Not Official.

ZINCUM.

ZINC.

Zn, eq. 64·91.

A bluish-white metal, of peculiar taste and of a perceptible smell when rubbed; laminated, and with a crystalline fracture.

It occurs native, as a Sulphide or as a Carbonate, and is separated from impurities by sublimation.

The laminated or granulated metal is official in the Appendix to the *B.P.* Metallic Zinc is official in the body of the *U.S.P.* It appears in the lists of Reagents in the Appendix to the *P.G.* The *U.S.P.* states that it is in the form of thin sheets, in irregular granulated pieces, or moulded into thin pencils or in fine powder.

Official Preparations.—Used to prepare Liquor Zinci Chloridi, Zinci Chloridum, Zinci Oxidum, Zinci Sulphas.

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

Tests.—Zinc has a sp. gr. of 7·1, the *U.S.P.* states from 6·9 when it is cast to 7·2 after it is rolled. It fuses at 411·6° C. (773° F.). The *U.S.P.* states 412° to 415° C. (773·6° to 779° F.). At about 940° C. (1724° F.) it boils, and may be readily distilled. It dissolves readily in diluted Hydrochloric Acid, simultaneously evolving Hydrogen gas, which burns with a blue flame on ignition. It yields, when dissolved in Hydrochloric Acid, a clear solution, which should answer the following tests:—When neutralised with Ammonia Solution it yields with Ammonium Hydrosulphide Solution a white precipitate insoluble in Acetic Acid, soluble in Hydrochloric Acid. When mixed with sufficient Ammonium Chloride to hold in solution the Hydroxide which would otherwise be precipitated, it yields on the addition of Ammonia Solution a white precipitate; it affords with Hydrogen Sulphide a similar white precipitate, insoluble in Acetic Acid, soluble in Hydrochloric Acid; with Ammonia Solution, Potassium or Sodium Hydroxide Solution it affords a white precipitate soluble in excess of the reagent; with Potassium Ferrocyanide Solution it yields a white precipitate insoluble in diluted Hydrochloric Acid. It should not contain Antimony, Arsenic, Aluminium, Cadmium, Copper, Iron, Lead or Magnesium, Sulphur or Phosphorus. A measured quantity of 10 c.c. of a solution containing 5 p.c. of the metal in diluted Hydrochloric Acid (a slight excess of Hydrochloric Acid being present) should not afford a coloration or turbidity when mixed with an equal volume of freshly prepared saturated Hydrogen Sulphide Solution and allowed to stand for 30 minutes, indicating the absence of Antimony, Arsenic, Cadmium, Copper and Lead. The solution in dilute Hydrochloric Acid when mixed with Ammonium Chloride and Ammonia Solution and boiled should not yield either a flocculent white precipitate or a brown flocculent precipitate, indicating the absence of Aluminium and Iron. A further portion of a similar solution when mixed with Ammonium Chloride and Ammonia Solution should not afford a turbidity on the addition of either Ammonium Oxalate Solution or Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. The specimen should not yield a reaction for Arsenic when examined by the modified Gutzeit's test or by the Bettendorf's test. The Hydrogen gas evolved during the solution of the metal in diluted Hydrochloric Acid should not possess the distinctive disagreeable odour of Hydrogen Sulphide, nor should a strip of Lead Acetate paper be altered in colour when suspended in the issuing gas, indicating the absence of Sulphur. A strip of paper moistened with Silver Nitrate Solution when similarly held in the escaping gas should not be blackened, indicating the absence of Phosphorus, and affording confirmatory evidence of the absence of Antimony, Arsenic and Sulphur. In performing the time-limit test for Arsenic, Cadmium, Copper, Lead and Iron, the *U.S.P.* dissolves 1 gramme of Zinc in a mixture of 10 c.c. of Nitro-hydrochloric Acid and 10 c.c. of Water, evaporates the solution to dryness, moistens the residue with 2 c.c. of Hydrochloric Acid, again evaporates to dryness, and finally dissolves the residue in 10 c.c. of Water.

ZINCI ACETAS.

ZINC ACETATE.

$Zn\,(C_2H_3O_2)_2,\ 3H_2O$, eq. 235·71.

FR., ACÉTATE DE ZINC; GER., ZINKCHLORID; ITAL., ACETATO DI ZINCO; SPAN., ACETATO ZINCICO.

Soft white glistening monoclinic crystals, possessing an acetous odour and a sharp metallic taste.

Zinc Acetate official in the *U.S.P.* contains 2 molecules of Water of crystallisation, that official in the *B.P.* 3 molecules. The *U.S.P.* Acetate is required to contain in the uneffloresced condition not less than 99·5 p.c. of pure crystallised Zinc Acetate.

It should be kept in well-closed vessels, as it has a tendency to effloresce on exposure to air, and also to lose Acetic Acid with the formation of a basic salt.

Solubility.—10 in 25 of Water; 4 in 1 of boiling Water; 1 in 40 of Alcohol (90 p.c.); 1 in 3 of boiling Alcohol (90 p.c.).

Medicinal Properties.—Similar to the Sulphate, chiefly used as a local astringent.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Not Official.—Lotio Zinci Acetatis.

Foreign Pharmacopœias.—Official in Ger., Hung., Mex., Port., Russ. and U.S.

Tests.—Zinc Acetate when heated partially fuses, losing its Water of crystallisation and a certain amount of acid. At still higher temperatures it is decomposed, and when ignited at a dull red heat leaves a residue of Zinc Oxide. It dissolves readily in Water, forming a solution which is slightly acid in reaction towards blue Litmus paper, but which is not always clear, as the commercial salt sometimes contains a small proportion of basic salt. It affords, however, a clear solution on the addition of a little Acetic Acid. The solution answers the tests distinctive of Zinc given under that heading. The aqueous solution affords on the addition of Ferric Chloride Solution a red coloration, changing to a reddish-brown precipitate on boiling. When warmed with Sulphuric Acid it evolves a distinctive acetous odour. When warmed with Sulphuric Acid containing a little Alcohol (90 p.c.) it evolves the peculiar odour of Ethyl Acetate (Acetic Ether). The dry salt, heated with a minute proportion of Arsenious Anhydride, yields the distinctive but highly poisonous odour of Cacodyl Oxide. The impurities mentioned under Zinc should be absent. Solutions should answer the tests given under the headings of Barium Chloride, Silver Nitrate, Sulphuric Acid, and Gutzeit's test appearing in small type below, indicating the absence of Sulphates, Chlorides, impurities derived from the use of Acetic Acid containing empyreumatic impurities and Arsenic.

Hydrogen Sulphide.—In an aqueous solution (1–10) of the salt Hydrogen Sulphide T.S. produces a pure white precipitate. The liquid filtered off from the precipitate should not leave a weighable residue on evaporation, *P.G.* 10 c.c. of an aqueous solution (1–20), to which 1 c.c. of Hydrochloric Acid has been added, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Sulphuric Acid.—On gently warming the salt with Sulphuric Acid it should not undergo any blackening, *P.G.*

Barium Chloride.—An aqueous solution of the salt (1–20) after the addition of a few drops of diluted Nitric Acid should remain clear upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—An acidulated solution as above should remain clear on the addition of T.S. of Silver Nitrate, *U.S.P.*

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

Not Official.

LOTIO ZINCI ACETATIS.—Zinc Acetate, 2 grains; Water, 1 fl. oz. Mix.

An astringent **collyrium** in conjunctivitis, or as an **injection** in gonorrhœa after the acute stage has passed.

Tincture of Opium causes no precipitate with this Lotion.

A lotion very commonly prescribed at one time was that containing Zinc Sulphate and Lead Acetate, which mutually react with formation of soluble Zinc Acetate and insoluble Lead Sulphate; it has been superseded by the above.

Not Official.

ZINCI BROMIDUM.

A whitish, very deliquescent, granular powder.

It should be kept in well-stoppered glass bottles and exposed as seldom as possible to the air, as it is extremely deliquescent.

The *U.S.P.* salt is required to contain when anhydrous at least 97 p.c. of pure Zinc Bromide.

Solubility.—4 in 1 of Water; 2 in 1 of Alcohol (90 p.c.).

Dose.—2 grains = 0·13 gramme 3 times a day for epilepsy.

Official in Mex., Span. and U.S.

Tests.—Zinc Bromide when strongly heated fuses; the *U.S.P.* states at a temperature of 394° C. (741·2° F.). It dissolves readily in Water, yielding a solution which has a slightly acid reaction towards blue Litmus paper, and which affords the tests distinctive of Zinc given under that heading. The solution also yields with Silver Nitrate Solution a yellowish curdy precipitate insoluble in Nitric Acid; when separated and washed, practically insoluble in Ammonia Solution, but readily soluble in Potassium Cyanide Solution. When heated with Sulphuric Acid and Manganese Dioxide, reddish vapours of Bromine are evolved, which produce an orange-yellow stain on filter paper moistened with Starch Mucilage. It is required by the *U.S.P.* to contain not less than 97 p.c. of pure Zinc Bromide as volumetrically determined by dissolving a weighed quantity of 0·3 of a gramme of the anhydrous salt in 10 c.c. of Water, and titrating with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator, not less than 26 c.c. nor more than 26·8 c.c. should be required to produce the end reaction. The impurities mentioned under Zinc should be absent from Zinc Bromide. The *U.S.P.* fixes a limit of Chloride, requiring that 1 gramme dissolved in 50 c.c. of Acetic Acid and 2 grammes of Lead Dioxide (free from Chloride) added; the mixture evaporated in a small beaker to at least 10 c.c.; the residue diluted with 10 c.c. of Distilled Water and filtered, should not give more than a slight turbidity on the addition of 2 c.c. of Nitric Acid and a few drops of Silver Nitrate Solution. The aqueous solution of the salt when mixed with Chlorine Water, diluted with an equal volume of

Water, and shaken with Carbon Bisulphide, the latter solution should not assume a violet colour, indicating the absence of Iodide. The aqueous solution of the salt should not yield a turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphate.

ZINCI CARBONAS.

ZINC CARBONATE. ZINC HYDROXYCARBONATE.

$ZnCO_3(ZnH_2O_2)_2, H_2O$, eq. 339·68.

FR., CARBONATE DE ZINC; GER., ZINKCARBONAT; ITAL., CARBONATODI ZINCO
SPAN., CARBONATO ZINCICO.

A dry, white, odourless and tasteless amorphous impalpable powder, permanent in the air.

It may be produced by precipitating solution of Zinc Sulphate with Sodium Carbonate. The precipitated Carbonate official in the *U.S.P.* is the hydrated Zinc Carbonate, and is required to yield, on ignition, not less than 72 p.c. of Zinc Oxide. The Carbonate is not official in the *P.G.*

The anhydrous normal Carbonate, $ZnCO_3$, occurs native as **Calamine.** The composition of the precipitated hydrated Carbonate varies much according to the conditions under which it is formed.

Medicinal Properties.—A mild astringent, used with other substances as a dusting powder, also in lotions.

Official Preparations.—Used in the preparation of Zinci Acetas, Zinci Oxidum, and Zinci Valerianas.

Foreign Pharmacopœias.—Official in U.S., Zinci Carbonas Præcipitatus.

Tests.—Zinc Carbonate when strongly heated loses Water and Carbon Dioxide, leaving a residue which whilst hot is yellow, and which when cold is white. It dissolves readily and completely with effervescence in Diluted Nitric Acid, and yielding a gas which, when passed into Lime Water, affords a white precipitate soluble in a sufficient excess of the gas, or soluble with effervescence in Diluted Hydrochloric Acid. The solution in Diluted Hydrochloric Acid answers the tests distinctive of Zinc given under that heading. The *B.P.* does not require it to yield any definite percentage of Oxide upon ignition. The *U.S.P.* requires it to yield not less than 72 p.c., 1 gramme of the salt when strongly ignited being required to yield a residue weighing not less than 0·72 gramme. The impurities mentioned under Zinc should also be absent. A solution in Diluted Nitric Acid should not afford a pronounced turbidity with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chloride and Sulphate. The *U.S.P.* fixes a limit of alkali calculating out to 0·3 p.c. of anhydrous Sodium Oxide, the test is described in small type below under the heading of Phenolphthalein. The solution employed by the *U.S.P.* in carrying out the tests of identity and purity is obtained by mixing 1·25 grammes of the salt with 10 c.c. of Diluted Sulphuric Acid and 10 c.c. of Water, removing the undissolved excess by filtration after effervescence has ceased.

Time-limit Test.—Add 10 c.c. of diluted Sulphuric Acid and 10 c.c. of Water to 1·25 grammes of the salt, and after effervescence has ceased, remove the undissolved excess by filtration. A portion of the filtrate acidulated with Hydrochloric Acid should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Phenolphthalein.—If 1 gramme of the salt be placed in a flask with 10 c.c. of boiling Water, and 2 drops of Phenolphthalein T.S. added, not more than 1 c.c. of Tenth-normal Hydrochloric Acid Volumetric Solution should be required to discharge the red colour, *U.S.P.*

ZINCI CHLORIDUM.

ZINC CHLORIDE.

$ZnCl_2$, eq. 135·29.

FR., CHLORURE DE ZINC; GER., ZINKCHLORID; ITAL., CLORURO DI ZINCO; SPAN., CLORURO ZINCICO.

White or almost white, very deliquescent fused irregular masses, or pencil-shaped sticks, or a white granular deliquescent powder. It is strongly caustic, and should be handled with great care.

Its official method of preparation is by the interaction of Zinc and Hydrochloric Acid.

It should be kept in small, well-stoppered glass bottles and exposed as little as possible to the air, as it is extremely deliquescent.

Solubility.—10 in 4 of Water; 1 in 1 of Alcohol (90 p.c.); freely in Ether; 1 in 4 (nearly) of Glycerin.

Medicinal Properties.—Diluted it is astringent, antiseptic and disinfectant. Seldom given internally. Externally, applied as a caustic, in form of **point** or **paste**, to indolent ulcers and malignant growths, to condylomata, and to nævi. As a **lotion**, 20 grains to 1 fl. oz. of Water, it is an efficient substitute for Carbolic Acid, in syringing offensive pus cavities, sinuses, foul ulcers, etc.

As a paste for packing the cavity of uterus in malignant disease.—*B.M.J.* '95, i. 756.

As an injection (1 grain to 1 fl. oz.) in gonorrhœa.

Official Preparation.—Liquor Zinci Chloridi.

Not Official.—Zinc Chloride Points, Compound Zinc Chloride Points, Caustique au Chlorure de Zinc, Guttæ Zinci Chloridi, Guttæ Zinci Chloridi cum Cocaina, Lotio Zinci Chloridi, Pasta Zinci Chloridi, Pasta Zinci Chloridi Comp., Pulvis Zinci Chloridi Comp.

Antidotes.—*See* Zinci Sulphas, p. 1250.

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

Tests.—Zinc Chloride fuses when heated. The *U.S.P.* says at a temperature of 115° C. (239° F.). The *B.P.* states that it is almost entirely soluble in Water, Alcohol (90 p.c.) and Ether. The commercial salt frequently contains a small proportion of Oxychloride, and does not then yield clear solutions with these solvents. The *U.S.P.* states that the 1 in 20 aqueous solution should be clear, or at the most only faintly opalescent, and if mixed with an equal volume of Alcohol (94·9 p.c.), a single drop of Hydrochloric Acid should suffice to render 10 c.c. of the mixture perfectly clear. The *P.G.* states that the 1 in 20 aqueous solution should be clear, or at the most but faintly turbid, and that the flocculent precipitate resulting on the addition of 3 volumes of Alcohol (90 p.c.) to this solution should again disappear on the addition of 1 drop of Hydrochloric Acid. The aqueous solution answers the tests distinctive of Zinc given under that heading. On the addition of Silver Nitrate T.S. it affords a white curdy precipitate, which, when separated and washed, is insoluble in Nitric Acid, readily soluble in Ammonia Solution or Potassium Cyanide Solution. When the salt is heated with Manganese Dioxide and Sulphuric Acid it evolves a greenish-yellow gas, possessing a distinctive pungent odour, and which produces a blue coloration with paper soaked in Starch Mucilage and Potassium Iodide Solution. Neither the *B.P.* nor the *P.G.* states that it should contain any definite percentage of Zinc Chloride. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Zinc Chloride as gravimetrically determined by dissolving 0·5 of a gramme of the salt in 200 c.c. of boiling Water, adding 5 drops of Phenolphthalein T.S. and sufficient Sodium Carbonate T.S. with constant stirring to yield a permanent alkaline reaction; the resulting precipitate is transferred to a filter and washed with boiling Water until all soluble matter is dissolved; dissolved in a sufficient quantity of Nitric Acid, evaporated to dryness and ignited until constant in weight, the residue should weigh not less than 0·297 gramme. The impurities mentioned under Zinc should be absent from the Zinc Chloride. It should respond to the test given in small type below under the heading of Barium Chloride, indicating the absence of Sulphates, and should also answer the tests described below under the heading of Ammonia Solution and Hydrogen Sulphide, indicating the absence of Calcium, Magnesium and alkali impurities.

Hydrogen Sulphide.—An aqueous solution (1–10) should not become coloured by T.S. of Hydrogen Sulphide after the addition of Hydrochloric Acid, *P.G.* An aqueous solution (1–20) with 1 c.c. of diluted Hydrochloric Acid added should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—An aqueous solution (1–20) after the addition of 1 c.c. of diluted Hydrochloric Acid should not be rendered turbid by the addition of T.S. of Barium Chloride, *U.S.P.*

A (1-10) aqueous solution of the salt should not be rendered turbid on the addition of T.S. of Barium Nitrate, *P.G.*

Ammonia Solution and Hydrogen Sulphide.—1 gramme of the salt should give a clear solution with 10 c.c. of Water and 10 c.c. of Ammonia T.S., and this solution should give a pure white precipitate with excess of Hydrogen Sulphide T.S. The liquid filtered off from this precipitate after evaporation and heating to redness should not leave a weighable residue, *P.G.*

LIQUOR ZINCI CHLORIDI. Solution of Zinc Chloride.

16 of granulated Zinc dissolved by heating with 44 of Hydrochloric Acid mixed with 20 of Distilled Water, and evaporated to 40. It should be free from Iron and Lead.

When made as above the solution will be basic and precipitate Oxychloride on dilution with Water. It should be evaporated rather lower, then neutralised with Hydrochloric Acid (so that it will cease to precipitate on being diluted with 10 volumes of Water, or when this diluted solution just reddens Methyl Orange Solution), and finally made up to 40.

When finished without loss the above quantities will yield a solution sp. gr. about 1·53. For details and an improved formula of **Chlor-Zinc Iodine (Schulze's Solution)** *see P.J.* (3) xxiii. 648.

Official in U.S., sp. gr. 1·548 at 25° C. (77° F.).

Fr. Codex states that the commercial solutions vary from 1·26 to 1·81; that having a sp. gr. of 1·45 is to be preferred.

Tests.—Solution of Zinc Chloride has a sp. gr. of about 1·53. The *B.P.* states 1·530. The *U.S.P.* solution contains about 50 p.c. by weight of Zinc Chloride, and is required to possess a sp. gr. of about 1·548 at 25° C. (77° F.). It should answer the tests distinctive of Zinc given under that heading and of Chlorides given under Zinc Chloride. It should not contain the impurities mentioned under Zinc, and when diluted should yield no turbidity on the addition of Barium Chloride T.S., indicating the absence of Sulphate.

Not Official.

ZINC CHLORIDE POINTS.—Zinc Chloride fused and run into conical moulds; preserved in glass tubes.

Darts of Zinc Chloride have been used in the treatment of anthrax.—*B.M.J.* '87, ii. 644.

COMPOUND ZINC CHLORIDE POINTS.—Zinc Chloride, 1; Zinc Oxide, 1; Wheaten Flour, 2; Water to make a stiff paste, which is formed into points.

CAUSTIQUE AU CHLORURE DE ZINC.—Zinc Chloride, 32; Zinc Oxide, 8; Dried Wheaten Flour, 24; Distilled Water, 4.—*Fr.*

GUTTÆ ZINCI CHLORIDI.—Zinc Chloride, 2 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

GUTTÆ ZINCI CHLORIDI CUM COCAINA.—Zinc Chloride, 2 grains; Cocaine Hydrochloride, 10 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

LOTIO ZINCI CHLORIDI.—Zinc Chloride, 1 grain; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

This has been incorporated in the *B.P.C.* as follows:—Zinc Chloride, 1; Distilled Water, 400.

PASTA ZINCI CHLORIDI.—Zinc Chloride, 1, 2 or 4; Starch, 6; Lard, 1; Glycerin of Starch, *q.s.*; rub the Zinc Chloride with the Lard and Starch, and make into a thick paste with Glycerin of Starch.—*University.*

PASTA ZINCI CHLORIDI COMPOSITA.—Zinc Chloride paste, 94; Extract of Opium, 4; rub the Extract smooth with 2 of Water, and then mix thoroughly with the paste.—*University.*

PULVIS ZINCI CHLORIDI COMP.—Zinc Oxide, mixed with an equal weight of Zinc Chloride, will preserve the latter dry enough to blow through a tube into any cavity required, and may be so kept in a bottle for a long time.

Not Official.

ZINC IODIDUM.

A white or whitish powder, which rapidly becomes moist and changes to a brown colour on exposure to the air. On account of its hygroscopic nature and its liability to thus change, it should be kept in well-stoppered bottles of a dark amber tint and protected as far as possible from the light. It is readily soluble in Water, Alcohol (90 p.c.), or Ether.

It has been used as an alterative remedy in chorea, scrofula and hysteria, but has not come into general use. It has also been employed as an external application.

Tests.—Zinc Iodide dissolves readily in Water, forming a solution which is acid in reaction towards blue Litmus paper, this solution should answer the tests distinctive of Zinc given under that heading. An aqueous solution yields with Silver Nitrate Solution a curdy, yellow precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution; with Mercuric Chloride Solution it yields a brilliant scarlet precipitate soluble in Potassium Iodide Solution. The salt is official in the *U.S.P.*, which requires it to contain, when anhydrous, not less than 98 p.c. of pure Zinc Iodide as volumetrically determined by dissolving a weighed quantity of 0·5 of a gramme of the dry Iodide in 20 c.c. of Water, adding 35 c.c. of Tenth-normal Volumetric Silver Nitrate Solution, 5 c.c. of Nitric Acid and 3 c.c. of Ferric Ammonium Sulphate T.S., shaking the mixture well and titrating the excess of Tenth-normal Volumetric Silver Nitrate Solution with Tenth-normal Volumetric Potassium Sulphocyanate Solution; not less than 3·4 nor more than 4 c.c. should be required.

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

Foreign Pharmacopœias.—Official in Mex. and U.S.; not in the others.

Not Official.

ZINCI NITRAS.

Large, colourless, deliquescent, prismatic crystals, very soluble in Water and in Alcohol (90 p.c.).

Medicinal Properties.—Used as a caustic in the place of Zinc Chloride; it penetrates deeper and produces less pain.

It can be made into a **paste** in the same way as Zinc Chloride.

Tests.—Zinc Nitrate answers the tests distinctive of Zinc given under that heading, and should also be free from the impurities usually occurring in the metal and referred to in the text. When Ferrous Sulphate Solution is carefully poured upon the surface of a cooled mixture of concentrated Sulphuric Acid and a solution of the salt, at the point of contact of the two liquids a dark brown zone appears.

When ignited it leaves a residue of Zinc Oxide.

ZINCI OXIDUM.

ZINC OXIDE.

ZnO, eq. 80·79.

FR., OXYDE DE ZINC; GER., ZINKOXYD; ITAL., OSSIDO DI ZINCO;
SPAN., OXIDO ZINCICO.

An odourless and tasteless, white amorphous impalpable powder, which gradually absorbs Carbonic Anhydride from the air. The method of preparation has some effect upon the colour of the product. A sample prepared from the precipitated Carbonate by ignition has a tendency to a faint yellow colour, whilst a sample prepared by the combustion of metallic Zinc is pure white.

It should be kept in well-closed vessels as it gradually absorbs Carbonic Anhydride from the air. The official process of preparation is by the ignition of Zinc Carbonate at a dull red heat, or by combustion with metallic heat.

Medicinal Properties.—Internally, but with doubtful success, as a sedative in chronic nervous spasmodic affections, and to check the perspirations of phthisis. Externally, as a mild astringent application in eczema and slight excoriations and ulcerations, in the form of **ointment** or **paste**: absorbent as a **dusting powder** when mixed with Starch.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Prescribing Notes.—*Generally prescribed in the form of* **pills.** *A good pill may be made by adding* ' *Diluted Glucose,*' *q.s. It is also given in lotions, with and without an equal quantity of Prepared Calamine, q.v. p.* 280.

Official Preparation.—Unguentum Zinci. Used in the preparation of Zinci Sulphocarbolas.

Not Official.—Dusting Powder, Emplastrum Zinci Oxidi, Gelatinum Zinci Durum, Gelatinum Zinci, Glycéré d'Oxyde de Zinc, Lassar's Paste, Pasta Unna, Pasta Zinci et Ichthamolis, Pessus Zinci, Pilula Zinci et Belladonnæ, Pulvis Zinci Oxidi Compositus, Pulvis Zinci Oxidi et Acidi Salicylici, Pulvis Zinci Oxidi et Acidi Borici, Pulvis Zinci Oxidi et Amyli, Pulvis Zinci Oleatis Compositus, Unguentum Zinci Stearatis, Unguentum Zinci cum Acido Salicylico, Pulvis Zinci et Calomelanos, Zinci Oleas (Shoemaker's), Zinc Oxide Plaster Mulls, Zinc and Salicylic Plaster Mull, and Zinc Gelatin.

Foreign Pharmacopœias.—Official in all; Dan., Ger. and Swiss have also Crude.

Tests.—Zinc Oxide when heated assumes a yellow colour which disappears on cooling. It dissolves readily and completely and with effervescence in diluted acids. When dissolved in Diluted Hydrochloric Acid the solution should answer the tests distinctive of Zinc given under that heading. The *B.P.* states that it should be entirely soluble when rubbed, and if necessary warmed, with Ammonia Solution mixed with strong Ammonia Solution. The 17th Edition of the *Companion* contains the following note:—'It is questionable whether any commercial Zinc Oxide is entirely soluble in Ammonia.' The *B.P.C.* states that the Oxide is never completely soluble in Ammonia Solution. Samples obtained in 1908 from the leading manufacturers were found, with one exception, to be readily and completely soluble in Ammonia. The *U.S.P.* states that it should be completely soluble in Ammonia Water. The *P.G.* makes no reference to its solubility in Ammonia. Neither the *B.P.* nor the *P.G.* states a requisite percentage of Zinc Oxide, nor is a method of determination indicated. The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Zinc Oxide as determined by digesting a weighed quantity of 1 gramme of the freshly ignited Zinc Oxide with 30 c.c. of Normal Volumetric Hydrochloric Acid Solution until solution is complete, adding 2 drops of Methyl Orange Solution and titrating the excess of Normal Volumetric Acid Solution with Normal Volumetric Potassium Hydroxide Solution, the latter being added slowly with constant stirring, allowing the precipitated Oxide to redissolve before adding fresh portions. Not more than 5·5 c.c. of acid should be in excess. The number of c.c. of Normal Volumetric Potassium

Hydroxide Solution used is subtracted from 30, the difference represents the number of c.c. of Normal Volumetric Hydrochloric Acid Solution utilised in neutralising the Oxide. 1 c.c. of Normal Volumetric Hydrochloric Acid Solution corresponds to 4·04 p.c. of Zinc Oxide. The impurities mentioned under the heading of Zinc should be absent from the Oxide. It should answer the tests given in small type below under the headings of Ammonium Oxalate, Sodium Phosphate, Barium Nitrate and Silver Nitrate, indicating the absence of Calcium, Magnesium, Sulphates and Chlorides. The *U.S.P.* includes a test for limit of alkali which is described in small type below under the heading of Phenolphthalein; the figure given corresponds to 0·3 p.c. of anhydrous Sodium Oxide. The solubility in Ammonia referred to in the large type above is officially adopted as a test for the absence of metallic Zinc. The *U.S.P.* adopts the time-limit test for the detection of Arsenic; the *P.G.* employs the Bettendorf's test. Standards have been suggested (*C.D.* '08, i. 797) of 0·2 p.c. for Lead and 10 parts per million for Arsenic.

Ammonium Oxalate.—The clear, colourless liquid obtained by dissolving 1 part of Zinc Oxide in 10 parts by weight of Diluted Acetic Acid (*P.G.*), when supersaturated with Ammonia Solution should not be rendered turbid by T.S. of Ammonium Oxalate, *P.G.*

Sodium Phosphate.—Neither should this liquid be rendered turbid by T.S. of Sodium Phosphate, *P.G.*

Hydrogen Sulphide.—The same liquid with Hydrogen Sulphide poured on as a layer gives a pure white zone, *P.G.* Digest 1 gramme of Zinc Oxide with occasional agitation in a mixture of 10 c.c. of diluted Hydrochloric Acid and 10 c.c. of Water until saturated; then remove the undissolved Zinc Oxide by filtration. A portion of the filtrate acidulated with Hydrochloric Acid, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the Ammonia Water should be omitted, *U.S.P.*

Phenolphthalein.—If 1 gramme of Zinc Oxide be placed in a flask with 10 c.c. of boiling Water, and 2 drops of Phenolphthalein T.S. be added, not more than 1 c.c. of Tenth-normal Hydrochloric Acid Volumetric Solution should be required to discharge the red colour, *U.S.P.*

Barium Nitrate.—Let 2 grammes of Zinc Oxide be agitated with 20 c.c. of Water and the mixture filtered. The filtrate should not be rendered more than opalescent by T.S. of Barium Nitrate, *P.G.* A solution of 1 gramme in a sufficient quantity of diluted Nitric Acid should not become more than slightly turbid upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—The filtrate obtained as in the last test should not be rendered more than opalescent by T.S. of Silver Nitrate, *P.G.* A solution obtained as in the last test should remain clear upon the addition of T.S. of Silver Nitrate, *U.S.P.*

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

Preparation.

UNGUENTUM ZINCI. Zinc Ointment.

Add 3 of finely sifted Zinc Oxide gradually to 17 of Benzoated Lard, previously melted at a low temperature; stir until cold.

(1 in $6\frac{2}{3}$)

Official in Austr., 15 in 100; Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed. and Swiss, 1 in 10; U.S., 1 in 5.

Not Official.

EMPLASTRUM ZINCI OXIDI (Aseptic).—Zinc Oxide, 20; Resin, 15; Japan Wax, 4; Benzoated Beef Tallow, 25; Anhydrous Wool Fat, 15; Washed Rubber, 8; Glycerin, 12; Methyl Salicylate, 0·6; Thymol, 0·4; all by weight.—*Y.P.B.* '07, 429; *C.D.* '07, ii. 178; *P.J.* '07, ii. 125.

GELATINUM ZINCI DURUM (*Unna*).—Dissolve Gelatin 15 and Glycerin 25 in Water 45. Rub down Zinc Oxide 10 with Glycerin 15, mix, and add sufficient Water to produce 100. All by weight.

Gelatinum Zinci.—Dissolve Gelatin 6 in Distilled Water 18; rub down Zinc Oxide 4 with Glycerin 11; add the Gelatin solution, and mix thoroughly. —*B.P.C. Formulary* 1901.

GLYCÉRÉ D'OXYDE DE ZINC.—Zinc Oxide, 1; Glycerin of Starch, 2. —*Fr.*

LASSAR'S PASTE.—Zinc Oxide, 24; Starch, 24; Salicylic Acid, 2; Soft Paraffin, 50. Used in eczema.

An unusual case of poisoning by absorption from use of Lassar's paste.—*L.* '04, i. 432.

This has been incorporated in the *B.P.C.* under the title Pasta Zinci Composita.

PASTA UNNA.—Gelatin, 15; Zinc Oxide, 10; Glycerin, 30; Water, 40. Melt, stir carefully, then add Ichthyol (Ammon.) 2 p.c.—*King's.*

Pasta Zinci et Ichthamolis.—Zinc Oxide, 10; Ammonium Ichthyosulphonate, 2; Gelatin, 16; Glycerin, 32; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

PESSUS ZINCI.—Zinc Oxide, 15 grains; Mass (Glyco-gelatin), 20 grains.—*Women's.*

Pessus Zinci Oxidi.—Zinc Oxide, 15 grains; Oil of Theobroma, to 120 grains.—*B.P.C.*

PILULA ZINCI ET BELLADONNÆ.—Zinc Oxide, 2 grains; Extract of Belladonna (*B.P.* '85), ¼ grain; Extract of Gentian, *q.s.*—*Charing Cross.*

Pilula Zinci Oxidi et Belladonnæ.—Zinc Oxide, 2 grains; Alcoholic Extract of Belladonna, ¼ grain.—*St. Thomas's.*

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

PULVIS ZINCI OXIDI COMPOSITUS. *Syn.* Dusting Powder.—Zinc Oxide, 3; Salicylic Acid, in fine powder, 1; Starch, 12.—*Squire.*

Pulvis Zinci Oxidi et Acidi Salicylici.—Zinc Oxide, 4; Salicylic Acid, in fine powder, 1; Starch, 15.—*B.P.C.*

PULVIS ZINCI OXIDI ET ACIDI BORICI.—Zinc Oxide, Boric Acid, in powder, equal parts.—*St. Thomas's.*

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

PULVIS ZINCI OXIDI ET AMYLI.—Zinc Oxide, 1; Starch Powder, 1.—*St. Thomas's.*

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

PULVIS ZINCI ET CALOMELANOS.—Zinc Oxide, Mercurous Chloride, Tannic Acid, and Starch, of each 1.—*Westminster.*

PULVIS ZINCI OLEATIS COMPOSITUS (*Squire*).—Zinc Oleate, in fine powder, 20; Boric Acid, in fine powder, 70; finely powdered French Chalk, 10.

UNGUENTUM ZINCI CUM ACIDO SALICYLICO.—Salicylic Acid, 20 grains; Zinc Ointment, ½ oz.; Soft Paraffin, ½ oz.—*Middlesex.*

UNGUENTUM ZINCI STEARATIS.—Zinc Stearate, 50; White Petrolatum, 50. To the White Petrolatum, melted on a water-bath, add the Zinc Stearate, continue the heat until smooth, then stir while cooling, until it congeals.—*U.S.P.*

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

ZINC OLEAS (Shoemaker's).—Dissolve 180 grains of Zinc Acetate in 40 fl. oz. of cold Water; add slowly 20 fl. oz. of a **Solution of Sodium Oleate,** made by dissolving powdered Castile Soap, 1 oz. in 20 fl. oz. of Water; wash the precipitate with cold Water, collect and dry.

It forms a solid cake, easily powdered, and melting at about 79·4° C. (175° F.).

Solution of Sodium Oleate of the above strength is also used to precipitate Bismuth, Copper, and Lead Oleates.

ZINC OXIDE PLASTER MULLS (*Unna*). — Containing ½ grain and 1 grain to the sq. in.

ZINC AND SALICYLIC PLASTER MULL (*Unna*).—Containing Zinc Oxide ½ grain and Salicylic Acid ¼ grain to the sq. in.

ZINC GELATIN (*Unna*).—Zinc Oxide, 10; Gelatin, 10; Glycerin, 20; Water, 20.

This has been incorporated in the *B.P.C.*, under the title **Pasta Zinci et Gelatini,** giving the quantities respectively, 15, 15, 35, 35.

Not Official.

ZINCI PERMANGANAS.

Reddish-purple, crystalline, hygroscopic masses.

Solubility.—About 1 in 3 of Water, generally with a slight residue.

As an **injection** in chronic urethritis, 1 grain in 8 fl. oz. of Water.—*B.M.J.* '89, i. 1458.

Not Official.

ZINCI PHOSPHIDUM.

Minutely crystalline, friable fragments, or a greyish-black powder, containing about 24 p.c. of Phosphorus, corresponding to the formula Zn_3P_2.

Solubility.—Insoluble in Water or Alcohol (90 p.c.). Soluble in acids with evolution of Phosphuretted Hydrogen, which is not spontaneously inflammable.

Medicinal Properties.—Strongly recommended as a substitute for Phosphorus.

In hay fever.—*Pr.* lv. 205; *P.J.* '95, ii. 205.

Dose.—$\frac{1}{20}$ to $\frac{1}{4}$ grain = 0·0032 to 0·0162 gramme, given in pill with Milk Sugar and Glucose.

Foreign Pharmacopœias.—Official in Fr. (Phosphure de Zinc), Mex. and Span.

ZINCI SULPHAS.

ZINC SULPHATE.

$ZnSO_4.7H_2O$, eq. 285·41.

FR., SULFATE DE ZINC OFFICINAL; GER., ZINKSULFAT; ITAL., SOLFATO DI ZINCO; SPAN., SULFATO ZINCICO.

Colourless, transparent, somewhat efflorescent, rhombic crystals, white acicular crystals or a granular crystalline powder. It should be kept in well-closed bottles.

Solubility.—10 in 7 of Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Astringent; given with doubtful result in chorea, also in infantile diarrhœa; in large doses a prompt emetic. As an astringent **injection** in leucorrhœa and in the less acute stages of gonorrhœa; as a **collyrium** in conjunctivitis.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme as a tonic; as an emetic, 10 to 30 grains = 0·65 to 2 grammes.

Ph. Ger. maximum single dose, 1·0 gramme.

Prescribing Notes.—*Tincture or Wine of Opium causes no precipitate with Solutions of Zinc.*

Incompatibles of Zinc salts are—Alkalis and their Carbonates, Lime Water, astringent vegetable Infusions or Decoctions and Milk.

Antidotes.—In case of poisoning with the salts of Zinc, Sodium Carbonate or Potassium Carbonate in large quantities dissolved in warm Water, Milk and Eggs freely, Tannic Acid or strong Tea, Laudanum, Linseed Meal Poultices to abdomen. If there is much pain in the abdomen, an enema of Gruel, or Starch and Water may be given.—*Murrell.*

Official Preparations.—Used in the preparation of Unguentum Zinci Oleatis, Zinci Carbonas, and Zinci Valerianas.

Not Official.—Buginarium Zinci Sulphatis, Injectio Sulphatum, Injectio Zinci Sulphatis, Lotio Rubra, Lotio Zinci Sulphatis, Collyre au Sulfate de Zinc, and Cadmii Sulphas.

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

Tests.—Zinc Sulphate melts when heated rapidly. At a temperature of 50° C. (122° F.) it loses 5 molecules of its Water of crystallisation, equivalent to 31·3 p.c.; at 100° C. (212° F.) the sixth molecule, equivalent to an additional loss of 6·3 p.c. or a total loss of 37·6 p.c. takes place; at a temperature of about 240° C. (464° F.) it parts with the remaining molecule of Water of crystallisation, equivalent to an additional loss of 6·3 p.c., or a total loss of 43·9 p.c. It dissolves readily in Water, forming a clear solution which is acid in reaction towards blue Litmus paper, and which yields the tests distinctive of Zinc given under that heading. The aqueous solution affords on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. Neither the *B.P.* nor the *P.G.* states a requisite percentage of pure crystallised Zinc Sulphate, nor is a method of determination indicated. The *U.S.P.* requires that in an unefflorescent condition it should contain not less than 99·5 p.c. of pure crystallised Zinc Sulphate, but gives no method of determination. The impurities mentioned under Zinc should be absent from the Sulphate. It should respond to the tests given in small type below under the headings of Litmus, Sodium Hydroxide, Silver Nitrate, Sulphuric Acid and Ferrous Sulphate, indicating the absence of free acid, Ammonium salts, Chlorides and Nitrates. A standard has been suggested (*C.D.* '08, i. 797) of 0·05 p.c. for Chloride, calculated as Zinc Chloride ($ZnCl_2$).

Litmus.—If 2 grammes of Zinc Sulphate be shaken with 10 c.c. of Alcohol (90 p.c.) and, after 10 minutes, filtered, the filtrate, diluted with 10 c.c. of Water, should not affect blue Litmus paper, *P.G.* If 1 gramme in small fragments be agitated with 10 c.c. of Alcohol (94·9 p.c.) for some time and filtered, the filtrate should not redden moistened Litmus paper, *U.S.P.*

Sodium Hydroxide.—Zinc Sulphate should not evolve Ammonia on the addition of T.S. of Sodium Hydroxide, *P.G.*

Hydrogen Sulphide.—The aqueous solution of Zinc Sulphate (1–20), after being acidulated with Hydrochloric Acid, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Silver Nitrate.—The aqueous solution (1–20) should not be rendered turbid by T.S. of Silver Nitrate, *P.G.*; not more than slightly turbid, *U.S.P.*

Sulphuric Acid and Ferrous Sulphate.—2 c.c. of an aqueous solution (1–10) of the salt, with 2 c.c. of Sulphuric Acid added and 1 c.c. of Ferrous Sulphate T.S. poured on as a layer, should not give a coloured zone, even on standing for some time, *P.G.*

Preparation.

UNGUENTUM ZINCI OLEATIS. Zinc Oleate Ointment.

Precipitate a solution containing 2 of Zinc Sulphate in 4 of Distilled Water with a solution of Hard Soap 4 in Distilled Water 40; wash the precipitated Oleate with hot Distilled Water until free from Sulphate; dry and mix with an equal weight of the Soft Paraffin, melted; stir until cold.

The Zinc Oleate is now made by precipitation instead of dissolving Zinc Oxide in Oleic Acid.

Not Official.

BUGINARIUM ZINCI SULPHATIS.—Zinc Sulphate, $\frac{1}{10}$ grain; Oil of Theobroma, 40 grains.—*Westminster.*

INJECTIO SULPHATUM.—Zinc Sulphate, Copper Sulphate, Ferrous Sulphate and Alum, of each 1 grain, Water to 1 fl. oz.—*Lock Hospital.*

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

INJECTIO ZINCI SULPHATIS.—Zinc Sulphate, 3 grains; Water 1 fl. oz.

For gonorrhœa and leucorrhœa.

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

Zinc Sulphate, 0·75; Distilled Water, *q.s.* to produce 100.

LOTIO RUBRA.—Zinc Sulphate, 2 grains; Compound Tincture of Lavender, 10 minims; Water, to 1 fl. oz. A stimulant to indolent ulcers.

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

Zinc Sulphate, 0·50; Compound Tincture of Lavender, 2; Distilled Water, *q.s.* to produce 100.

LOTIO ZINCI SULPHATIS.—Zinc Sulphate, 1 grain; Distilled Water, 1 fl. oz. Used in ophthalmia.—*London Ophthalmic.*

COLLYRE AU SULFATE DE ZINC.—Zinc Sulphate, 0·15; Rose Water, 100.—*Fr.*

Antiseptin is stated to be a mixture of Zinc Sulphate and Iodide, Thymol and Boric Acid.

Zinci Sulphis (Zinc Sulphite) is a white crystalline powder, sparingly soluble in Water. It has been used as a relatively non-toxic antiseptic for impregnating gauze and dressings.

CADMII SULPHAS.—Colourless crystals, readily soluble in Water, insoluble in Alcohol. Has been used as an astringent in the place of Zinc Sulphate.

Official in Fr., Mex. and Port.

ZINCI SULPHOCARBOLAS.

ZINC SULPHOCARBOLATE.

ZINC PHENOL-PARA-SULPHONATE.

$Zn(OH \cdot C_6H_4 \cdot SO_3)_2$, $8H_2O$, eq. 551·55.

Colourless or almost colourless efflorescent rhombic crystals, sometimes possessing a faint Phenol odour and slightly pinkish tint.

The *B.P.* gives the formula for Zinci Sulphocarbolas with 1 molecule of Water of crystallisation. It is officially stated that it may be obtained by heating a mixture of Phenol and Sulphuric Acid, and saturating the product with Zinc Oxide. It has been pointed out in subsequent editions of the *Companion* that, prepared in this way, it will contain a quantity of Sulphate. The salt contains 8 molecules of Water of crystallisation. The *U.S.P.* describes the salt under the heading Zinci Phenolsulphonas or Zinc Phenolsulphonate.

It should be kept in well-closed glass bottles of a dark amber tint and exposed as little as possible to the air, as the salt effloresces and has a tendency to become pink on exposure to air.

It is extraordinary that the official monograph should describe the salt as 'efflorescent' when the official formula shows only 1 molecule of Water of crystallisation; as a matter of fact, the commercial salt contains 8 molecules of Water of crystallisation, and corresponds to the above formula.

Solubility.—1 in 2 of Water; 3 in 1 of boiling Water; 1 in 2½ of Alcohol (90 p.c.).

Greenish and Smith (*P.J.* '02, i. 552) give the solubility of the salt as 1 in 2·7 of Water and state that on consideration it might be thought that Zinc Phenol-para-sulphonate would be fairly stable, owing to the fact that it is a Para salt. The experiments made to determine whether the salt yielded a constant weight when dried at a given temperature not being satisfactory, the solubility was therefore determined gravimetrically by precipitating with Sodium Carbonate as usual and the result calculated for a salt of the official formula, ignoring, moreover, the fact that an amount of Zinc Oxide corresponding to even the 'assumed' official formula had not been obtained. The process would have worked admirably had the official formula been correct, but Squire and Caines (*C.D.* '02, ii. 945) have shown that the reason for their inability to obtain a constant weight was the incorrectness of their assumption regarding the pharmacopœial formula; the salt containing 8 molecules of Water of crystallisation and not 1. Greenish and Smith's figure (1 in 2·7) for Zinc Sulphocarbolate, as it should properly be understood, is incorrect, notwithstanding their subsequent statement (*P.J.* '03, ii. 947) that the solubility given is correct for a salt of this composition $Zn(OHC_6H_4SO_3)_2$, H_2O. If calculated figures are to be admitted as 'authoritative,' the percentage of Magnesium in, say, Magnesium Sulphate might with equal reason be determined by the usual method, and the solubility calculated for a salt containing 1 molecule of Water of crystallisation instead of 7, provided the official volume was sufficiently condescending to adopt an incorrect formula for the salt. By a curious oversight a misprint occurs in their second note on the solubility of Zinc Sulphocarbolate and Ammonium Phosphate. In giving their final conclusion that if the composition of the official salt is altered from 1 molecule of Water of crystallisation to 8, then the solubility of the salt must be proportionately increased, they have given the formula for the Mono-hydrated Zinc Sulphocarbolate as $Zn(OHC_6H_4SO_3)_2$, HO_2, instead of $Zn(OHC_6H_4SO_3)_2$, H_2O. The criticisms referring to the solubility figure for Ammonium Phosphate appear under the heading of Ammonii Phosphas.

Medicinal Properties.—Astringent and antiseptic.

For a **spray** to the throat, 5 grains to the oz. of Water; for a **nasal douche**, 2 grains to the oz. of Water; for **vaginal injection**, 60 grains in a pint of Water, for leucorrhœa or gonorrhœa.

Foreign Pharmacopœias.—Official in Austr. and Jap. (Zincum Sulphocarbolicum); Dutch (Sulphophenylas Zincicus); Russ. and Swiss (Zincum Sulfophenolicum); U.S. (Zinci Phenolsulphonas).

Tests.—Zinc Sulphocarbolate when heated to 100° C. (212° F.) loses 6 molecules of Water of crystallisation, equivalent to a loss of 19·45 p.c. At 125° C. (257° F.) it loses the remaining molecules of Water of crystallisation, equivalent to an additional loss of 6·48 p.c., or total loss of 25·93 p.c. When more strongly heated it chars, evolves an odour of Phenol and leaves a residue amounting to about 14·6 p.c. of the original weight. It dissolves readily in Water, forming a solution which is acid in reaction towards blue Litmus paper, and which then diluted yields with Ferric Chloride T.S. a violet colour and which answers the tests distinctive of Zinc given under that heading. The *B.P.* neither states a requisite percentage nor a method of determination. The *U.S.P.* requires that the uneffloresced crystals should contain not less than 99·5 p.c. of pure Zinc Paraphenol-sulphonate, but gives no method of determination. It may be determined gravimetrically by precipitating a weighed quantity of the salt, dissolved in a definite volume of Water, by the addition of Ammonium Carbonate Solution, filtering off the precipitated Zinc Carbonate, washing, drying, igniting and weighing as Zinc Oxide. 80·8 parts of Zinc Oxide correspond to 408·5 parts of anhydrous Zinc Sulphocarbolate or 426·39 parts of Zinc Sulphocarbolate of the *B.P.* formula with 1 molecule of Water of crystallisation, or to 551·55 parts of crystallised Zinc Sulphocarbolate of the correct formula with 8 molecules of Water of crystallisation. The impurities mentioned under Zinc should be absent from this salt. It should conform to the tests given below under the headings of Barium Chloride, Silver Nitrate, and modified Gutzeit's test, indicating the absence of Sulphates, Chlorides, and Arsenic.

Time-limit Test.—The aqueous solution of the salt (1–20) to which 1 c.c. of diluted Hydrochloric Acid has been added, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—The aqueous solution of the salt (1–20) should not become turbid upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—A similar solution should not become turbid upon the addition of T.S. of Silver Nitrate, *U.S.P.*

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

ZINCI VALERIANAS.

ZINC VALERIANATE.

ZINC-ISO-VALERIANATE.

$Zn(C_5H_9O_2)_2 2H_2O$, eq. 301·29.

Fr., Valérianate de Zinc; Ger., Zinkvalerianat; Ital., Valerianato di Zinco; Span., Valerianato Zincico.

White lustrous pearly scales, having a strong odour of Valerianic Acid and a sweetish astringent metallic taste.

It should be kept in well-stoppered bottles, as when exposed to the air it slowly loses Valerianic Acid. The *B.P.* gives the formula for the anhydrous salt; the salt really contains 2 molecules of Water of crystallisation; the *U.S.P.* gives the formula with 2 molecules of Water of crystallisation. The official method of preparation is by saturating Iso-valerianic Acid with Zinc Carbonate, or by the interaction of Zinc Sulphate and Sodium Iso-valerianate.

Solubility.—1 in 120 of Water; 1 in 60 of Alcohol (90 p.c.); 1 in 500 of Ether.

Medicinal Properties.—Antispasmodic and nervine tonic, used in various neuralgic and hysterical affections, and sometimes in chorea.

In hay fever.—*B.M.J.* '96, i. 967.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Incompatibles.—All acids, soluble Carbonates, most metallic salts and vegetable astringents.

Not Official.—Pilula Valerianæ Composita, and Pilula Zinci Valerianatis.

Foreign Pharmacopœias.—Official in Dutch, Fr., Hung., Ital., Jap., Mex., Port., Russ., Span., Swed. and U.S.

Tests.—Zinc Valerianate when heated melts, and at a higher temperature is decomposed, evolving inflammable vapours, and leaving a residue of Zinc Oxide which when dissolved in Diluted Hydrochloric Acid should answer the tests distinctive of Zinc given under that heading. It dissolves sparingly in Water, forming a solution which possesses an acid reaction towards blue Litmus paper. The *U.S.P.* states that it should dissolve without residue in Ammonium Carbonate T.S. 0·5 of a gramme of the salt when dissolved in a mixture of 0·5 c.c. of Hydrochloric Acid and 9 c.c. of Water yields a liquid from which the Iso-valeric Acid separates and floats as an oily layer. The *B.P.* does not state a requisite percentage of pure Zinc Valerianate, but gives a method of determination, stating that it should yield not less than 26 nor more than 30 p.c. of Zinc Oxide. The theoretical percentage of Zinc Oxide is 26·8, in the salt containing 2 molecules of Water of crystallisation; in the salt of the present official formula it is 30·4 p.c. A number of commercial samples yielded from 21 to 64 p.c. of Oxide and suggested a minimum standard of 26 p.c. All the samples examined showed Butyric Acid by the Copper test. The commercial 'præcip.' generally contains a quantity of Oxide, but pure samples can occasionally be obtained.

The *U.S.P.* states that the salt should contain not less than 99 p.c. of pure Zinc Valerate ($2H_2O$), but gives no method of determination. The salt should not contain the impurities mentioned under Zinc. When testing for Butyric Acid the *B.P.* tests the distillate with Copper Acetate Solution; the *U.S.P.* tests the concentrated aqueous solution of the salt with a concentrated Copper Acetate Solution by the test described in small type below under the heading of Copper Acetate. The salt should answer the tests given in small type below under the headings of Silver Nitrate, Barium Chloride, Ferric Chloride and modified Gutzeit's test.

Time-limit Test.—If 0·5 gramme of the salt be dissolved in a mixture of 0·5 c.c. of Hydrochloric Acid and 9 c.c. of Water, tbe Valeric (Iso-Valeric) Acid will be liberated and float as an oily layer on the surface of the liquid. After filtering through a wetted filter, the clear solution should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—If 0·5 gramme be dissolved in a mixture of 0·5 c.c. of Nitric Acid and 4·5 c.c. of Distilled Water and the mixture filtered through a small wetted filter, the filtrate should show but a faint cloudiness upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—A similar filtrate should show but a faint cloudiness upon the addition of T.S. of Silver Nitrate, *U.S.P.*

Ferric Chloride.—If 0·5 gramme be triturated with 3 c.c. of Water, and 0·2 c.c. of Ferric Chloride T.S. added, the filtrate should not show a red colour, *U.S.P.*

Copper Acetate.—This T.S. should not immediately affect the transparency of the distillate obtained on heating the salt with Diluted Sulphuric Acid. Oily drops are formed after the lapse of a little time, and these gradually pass into a bluish-white crystalline deposit, *B.P.* A mixture of a concentrated solution of Copper Acetate in Water and a concentrated aqueous solution of the salt should remain perfectly clear, *U.S.P.*

Gutzeit's Test.—If 0·5 gramme of the salt be heated with a mixture of 9·5 c.c. of Distilled Water and 0·5 c.c. of Hydrochloric Acid and filtered, the filtrate should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Not Official.

PILULA VALERIANÆ COMPOSITA.—Zinc Valerianate, Iron Valerianate and Quinine Valerianate, of each 1 grain.—*Samaritan.*

This has been incorporated in the *B.P.C.* under the title **Pilulæ Ferri Valerianatis Compositæ,** *syn.* Pilulæ Trium Valerianatum.

PILULA ZINCI VALERIANATIS.—Zinc Valerianate, 1 grain; Compound Pill of Asafetida, 2 grains.—*Throat* and *St. Thomas's.*

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

ZINGIBER.

GINGER.

FR., GINGEMBRE; GER., INGWER; ITAL., ZENZERO; SPAN., RIZOMA DE JENGIBRE.

The scraped and dried Rhizome of *Zingiber officinale*, Roscoe.

From plants cultivated in the West Indies, India, and other countries.

Medicinal Properties.—Aromatic stimulant and carminative. It is given in atonic dyspepsia, flatulence, and as a corrective adjunct to purgative medicines.

Official Preparations.—Syrupus Zingiberis, and Tinctura Zingiberis; used in the preparation of Infusum Sennæ, Pilula Scillæ Composita, Pulvis Cinnamomi Compositus, Pulvis Jalapæ Compositus, Pulvis Opii Compositus, Pulvis Rhei Compositus, Pulvis Scammonii Compositus. Contained in Mistura Sennæ Composita, Pilula Aloes et Ferri, and Pilula Cambogiæ Composita. The **Tincture** is used in the preparation of Acidum Sulphuricum Aromaticum, Liquor Sennæ Concentratus, Pilula Scammonii Composita, and contained in Infusum Cinchonæ Acidum.

Not Official.—Tinctura Zingiberis Fortior, and Oleoresina Zingiberis.

Foreign Pharmacopœias.—Official in all; Fr., Gingembre; Ital., Zenzero; Port., Gengibre; Mex. and Span., Jengibre.

Descriptive Notes.—The rhizome of Ginger comes into commerce in several forms, which are either coated, partially scraped, or entirely scraped, and in some varieties washed with Milk of Lime. The last are termed bleached.

The rhizome differs in being either starchy and brittle with a fibrous fracture, or hard and resinous and rather tough, also in the degree of pungency and flavour.

The bleached Jamaica Ginger is considered to be the best for flavour, and the Cochin next; that of Fiji, which is rare in commerce, has a characteristic lemon flavour. The West African Ginger, although inferior in appearance and in smaller pieces, is often superior in pungency. The pieces, which are known technically as races or hands, are in the finer Jamaica and Cochin varieties branched laterally, about 3 in. (75 mm.) long, the branches being compressed, more or less oval, and contracted below, and at the rounded end exhibiting a depression corresponding to the base of the leafy stem. The scraped surface is of a pale buff colour and fibrous appearance, the taste hot and pungent and the flavour characteristic.

In some specimens of Ginger the appearance is horny throughout, owing to the root having been scalded before drying, but usually it is mealy towards the apices, even when resinous below. Its odour is due to $\frac{1}{4}$ p.c. of a volatile Oil, but its pungency to an oily body named Gingerol.

An inferior variety known as Ratoon Ginger is sometimes imported from the West Indies; it consists of the younger shoots, which are generally kept for propagating the plant. Japanese Ginger is occasionally imported, it has a greyish fracture, occurs in smaller pieces and is apparently derived from a different species.

Powdered Ginger is characterised by the cells containing resin, by the pyriform compressed starch grains 12 to 40 μ long, appearing linear when seen laterally, having the hilum at the smaller end, by the thin-walled polygonal parenchymatous cells, and the sometimes septate bast fibres with irregularly nodose extremities.

Tests.—Ginger yields when genuine and unbleached from 3 to 4 p.c. of ash, and 5 p.c. should not be exceeded. It yields not less than 1·5 p.c. of soluble ash. The extractive matter soluble in cold Water is usually about 10 p.c., and should not be less than 8·5 p.c.; the extractive matter soluble in Alcohol (90 p.c.) usually amounts to about 5 p.c., and should not be materially below this figure.

Preparations.

SYRUPUS ZINGIBERIS. SYRUP OF GINGER.

1 of Ginger (in the form of strong Tincture 1 in 2); Syrup *q.s.* to yield 40. (1 of Ginger in 40)

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

Official in Jap., 1 of Tincture in 10; Swed., 1 (rhizome) in 20, by weight; U.S., 3 (Fluid Extract) in 100.

TINCTURA ZINGIBERIS. TINCTURE OF GINGER.

1 of Ginger in No. 40 powder, percolated with Alcohol (90 p.c.) to yield 10. (1 in 10)

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

Official in Belg., Ger., Hung., Ital., Jap., Mex., Port., Swiss and U.S., 1 in 5; all by weight except U.S.

Tests.—Tincture of Ginger has a sp. gr. of 0·835 to 0·840; it contains about 0·5 p.c. w/v of total solids and about 88 p.c. w/v of Absolute Alcohol.

Not Official.

TINCTURA ZINGIBERIS FORTIOR. *Syn.* Essence of Ginger (*B.P.* '85).—Ginger percolated with Alcohol (90 p.c.) to form 1 in 2.

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

Squire's **Essence of Ginger** has always been twice the above strength.

By repercolation a Fluid Extract 1 in 1, or even 2 in 1, can be readily prepared.

U.S. has Fluidextractum Zingiberis 1 in 1 with Alcohol (95 p.c.).

OLEORESINA ZINGIBERIS (*U.S.*). *Syn.* Gingerine.

Ginger, in No. 60 powder, exhausted by percolation with Acetone and evaporation.

Should be kept in a well-stoppered bottle.

CINCHONÆ RUBRÆ CORTEX.

QUINQUINA ROUGE (*Fr.*)

DETERMINATION OF TOTAL ALKALOIDS AND QUININE.

Process of the *French Codex* (1908).

THE amount of total alkaloids and crystallised basic Quinine Sulphate containing 8 molecules of Water of crystallisation, which the bark official in the new *Fr. Codex* is required to yield, are briefly referred to on p. 382 under the comparison of the respective requirements of the more important Pharmacopœias. This section of the work was too far advanced to enable the lengthy process to be introduced under the heading of Cinchona, and it is included here in view of the interest attaching to the subject.

Tests.—The time available for a trial of the undermentioned process has necessarily been short, but so far as it is possible to judge, except for the difficulty involved in manipulating such large quantities of solvents of so volatile and inflammable a nature, the process works well. If the solvents are not subsequently recovered by distillation, the process is not economical. The essential details of the process are as follows: A sample of the bark, amounting to about 50 grammes, is powdered and the powder passed through a No. 45 sieve. The amount of moisture is determined on a weighed quantity of 0·5 of a gramme, drying the powder at 100° C. (212° F.). The bark under examination lost at this temperature moisture equivalent to 8·6 p.c., so that 100 parts of the original powdered bark may be considered as equivalent to 91·4 parts of the dried and powdered bark. A weighed quantity of 30 grammes of the dried and powdered bark is introduced into a wide mouth well-stoppered bottle of about 1 litre capacity, and a previously prepared mixture of 35 c.c. of Ammonia Solution (10 p.c. w/w) and a sufficient quantity of Alcohol (95 p.c.) to produce a volume of 180 c.c. is poured upon it; the mixture is allowed to stand for 1 hour, shaking from time to time and 720 c.c. of Ether then added. The stopper of the bottle is securely tied in by the aid of string passed round the neck of the bottle, the contents are briskly shaken and allowed to remain at rest for 6 hours with intervals of frequent shaking, the liquid is filtered through a plaited filter paper contained in a covered funnel, and a measured quantity of 750 c.c. of the solution (= 25 grammes of the dried and powdered bark) is removed. The whole of the Ether is distilled, evaporation being conducted several times in a flask of 500 c.c. capacity and away from all naked flames, the flask being simply plunged into warm Water. After the Ether is completely distilled the evaporation is continued until a portion of the Alcohol is also removed, the liquid is transferred to a flask of 125 c.c. capacity and the distillation continued until nothing further passes over. The last traces of Alcohol are removed by immersing the flask up to the neck in almost boiling Water in a water-bath, the residue which is generally sticky and coloured owing to the alkaloids being impure is dissolved in 40 c.c. of Diluted Sulphuric Acid, after previously adding a small quantity of Water, solution being effected by gently warming the mixture on a water-bath and then allowing the solution to cool, when the acid solution is filtered through an unplaited filter and collected in a glass separator of 250 c.c. capacity. A measured quantity of 125 c.c. of Chloroform is introduced, followed by a sufficient quantity of dilute Ammonia Solution to liberate the alkaloids and to produce a distinct ammoniacal odour; the addition of the Ammonia produces a considerable reddish-brown deposit, colouring matter, etc., which holds a large amount of the Chloroform in suspension necessitating filtration through a plug of cotton-wool, under pressure, and the washing of this precipitate to free it from retained alkaloids. The chloroformic solution of the alkaloids is separated, transferred to a flask and the treatment of the ammoniacal solution in the separator twice repeated, using in each instance 125 c.c. of Chloroform. The mixed chloroformic solutions are separated in each instance, washed with 10 c.c. of Water, allowed to separate and the aqueous washings rejected. The chloroformic solution is distilled in such a manner that 200 c.c. of liquid remain, the chloroformic liquid is transferred, after cooling, to a flask graduated at 250 c.c. The flask in which the distillation has been conducted is washed with a few small quantities of Chloroform, and the washings transferred to the graduated flask and diluted with sufficient Chloroform to bring the volume to 250 c.c., they are then thoroughly mixed. A measured quantity of 50 c.c. (= 5 grammes of the dried and powdered Cinchona bark) is removed and evaporated to dryness in a conical flask of 90 c.c. capacity, the residue is dried at 100° C. (212° F.) and weighed, the weight of the residue multiplied by 20 yields the amount of alkaloids contained in 100 grammes of powdered Cinchona bark, and this weight should not be less than 5 grammes. In the experiment under consideration the amount of total alkaloid amounted to 8·8 p.c. and was fairly highly coloured. When titrated with Normal Volumetric Hydrochloric Acid Solution, using Hæmatoxylin Solution as an indicator of neutrality and calculating the result with a factor for anhydrous Quinine it indicated 5·78 p.c. of alkaloids.

Determination of Quinine.—The Chloroform is removed by distillation from the remaining 200 c.c. of the above Chloroform solution of the total alkaloids, the syrupy residue is treated with 50 c.c. of Ether which is dropped on a little at a time, the Cinchonine and the greater part of the Cinchonidine will be precipitated in a crystalline condition. When the precipitate has settled down, the ethereal solution is decanted into a flask, the crystals washed by decantation with 75 c.c. of Ether, used in 3 portions; the ethereal solutions of Quinine in the flask are mixed, almost the whole of the Ether distilled and the liquor so concentrated is transferred to an evaporating dish and allowed to evaporate spontaneously, the Ether washings are also transferred to the dish previous to evaporation. The almost colourless sticky residue is dissolved in 20 c.c. of Sulphuric Acid Solution (2 p.c. w/w) by warming on a water-bath until solution is completed; dilute Ammonia Solution is added little by little to the warm limpid solution until the precipitate at first formed ceases to redissolve. The liquid will now be slightly turbid and alkaline, and 5 p.c. w/w Sulphuric Acid Solution is added carefully drop by drop until the liquid, now rendered limpid, yields a very faintly acid reaction towards blue Litmus paper, the volume should be about 15 c.c. which should be cooled and allowed to crystallise during 12 hours in a cool place, the crystals collected on a porcelain dish of 20 mm. diameter pierced with a hole which should be covered with a circle of flannel with a diameter a little bit larger than the hole; the complete apparatus being placed in a very small filter, which has been previously moistened with Distilled Water. The crystalline Sulphate is transferred to the funnel washed with 6 c.c. of Distilled Water, used in 3 separate portions and which have previously served to wash out the evaporating basin in which the crystallisation was effected. The funnel is inverted over a piece of white filter paper, the basic Quinine Sulphate in the shape of a compact cake is detached and dried in the air; when the drying has proceeded sufficiently far the circle of flannel is separated, which will be found to be cleanly effected without retention of the product, the cake of Sulphate is placed in a watch-glass, at the same time transferring any particles which may have adhered to the flannel, and complete desiccation is effected at a temperature of 100° C. (212° F.) until of constant weight. The Sulphate should be weighed between 2 watch-glasses held together by means of a metal clip, the whole having been previously weighed. The weight of Sulphate obtained should not be less than 0·251 gramme, which corresponds to 1·257 grammes of basic Quinine Sulphate (dried at 100° C. (212° F.)), or to 1·092 grammes of anhydrous Quinine in 100 grammes of the dried and powdered bark. This is equivalent to a yield of not less than 1·5 p.c. of basic Quinine Sulphate $(C_{20}H_{24}N_2O_2)_2$ H_2SO_4 $8H_2O$, to 1·257 p.c. of basic Quinine Sulphate dried at 100° C. (212° F.), or to 1·092 p.c. of anhydrous Quinine from the dried and powdered bark. The crystallised basic Sulphate of Quinine obtained in the experiment in question was of good crystalline appearance, and was practically free from colour. The percentages calculated on the dried and powdered bark corresponded to 4·08 p.c. of basic Quinine Sulphate $(C_{20}H_{24}N_2O_2)_2$ H_2SO_4 $8H_2O$, eq. to 3·425 p.c. of basic Quinine Sulphate dried at 100° C. (212° F.), or to 2·97 p.c. of anhydrous Quinine.