNGUENTUM MENTHOL.**—Menthol, 5 grains; Vaseline, 1 oz.—*Throat.*

**MENTHOL VALERIANATE.**—A clear, colourless, oily liquid, having a faint odour of Menthol. It is a Menthol Ester of Valerianic Acid, insoluble in Water, soluble in Alcohol (90 p.c.) and in Ether. Useful as a stomachic and carminative in the anorexia and vomiting of phthisis, and in the vomiting of pregnancy. Also in hysteria and neuralgia.

**Dose.**—5 to 10 minims = 0·3 to 0·6 c.c. on Sugar.

**Tests.**—Menthol Valerianate, when warmed with Liquor Potassæ, is decomposed, yielding an odour of Menthol and Potassium Valerianate. If the alkaline aqueous liquid be rendered acid with Sulphuric Acid, the characteristic odour of Valerianic Acid is evolved.

**Validol.**—A solution of Menthol in Menthol Valerianate, containing about 30 p.c. of the former.

Efficacious in sea-sickness in doses of 8 to 20 drops.

**Menthosol,** a mixture of Menthol and Para-monochlorophenol, is applied in the form of 5, 10 or 15 p.c. solutions in laryngeal phthisis.—*B.M.J.E.* '02, i. 43.

**Menthoxol** is stated to be an alcoholic solution of Menthol, containing Hydrogen Peroxide. It has been used in the treatment of abscesses and suppurating wounds.

Not Official.

## MENYANTHES.

BUCKBEAN.

The Leaves of *Menyanthes trifoliata*, L., a gentianaceous plant.

**Medicinal Properties.**—A bitter tonic and cathartic.
Recommended in functional amenorrhœa.—*L.* '85, i. 132, 235.

**Dose.**—2 to 6 fl. oz. = 56·8 to 170·4 c.c. of 1 in 20 Infusion.

**Foreign Pharmacopœias.**—Official in Austr., Dutch, Ger., Hung., Jap. and Swiss (Trifolium Fibrinum); Dan., Fr., Norw., Russ. and Swed. (Menyanthes); Ital. (Trifoglio Fibrino); Port. (Trifolio Fibrino). Not in the others.

**EXTRACTUM MENYANTHIS.**—Buckbean exhausted with boiling Water, and the liquor evaporated to an Extract.

**Dose.**—15 to 30 grains = 1 to 2 grammes.

**Foreign Pharmacopœias.**—Official in Austr., Dutch, Ger., Port., Russ. and Swed. Not in the others.

Not Official.

## METHYL CHLORIDUM.

$CH_3Cl$, eq. 50·10.

Methyl Chloride is a colourless gas, of an ethereal odour and a sweet taste, soluble in Water to the extent of 2·8 volumes. It burns with a greenish flame. It is reduced to the liquid state by cold and pressure, and is supplied in metal or glass cylinders, some of which are fitted with a valve and a tube for producing a jet.

**Medicinal Properties.**—It is used as a local anæsthetic for surgical procedures of short duration, producing intense cold by its evaporation. It is allowed to escape from the tube, forming a spray which should be applied obliquely to the part, but only for a few seconds, as, if used incautiously, it may produce blisters.

Used in lumbago, sciatica and neuralgia by stypage, *i.e.*, laying on the painful part a pledget of Cotton-Wool or Lint soaked in the remedy; or the spray can be played on to the Wool as it lies on the part.

**Official in** Fr. (Chlorure de Méthyle).

**Tests.**—Methyl Chloride, when passed through Water which has been cooled down by Ice, yields a solution which should be neutral in reaction towards Litmus paper, should yield no turbidity or precipitate with Silver Nitrate Solution, and should not affect Starch Solution containing Potassium Iodide.

Not Official.

## METHYLAL.

$C_3H_8O_2$, eq. 75·49.

A colourlesss, volatile liquid, sp. gr. 0·855. Boils at 107° F. Readily soluble in Water and Alcohol (90 p.c.).

**Medicinal Properties.**—Has been employed as a hypnotic; mixed with Oil or Glycerin, as a local anæsthetic.

Almost as ill adapted for a hypnotic as Ether.—*L.* '99, ii. 5.

**Dose.**—15 to 60 minims (in Water) = 0·9 to 3·6 c.c.

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Not Official.

## METHYLENE BLUE.

$C_{16}H_{18}N_3SCl$, eq. 317·39.

TETRAMETHYLTHIONINE HYDROCHLORIDE, METHYLTHIONINÆ HYDROCHLORIDUM, METHYLTHIONINE HYDROCHLORIDE.

Prismatic crystals having a bronze-green fluorescence or as a dark green crystalline powder. It stains the skin an intense blue. It dissolves readily in Water, forming an intensely blue coloured solution.

It may be prepared by the action of Hydrogen Sulphide on an oxidation product of Para-amido-dimethylaniline.

**Medicinal Properties.**—It has been employed as an analgesic in rheumatism and sciatica, also in migraine; in some cases it may produce gastric irritation and cystitis.—*B.M.J.* '98, ii. 1055; *B.M.J.E.* '00, ii. 75. It acts specifically in malaria and also in gonorrhœa.—*B.M.J.E.* '01, i. 104; *T.G.* '00, 474.

Intramuscular injection for diagnosing the degree of penetrability of the kidney tissue. 1 c.c. of a 5 p.c. solution injected deeply into the gluteal muscles. Urine should be greenish in colour half an hour after injection. A more rapid appearance of the colour, or its shortened elimination and delayed excretion, serve as criteria for the degree of the renal lesion.—*T.G.* '00, 404; *Merck's Archives*, '99, 104.

Use in malaria further advocated (*Pr.* lxxviii. 682); 2-grain doses with powdered nutmeg and a small quantity of Codeine to prevent strangury and nausea.

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

**Prescribing Notes.**—*It is conveniently given in pills, using 'Diluted Glucose' as the excipient, or in capsules. Care must be taken to ensure purity of the sample, and only Zinc-free Methylene Blue should be used for internal administration. Methylene Blue is frequently prescribed in capsules with Oil of Sandal Wood.*

**Foreign Pharmacopœias.**—Official in Fr. (Bleu de Méthylène officinale); Mex. (Azul de Metilena); Swiss (Methylenum cœruleum); U.S. (Methylthioninæ Hydrochloridum).

**Tests.**—Methylene Blue yields, when dissolved in Water, a very deep blue coloured solution, changing on the addition of Hydrochloric Acid to a lighter shade of blue, and on the addition of Sodium Hydroxide Solution to a purplish shade. When the latter reagent is added in excess a dirty violet precipitate is produced. When treated with Zinc and Hydrochloric Acid it is decolorised. The double Zinc Salt (Tetramethylthionine Zinc Hydrochloride) is also known commercially under the name of Methylene Blue, and it is necessary, therefore, to distinguish between this and Methylene Blue for medicinal use. Medicinal Methylene Blue should not leave more than 0·4 p.c. of ash, which, when dissolved in Hydrochloric Acid, should not answer the tests distinctive of Zinc given under that heading. It should not afford any reaction for Arsenic when ignited with dry Sodium Carbonate and Potassium Nitrate and examined by the modified Gutzeit's test.

**Antirheumatin,** a mixture of Sodium Salicylate and Methylene Blue, introduced as an antirheumatic, and administered internally in doses of 1 to 2 grains = 0·06 to 0·12 gramme. It must not be confounded with **Antirheumin,** which is a preparation containing Fluorine compounds.

**METHYL VIOLET.**—Under the fancy name **Pyoctanin** (blue) it has been recommended in the internal and local treatment of malignant tumours.—*T.G.* '94, 706; *B.M.J.E.* '94, ii. 12. Locally in corneal ulceration.—*T.G.* '93, 55.

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# MEZEREI CORTEX.

## MEZEREON BARK.

FR., MÉZÉRÉON OU BOIS GENTIL; GER., SEIDELBASTRINDE; ITAL., MEZEREO; SPAN., MECEREON.

The dried Bark of *Daphne Mezereum*, L., of *Daphne Laureola*, L., or of *Daphne Gnidium*, L.

**Medicinal Properties.**—Externally, rubefacient and vesicant. Rarely given alone internally as a gastric stimulant, but it appears as an ingredient in Liquor Sarsæ Compositus Concentratus.

**Official Preparation.**—Used in the preparation of Liquor Sarsæ Compositus Concentratus.

**Not Official.**—Extractum Mezerei Æthereum and Unguentum Mezerei.

**Foreign Pharmacopœias.**—Official in Jap., Mex. (Mezereón), Port. (Trovisco), Swed., Swiss and U.S. Not in the others.

**Descriptive Notes.**—Mezereon Bark as met with in commerce consists of loose, more or less quilled, strips of thin bark about $\frac{1}{20}$ in. thick, finely fibrous, and too tough to be broken; the colour varies from pale, dull greenish-brown in that of *D. Laureola* to reddish-brown in that of *D. Mezereum* and dark purplish in that of *D. Gnidium*. Mezereon Bark is chiefly imported from Germany, but the last-named from Algeria and the South of France. In *D. Laureola* the leaf scars are crowded at intervals, but in the two latter are irregularly scattered, and the bark of *D. Gnidium* is hairy towards the apex. The outer corky coat readily separates from the green fibrous layer, which is white and satiny on the inner surface. The bark has an acrid taste and but little odour. It apparently owes its activity to a resin. The official bark is referred to the three species above named, but to *D. Mezereum* and other European species in the *U.S.P.* and the distinguishing feature is there mentioned that the transverse section exhibits numerous groups of bast fibres in the secondary bast. Mezereon Bark is not used in powder, but the principal microscopical features are the very long fibres, often 3 mm. long and only 5 to 10 $\mu$ in diameter; and the thin-walled tabular cells of the cork hexagonal in tangential section.

**Tests.**—Mezereon Bark contains from 3 to 4 p.c. of ash, which latter figure should not be exceeded.

### Not Official.

**EXTRACTUM MEZEREI ÆTHEREUM** (*B.P.* '85).—The Ether-soluble portion of alcoholic extract of Mezereon Bark.

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

**Foreign Pharmacopœias.**—Official in Port. (Extracto de Trovisco) with Alcohol only; U.S., **Fluid Extract**, 1 in 1, Mezereon Bark treated with a mixture of Alcohol (90 p.c.), 4; Water, 1. Not in the others.

**UNGUENTUM MEZEREI.**—Ext. Garou, 4; Lard, 90; White Wax, 10; Alcohol, 9.

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Not Official.

## MORI SUCCUS.

MULBERRY JUICE.

The deep purple juice of the ripe Fruit of *Morus nigra*, L. Sp. gr. about 1·060.

**Medicinal Properties.**—Refrigerant and laxative; serves to prepare a grateful drink in febrile cases, and as a flavouring and colouring agent.

**Foreign Pharmacopœias.**—Official in Fr., Suc de Mûre; Mex., Jugo de Moras; Port., Amoras; Span., Zumo de Moras.

The **Fruit** is official in Ital.

**SYRUPUS MORI.**—Mulberry Juice, 20; Refined Sugar, 36; Alcohol (90 p.c.), 2½; heat the Juice to the boilingpoint, and, when it has cooled, filter it; dissolve the Sugar in the filtered liquid by a gentle heat, and add the Alcohol; the product should weigh 54. Sp. gr. 1·330.

**Dose.**—1 fl. drm. = 3·6 c.c.

**Foreign Pharmacopœias.**—Official in Austr., Belg., Fr. (Sirop de Mûres), Hung., Ital. and Swiss. Not in the others.

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Not Official.

## MORPHINA.

$C_{17}H_{19}NO_3, H_2O$, eq. 300·93.

Colourless, shining, rhombic prisms, or as a white, odourless, crystalline powder, having a bitter taste and an alkaline reaction. It is the principal alkaloid obtained from Opium.

**Solubility.**—1 in 1000 of cold Water; 1 in 100 of Alcohol (90 p.c.); 1 in 10 of Oleic Acid; 1 in 125 of Glycerin; but the solubilities depend very largely on the physical condition of the alkaloid. Insoluble in Ether (thus differing from Narcotine). Aqueous alkalis, even Lime Water, dissolve it readily when freshly precipitated; Ammonia, however, but sparingly; where a very strong solution is required, Hypophosphorous Acid has been suggested as a solvent.

**Medicinal Properties** (*see* Morphinæ Hydrochloridum).—Owing to its slight solubility in Water it is rarely given in its purely alkaloidal form.

**Dose.**—$\frac{1}{10}$ to $\frac{1}{2}$ grain = 0·0067 to 0·032 gramme.

**Official Preparations.**—Morphine Acetate, Morphine Hydrochloride, and Morphine Tartrate.

**Not Official.**—Elixir Acetomorphinæ et Terpini, Elixir Heroin cum Terpene, Glycerinum Acetomorphinæ, Glycerinum Heroinæ Compositum, Linctus Acetomorphinæ, Linctus Heroin, Pastillus Acetomorphinæ Compositus, Pastilli Heroin, Diacetyl-morphine (Heroine), Diacetyl-Morphine Hydrochloride, Benzylmorphine Hydrochloride (Peronine), Mono-ethyl-morphine Hydrochloride (Dionine), Morphine Hydrobromide, Morphine Lactate, and Morphine Sulphate, Liquor Morphinæ Sulphatis, Pulvis Morphinæ Compositus.

**Foreign Pharmacopœias.**—Official in Fr., Hung., Mex. (Morfina), Port., Span. and U.S. Not in the others.

**Tests.**—Morphine when heated to 100° C. (212° F.) loses its Water of crystallisation slowly, but when dried at 110° C. (230° F.) the Water of crystallisation is rapidly lost. It melts at about 230° C. (446° F.), and at a somewhat higher temperature the alkaloid turns brown. It is only very slightly soluble in

Water and the aqueous solution has an alkaline reaction towards red Litmus paper.

A particle of solid Morphine yields the following characteristic colour reactions: when treated with a drop of a perfectly neutral Ferric Chloride T.S., or with Ferric Ammonium Sulphate Solution (10 p.c. w/v), it yields a very characteristic deep greenish-blue colour, changing to green on adding an excess of the reagent; with Sulphuric Acid it yields no coloration, or at the most but a slight yellowish tint, but if heated on the water-bath it assumes a brownish coloration. Dott has pointed out that solid Morphine yields a distinct though faint pink colour when treated with Sulphuric Acid; if heated with Sulphuric Acid to 150° C. (302° F.) a dirty green or rose-red colour is produced, and if the temperature be still further raised the solution becomes almost black; when cooled and diluted with Water the solution yields a greenish-blue colour, which on the addition of Ammonia Solution changes to green; when heated on a water-bath for 10 or 15 minutes with Sulphuric Acid, cooled and a few drops of diluted Nitric Acid added, a violet coloration, changing rapidly to blood-red, is produced; Sulphuric Acid, to which a small quantity of Sodium Arsenate has been added, affords a bluish-green coloration, which on raising the temperature passes from green to deep blue and finally to a dark olive green; if a small quantity of Bismuth Oxynitrate be added to a mixture of Sulphuric Acid and the alkaloid, a purplish-brown coloration is yielded. Sulphuric Acid containing 0·5 p.c. of Ammonium Molybdate (Frohde's) reagent yields with Morphine a violet-blue coloration, changing to green and ultimately to deep blue. Sulphuric Acid containing a crystal of Potassium Iodate yields a dark brown coloration; Sulphuric Acid containing in each c.c. a drop of Formaldehyde Solution yields an intense purple coloration; a similar purple coloration is produced if the alkaloid be mixed with 2 parts of Cane Sugar, and if a drop of concentrated Sulphuric Acid be added, the colour changing gradually from blood-red to brownish-red and becoming brown on dilution with Water. Sulphuric Acid containing a crystal of Potassium Bichromate is slowly reduced with the production of a green coloration. Nitric Acid yields an orange-red colour changing to yellow. With Potassium Ferricyanide Solution containing a drop of neutral Ferric Chloride T.S. it yields a deep blue coloration. It reduces Iodic Acid with liberation of Iodine, and if solution of Starch be present a blue coloration of Iodide of Starch is immediately produced. In employing this test it is essential that the reagent itself should not give free Iodine on treatment with a drop of diluted Sulphuric or Acetic Acid. It dissolves readily in diluted Hydrochloric or Sulphuric Acid, and if the alkaloid be carefully and exactly neutralised and the solution be of a sufficient degree of concentration, it will respond to the following tests. Ammonia Solution produces a white precipitate soluble with difficulty in excess of the reagent; Ammonium Carbonate Solution and Solution of Lime Water also produce a white precipitate speedily becoming crystalline. The alkali Carbonates in excess have a tendency to redissolve the precipitate, but it is insoluble in excess of the Bicarbonates. Potassium or Sodium Hydroxide Solution yields a white precipitate readily soluble in excess. Mercuric Potassium Iodide (Mayer's) Solution produces a white gelatinous precipitate. Potassium Ferricyanide Solution containing 1 or 2 drops of Ferric Chloride T.S. produces in solutions faintly acidified with Hydrochloric Acid a blue coloration or a precipitate of Prussian blue. Morphine is alkaline in reaction towards red Litmus, Methyl Orange, and Iodeosin Solutions; it forms salts which are neutral in reaction towards these indicators. It may therefore be titrated with Normal or Tenth-normal Volumetric Hydrochloric or Sulphuric Acid Solution, using one or other of these solutions as an indicator of neutrality. Methyl Orange or Iodeosin Solution is most suitable for the purpose; a known weight of the alkaloid may be dissolved in an excess of Normal Volumetric Sulphuric Acid Solution, a few drops of Methyl Orange or Iodeosin Solution added and the excess of Acid titrated with Normal Volumetric Sodium Hydroxide Solution. The number of c.c. of volumetric alkali solution in excess is subtracted from the number of c.c. of volumetric acid solution used, the difference representing the number of c.c. of normal volumetric acid solution neutralised by the alkaloid. 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·30093 gramme of hydrated Morphine or 0·28305 gramme of anhydrous Morphine. Morphine may be distinguished from

Codeine by the Nitric Acid test, Codeine yielding a yellow coloration not changing to red; by Ferric Chloride T.S., which produces a dull greenish-blue coloration, but which does not affect Codeine; by Sulphuric Acid, containing a trace of Selenious Acid, which gives with Morphine a blue coloration changing to green and finally to brown, and with Codeine a green coloration changing to blue and afterwards to a grass green; this test also serves to distinguish Morphine from Narcotine, the latter giving a green coloration changing to brown and ultimately to cherry-red. Morphine may be distinguished from Quinine by the Nitric Acid colour test; from Strychnine and Acetanilide by the Sulphuric Acid and Potassium Bichromate test, the former yielding with these reagents a purple coloration, the latter a deep crimson colour.

The more generally occurring impurities are other alkaloids, *e.g.*, Narceine, Narcotine, Thebaine, and Pseudomorphine, Ammonium salts, Meconic Acid or Meconates, and mineral matter.

The Morphine obtained from any of the official Morphine salts by precipitation is required by the *B.P.* to yield little or nothing to Benzol, which is considered sufficient evidence of the absence of other alkaloids; the *U.S.P.* requires that 0·2 of a gramme of Morphine should yield a clear solution with 4 c.c. of Potassium Hydroxide T.S., and that no insoluble residue should remain; the Solution of Potassium Hydroxide should not evolve any odour of Ammonia, indicating the absence of Ammonium salts. If a few drops of Ferric Chloride T.S. be added to a solution of 0·1 of a gramme of Morphine in 10 c.c. of diluted Hydrochloric Acid no red coloration should be produced, indicating the absence of Meconic Acid or Meconates. When ignited with free access of air, Morphine should leave no weighable residue, indicating the absence of mineral matter.

A reference to a process of separating small quantities of Morphine from Tinctures and such like substances is indicated in the large type under Tinctura Camphoræ Compositus, a reference is also made under the same heading to the association, in cough mixtures, of Morphine with the alkaloids of Ipecacuanha; the latter yield somewhat similar colour reactions to those of Morphine, and a further reference is made to these reactions under Emetine, Cephaëline, and Psychotrine.

**DIACETYL-MORPHINE.** Heroin, $C_{17}H_{17}NO\,(C_2H_3O_2)_2$, eq. 366·45.—A fine white, odourless, crystalline powder, possessing a feeble bitter taste. **Soluble** 1 in 900 of Water; 1 in 40 of Alcohol (90 p.c.); readily in diluted acids.

**Official in** Austr. (Morphinum diacetylicum), and (Russ. Heroinum).

**Tests.**—The Acetic Ester of Morphine melts at 169° to 172° C. (336·2° to 341·6° F.). It is readily and completely soluble in Chloroform, but practically insoluble in Water. It may be distinguished from Morphine by yielding no blue coloration when mixed with a few drops of a solution of Potassium Ferricyanide containing a little Ferric Chloride T.S., and by its failure to set free Iodine from Iodic Acid; with Sulphuric Acid containing a trace of Nitric Acid it yields a yellowish-red coloration in the cold, and, on warming, a blood-red coloration; with Nitric Acid it yields at first a yellow coloration, and, on warming, a red. When warmed with Sulphuric Acid and a few c.c. of Alcohol (90 p.c.) it evolves a characteristic odour of Ethyl Acetate. It is alkaline in reaction towards the usual indicators of neutrality, and combines with diluted mineral acids to form salts which are neutral in reaction towards the usual indicators. It may be determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange or Iodeosin Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·36645 gramme of Diacetyl-morphine. It should dissolve in concentrated Sulphuric Acid without colour, indicating the absence of foreign organic impurities; the presence of Morphine may be ascertained by the reactions given above. When ignited with free access of air it should leave no weighable residue.

**DIACETYL-MORPHINE HYDROCHLORIDE.** Heroin Hydrochloride, $C_{17}H_{17}NO\,(C_2H_3O_2)_2HCl$, eq. 402·64.—A white, odourless, crystalline powder.

**Solubility.**—1 in 2 of Water; 1 in 11 Alcohol (90 p.c.); insoluble in Ether.

The solubility of Heroin Hydrochloride was carefully determined in the author's laboratory, and the above figures represent the results of numerous determinations. Continental samples of the salt had a solubility of 1 in 2 of Water, which is that also given by the manufacturer.

Dott states (*C.D.* '05, i. 489; *P.J.* '05, i. 440) that the Hydrochloride appears to contain $2H_2O$, one molecule of which is lost under 100° C. (212° F.), the remaining portion at 120° C. (248° F.). Samples of Continental make examined in the author's laboratory showed a loss at 100° C. (212° F.) of 1·2 p.c., at 120° C. 1·8 p.c.

**Medicinal Properties.**—Introduced as a substitute for Morphine, it being stated to possess the advantages of not causing constipation and of being active in much smaller doses. Has been found useful in acute and chronic bronchitis, bronchial asthma, the cough of phthisis, in acute pneumonia and in pertussis.

Result of five years' experience in the use of this drug in simple bronchitis, bronchitis with measles, the bronchitis of influenza, chronic catarrhal bronchitis, phthisis and pneumonia: its effects as a cough-relieving agent were prompt and definite, and in the case of almost incessant cough or severe paroxysms during the night its good effects were especially noticeable, whilst in phthisis its use was followed by most satisfactory results. In chronic bronchial catarrh it seems to have a positive curative value. In measles, when the bronchial irritation was prominent, nothing else was found as serviceable.—*L.* '00, i. 180.

Has been recommended in the treatment of the morphia habit, but its use is deprecated on the ground that the craving following its use is infinitely more unmanageable than is that of Morphine.—*B.M.J.E.* '01, ii. 24; *L.* '01, ii. 263; *B.M.J.E.* '07, i. 87.

**Dose.**—$\frac{1}{24}$ to $\frac{1}{6}$ grain = 0·0027 to 0·01 gramme.

It is advisable to commence with the smaller dose, as some persons are easily affected by it, and repeated doses of $\frac{1}{16}$ and $\frac{1}{12}$ grain have produced toxic symptoms.

**Foreign Pharmacopœias.**—Official in Jap., Swiss (Morphinum diacetylicum hydrochloricum); Russ. (Heronium hydrochloricum); Russ., maximum single dose, 0·01 gramme; maximum daily dose, 0·02 gramme; Swiss, maximum single, 0·005, maximum daily, 0·15; Jap., maximum single, 0·01, maximum daily, 0·03.

**Tests.**—Diacetyl-morphine Hydrochloride has a m.p. of 116° to 117° C. (240·8° to 242·6° F.). It dissolves readily in Water, yielding solutions which are neutral in reaction towards Litmus, and from which the free base is liberated, on the addition of Ammonia Solution or Sodium Bicarbonate Solution; the separated base should possess the m.p. and respond to the tests given under Heroin. The anhydrous Hydrochloride should contain theoretically 91 p.c. of Diacetyl-morphine, and the percentage of the latter may be determined by titrating a weighed quantity of the salt with Normal or Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality, and adding sufficient Ether to retain the liberated alkaloid in solution. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution represents 0·36645 gramme of Diacetyl-morphine or 0·40264 gramme of anhydrous Diacetyl-morphine Hydrochloride. Dott (*C.D.* '05, i. 489) has proposed the following test:—Dissolve a weighed quantity of 0·4 of a gramme of the salt in 4 c.c. of Water, add 0·1 of a gramme of Sodium Bicarbonate, allowing it to stand for several hours; a precipitate should be yielded which, when collected on a small filter, washed with 6 c.c. of Water and dried in a water-bath, should weigh 0·3 of a gramme. The majority of the samples examined in the author's laboratory, when assayed according to this test, showed a higher yield of residue than 0·3 gramme. The Hydrochloride should be free from the impurities mentioned under Heroin.

**ELIXIR HEROIN CUM TERPENE.**—Heroin, $\frac{1}{2}$ grain; Terpene Hydrate, 8 grains; Alcohol (90 p.c,), 6 fl. drm.; Syrup of Virginian Prune Bark, 3 fl. drm.; Glycerin, 3 fl. drm. Dose.—$\frac{1}{2}$ to 2 drm. = 1·8 to 7·1 c.c. (Each fl. drm. contains $\frac{1}{24}$ grain Heroin and $\frac{2}{3}$ grain Terpene Hydrate.)—*Bournemouth Formulary.*

**Elixir Acetomorphinæ et Terpini.**—Acetomorphine Hydrochloride, 0·10; Terpin Hydrate, 1; Alcohol, 45; Glycerin, 22·50; Syrup of Wild Cherry, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* has changed the quanity of Alcohol to 50, and the quantity of Glycerin to 25.

**GLYCERINUM HEROINÆ COMPOSITUM.** *Syn.* Glycaphorm. —Heroin Hydrochloride, 10 grains; Chloroform, 20 minims; Syrup of Roses, 10 fl. oz.; Distilled Water, 2 fl. oz.; Alcohol, 40 minims; Glycerin, *q.s.* to make 20 fl. oz.

Dissolve the Heroin in the Water and add the syrup, gradually shaking after each addition. Dissolve the Chloroform in the Alcohol, add the syrup; then add Glycerin to 20 fl. oz.—*Pharm. Form.*

**Glycerinum Acetomorphinæ.**—Acetomorphine Hydrochloride, 0·05; Chloroform, 0·20; Alcohol (90 p.c.), 0·40; Syrup of Roses, 50; Distilled Water, 10; Glycerin, *q.s.* to make 100.—*B.P.C.*

**Glycerinum Heroini Compositum.**—Heroin, 20 grains; Ammonium Hypophosphite, 640 grains; Fluid Extract of Hyoscyamus, 320 minims; Fluid Extract of White Pine, $2\frac{2}{3}$ fl. oz.; Soluble Tincture of Tolu, 2 fl. oz.; Glycerin, 10 fl. oz.; Syrup of Wild Cherry Bark, 6 fl. oz.; Cinnamon Water, *q.s.* to make 40 fl. oz.—*Canadian Formulary* 1908.

**LINCTUS HEROIN.**—Heroin Hydrochloride, 2 grains; Tincture of Hyoscyamus, 4 fl. drm.; Spirit of Chloroform, 4 fl. drm.; Syrup of Tolu, 1 fl. oz.; Syrup of Virginian Prune Bark, 1 fl. oz.; Glycerin, *q.s.* to produce 6 fl. oz.

Mix. (Each fl. drm. contains $\frac{1}{24}$ grain of Heroin Hydrochloride). Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 to 7·1 c.c.—*Bournemouth Formulary.*

**Linctus Acetomorphinæ.**—Acetomorphine Hydrochloride, 0·10; Tincture of Hyoscyamus, 7·50; Spirit of Chloroform, 7·50; Syrup of Balsam of Tolu, 15; Syrup of Wild Cherry, 15; Glycerin, *q.s.* to produce 100.—*B.P.C.*

**PASTILLI HEROIN.**—Heroin Hydrochloride, 1 grain; Ammoniated Glycyrrhizin, 10 grains; Pumilio Pine Oil, 8 minims; Glyco-gelatin, sufficient to make 32 pastilles. Each pastille contains $\frac{1}{32}$ grain of Heroin Hydrochloride. —*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* as follows:—Pastillus Acetomorphinæ Compositus.—Acetomorphine Hydrochloride, $\frac{1}{32}$ grain; Ammoniated Glycyrrhizin, $\frac{5}{16}$ grain; Pine Oil, $\frac{1}{4}$ minim.—*B.P.C.*

**BENZYL-MORPHINE HYDROCHLORIDE.** Peronine. $C_{17}H_{18}NO_3.C_7H_7.HCl$, eq. 408·61.—It may be prepared by the action of Benzyl Chloride on Morphine.

A bitter, odourless, white, micro-crystalline powder, soluble 1 in 200 of Water, 1 in 160 of Alcohol (90 p.c); insoluble in Chloroform and Ether.

**Medicinal Properties.**—Narcotic and sedative, introduced as a substitute for Morphine and Codeine in the irritative cough of phthisis and chronic bronchitis.—*B.M.J.E.* '98, ii. 43; *L.* '99, ii. 139.

An exhaustive report on Benzyl-morphine by Stockman and Dott; the remarks found under Diacetyl-morphine are also applicable to the Benzyl compound.—*L.* '90, ii. 191; '99, ii. 139.

Instillation of 1 to 2 p.c. solution into conjunctival sac induces anæsthesia of the cornea.—*B.M.J.E.* '99, ii. 71.

**Dose.**—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

**Tests.**—Benzyl-morphine Hydrochloride, when strongly heated, evolves a strong aromatic odour, the salt dissolves in Water, forming a solution neutral in reaction to Litmus, from which Ammonium, Potassium, or Sodium Hydroxide Solution precipitates the free base. It is precipitated by the usual alkaloidal reagents, *e.g.*, Potassium Mercuric Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, Picric Acid, etc. With Sulphuric Acid containing a trace of Nitric Acid it yields a dark brownish-red coloration. It is distinguished from Morphine by yielding no blue coloration with Potassium Ferricyanide Solution containing a few drops of Ferric Chloride T.S., and by its failure to liberate Iodine from Iodic Acid. It contains theoretically 91·1 p.c. of Benzyl-morphine, which may be determined by titration in a similar manner to that described under Diacetyl-morphine Hydrcchloride. 1 c.c. of Volumetric Potassium

Hydroxide Solution represents 0·40861 gramme of anhydrous Benzyl-morphine Hydrochloride, $C_{17}H_{18}NO_3(C_7H_7)HCl$.

**MONO-ETHYL-MORPHINE HYDROCHLORIDE.** Dionine, $C_{17}H_{18}NO_3 \cdot C_2H_5HCl.H_2O$, eq. 364·94.—A bitter, odourless, white, microcrystalline powder.

**Solubility.**—1 in 7 of Water; 1 in 5 of Alcohol (90 p.c.); insoluble in Ether.

The above figures were carefully determined in the author's laboratory, and have been confirmed on repetition. The solubility of the salt in Alcohol (90 p.c.) varies greatly with the temperature, slight variations producing an appreciable effect; the salt which had a solubility in Alcohol (90 p.c.) at 15·5° C. (60° F.) of 1 in 5, dissolved readily 1 in 1 of warm Alcohol (90 p.c.). The figures for the solubility given by Dott (*C.D.* '05, i. 489) are 1 in 14 of Water, 1 in 29 of Alcohol (90 p.c.).

**Medicinal Properties.**—Analgesic, not a local anæsthetic.

Its regular and systematic use in the form of a 5 to 10 p.c. solution has been recommended (*B.M.J.* '04, ii. 1303) in interstitial keratitis. A 5 p.c. solution was found (*L.* '05, ii. 835) very beneficial in corneal opacities from recent keratitis. It is one of the most valuable agents we possess (*L.* '06, ii. 15; *F.T.* '07, i. 53) for the relief of deep-seated ocular pain, *e.g.*, in glaucoma, iritis, sclerotitis, etc.

As an analgesic (*B.M.J.* '06, i. 1098) it is used chiefly in the form of a 5 p.c. aqueous solution or made up with Vaseline as an ointment in similar strength. Not only an ocular anæsthetic, but a powerful ocular analgesic. It neither dilates the pupil nor increases the tension of the eye. It is advisable to begin with a 2 p.c. solution and gradually increase the strength so that in the course of a few days 5 p.c. may be used. Drops of a weak solution (1 or 2 p.c.) have given considerable relief in those cases, chiefly of neurotic and neurasthenic patients, where no disease or abnormality may be discoverable on careful examination, and yet the patient constantly complains of the feeling of soreness. No other method for the clearing up of corneal opacities can be compared with the results of the use of this drug. In the treatment of all forms of corneitis it may be used in 1 or 2 p.c. solution combined with Atropine. When the inflammatory symptoms have subsided, the Atropine is stopped, but the Dionine is continued alone for a considerable time. For the clearing up of corneal opacities, an ointment containing 4 grains to the oz. may be used to commence with, gradually increasing the strength to 12 grains to the oz.

As an ocular analgesic in 5 p.c. aqueous solution, or as an ointment of similar strength.—*B.M.J.* '04, i. 1009.

Has been found useful in relieving the cough of phthisis and bronchitis.—*B.M.J.E.* '99, i. 36; '01, ii. 68; '02, i. 60; *P.J.* '01, ii. 645.

In the treatment of the drug habit, ¼ to ½ grain doses.—*B.M.J.E.* '99, i. 83.

**Dose.**—⅓ to ½ grain = 0·021 to 0·032 gramme, dissolved in Water; or in the form of a syrup.

**Official in** Swiss. Swiss, maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

**Tests.**—Mono-ethyl-morphine Hydrochloride melts at about 124° C. (255·2° F.). It dissolves in Water, forming a solution which is neutral in reaction towards Litmus and which yields precipitates with the usual alkaloidal agents, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-potassium Iodide (Wagner's) Solution, etc.

Sulphuric Acid dissolves Dionine, forming a clear colourless solution, and evolves simultaneously Hydrochloric Acid gas; the addition of 1 or 2 drops of Ferric Chloride T.S. produces on warming a violet coloration changing to a deep blue, which upon the further addition of 1 or 2 drops of Nitric Acid assumes a deep red coloration. With Sulphuric Acid Solution containing 0·5 p.c. of Ammonium Molybdate it yields a similar violet coloration to that of Morphine. If 0·5 of a gramme of Dionine be dissolved in 5 c.c. of Water it yields with Ammonia Solution (sp. gr. 0·910) a copious white precipitate which redissolves on the addition of about 5 c.c. of the Ammonia Solution, but the free base again separates in the form of crystals in a short time; Codeine under similar circumstances yields a precipitate which is permanently dissolved on the addition of 1 c.c. of the Ammonia Solution.

Ethyl-morphine may be distinguished from Morphine by yielding no immediate blue coloration or precipitate with a solution of Potassium Ferricyanide containing a trace of Ferric Chloride T.S. The anhydrous salt contains theoretically 85 p.c. of Ethyl-morphine, it is neutral in reaction towards Phenolphthalein and may be titrated in a similar manner to Diacetyl-morphine Hydrochloride. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution represents 0·36494 gramme of anhydrous Mono-ethyl-morphine Hydrochloride. It should be free from the impurities mentioned under Diacetyl-morphine Hydrochloride.

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# MORPHINÆ ACETAS.

MORPHINE ACETATE.

$C_{17}H_{19}NO_3$, $C_2H_4O_2$, $3H_2O$, eq. 396·27.

FR., ACÉTATE DE MORPHINE; GER., MORPHINACETAT; ITAL., ACETATO DI MORFINA; SPAN., ACETATO MORFICO.

A light, white, crystalline powder, possessing a faint acetous odour and a bitter taste. It gradually loses Acetic Acid when exposed to the air, and should therefore be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the atmosphere.

**Solubility.**—Theoretically 1 in 2½ of Water, but most samples will require the addition of Acid; 1 in 100 of Alcohol (90 p.c.); 1 in 5 of Glycerin.

It has been stated (*C.D.* '05, i. 282) that the solubility for Morphine Acetate would be better described as 1 in 3 of Water.

**Medicinal Properties.**—*See* Morphinæ Hydrochloridum.

The Injectio Morphinæ Hypodermica formerly (*B.P.* 1885) contained one grain of Morphine Acetate in ten minims, now (*B.P.* 1898) it contains one grain of Morphine Tartrate in twenty-two minims.

Recommended in diabetes.—*Pr.* xxxviii. 20; *B.M.J.* '89, i. 118.

**Dose.**—⅛ to ½ grain = 0·008 to 0·032 gramme.

**Prescribing Notes.**—*As it is practically impossible to dry the salt without a slight loss of Acetic Acid, the commercial Acetate generally requires a little added Acetic Acid to make a clear solution. Aqueous solutions have a strong tendency to deposit a basic Morphine Acetate, and to become acid.*

**Incompatibles.**—Alkalis and alkaline earths, astringent vegetable infusions and decoctions.

**Official Preparation.**—Liquor Morphinæ Acetatis.

**Not Official.**—Injectio Morphinæ et Atropinæ Hypodermica.

**Antidotes.**—*See* Morphine Hydrochloride.

**Foreign Pharmacopœias.**—Official in Belg., Mex., Port. and U.S. Not in the others.

**Tests.**—Morphine Acetate when heated loses Water and Acetic Acid and melts, according to the *U.S.P.*, at about 200° C. (392° F.).

It affords upon the addition of Ammonia Solution, in slight excess, a white precipitate rapidly becoming crystalline, and if this precipitate is separated, washed with a little cold Morphinated Water and dried, it responds to the tests described under Morphine. A small quantity of the salt warmed with a little Sulphuric Acid and 1 or 2 c.c. of Alcohol (90 p.c.) yields a characteristic odour of Ethyl Acetate. The test for Acetates with Ferric Chloride Test-solution cannot be employed unless the alkaloid is first removed, owing to the reaction of the Morphine which produces a greenish-blue destroyed by acids or by heat. When warmed with Sulphuric Acid it evolves an odour of Hydrogen Acetate. It is officially required to yield 71 p.c. of anhydrous Morphine equivalent to 75·4 p.c. of hydrated Morphine and to 99·4 p.c. of a salt of the pharmacopœial formula, as gravimetrically determined by dissolving 2 grammes of the salt in a mixture of 6 c.c. of warm Morphinated Water and 0·1 c.c. of Acetic Acid and precipitating this solution with Ammonia Solution in slight excess, the precipitate being washed with a little cold Morphinated Water, dried first by pressure between sheets of bibulous paper, and then at a temperature of 55° to 60° C. (131° to 140° F.), and eventually at a temperature of 110° C. (230° F.); the crystals should weigh 1·42 grammes. The *B.P.* states that in the event of the salt yielding a larger proportion of Morphine than this, before use it should be recrystallised from hot Water acidulated with Acetic Acid. It should be free from the impurities mentioned under Morphine; when ignited with free access of air the salt should leave no weighable residue, indicating the absence of mineral impurity.

### Preparation.

**LIQUOR MORPHINÆ ACETATIS.** SOLUTION OF MORPHINE ACETATE.

Morphine Acetate, $17\frac{1}{2}$ grains; Diluted Acetic Acid, 38 minims; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

**Dose.**—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain.

### Not Official.

**INJECTIO MORPHINÆ ET ATROPINÆ HYPODERMICA.**—Morphine Acetate, 10 grains; Atropine Sulphate, $\frac{1}{4}$ grain; Water, 120 minims; dissolve.

$\frac{1}{2}$ grain of Morphine Acetate and $\frac{1}{80}$ grain of Atropine Sulphate in every 6 minims.

**Dose.**—1 to 6 minims for each injection = 0·06 to 0·36 gramme.

Atropine combined with Morphine increases its analgesic and hypnotic effects, whilst it lessens the tendency to sickness, dyspepsia, depression and constipation.

The *B.P.C.* solution contains 6 p.c. of Morphine Sulphate and 0·12 p.c. of Atropine Sulphate.

Not Official.

## MORPHINÆ HYDROBROMIDUM.

MORPHINE HYDROBROMIDE.

$C_{17}H_{19}NO_3$, HBr, $2H_2O$, eq. 399·16.

Forms long, colourless needles, soluble 1 in 25 Water, 1 in 50 of Alcohol (90 p.c.). It is employed for similar purposes to the Hydrochloride.

**Dose.**—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

**Tests.**—Morphine Hydrobromide loses at a temperature of 100° to 110° C. (212° to 230° F.) two molecules of Water of crystallisation, equivalent to 8·9 p.c. It dissolves in Water, yielding a solution which is neutral or but faintly acid to Litmus paper; on the addition of a slight excess of Ammonia Solution it yields a precipitate rapidly becoming crystalline, which, when separated, washed and dried, answers the tests characteristic of Morphine given under that heading. The aqueous solution yields with Silver Nitrate Solution a yellowish curdy precipitate which, when separated and washed, dissolves readily in Potassium Cyanide Solution, but which is practically insoluble in Ammonia Solution and insoluble in Nitric Acid. It contains theoretically 70·9 p.c. of anhydrous Morphine, equivalent to 75·4 p.c. of hydrated Morphine, which may be gravimetrically determined by methods similar to those described under Morphine Acetate, Hydrochloride, and Tartrate. It should be free from the impurities mentioned under Morphine, and the salt, when ignited with free access of air, should leave no weighable residue.

## MORPHINÆ HYDROCHLORIDUM.

MORPHINE HYDROCHLORIDE.

HYDROCHLORATE OF MORPHINE.—*B.P.* '85.

$C_{17}H_{19}NO_3$, HCl, $3H_2O$, eq. 372·88.

FR., CHLORHYDRATE DE MORPHINE; GER., MORPHINHYDROCHLORID; ITAL., CLORIDRATO DI MORFINA; SPAN., CLORURO MORFICO.

White, odourless, lustrous, silky needles, or a white microcrystalline powder, possessing a bitter taste.

**Solubility.**—1 in 24 of Water; about 1 in 72 of Alcohol (90 p.c.); 1 in 8 of Gycerin; insoluble in Ether.

The above figure for Morphine Hydrochloride in Water has been confirmed on repetition; the figure for Alcohol (90 p.c.) has been altered from 1 in 50 to 1 in 72, the former figure represented the solubility in Rectified Spirit of the *B.P.* 1885; the increased strength of the Alcohol official in *B.P.* 1898 causing a corresponding difference in solubility. The Report of the Committee of Reference in Pharmacy recommends the solubility of 1 in 25 of Water, and states that 1 gramme dissolves in 69 c.c. of Alcohol (90 p.c.). It should be kept in well-stoppered bottles of a dark amber tint.

**Medicinal Properties.**—Morphine possesses in a marked degree the analgesic and hypnotic effects of Opium. It has the advantage over Opium of being less apt to disturb digestion and cause constipation, more particularly when given by hypodermic injection; it is also less likely to cause headache and nausea. It is more readily absorbed and acts quicker; it is better adapted for hypodermic injection and for suppositories. Opium, however, is better for relieving pain in the alimentary tract, as in gastric ulcer and abdominal pain; it is also more useful as a diaphoretic and in diabetes. It lessens the secretions, diminishes diarrhœa, and produces constipation. Children are very susceptible to the action of Morphine.

Valuable papers on its use in cardiac diseases, *L.* '98, ii. 1393, and on Opium in acute and chronic disease, *Pr.* '07, i. 625.

Given immediately before the general anæsthetic or before the patient leaves the table, prevents post-anæsthetic vomiting.—*L.* '08, i. 292.

A hypodermic injection given before the administration of a general anæsthetic decreases the patient's susceptibility to shock during the operation.—*L.* '05, i. 853.

Amongst the various references to Morphine or Morphine salts, ⅙ to ⅓ grain has been recommended hypodermically (*B.M.J.* '04, ii. 1635, 1783) in the treatment of hæmoptysis. An exception to the exhibition of Morphine (*B.M.J.* '05, i. 68) is found when the bleeding is so profuse as to flood the air passages, and threatens to suffocate the patient.

Morphinomania treated successfully by Atropine and Strychnine.—*B.M.J.* '07, i. 1173.

In the treatment of puerperal eclampsia, injection of ⅙ to 1 grain.—*B.M.J.* '01, ii. 810; '02, i. 71, 509; '05, ii. 718, 719, 749; *L.* '01, i. 1823; *T.G.* '01, 622.

**Dose.**—⅛ to ½ grain = 0·008 to 0·032 gramme.

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

**Prescribing Notes.**—*The salts of Morphine are all readily soluble in Water, the Acetate being the most soluble, but it is apt to deposit a basic salt; the Tartrate and Lactate are next, being about* 1 *in* 10; *the Sulphate, Hydrobromide and Hydrochloride are the least soluble, requiring rather more than* 20 *of Water to* 1 *of the salt.*

**Incompatibles.**—Alkalis and alkaline earths, astringent vegetable infusions and decoctions, Ferric Chloride.

**Official Preparations.**—Liquor Morphinæ Hydrochloridi, Suppositoria Morphinæ, Trochiscus Morphinæ and Trochiscus Morphinæ et Ipecacuanhæ. Contained in Tinctura Chloroformi et Morphinæ Composita.

**Not Official.**—Insufflatio Morphinæ, Linctus Morphinæ (*Squire*), Linctus Morphinæ Acidus (*Squire*).

**Antidotes.**—If taken by the mouth, induce vomiting, and wash out the stomach. Keep the patient walking about, and rouse him in every way. Ammonia or Spirit of Sal Volatile to the nose, inject a pint of strong Coffee into the bowel. Hypodermic injection of Atropine Sulphate 1/20 grain, repeating in a quarter of an hour if necessary. Tincture of Belladonna, Amyl Nitrite inhalation, artificial respiration.—*Murrell.* 1/32 grain Strychnine acts as an antidote to ½ grain Morphine.—*L.* '71, ii. 840, 907. Potassium Permanganate is used to wash out the stomach; a solution of 120 minims of Liq. Pot. Permang. in a pint of Water is suitable. If quantity of Opium or Morphine taken is unknown, 8 to 10 grains Potassium Permanganate in from 4 to 8 fl. oz. of Water should be administered at once. The solution may be acidulated with Acid. Sulphuricum Dilutum with advantage.—*B.M.J.* '95, i. 1369; '95, ii. 55, 76; '96, i. 1194; *T.G* '98, 97. Picrotoxine, 1/20 grain.—*L.* '89, i. 497. ½ grain doses of Cocaine at intervals of half an hour until consciousness returns and breathing is normal, as an antidote.—*M.P.* '02, i. 147; *P.J.* '02, i. 114.

Case of poisoning by 8 grains of Morphine Sulphate (in three hypodermic injections), treated by artificial respiration, subcutaneous injection of 30 oz. of normal saline solution, and drinking a diluted solution of Potassium Permanganate.—*L.* '02, i. 1317.

Value of Oxygen in poisoning by Morphine.—*L.* '98, ii. 545.

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

**Tests.**—Morphine Hydrochloride when heated to 100° C. (212° F.) loses its Water of crystallisation, equivalent to 14·4 p.c., and when still more strongly heated chars without melting. The German Pharmacopœia states that it loses 14·4 p.c. of its weight at 100° C. (212° F.), and that the anhydrous Morphine Hydrochloride should be of a pure white or only of a pale yellow colour; when heated to 250° C. (482° F.) it changes to a brown colour.

It dissolves in Water, yielding a solution neutral in reaction towards Litmus paper; when the solution is treated with a slight excess of Ammonia Solution it yields a white precipitate rapidly becoming crystalline, which, when separated and washed with Morphinated Water and carefully dried, answers tests characteristic of Morphine given under that heading. The aqueous solution acidified with Nitric Acid yields on the addition of Silver Nitrate Solution a white curdy precipitate, which when separated dissolves readily in Ammonia Solution and in solution of Potassium Cyanide, but is insoluble in Nitric Acid. When warmed with Sulphuric Acid it evolves Hydrochloric Acid gas. It is officially required to contain 75·5 p.c. of anhydrous Morphine, equivalent to 80·2 p.c. of hydrated Morphine and to 99·5 p.c. of pure Morphine Hydrochloride of the pharmacopœial formula as gravimetrically determined by dissolving 2 grammes of the salt in 250 c.c. of warm Morphinated Water, precipitating the Morphine with the smallest possible excess of Ammonia Solution, filtering, washing the crystalline precipitate with a little cold Morphinated Water, and drying first between folds of bibulous paper, then at a temperature of 55° to 60° C. (131° to 140° F.) and finally at a temperature of 110° C. (230° F.); the crystals should weigh 1·51 grammes.

The Report of the Committee of Reference in Pharmacy recommends that the 2 grammes of the salt employed in the above quantitative estimation should be dissolved in 50 c.c. instead of 250 c.c. of warm Morphinated Water, and the precipitated Morphine should weigh 1·5 to 1·51 grammes. Morphine Hydrochloride should be free from the impurities mentioned under Morphine. The *U.S.P.* states that on the addition of Potassium Carbonate T.S. to a 1 in 30 aqueous solution of the salt a white precipitate should be formed, which should be soluble without colour in Chloroform indicating the absence of Apomorphine. The Benzol test is given under Morphina.

**Potassium Carbonate.**—5 c.c. of an aqueous solution of the salt (1–30) should give immediately, or after a few seconds, with 1 drop of Potassium Carbonate T.S., a pure white crystalline precipitate which even on exposure to the air undergoes no coloration. When agitated with Chloroform no red colour should be developed, *P.G.;* the white precipitate formed should dissolve in Chloroform without colour, *U.S.P.*

**Ether.**—If the solution of this precipitate in Sodium Hydroxide T.S. be agitated with an equal volume of Ether, the separated ethereal layer when evaporated to dryness should not leave a weighable residue, *P.G.*

**Potassium Hydroxide.**—An aqueous solution of the salt yields a white precipitate with Potassium Hydroxide T.S., readily soluble in excess, *B.P.*

## Preparations.

### LIQUOR MORPHINÆ HYDROCHLORIDI. Solution of Morphine Hydrochloride. *B.P.Syn.*—Solution of Hydrochlorate of Morphine.

Morphine Hydrochloride, 17½ grains; Diluted Hydrochloric Acid 38 minims; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

**Dose.**—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain of Morphine Hydrochloride.

**Foreign Pharmacopœias.**—Official in Fr. Soluté de Morphine (Chlorhydrate) pour Injection Hypodermique, 1 in 50; Port. (Soluto de Chlorhydrato de Morphina), 1 in 20, for hypodermic injection. Not in the others.

### SUPPOSITORIA MORPHINÆ. Morphine Suppositories.

¼ grain of Morphine Hydrochloride in each, with Oil of Theobroma.

Half the strength of *B.P.* '85.

### TINCTURA CHLOROFORMI ET MORPHINÆ COMPOSITA.

The formula is given under Chloroform. The proportion of Morphine has been much increased, and is now more than four times what it was in *B.P.* '85. 10 minims now contain ¾ minim of Chloroform, ½ Minim of Diluted Hydrocyanic Acid, $\frac{1}{11}$ grain of Morphine Hydrochloride, and 1 minim of Tincture of Indian Hemp.

### TROCHISCUS MORPHINÆ. Morphine Lozenge.

$\frac{1}{36}$ grain of Morphine Hydrochloride in each lozenge, with Tolu Basis.

**Dose.**—1 to 6 lozenges. One occasionally for cough.

**Official** in Jap. (Pastilli Morphini Hydrochlorici), 0·005 gramme in each pastille.

### TROCHISCUS MORPHINÆ ET IPECACUANHÆ. Morphine and Ipecacuanha Lozenge.

$\frac{1}{36}$ grain of Morphine Hydrochloride, and $\frac{1}{12}$ grain of powdered Ipecacuanha Root in each, with Tolu Basis.

**Dose.**—1 to 6 lozenges. One occasionally for cough.

**Foreign Pharmacopœias.**—Official in U.S. contains $\frac{1}{40}$ grain of Morphine Sulphate, and $\frac{3}{25}$ grain of Ipecacuanha in each; Swiss (Pastilli Ipecacuanhæ cum Opio), contains about 0·002 gramme = $\frac{1}{32}$ grain of each, Ipecac. and Opium. Jap. (Pastilli Opii et Ipecacuanha). Each pastille contains 0·025 gramme = about ⅓ grain of each, Opium and Ipecacuanha.

## Not Official.

**INSUFFLATIO MORPHINÆ.**—Morphine Hydrochloride, ¼ grain; Bismuth Oxychloride, 1 grain; Starch, ½ grain.—*City Chest.*

The Morphine Insufflations of *Royal Chest* are dilutions with Milk Sugar, and those of *Throat* and *Great Northern*, with dried Starch.

**LINCTUS MORPHINÆ** (*Squire*).—Solution of Morphine Hydrochloride, 3 minims; Spirit of Chloroform, 3 minims; Glycerin, 30 minims; Syrup, to 1 fl. drm.

**LINCTUS MORPHINÆ ACIDUS** (*Squire*).—Solution of Morphine Hydrochloride, 3 minims; Spirit of Chloroform, 3 minims; Lemon Juice, 15 minims; Glycerin, to 1 drm.

Both the above are very palatable.

This has been incorporated in the *B.P.C.* under title **Linctus Sedativus.** *Syn.*—Linctus Morphinæ Acidus.

Not Official.

## MORPHINÆ LACTAS.

Morphine Lactate, $C_{17}H_{19}NO_3C_3H_6O_3$, eq. 372·42, occurs in colourless, prismatic crystals.

**Solubility.**—1 in 8 of Water, 1 in 93 of Alcohol (90 p.c.).

**Dose.**—⅛ to ½ grain = 0·008 to 0·032 gramme.

Not Official.

## MORPHINÆ SULPHAS.

Morphine Sulphate $(C_{17}H_{19}NO_3)_2$, $H_2SO_4$, $5H_2O$, eq. 752·84, occurs in colourless acicular crystals.

**Solubility.**—1 in 21 of Water, freely in hot Water; 1 in 700 of Alchhol (90 p.c.).

**Dose.**—⅛ to ½ grain = 0·008 to 0·032 gramme.

**Foreign Pharmacopœias.**—Official in Jap., Mex., Norw., Port., Span. and U.S. Not in the others.

**Tests.**—Morphine Sulphate loses 3 molecules of Water of crystallisation, equivalent to 7·12, p.c. at 100° C. (212° F.). When strongly heated [about 250° C. (482° F.)] it changes to a brown colour and finally chars without melting. It dissolves in Water, yielding a clear solution which is neutral in reaction towards Litmus paper; this solution affords with Ammonia Solution a white crystalline precipitate, which should answer the tests characteristic of Morphine given under that substance. It should afford with Barium Chloride T.S. a white precipitate insoluble in Hydrochloric Acid. It contains theoretically 75·2 p.c. of anhydrous Morphine, and may be gravimetrically determined by a similar process to that given for Morphine Acetate, Hydrochloride, or Tartrate.

**LIQUOR MORPHINÆ SULPHATIS.**—Sulphate of Morphine, 1; Rectified Spirit, 25; Distilled Water, *q.s.* to produce 100.—*B.P.* 1885.
This has been incorporated in the *B.P.C.*

**PULVIS MORPHINÆ COMPOSITUS.**—Morphine Sulphate, 1·5; Camphor, 32; Glycyrrhiza in No. 80 powder, 33; Precipitated Calcium Carbonate, 33·5; Alcohol, *q.s.* Rub the Morphine Sulphate with the Precipitated Calcium Carbonate, added in portions of about 5 each, until it is thoroughly mixed, then rub the Camphor with a little Alcohol and mix intimately with the Glycyrrhiza and the other powders. Finally, pass the powder through a No. 40 sieve, pulverise the residue if any should be left on the sieve, add to the sifted powder and mix thoroughly. Transfer it to well-stoppered bottles. Average Dose, 7½ grains = 0·5 gramme.—*U.S.P.*
This has been incorporated in the *B.P.C.*

**PILULÆ ATROPINÆ ET MORPHINÆ.** *See* p. 204.

# MORPHINÆ TARTRAS.

MORPHINE TARTRATE.

$(C_{17}H_{19}NO_3)_2C_4H_6O_6,3H_2O$, eq. 768·66.

FR., TARTRATE DE MORPHINE; GER., MORPHINTARTRAT; ITAL., TARTRATO DI MORFINA; SPAN., TARTRATO MORFICO.

Colourless, acicular crystals, or as a fine, white, crystalline powder.

It may be prepared by the combination of Morphine with its molecular equivalent of Tartaric Acid.

**Solubility.**—1 in 10 of Water; sparingly in Alcohol (90 p.c.).

The solubility of this salt is sometimes affected by the presence of a small quantity of the Acid Tartrate; the latter being much less soluble than the official salt.

**Dose.**—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

**Official Preparations.**—Injectio Morphinæ Hypodermica and Liquor Morphinæ Tartratis.

**Tests.**—Morphine Tartrate dissolves in Water, forming a solution which is neutral in reaction towards Litmus paper, the solution yields, on the addition of Ammonia Solution in slight excess, a white precipitate rapidly becoming crystalline, which when separated yields the tests distinctive of Morphine described under that heading. The aqueous solution after the removal of the alkaloid, when mixed with Calcium Chloride Solution in excess, affords a white granular precipitate which, when separated and washed, is soluble in concentrated Potassium Hydroxide Solution; when a sufficiently concentrated solution is mixed with concentrated Potassium Acetate Solution it affords, when acidulated with Acetic Acid, a white crystalline precipitate; the precipitation being still more marked in the presence of Alcohol (90 p.c.); Ferrous Sulphate Solution added to a solution acidulated with Acetic Acid, followed by the addition of a few drops of Hydrogen Peroxide Solution, and finally with an excess of Potassium Hydroxide Solution, gives a purple or violet coloration. It is officially required to yield 73·5 p.c. of anhydrous Morphine equivalent to 78·13 p.c. of hydrated Morphine as gravimetrically determined by dissolving 2 grammes of the salt in 20 c.c. of warm Morphinated Water, precipitating the alkaloid with the slightest possible excess of Ammonia Solution, washing the crystalline precipitate with cold Morphinated Water and drying first between folds of bibulous paper, then at a temperature of 55° to 60° C. (131° to 140° F.), and finally at a temperature of 110° C. (230° F.); the crystals should weigh 1·47 grammes. It should be free from the impurities mentioned under Morphina, and when ignited with free access of air the salt should leave no weighable residue.

The salt is efflorescent at 20° C. (68° F.), and it should therefore be kept in well-stoppered glass bottles of a dark amber tint and kept as far as possible from contact with the air and in a cool place. It has a tendency, when kept for a lengthened period, to become converted into the Acid Tartrate, which dissolves with less facility in Water, and the presence of any appreciable proportion of such a salt is at once manifest by the increased insolubility in Water.

### Preparations.

**INJECTIO MORPHINÆ HYPODERMICA.** Hypodermic Injection of Morphine.

Dissolve 50 grains of Morphine Tartrate in recently boiled and cooled Distilled Water to produce 1100 minims. (1 in 20)

**Dose.**—*By subcutaneous injection*, 2 to 5 minims = 0·12 to 0·3 c.c.

The official Hypodermic Injection is now made with the Tartrate, containing 1 grain in 22 minims, which is about half the strength of that in *B.P.* '85. On account of the great difference in strength of the various solutions of Morphine salts, it is extremely important that they should be very plainly labelled, and used with very great care. It is also desirable that prescribers should clearly define the strength.

Tablets for making the injection are convenient and portable.

Atropine Sulphate, $\frac{1}{200}$ to $\frac{1}{100}$ grain is added to each dose of Morphine Injection to increase its analgesic and hypnotic effects, and to lessen its depressing and constipating effects.

**LIQUOR MORPHINÆ TARTRATIS.** SOLUTION OF MORPHINE TARTRATE.

Morphine Tartrate, 17½ grains; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

**Dose.**—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain.

## MORRHUÆ OLEUM.

COD-LIVER OIL.

*N.O.Syn.*—OLEUM JECORIS ASELLI.

FR., HUILE DE FOIE DE MORUE; GER., LEBERTHRAN; ITAL., OLIO DI FEGATO DI MERLUZZO; SPAN., ACEITE DE HIGADO DE BACALAO.

A pale yellow, or yellow oily fluid, possessing a characteristic fishy odour and taste; extracted from the fresh liver of the Cod, *Gadus Morrhua*, at a temperature not exceeding 82·2° C. (180° F.); subsequently removing solid fat by filtration at about −5° C. (23° F.).

The alkaloids Morrhuine and Aselline have been isolated.

**Solubility.**—Sparingly in Absolute Alcohol; 1 in 2 of Ether; 1 in 3½ to 4 of Acetic Ether.

A solvent of pure Quinine. 1 fl. oz. at 140° F. will dissolve 4 grains readily.

**Medicinal Properties.**—Nutritive; nervine and hæmatinic tonic. Most efficient in all forms of tubercular disease and in rickets and tertiary syphilis; useful in the chronic eczema and chronic bronchitis of children; and generally in all cases of impaired nutrition and nervous debility due to over-work, acute disease, or under-feeding. In pulmonary consumption it deservedly possesses a high reputation: given in emulsion, with or without Malt Extract. It is contra-indicated in hæmoptysis, diarrhœa, and dyspepsia. It is easily assimilated, and is best given after meals, but it may produce indigestion and nausea; sometimes administered by inunction, but the odour is objectionable.

It is stated (*Edin. Med. Journ.* '05, 463) to be pre-eminently the best of the tonic remedies which have been used in the treatment of pulmonary tuberculosis. It should be taken twice a day within half an hour after meals. Best to commence with 1 drm. doses and after a time to increase to 2 drm. doses; the amount should never exceed ½ oz. For children Parrish's Food or Iron Wine is a good vehicle.

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

**Prescribing Notes.**—*Numerous and varied methods have been adopted for covering the taste of the Oil. It has been given floating on Orange Wine, Orange*

*Juice, Milk, Coffee, also in a mixture of Tincture of Orange, diluted mineral Acid and Syrup. A favourite form is that of the* **Emulsion** *which may be made with Gum Acacia, Tragacanth, or yolk of egg or any combination of these; another and very excellent method is that given under Malt Extract, see p. 270. The Oil by itself may be given in capsules containing 30 or 60 minims in each.*

**Not Official.**—Cremor Morrhuæ Pancreaticus, Emulsion d'Huile de Foie de Morue, Emulsio Olei Morrhuæ, Emulsio Olei Morrhuæ cum Hypophosphitibus, Ovis et Vino, Emulsio Morrhuæ Pancreatica, Emulsio Morrhuæ Pancreatica cum Extracto Malti, Emulsio Olei Morrhuæ Composita, Emulsum Olei Morrhuæ cum Hypophosphitibus, Huile de Foie de Morue Créosotée, Huile de Foie de Morue Phosphorée, and Morrhuol.

**Foreign Pharmacopœias.**—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Norw., Russ., Swed. and Swiss (Ol. Jecoris Aselli); Fr. (Huile de Foie de Morue); Ital. (Oleo di Fegato di Merluzzo); Jap. (Ol. Jecoris; Port. (Oleo de Bacalhau); Mex. and Span. (Aceite de Higado de Bacalao); U.S. (Oleum Morrhuæ). Dutch and Swed. have also Oleum Jecoris Aselli Ferratum. Dutch has also Oleum Jecoris Aselli cum Iodeto Ferroso; Swiss has also Oleum Jecoris Iodetum.

**Tests.**—Cod-Liver Oil is officially required to possess a sp. gr. of 0·920 to 0·930. Fifteen samples examined in the author's laboratory had a sp. gr. of 0·922 to 0·928, with an average of 0·925. The *U.S.P.* states 0·918 to 0·922 at 25° C. (77° F.); the *P.G.* 0·926 to 0·931. The Oil is officially required to be readily soluble in Ether and in Chloroform and slightly soluble in Alcohol (90 p.c.). A violet coloration is developed when a drop of Sulphuric Acid is added to a few drops of Oil on a porcelain tile. The *U.S.P.* includes a test in which Sulphuric Acid is added to a chloroformic solution of the Oil, the *P.G.* one in which the Acid is added to the Carbon Bisulphide Solution of Oil. The *B.P.* requires that a precipitate of coagulated Albumen should be formed at the junction of the two liquids when Nitric Acid is carefully poured on to the surface of some Oil contained in a test-tube. Neither the *U.S.P.* nor *P.G.* includes a test for Albumen with Nitric Acid. Exposure of the Oil for two hours to a temperature of 0° C. (32° F.) should not result in the separation of solid fat. The *P.G.* states that no solid fat, or only an insignificant amount, should separate on prolonged standing at 0° C. (32° F.). The Saponification value, the Iodine absorption and a determination of the amount of free fatty acid are important factors to be observed in judging of the purity of a specimen of Cod Oil. Cod-Liver Oil has a Saponification value of about 185, and an Iodine absorption of about 160. Fifteen samples examined in the author's laboratory had Saponification values from 181·4 to 190·4, with an average of 186·8, and Iodine absorptions from 147·3 to 165·1, with an average of 155·7. The *U.S.P.* requires a Saponification value of 175 to 185, and an Iodine absorption of not less than 140 nor more than 150; the *P.G.* a Saponification value of not more than 196·5 and an Iodine absorption of not less than 140 nor more than 152. The percentage of free acid varies from 0 p.c. in a very fine colourless Oil to 9 p.c. in dark-coloured samples altered by heat and long keeping; it may be determined by warming a weighed quantity of 5 or 10 grammes of the Oil with 20 c.c. of Alcohol (90 p.c.) and titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, 1 c.c. of the Tenth-normal solution being equivalent to 0·028014 gramme of Oleic Acid. Good specimens require from 0·0 to 1·8 c.c. (average 1·3 c.c.) of Tenth-normal Volumetric Sodium Hydroxide Solution to neutralise the free acid contained in 5 grammes of the Oil, corresponding to from 0·0 to 1·0 p.c. (average 0·73 p.c.), of free Acid calculated as Oleic Acid. Fifteen samples examined in the author's laboratory showed from 0·0 to 1·0 p.c. of free Oleic Acid. The *U.S.P.* and *P.G.* limit of free Acid is that the Oil shall at the most have only a very slightly acid reaction towards blue Litmus paper moistened with Alcohol of the respective pharmacopœial strengths. Upon the acidity of the sample also depends the presence or absence of Albumen; fine oils with little acid show an Albumen ring on being floated upon Nitric Acid, sp. gr. 1·400.

The determination of the refractive index has been suggested (*C.D.* '02, i. 505) as a means of judging the purity of the Oil. The Norwegian Oil is stated to have a higher refractive index than Newfoundland Oil. The refractive figure of Newfoundland Oil is shown to vary between + 42 to + 44·45, whilst that of the Norwegian Oil varies between + 44 to + 48. Cod-Liver Oil produces a great increase in temperature when mixed with Sulphuric Acid (Maumené), which distinguishes it from most other oils except liver oils. For the detection of Seal Oil and other fish oils the Nitric Acid colour test may be employed. Vegetable oils may be detected by the alteration in density and the reduction in the Iodine absorption. Refined Seal Oil, which has been frequently used as an adulterant, may be detected by the determination of the Saponification value, the Iodine absorption and rise of temperature with Sulphuric Acid.

Cod-Liver Oil contains from 1 to 1·5 p.c. of unsaponifiable matter, which may be determined by saponifying 5 grammes of the Oil with sufficient Alcoholic Potassium Hydroxide Solution to ensure complete saponification, evaporating off the Alcohol on a water-bath, dissolving the residue in hot Water, transferring to a separator, cooling, and when cold shaking out with Ether; the Ether is evaporated off, the residue dried at 100° to 105° C. (212° to 221° F.) till constant in weight; when dissolved in a little Carbon Bisulphide and tested with Sulphuric Acid it should give a well-marked purple coloration.

**Litmus.**—The Oil should show only a very slightly acid reaction to blue Litmus paper previously moistened with Alcohol, *P.G.* and *U.S.P.*

**Sulphuric Acid.**—A few drops of the Oil on a porcelain slab give a violet coloration with a drop of strong Sulphuric Acid, *B.P.* and *U.S.P.* A solution of 1 drop of Oil in 20 drops of Chloroform, shaken with 1 drop of Sulphuric Acid, acquires a violet-red tint, rapidly changing to rose-red and finally to brownish-yellow, *U.S.P.* A solution of 1 drop of the Oil in 20 drops of Carbon Bisulphide is coloured violet-red on the addition of 1 drop of Sulphuric Acid, the colour afterwards changing to brown, *P.G.*

**Nitric Acid.**—A mixture of 15 drops of Oil and 3 drops of fuming Nitric Acid gives a bright rose coloration, changing to lemon-yellow, *P.G.* If 2 or 3 drops of Nitric Acid be allowed to flow alongside of 10 to 15 drops of the Oil, contained in a watch-glass, a red colour will be produced at the point of contact; when the mixture is stirred, the colour becomes bright rose-red, changing soon to lemon-yellow. Seal Oil shows at first no change of colour, whilst other fish oils when examined by this test become at first blue and afterwards brown and yellow, *U.S.P.*

**Elaidin Test.**—If a mixture of 1 c.c. of fuming Nitric Acid, 1 c.c. of Water and 2 c.c. of Cod-Liver Oil be carefully shaken together, it should neither wholly nor in part solidify within 1 or 2 days, *P.G.*

**Iodine Absorption.**—Dissolve about 0·3 gramme of the Oil in 10 c.c. of Chloroform in a 250 c.c. flask and add 25 c.c. of a mixture of equal parts of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. Allow the mixture to stand for 4 hours protected from light, then add 20 c.c. of Potassium Iodide T.S. and dilute with 50 c.c. of Water. Then, on titrating with Tenth-normal Volumetric Sodium Thiosulphate Solution, an Iodine value of not less than 140 nor more than 150 should be obtained, *U.S.P.*; about 0·5 gramme of the Oil is weighed into a stoppered bottle, dissolved in 15 c.c. of Chloroform, and 25 c.c. of Alcoholic Iodine Solution and Alcoholic Mercuric Chloride Solution added, and the mixture allowed to stand for 4 hours in a dark chamber protected from direct daylight; 1·5 gramme of Potassium Iodide and 100 c.c. of Water are added to the mixture, and the excess of Iodine is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution; 100 parts by weight of Cod-Liver Oil shall absorb not less than 140 and not more than 152 parts of Iodine, *P.G.*

**Saponification.**—If 1 gramme of the Oil be heated in a reflux condenser with 20 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution for half an hour, and, after cooling and the addition of a few drops of Phenolphthalein T.S., the mixture be titrated with Semi-normal Hydrochloric Acid Volumetric Solution, not less than 13 c.c. of acid should be required for decoloration, *P.G.*

### Not Official.

[*] **CREMOR MORRHUÆ PANCREATICUS.**—Stronger Glycerin of Pepsin, 4; Glycerin of Pancreatin, 4; Cod-Liver Oil, 50; Decoction of Irish Moss, 27·50; Syrup of Tolu, 3; Alcohol, 3; Essential Oil of Almonds, 0·10; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

[*] **EMULSIO MORRHUÆ PANCREATICA.**—Glycerin of Pancreatin, 2·50; Stronger Glycerin of Pepsin, 2·50; Cod-Liver Oil, 40; Gluside, 0·025; Solution of Potassium Hydroxide, 1; Tragacanth, in powder, 2; Gum Acacia, in powder, 8; Oil of Cassia, 0·075; Oil of Bitter Almonds, 0·075; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

*B.P.C. Supplement* has altered the quantities as follows:—Glycerin of Pancreatin, 3·5; Stronger Glycerin of Pepsin, 3·5; Cod Liver Oil, 50; Gluside, 0·033; Solution of Potassium Hydroxide, 1·25; Tragacanth, in powder, 2·5; Gum Acacia, in powder, 10; Oil of Cassia, 0·1; Oil of Bitter Almonds, 0·1; Distilled Water, *q.s.* to produce 100.

[*] **EMULSIO MORRHUÆ PANCREATICA CUM EXTRACTO MALTI.**—Glycerin of Pancreatin, 9; Cod-Liver Oil, 40; Gum Acacia, in powder, 2; Tragacanth, in powder, 0·25; Saccharated Solution of Lime, 2; Extract of Malt, *q.s.* to produce 100.—*B.P.C.*

*B.P.C. Supplement* has altered the quantities as follows:—Glycerin of Pancreatin, 10; Cod Liver Oil, 50; Gum Acacia, in powder, 2·5; Tragacanth, in powder, 0·31; Saccharated Solution of Lime, 2·5; Extract of Malt, *q.s.* to produce 100 by volume.

**EMULSIO OLEI MORRHUÆ.**—Cod-Liver Oil, 8 fl. oz.; the Yolks of two Eggs; Tragacanth, in powder, 16 grains; Elixir of Gluside, 60 minims; Simple Tincture of Benzoin, 60 minims; Spirit of Chloroform, ½ fl. oz.; Essential Oil of Bitter Almonds, 8 minims; Distilled Water, to produce 16 fl. oz. Measure 5 fl. oz. of the Water; place the Tragacanth in a dry mortar and triturate with a little of the Cod-Liver Oil; then add the yolks of Eggs and stir briskly, adding Water as the mixture thickens. When of a suitable consistence, add the remainder of the Oil and Water alternately, with constant stirring, avoiding frothing.

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[*] These formulas closely resemble those previously published in *Armour's Formulary* (9th edition).

Transfer to a pint bottle, add the Elixir of Gluside, Tincture of Benzoin, Spirit of Chloroform and Oil of Almonds, previously mixed; shake well, and add Distilled Water if necessary to make the product measure 16 fl. oz.—*B.P.C. Formulary* 1901, now incorporated in *B.P.C.* as follows:—

**Emulsio Olei Morrhuæ Composita.**—Cod-Liver Oil, 50; Yolk of Egg, by volume, 6·50; Tragacanth, in powder, 0·25; Elixir of Gluside, 0·75; Simple Tincture of Benzoin, 0·75; Spirit of Chloroform, 3; Essential Oil of Bitter Almonds, 0·10; Distilled Water, *q.s.* to make 100.

**Dose.**—2 to 8 fl. drm. = 7·1 to 28·4 c.c.

This preparation can be medicated with any desired salt by dissolving such salt in the Water previous to making the emulsion; **Cod-Liver Oil Emulsion with Glycerophosphates** and **Cod-Liver Oil with Hypophosphites** are typical preparations. Substances soluble in the Oil should be added to it before emulsification.

**Emulsum Olei Morrhuæ.**—Cod-Liver Oil, 500 c.c.; Gum Acacia, in powder, 125 grammes; Syrup, 62·5 c.c.; Oil of Bitter Almonds, 12 minims; Water, *q.s.* to make 1000 c.c.—*Proposed Canadian Addendum, P.J.* '99, ii. 231.

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

**Emulsio Olei Morrhuæ.**—Cod-Liver Oil, 50; Gum Acacia, in fine powder, 12·50; Syrup, 6·25; Oil of Bitter Almonds, 0·10; Distilled Water, *q.s.* to make 100.—*B.P.C.*

Cod-Liver Oil, 50; Powdered Acacia, 12·5; Solution of Gluside, 0·75 *or* Syrup of Tolu, 10; Water, *q.s.* to make 100. Flavouring as desired.—*Canadian Formulary* 1905; *C.F.* 1908 changed the quantity of Solution of Gluside to 0·7, but otherwise the formula is the same as 1905.

**Emulsum Olei Morrhuæ.**—Cod-Liver Oil, 50; Acacia, in fine powder, 12·5; Syrup, 10; Oil of Gaultheria, 0·4; Water, *q.s.* to produce 100.—*U.S.P.*

The Oil of Gaultheria may be replaced if desired by a suitable quantity of Oil of Bitter Almond or other suitable flavouring.—*U.S.P.*

**Émulsion d'Huile de Foie de Morue.**—Put into a bottle 140 of Cod-Liver Oil, 4 drops of Essence of Almonds, 60 of Syrup, and 40 of Orange Flower Water; boil for 20 minutes 5 of Carrageen in sufficient quantity of water to obtain 220 of decoction. Strain with pressure through a cloth, and reduce the liquid by means of water-bath to 160, and pour the hot liquid into the bottle containing the other ingredients, agitate for 5 minutes, and then from time to time until cold; all by weight except the Essence of Almonds.—*Fr. Codex.*

**Foreign Pharmacopœias.**—Belg. (Jecoris Aselli Olei Emulsio), Carrageen 10, Water 500, make 450 parts of decoction. Mix, Tragacanth 1, Cod-Liver Oil 500, Anethol 2, Acetic Ether 1, Oil of Bitter Almonds 0·50. Add this mixture to the decoction and 50 parts of Glycerin. Span., (Emulsion de Aceite de Higado de Bacalao), Oil of Bitter Almonds 0·25, Carrageen 10, Glycerin 120, Cod-Liver Oil 500, Water to 1000.

**EMULSUM OLEI MORRHUÆ CUM HYPOPHOSPHITIBUS.**—Cod-Liver Oil, 50; Acacia, in fine powder, 12·5; Calcium Hypophosphite, 1; Potassium Hypophosphite, 0·5; Sodium Hypophosphite, 0·5; Syrup, 10; Oil of Gaultheria, 0·4; Water, *q.s.* to make 100.—*U.S.P.*

The Oil of Gaultheria may be replaced if desired by a suitable quantity of Oil of Bitter Almond or other suitable flavouring.—*U.S.P.*

**Emulsio Olei Morrhuæ cum Hypophosphitibus, Ovis et Vino.**—Cod-Liver Oil, 8 fl. oz.; Yolks of Eggs, 2; Powdered Tragacanth, 8 grains; Solution of Saccharine (15 p.c.), 1 fl. drm.; Simple Tincture of Benzoin, 1 fl. drm.; Spirit of Chloroform, 4 fl. drm.; Essential Oil of Almonds, 8 minims; Sodium Hypophosphites, 60 grains; Calcium Hypophosphites, 60 grains; Sherry, *q.s.* to produce 16 fl. oz. Dissolve the Hypophosphites in the Wine, place the Tragacanth in a dry mortar, rub with a little Oil, then add the yolks of Eggs (previously beaten), stir briskly, add Wine and Oil alternately until quantity is made up.—*A.Ph.F.*

**Emulsio Olei Morrhuæ cum Hypophosphitibus.**—Cod-Liver Oil, 50; Yolk of Egg, by volume, 6·50; Tragacanth, in powder, 0·25; Elixir of Gluside, 0·75; Simple Tincture of Benzoin, 0·75; Spirit of Chloroform, 3; Oil of Bitter Almonds, 0·10; Sodium Hypophosphite, 0·75; Calcium Hypophosphite, 0·75; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

It is sometimes made with Sherry instead of Distilled Water, and should then be distinguished as Emulsio Olei Morrhuæ cum Hypophosphitibus et Vino.

**Foreign Pharmacopœias.**—Span. (Emulsion de Aceite de Higado de Bacalao con Hipofosfitos), Oil of Bitter Almonds 0·25, Calcium Hypophosphites 5, Sodii Hypophosphites 5, Carrageen 10, Glycerin 120, Cod-Liver Oil 500, Water to 1000. Swiss (Emulsio Olei Jecoris), Cod-Liver Oil 1000, Gum Arabic 10, Tragacanth 10, White Gelatin 2, Calcium Hypophosphites 5, Sodii Hypophosphites 5, Sugar, 0·2; Cinnamon Oil 4 drops, Alcohol 50, Orange Water 40, Water 878. U.S. (Emulsio Olei Morrhuæ and Emulsum Olei Morrhuæ cum Hypophosphites), *see* above. Mex. (Emulsion de Aceite de Bacalao), Tragacanth 4, Glycerin 50, Cod-Liver Oil 250, Oil of Bitter Almonds 0·25, Calcium Hypophosphites 5, Sodium Hypophosphites 5, Water 200.

**HUILE DE FOIE DE MORUE CRÉOSOTÉE.**—Creosote, 1; Cod-Liver Oil, 99.—*Fr. Codex.*

**HUILE DE FOIE DE MORUE PHOSPHORÉE.**—Cod-Liver Oil, 497·5; Phosphorated Oil (1 p.c.), 2·5.—*Fr. Codex.*

**MORRHUOL.**—Cod-Liver Oil treated first with aqueous solution of Sodium Bicarbonate to remove the acids, then agitated with Alcohol (90 p.c.), which on evaporation yields Morrhuol. Brown Oil yields 4½ to 6 p.c., the straw coloured 2½ to 3 p.c.—*Y.B.P.* '86, 234; *P.J.* '97, ii. 458.

Proposed as a substitute for Cod-Liver Oil, but without the Carbo-hydrates, and, owing to its small bulk, is adapted for administration in capsules.

**Dose.**—3 grains = 0·2 gramme.

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# MOSCHUS.

## MUSK.

FR., MUSC; GER., BISAM; ITAL., MUSCHIO; SPAN., ALMIZCLE.

The dried secretion from the preputial Follicles of *Moschus moschiferus*, L. Dark reddish-brown grains or masses of grains, somewhat unctuous to the touch, and possessing a peculiar penetrating persistent odour and a somewhat bitterish taste.

*Dan.*, should be practically free from moisture, and yield not more than 8 p.c. of ash; *U.S.*, 8 p.c. of ash.

Commercial samples contain large quantities of moisture (about 30 p.c.).

The Musk-deer is a native of the mountainous regions of Central Asia. Musk is imported from China and India.

**Medicinal Properties.**—A diffusible stimulant and antispasmodic. Used in hysteria and spasmodic asthma, and as a stimulant in the prostration of diseases such as typhoid.

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

**Prescribing Notes.**—*Usually prescribed in a* **mixture** *or in* **pills.** *See formulas given below.*

**Not Official.**—Mistura Moschi, Moschus Exsiccatus, Pilula Moschi, and Tinctura Moschi.

**Foreign Pharmacopœias.**—Official in all except Austr., Belg., Dan., Ger. and Ital; Fr. (Musc); Port. (Almiscar); Mex. and Span. (Almizcle).

**Descriptive Notes.**—Musk enters commerce in two forms, viz., either in the original sacs or "pods," or in a granular powder known as Grain Musk, consisting of the dried contents of the sacs. The best kind is that known as Tonquin or China Musk; it occurs in oval, plano-convex sacs, covered on the convex side with long hairs, and has a small nearly central orifice around which bristly hairs converge. A pod contains on the average about 40 to 45 grammes of Grain Musk. It is imported *viâ* Canton. Yunnan Musk comes next in value, it comes *viâ* Shanghai; the sacs are more rounded and less oval, with crowded short hairs, and the orifice is usually stopped with a plug of rice straw. The Assam or Nepaul Musk occurs in sacs that have a rounder outline and a larger orifice, or are more spherical ('bally'), with the inner surface partly filled with a grisly substance and contains proportionately less grain than the other kinds. Cabardine, Russian or Siberian Musk, so called from the name Kabarga given to the animal in the Altai Mountains, is of a narrower oval form than the Tonquin Musk, more flattened, and the hairs are drier and the flat or ventral surface often has a white efflorescence. Its odour is weaker and slightly ammoniacal, and it is the least valuable kind. Musk is sometimes falsely packed, when stitches can be seen round the margin, especially if placed in lukewarm Water; or adulterated by the insertion of particles of lead, etc. If the hairs do not converge to the orifice the sac is of artificial character. The sacs are usually tested by probing with a long pin and the odour judged by the Musk attached to the pin when withdrawn, but it is necessary to use a fresh pin for each pod or the odour of a good pod or sac may be communicated to an adulterated one. The grains are officially stated to be 'contained in an oval sac 1½ to 2 in. (37 to 50 mm.) in diameter, nearly smooth on one side and covered on the outer side with hairs concentrically arranged around a nearly central orifice,' this description applying to Tonquin or China Musk pods. Artificial Musk that can be used as a perfume has recently been the subject of several patents.

**Tests.**—Musk is officially required to be free from impurities of an earthy nature, and should not leave more than 8 p.c. of ash when ignited with free access of air. Musk contains a considerable proportion of moisture, amounting to about 30 p.c.; the *U.S.P.* requires that the moisture should not exceed 15 p.c. and that the ash should not amount to more than 8 p.c. The moisture is determined by drying the Musk over Sulphuric Acid.

### Not Official.

**MISTURA MOSCHI.**—Musk, 3; Gum Acacia, 3; Sugar, 3; Rose Water, 160; triturate the **Musk** with the Sugar, then with the Gum Acacia; add the Rose Water gradually.

**Dose.**—1 to 2 fl. oz. = 28·4 to 56·8 c.c.
An emulsion (1 in 100) is **Official in** Swed.

**MOSCHUS EXSICCATUS.**—Musk which has been dried over Strong Sulphuric Acid. It keeps better than that which is usually supplied as 'grain Musk.' It is easily made into pills with Dispensing Syrup or 'Diluted Glucose.'

**PILULA MOSCHI.**—Musk, 12; Powdered Gum Acacia, 3; Powdered Liquorice, 3.

Dried Musk, 12; Powdered Gum Acacia, 1; 'Diluted Glucose,' *q.s.*

**TINCTURA MOSCHI.**—Musk, 5; Alcohol (95 p.c.), 45; Water, 45; Alcohol (45 p.c.), *q.s.* to produce 100. Triturate the Musk with the Water a little at a time until a smooth mixture is obtained, transfer to a bottle, and allow it to stand for 24 hours; add the Alcohol and macerate the mixture for 6 days, occasionally shaking it, then filter through a plain paper filter and, when the liquid has drained off completely, pass enough Alcohol (45 p.c.) through the filter to make 100 of Tincture.—*U.S.P.*

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

Musk, 5; Alcohol (90 p.c.), 50; Distilled Water, 45; Alcohol (45 p.c.), *q.s.* to produce 100.—*B.P.C.*

Fr., Mex. and Port.—Musk, 1; Spirit, 10.
Dutch, Russ. and Swiss.—Musk, 1; Spirit, 25; Water, 25.
Span.—Musk, 1; Spirit, 25.
U.S.—Musk, 5; Water, 45; Alcohol, 45; Diluted Alcohol to measure 100.
All by weight except U.S.

### Not Official.

## MYROBALANUM.

The dried immature Fruits of *Terminalia Chebula*, Retz., commonly known as *Chebulic myrobalans*. A local astringent.

**Dose.**—30 to 60 grains = 2 to 4 grammes.

**UNGUENTUM MYROBALANI.**—Myrobalans, in very fine powder, 1, Benzoated Lard,* 4.—*Ind.* and *Col. Add.*

**UNGUENTUM MYROBALANI CUM OPIO.**—Myrobalan Ointment, 92½; Opium, in powder, 7½.—*Ind.* and *Col. Add.*

## MYRISTICA.

### NUTMEG.

FR., MUSCADE DES MOLUQUES; GER., MUSKATNUSS; ITAL., NOCE MOSCATA; SPAN., NUEZ MOSCADA.

The dried Seed of *Myristica fragrans*, Houtt., divested of its testa.

It is cultivated in the Banda Islands of the Malayan Archipelago and imported from Sumatra and the Molucca Islands, and occasionally from the West Indies and the Seychelles.

**Medicinal Properties.**—Aromatic, stimulant, and carminative. Frequently used to cover the taste of Rhubarb and other medicines. The expressed and volatile Oils have been much used in chronic rheumatic pains and in lotions for the hair. In large and poisonous doses it resembles the action of Cannabis Indica.

Severe toxic symptoms followed on taking a whole nutmeg, grated, in a wineglassful of Gin, to procure abortion.—*L.* '02, i. 1035, 1798.

Paper on nutmeg poisoning by Cushny; he notes the scanty recognition of this in English medical literature, and narrates the death of a boy after eating two nutmegs.—*B.M.J.* '08, i. 387 and *L.* '08, i. 495.

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

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* Adeps Induratus (Lard deprived of a portion of its Oil by pressure) may be employed in India and the Colonies when prevailing high temperatures render it necessary. *See Appendix I. Ind.* and *Col. Add.*

**Prescribing Notes.**—*The* **Oil** *may be given on Sugar, or in* **pill** *with Liquorice powder and Soap, see p.* 897.

**Official Preparation.**—Oleum Myristicæ. Used in the preparation of Pulvis Catechu Compositus, Pulvis Cretæ Aromaticus, Spiritus Armoraciæ Compositus and Tinctura Lavandulæ Composita; of the **Oil,** Spiritus Myristicæ. Used in the preparation of Spiritus Ammoniæ Aromaticus, Tinctura Guaiaci Ammoniata, Tinctura Valerianæ Ammoniata and Pilula Aloes Socotrinæ. Of the **Spirit,** contained in Mistura Ferri Composita.

**Not Official.**—Oleum Myristicæ Expressum (Myristicæ Adeps).

**Foreign Pharmacopœias.**—Official in Austr., Dutch, Ger., Russ., Swed. and Swiss (Semen Myristicæ); Belg. and Hung. (Nux Moschata); Fr. (Muscadedes Moluques); Ital. (Noce Moscata); Port. (Noz Moschada); Mex. and Span. (Nuez Moscada); U.S. (Myristica). Not in Dan., Jap. or Norw.

**Descriptive Notes.**—Nutmegs, freed from the endocarp or shell, are imported into this country from Penang, Singapore, Bombay, and the West Indies. The Dutch formerly treated the Nutmegs with Milk of Lime with the view of preventing germination and so securing a monopoly, but avowedly to protect them from the attack of insects; but exposure to the sun for a week effectually prevents germination. The Chinese prefer to import them in the shell, dried till they rattle inside, in spite of the increase of cost of freight; the aroma of the seed is best preserved in this manner. Nutmegs are sorted according to size, and may vary from 66 to 132 to the lb., those from 66 to 84 being of good size and fetching, if in good condition, the highest price. The smaller and defective or irregularly formed Nutmegs are used for distilling the Oil, and for expressing the fixed Oil known as Nutmeg Butter, and erroneously as Oil of Mace; Nutmeg Butter is also imported from Singapore. Nutmegs are obtusely oval or rounded, and vary very much in size, those of good quality are 1 to $1\frac{1}{4}$ in. long (25 to 31 mm.) and $\frac{7}{8}$ in. (22 mm.) broad (rarely exceed 1 in. (25 mm.) in length, *B.P.*). The surface is furrowed and veined, with a circular scar at the broad end; the transverse section shows ruminated Albumen caused by the infolding layer of the light brown perisperm; it is easily cut, and has a waxy lustre, a characteristic odour, and a slightly bitter, aromatic taste. The microscopical characters of Nutmegs are the dark brown tabular cells of the perisperm and the polyhedric cells of the endosperm, some containing starch grains with a central hilum, often in groups of 4 to 8, others a large rhombic crystalloid, and others filled with brown oleoresinous colouring matter. Malabar Nutmegs (*Myristica Malabarica*, Lam.) which are sometimes offered for sale have practically no aroma. Macassar Nutmegs (*Myristica argentea*, Warb.) imported from New Guinea *viâ* Macassar have a faint Nutmeg flavour, but are much more acrid. Both of these are longer than true Nutmegs, exceeding an inch and a half as a rule.

Mace, the arillus of Nutmegs, is sold separately. When fresh it is of a bright crimson red colour, but fades to bright orange brown. The distinctive microscopical characters of true Mace are the polymorphous grains of amylodextrin in the parenchymatous cells, which are coloured brownish red by solution of Iodine in Iodide of Potassium, and the large elongated thick-walled quadrangular, epidermal cells, often with pointed ends. Powdered Mace is frequently adulterated with Bombay Mace; the latter can be detected by the rounded cells containing a dark yellow colouring matter, often free, and by the red flocculent precipitate given in an alcoholic extract of the Mace by the solution of Lead Acetate; if the Mace is genuine, only a milky-white turbidity is produced. Turmeric, which is not likely to be used, gives a similar precipitate, but filtering paper dipped in the alcoholic solution and dried gives with Boric Acid an orange red or red brown colour, which Bombay Mace does not. Bombay Mace also contains a fat which has different chemical characters from that of the true Mace. *Myristica fatua*, Houtt., and *M. cinnamomea*, King, appear to be the only species resembling in flavour the true Nutmeg.

**Tests.**—Nutmeg when incinerated with free access of air yields from 2 to 3 p.c. of ash, and the figure should not exceed 4 p.c. It yields from 9 to 15 p.c. of volatile Oil, which should answer the tests given under Oleum Myristicæ; it also contains from 30 to 40 p.c. of fixed Oil.

### Preparations.

**OLEUM MYRISTICÆ.** OIL OF NUTMEG.

A colourless, or pale yellow, mobile liquid, possessing a characteristic odour and a spicy taste; distilled from Nutmeg.

It darkens in colour and becomes viscid by oxidation on exposure to air. It should therefore be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from exposure to the air and light.

**Solubility.**—In all proportions of Absolute Alcohol; 1 in 4½ of Alcohol (90 p.c.); sparingly in Alcohol (60 p.c.).

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

**Foreign Pharmacopœias.**—Official in Austr., Dutch, Ger., Hung., Russ. and Swiss (Oleum Macidis); Belg. (Essentia Myristica); Jap. (Oleum Myristicæ Ætherum); Norw. and Swed., (Ætheroleum Macidis); Port. (Essencia de Noz Moschada); U.S. (Oleum Myristicæ).

**Tests.**—The Oil of Nutmeg has a sp. gr. of 0·865 to 0·930. The official figures are 0·870 to 0·910; the *U.S.P.* 0·884 to 0·924 at 25° C. (77° F.); the *P.G.* 0·890 to 0·930. It is officially required to form a clear solution with its own volume of a mixture of equal parts of Absolute Alcohol and Alcohol (90 p.c.); the *U.S.P.* states that it is soluble in an equal volume of Alcohol (94·9 p.c.) and also soluble in 3 volumes of Alcohol (90 p.c.); the *P.G.* states that it dissolves in 3 parts of Alcohol (90 p.c.). The Oil is optically dextrogyrate, the rotation being from +7° 52′ to +28 in a 100 mm. tube. The *B.P.* requires that the Oil when evaporated on a water-bath shall not leave a residue which crystallises on cooling, which indicates the absence of concrete Oil of Nutmeg. The *U.S.P.* states that when 2 or 3 c.c. of Oil are evaporated on a water-bath no residue which crystallises on cooling should be left. The Pharmacopœia test for concrete Oil of Nutmeg has been somewhat adversely criticised;

attention is drawn (*P.J.* '01, i. 328) to the necessity for modification of the pharmacopœial description. The requirement that the Oil should yield, when evaporated on a water-bath, no residue which crystallises on cooling, necessitates the attachment of some qualifying phrase, such as 'by fractionation,' and the Pharmacopœia description as the 'Oil distilled from Nutmeg,' otherwise the tests given in the *B.P.* would seem to require modification.

The presence of fixed or fatty Oil which is carried over mechanically during distillation is supposed to cause an unpleasant preponderance of the Nutmeg over the lemon flavour in Sal Volatile.

The Oil contains Dextro- and Lævo-Pinene, Dipentine, Myristicol, Myristicin, Myristinic Acid, and a Phenol-like substance which yields an emerald green with Ferric Chloride T.S.

### SPIRITUS MYRISTICÆ. Spirit of Nutmeg.

Oil of Nutmeg, 1; Alcohol (90 p.c.), *q.s.* to produce 10.

Should be clarified if necessary, by means of Talc.
*B.P.* 1885 was 1 in 50.

**Dose.**—5 to 20 minims = 0·3 to 1·2 c.c.

**Tests.**—Spirit of Nutmeg has a sp. gr. of about 0·833; it contains about 0·5 p.c. w/v of total solids, and about 86·0 p.c. w/v of Absolute Alcohol.

**Not Official.**

**OLEUM MYRISTICÆ EXPRESSUM.** *Syn.* Myristicæ Adeps.—A concrete Oil, of a firm consistence and orange colour, obtained from Nutmeg by expression and heat.

**Foreign Pharmacopœias.**—Official in Austr. (Ol. Myristicæ Expressum); Dutch and Swiss (Oleum Myristicæ); Fr. (Beurre de Muscade); Ger. (Ol. Nucistæ); Mex. (Manteca 'O Aceite concreto de Nuez Moscada); Port. (Oleo de Noz Moschada). Not in the others.

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# MYRRHA.

## MYRRH.

Fr., Myrrhe; Ger., Myrrhe; Ital., Mirra; Span., Mirra.

Small, irregular, brownish-yellow, or reddish-brown, rounded fragments, or tears, or masses of them, having a dusty appearance on the surface, and possessing a strong characteristic aromatic odour. It is a Gum Resin obtained from the Stem of *Balsamodendron Myrrha*, and probably other species.

Collected in Somaliland and South-eastern Arabia.

Myrrh contains from 57 to 59 p.c. of Gum, a neutral Resin, a soft Resin and two acid Resins, and from 7 to 8 p.c. of an ethereal Oil.

**Solubility.**—Myrrh contains from 40 to 65 p.c. of Gum soluble in Water; the remainder, consisting of Resin, is mostly soluble in Alcohol.

**Medicinal Properties.**—Stomachic and carminative; expectorant. Locally to aphthæ of mouth and spongy gums.

**Prescribing Notes.**—*The Tincture mixed with Water* (1 *to* 24) *is used as a gargle, but the addition of Mucilage of Gum Acacia is often necessary; also mixed with Solution of Borax as a mouth-wash.*

**Official Preparation.**—Tinctura Myrrhæ. Contained in Decoctum Aloes Compositum, Mistura Ferri Composita, Pilula Aloes et Myrrhæ, Pilula Galbani Composita, and Pilula Rhei Composita.

**Not Official.**—Gargarisma Myrrhæ (*Squire*).

**Foreign Pharmacopœias.**—Official in all except Hung.

**Descriptive Notes.**—Myrrh as imported is usually mixed with the Gum Resins of allied species of *Balsamodendron*, which need to be removed. None of these have the strong bitterness of Myrrh, but most of them are acrid. Bissabol, the product of *Balsamodendron Erythræum*, var. *glabrescens*, Engl., has a distinct odour and taste, but much resembles Myrrh in colour and in the presence of white streaks of gum. It does not give the violet colour with the official test for Myrrh (*P.J.* (4) xiii. 666–7). It is known in commerce as 'Opopanax,' and is the source of the 'Oil of Opopanax' used in perfumery. True Opopanax Oil has a strong flavour of Celery or Lovage, and is the product of an umbelliferous Gum Resin imported from Persia. Indian and African Bdelliums are acrid, but have neither the taste nor odour of Myrrh, and have not white streaks of gum; the former has a taste like cedar; they have a dull fracture and are tougher and less easily broken than Myrrh.

Pure Myrrh is characterised by its distinctive odour and flavour and its bitter taste, and by assuming a violet colour when moistened with Nitric Acid, which the false Myrrhs do not present when so treated. It varies much in size and form, but is usually reddish-brown externally, with a powdery surface, and when broken either presents a dull uniform resinous fracture, often somewhat translucent, or in other pieces there occur distinct white streaks, indicating gum. Crude or unpicked Myrrh should not be used in pharmacy, as it contains so much foreign matter that its price is only one-third of that of selected Myrrh. Pieces in which coiled drops of thickened oil have exuded on the surface will be richer in aroma and contain more oil. Pieces containing white streaks are more suitable for emulsion, and those with little gum are preferable for tincture, the gum being insoluble in Alcohol. The gum left after making the tincture makes a good adhesive mucilage when dissolved in water.

**Tests.**—Myrrh is officially required to yield a violet colour when moistened with Nitric Acid. This test has been modified (*P.J.* '01, ii. 666) to 0·5 of a gramme of coarsely powdered Myrrh mixed with 10 c.c. of Ether and shaken occasionally for 10 minutes yields a filtrate, 2 c.c. of which should yield on evaporation a residue which is coloured violet with the vapour of Nitric Acid. No percentage of matter soluble or insoluble in Alcohol (90 p.c.) is given nor is any reference made to the percentage of ash. The *U.S.P.* states that in Alcohol (94·9 p.c.) it yields a brownish-yellow tincture, acquiring a purplish-red tint on the addition of Nitric Acid, but no percentage of matter soluble or insoluble in Alcohol is recorded. The German Pharmacopœia requires that when 1 gramme of powdered Myrrh is shaken with 2 or 3 grammes of Ether, the liquid filtered and the yellow filtrate treated with Bromine vapour, a reddish-violet coloration is produced. This Bromine reaction is usually considered to be unreliable. A test which is stated to distinguish between Heerabol and Bissabol Myrrh is as follows:—Mix 6 drops of a 1 in 15 Petroleum Ether extract of the Myrrh with 3 c.c. of Glacial Acetic Acid, and float the mixture carefully on the surface of 3 c.c. of Sulphuric Acid, a rose-red coloration forms at the point of contact of the two liquids.

100 parts of Myrrh when completely exhausted with boiling Alcohol (90 p.c.) are required by the *P.G.* to leave a residue which upon drying shall not yield more than 70 parts; the percentage of ash shall not amount to more than 6 p.c. Myrrh is stated (*C.D.* '00, i. 101) to be easily obtainable of good quality, it should leave when exhausted by Alcohol (90 p.c.) not more than 60 p.c. of insoluble residue, and the ash should not exceed 5 p.c. and should be almost entirely soluble in dilute Hydrochloric Acid.

Dieterich suggests a limit of not more than 70 p.c. of matter insoluble in Alcohol and that the percentage of ash should not be more than 10 p.c., and also suggests the inclusion of figures for the Acid, Ester and Saponification values of the Gum Resin, and gives for Heerabol Myrrh containing 20 p.c. of matter soluble in Alcohol an Acid value of 25·48, an Ester value of 204·12, and a Saponification value of 229·60.

A sample of Gum Myrrh Elect examined in the author's laboratory gave 49·94 p.c. of matter insoluble in Alcohol (90 p.c.); 3·75 p.c. of ash. It contained 50·06 p.c. of matter soluble in Alcohol (90 p.c.) and possessed an Acid value of 19·6, an Ester value of 118·44 p.c. and a Saponification value of 138·04 p.c. Other samples of the Gum Resin examined for percentage of ash only gave from 3·3 to 4·6 p.c. Samples of powdered Myrrh gave from 4·7 to 6·2 p.c. of ash. Two samples of the powder gave 45·92 and 45·69 for the Acid value, 86·24 and 91·51 for the Ester value, and 132·16 and 137·20 for the Saponification value. They contained respectively 6·2 p.c. and 6·05 p.c. of ash. They were unfortunately not examined for the percentage of matter soluble in Alcohol (90 p.c.). A sample of powder yielded 4·5 p.c. of ash and yielded 56·90 p.c. of matter soluble in Alcohol (90 p.c.).

### Preparation.

## TINCTURA MYRRHÆ. TINCTURE OF MYRRH.

Myrrh, 1; Alcohol (90 p.c.), *q.s.* to yield 5. (1 in 5)

*B.P.* 1885 was 1 in 8.

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

**Foreign Pharmacopœias.**—Official in Austr., Belg., Dan., Dutch, Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 in 5. All by weight except U.S. Not in Fr. or Hung.

**Tests.**—Tincture of Myrrh has a sp. gr. of 0·845 to 0·855; it contains from 4 to 6 p.c. w/v of total solids, averaging about 5 p.c. w/v, but this figure must necessarily depend upon the amount of matter soluble in Alcohol (90 p.c.) contained in the Gum Resin used; it also contains about 85 p.c. w/v of Absolute Alcohol. A few drops of the Tincture evaporated on a water-bath yield a residue giving a violet coloration when moistened with Nitric Acid.

### Not Official.

**GARGARISMA MYRRHÆ** (*Squire*).—Tincture of Myrrh, 1; Honey, 1; Infusion of Roses, 18.

This has appeared in *Squire's Companion* since 1864 and is now incorporated in the *B.P.C.*

**TINCTURE OF MYRRH AND BORAX.**—*See* Borax.

### Not Official.

## NAPHTHALINUM.

NAPHTHALENE.

$C_{10}H_8$, eq. 127·10.

Crude Naphthalene is a hydrocarbon, crystallising from coal-tar. When purified by sublimation it occurs in white micaceous scales, with a characteristic odour, melting at 80° C. (176° F.).

**Solubility.**—Insoluble in Water; soluble 1 in 25 of Alcohol (90 p.c.); 1 in 1½ of Chloroform; 1 in 3 of Ether; 1 in 7½ of Oil of Turpentine; 1 in 8 of Olive Oil; slightly soluble in Glycerin.

**Medicinal Properties.**—Antiseptic; the fine powder is dusted over ulcers and wounds, and is useful for disinfecting cavities. It is given as an intestinal disinfectant. A parasiticide in scabies, as 10 p.c. solution in Olive Oil, or as an Ointment.

Crude Naphthalene in balls and other shapes is used to protect furs and woollen articles from moths.

**Dose.**—Usual dose, 2 to 5 grains = 0·13 to 0·32 gramme, every four or six hours. Larger doses have been given, but are apt to upset digestion, and in some cases to produce toxic symptoms.

**Prescribing Notes.**—*It has a nauseous taste and odour; when given internally it may be enclosed in a cachet or capsule; or made into pills with* 1 *of Compound Tragacanth Powder to* 12, *and massed with 'Diluted Glucose.'*

**Foreign Pharmacopœias.**—Official in Austr., Dutch, Ger., Ital., Jap., Mex., Russ., Swed., Swiss and U.S. Not in the others.

**Tests.**—Naphthalene melts at 80° C. (176° F.) and boils at 218° C. (424·4° F.), it volatilises slowly at the ordinary temperature and completely with further heat. it burns with a luminous smoky flame. It should not possess an acid reaction to blue Litmus paper moistened with Water, indicating the absence of free acids, *e.g.*, Sulphuric Acid. It should dissolve colourless in warm concentrated Sulphuric Acid if quite pure, but a decided pinkish tint is observed if the sample contains 1 p.c. of impurity, the coloration becoming a deeper pink or even brown the larger the proportion of foreign matter present. 0·5 of a gramme when ignited with free access of air should leave no weighable residue, indicating the absence of mineral impurity.

**NAPHTHALINUM PRÆCIPITATUM.**—A fine powder, obtained by dissolving the crystals in hot Alcohol, and pouring into a quantity of cold Water, Recommended as less irritating than the powdered crystals.

**PULVIS NAPHTHALINI** (*Rossbach*).—Purified Naphthalene, 75 grains: Sugar, 75 grains; Oil of Bergamot, ½ minim; divide into 20 powders. In vesical catarrh.—*L.* '85, i., 360.