Foreign Pharmacopœias.—Official in Belg., Fluid Extract 1, Syrup 9; Fr., Extract 25, Water 50, Simple Syrup 975, concentrate to 1000 by weight; Ital., Extract 2, Water 5, Syrup 98, concentrate to 100 by weight; Mex., Extract 25, Syrup 975; Swiss, 1 of Extract in 100.

Not Official.

LACHNANTHES TINCTORIA.

A North American plant, known colloquially as Red Root or Spirit Weed, a native of the United States. A homœopathic remedy for checking the cough of phthisis, and for treating pneumonia and typhus. Did not exert any inhibitory action on the progress of tuberculosis, but rather seemed to hasten it.—*B.M.J.* '01, ii. 747, 912, 1124, 1868, 1874; '02, i. 59, 101, 113; '02, ii. 146; *L.* '01, ii. 1605; '02, ii. 72; *Pr.* lxvii. 493; *P.J.* '02, i. 103.

Dose.—2 to 10 minims of a 1 to 10 **Tincture** made with Alcohol (45 p.c.). A **solid** and a **fluid extract** are also known commercially.

Not Official.

LACTUCA.

Lettuce is the Flowering Herb of the wild indigenous plant, *Lactuca virosa*, L.

Medicinal Properties.—A sedative in irritable cough, either in the form of Extractum Lactucæ or as Lactucarium.

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

LACTUCARIUM.—The juice from the incised flower-stalk of *Lactuca virosa* and other species, collected and dried.

Dose.—2 to 6 grains = 0·13 to 0·40 gramme.

Foreign Pharmacopœias.—Official in Dutch, Hung., Mex., Port., Span. and U.S. Not in the others.

SYRUPUS LACTUCARII.—Tincture of Lactucarium, 10; Glycerin, 20; Citric Acid, 0·1; Orange-Flower Water (*U.S.P.*), 5; Syrup, *q.s.* to produce 100. Mix the Tincture with the Glycerin, add the Orange-Flower Water in which the Citric Acid has been previously dissolved, filter if necessary, add the Syrup and make up to 100.—*U.S.P.*

Average Dose.—2 fl. drm. = 7·1 c.c.

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

TINCTURA LACTUCARII.—Lactucarium, 50; Glycerin, 25; Alcohol (95 p.c.); Purified Petroleum Benzin, Diluted Alcohol (49 p.c.), Water, of each a sufficient quantity to make 100. Powder the Lactucarium with coarse sand and add 200 of Purified Petroleum Benzin, after macerating for 48 hours with frequent agitation pour the mixture on a double filter and allow to drain, wash the residue by gradually adding 150 of Purified Petroleum Benzin, and let the Lactucarium dry by exposure to air. Powder the dried Lactucarium using more sand if necessary, and pack it moderately in a percolator; mix the Glycerin with 20 of Water and 50 of Alcohol (95 p.c.), and moisten the powder with 50 of the mixture and macerate for 24 hours, then let the percolation proceed slowly, gradually adding first the remainder of the menstruum, and then Diluted Alcohol (49 p.c.) until the Lactucarium is exhausted; reserve the first 75 of percolate, evaporate the remainder to 25, mix with the reserved portion, filter, and make up to 100 with Diluted Alcohol (49 p.c.).—*U.S.P.*

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

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

TINCTURA LACTUCARII ET OPII.—Official in Mex. Alcoholic Extract of Lactucarium 2, Extract of Opium 1, Alcohol (50 p.c.), *q.s.* to 80.

SYRUPUS LACTUARII ET OPII.—Official in Mex. 1 of the above Tincture in 50.

TROCHISCI LACTUCÆ.—Lozenges containing 1 grain Extract Lettuce in each.

LANOLIN. *See* ADEPS LANÆ.

Not Official.

LARICIS CORTEX.

LARCH BARK.

The Bark of *Larix Europæa*, DC.; collected in the spring, deprived of its outer portion and dried. It contains a volatile crystallisable acid, **Larixinic Acid**, which sublimes in vapour of water.

Medicinal Properties.—Similar to those of Oil of Turpentine. Useful in chronic bronchitis to diminish excessive secretion; the Tincture well diluted forms an astringent injection.

TINCTURA LARICIS.—Larch Bark, 1; Alcohol (90 p.c.), *q.s.* to make 8. (1 in 8)

Dose.—20 to 30 minims = 1·2 to 1·8 c.c.
This has been incorporated in the *B.P.C.*

TEREBINTHINA VENETA or **T. LARICIS** (Venice Turpentine).—A viscid liquid of a yellowish or greenish-yellow colour, obtained from *Larix Europæa*, D.C. It does not readily harden on exposure to air, or when mixed with $\frac{1}{16}$ of Magnesia. Soluble in absolute Alcohol. It is much used on the Continent, and in veterinary practice in this country.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. (Térébinthine du Mélèse), Hung., Ital. (Trementina di Venezia), Norw., Port., Russ., Span. (Trementina de Alerce), Swed. and Swiss. Not in the others.

VASOLIMENTUM TEREBINTHINÆ.—Venice Turpentine, 20; Liquid Vasoliment, 80.—*Hager.*

PAROGENUM TEREBINTHINÆ.—Venice Turpentine, factitious, 20; Parogen, *q.s.* to produce 100.—*B.P.C.*

LAUROCERASI FOLIA.

CHERRY-LAUREL LEAVES.

FR., LAURIER CERISE; GER., KIRSCHLORBEER; ITAL., LAUROCERASO;
SPAN., LAUREL-CEREZO.

Descriptive Notes.—The fresh Leaves of *Prunus Laurocerasus*, L., are official. There are about six varieties of the plant in cultivation in this country. The strongest and hardiest is the variety *Caucasica*, which has darker green, thicker and less rounded leaves than the variety *Colchica*, in which they are more obovate, more delicate and paler: the variety *Schipkaensis* has smaller leaves, about the size of those of the bay tree, and forms a small shrub only 3 to 5 feet high. M. Perinelle is of opinion that the variety *Caucasica* should be official, *P.J.* (3) xviii. 170. The Leaves in all the varieties are coriaceous, shining above, but paler beneath where the midrib is prominent, and at the base on each side of the midrib there are one or two glandular depressions. The Leaves are lanceolate oblong, or more or less obovate oblong, 5 to 7 in. long ($12\frac{1}{2}$ to 17 cm., *P.B.*) and $1\frac{1}{2}$ to 2 in. wide, attenuated towards either end, or rounded in some varieties, with a slightly revolute margin, with short sharp serratures, and glandular teeth, which are more distant towards the base. The taste is astringent and bitterish. The Leaves are inodorous until bruised, but then immediately emit an odour of bitter almonds and Hydrocyanic Acid; the Leaves can be dried whole and powdered, and still yield Hydrocyanic Acid when the powder is moistened. The glucoside yielding Laurocerasin occurs in the parenchyma of the leaf, and the emulsin in the endodermis of the veins. The Leaves contain the largest amount of Hydrocyanic Acid in July, and the least in February, as much as $2\frac{1}{2}$ p.c. having been found in June in young leaves. Cherry-Laurel Water is liable to vary in percentage of Hydrocyanic Acid, according to the time of year that the Leaves are collected, whether the Leaves are young or fully matured, and also according to the variety employed; the finely-chopped Leaves also yield more Hydrocyanic Acid than if merely bruised.

Official Preparation.—Aqua Laurocerasi.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. (Laurier Cerise), Ital. (Lauroceraso), Port. (Loureiro-Cerejeira), and Span. Not in the others.

Dutch has an Oleum Laurocerasi.

Preparation.

AQUA LAUROCERASI. CHERRY-LAUREL WATER.

Fresh Cherry-Laurel Leaves, 16; Water, 50; distil 20, and standardise the distillate to contain $\frac{1}{10}$ p.c. of Hydrocyanic Acid, HCN.

Note.—To ascertain if it lost much of its strength by keeping, a sample was taken which contained 0·104 p.c., and placed in a pint bottle about three-quarters full for a month, it then gave 0·094 p.c.; the bottle was then kept for a week with only 3 oz. in it, and then gave 0·093 p.c.; the same was then kept three days with the cork out, and then gave 0·038 p.c.

It would appear, therefore, that when kept in a closed vessel, the preparation is stable; but, notwithstanding the adoption of an official standard, commercial samples will be found sometimes as low as half the official strength.

Medicinal Properties.—Nervine sedative. Similar to Hydrocyanic Acid, but without the nauseous odour of the Acid. Used as a lotion to allay itching in cutaneous diseases; also as an adjunct to eye lotions (1 or 2 in 16).

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

20 minims = 1 minim Diluted Hydrocyanic Acid.

Incompatibles.—Same as Hydrocyanic Acid.

Antidotes.—In case of overdose, the antidotes should be as directed under Acidum Hydrocyanicum Dilutum,' p. 54.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ital., Span. and Swiss, 1·0 HCN per 1000; Fr., ·55 to ·7 per 1000; Port., Leaves, 1 in 2, not standardised. Not in the others.

The *Brussels Conference* agreed to a strength of 1 per 1000.

Tests.—Cherry-Laurel Water is officially required to contain 0·1 p.c. of absolute Hydrogen Cyanide. The method adopted by the *B.P.* for the determination is a volumetric one, and is described in the large type under 'Acidum Hydrocyanicum Dilutum.' It is to be assumed that a quantity proportionate to the difference in strengths between the two preparations is to be employed, but no statement to this effect appears. The comments made on the process appearing in the large type apply also here. The alternative process there suggested may be employed for this assay, using 50 c.c. of the Water.

LAVANDULÆ OLEUM.

OIL OF LAVENDER.

FR., ESSENCE DE LAVANDE; GER., LAVENDELÖL; ITAL., ESSENZA DI LAVANDA; SPAN., ESENCIA DE ESPLIEGO.

A pale yellow, or yellowish-green, oily liquid, having a pleasant characteristic odour, and an aromatic and somewhat bitter taste. It is the volatile Oil distilled from the Flowers of *Lavandula vera*, DC.

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

The principal constituents are an Alcohol **Linalool**, $C_{10}H_{18}O$, eq. 152·98, identical with that obtained from Lignum Aloes, and its Acetic Ester (Linalyl Acetate), which also forms the principal constituent of Oil of Bergamot.

It contains also the terpenes, Pinene and Limonene, a second Alcohol, Geraniol, and a sesquiterpene. English Oil of Lavender contains from 7 to 10 p.c. of Esters calculated as Linalyl Acetate ($C_{10}H_{17}O \cdot C_2H_3O$, eq. 194·68), whilst the French Oils contain from 25 to 50 p.c. Cineol is also present to a greater extent in the English than in the foreign oils. Gildemeister and Hoffmann state that the value of Lavender Oil depends on its content of Linalyl Acetate, but Parry, in common with most others, is of opinion that no comparison between the oils can be made on the basis of their Ester content, Linalyl Acetate not being the sole odoriferous constituent of Lavender Oil. Coumarin has been detected in French Lavender Oil.

It is sometimes adulterated with the foreign Oil of *L. vera*, DC., and the foreign Oil is frequently adulterated with Oil of Spike from *L. spica*, DC. The flavour is stated to be improved by keeping for a year after distillation, and then mixing with an equal volume of Absolute Alcohol.

Solubility.—In all proportions of Alcohol (90 p.c.) and Absolute Alcohol; sparingly soluble in Alcohol (60 p.c.).

Medicinal Properties.—An aromatic gastric stimulant and carminative. Useful in flatulence and colic.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·12 c.c.

Prescribing Notes.—*The* **oil** *is rarely given alone, it is used as an adjuvant to other medicines. Small doses of the* **spirit** *are given on Sugar. The* **Compound Tincture** *is a favourite colouring for mixtures.*

Official Preparations.—Of the **Oil**, Spiritus Lavandulæ, and Tinctura Lavandulæ Composita. Contained in Linimentum Camphoræ Ammoniatum. The Compound Tincture is contained in Liquor Arsenicalis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Ger., Norw. (Ætheroleum Lavandulæ), Ital. (Essenza di Lavanda), Russ., and Swed., sp. gr. 0·885 to 0·895; Dutch, sp. gr. 0·880 to 0·890; Fr., sp. gr. 0·882 to 0·895; Hung. and Jap., sp. gr. 0·885 to 0·900; Port. (Essencia de Alfazema), sp. gr. 0·875 to 0·940; Span. (Esencia de Espliego), sp. gr. 0·87 to 0·94; Swiss, sp. gr. 0·882 to 0·895; U.S., sp. gr. 0·880 to 0·892 at 25° C. (77° F.).

Tests.—Lavender Oil has a sp. gr. of 0·885 to 0·895, the official requirement is not below 0·885, the *U.S.P.* 0·875 to 0·910 at 25° C. (77° F.); the *P.G.* 0·885 to 0·895. The optical rotation in a tube of 100 mm. is from $-3°$ to $-10°$. It is officially required to dissolve in 3 times its volume of Alcohol (70 p.c.), which corresponds with the requirements of the *U.S.P.* The *P.G.* specifies Alcohol (68 to 69 p.c.) and the parts refer to parts by weight. All specimens of Lavender Oil will not yield a clear solution with 3 to 3½ volumes of the weaker strength Alcohol of the *P.G.* Neither the *B.P.* nor the *U.S.P.* includes a process for the determination of the Ester content. The *P.G.* volumetric determination expressed in terms of Linalyl Acetate indicates at least 29·5 p.c. A standard of not more than 11 p.c. of Linalyl Esters has been suggested (*Y.P.B.* '03, 248) and not less than 36 p.c. for the French Oils.

The more generally occurring sophistications are Turpentine Oil, Spike Oil, Spanish Lavender Oil, Rosemary Oil, and Alcohol. Turpentine Oil lowers the sp. gr. and effects the rotation according to whether the Turpentine Oil used as the adulterant is dextrorotatory, *e.g.*, American Turpentine Oil, or lævorotatory, *e.g.*, French Turpentine Oil. Spike Oil increases the sp. gr. and lowers the rotation. Spanish Lavender Oil behaves in a similar manner. Rosemary Oil increases the sp. gr. and lowers the rotation, but renders the Oil less soluble.

Various substances, *e.g.* Ethyl Succinate, Benzoic, Oxalic and Salicylic Acids, have from time to time been added to the oil with a view to masking adulteration by artificially raising the Ester-content. The presence of Ethyl Succinate and Benzoic and Oxalic Acids may be determined by saponifying a weighed quantity of 2 grammes of the Oil with Potassium Hydroxide Solution, neutralising with Acetic Acid, diluting to 50 c.c. and adding 10 c.c. of saturated Barium Chloride Solution. The mixture is warmed for 2 hours on the water-bath and allowed to cool. The formation of a crystalline precipitate indicates adulteration. Salicylic Acid may be detected by the purple-violet coloration produced on the addition of Ferric Chloride T.S. after saponification and by the m.p. of the isolated acid. The presence of Benzoic Acid may be confirmed by Ferric Chloride T.S. and the m.p. of the isolated acid. The presence of Alcohol may be determined by a diminution in volume when the Oil is shaken with Water.

Adulteration with Glycerin Monacetate has also been noticed. Such adulteration may be detected by shaking the suspected oil with 4 to 5 volumes of Petroleum Ether, in which the Glycerin ester is insoluble, and Glycerin may be further identified by the Acrolein reaction.

Water.—When the Oil is shaken with Water in a narrow graduated cylinder its volume should not be diminished (absence of Alcohol), *U.S.P.*

Volumetric Determination.—If 1 gramme of the Oil be heated in a reflux condenser with 10 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution for half an hour on a water-bath, and after cooling and the addition of a few drops of Phenolphthalein T.S., the mixture be titrated with Semi-normal Volumetric Hydrochloric Acid Solution, at most 7 c.c. of the Acid should be necessary to discharge the colour, *P.G.*

Preparations.

SPIRITUS LAVANDULÆ. SPIRIT OF LAVENDER.

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

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

It is 5 times the strength of *B.P.* '85.

Foreign Pharmacopœias.—Official in Russ., 1 in 100; Dan. and Swed., 2 in 100; Jap., 3 in 100; U.S., 5 in 100; all with the Oil, and all by weight except U.S. Austr., Dutch, Ger., Ital. and Swiss, all 1 in 4, and Port. 1 in 2, from the flowers. Not in the others.

Tests.—Spirit of Lavender has a sp. gr. of 0·835 to 0·838, and contains about 68 p.c. w/v of Absolute Alcohol.

TINCTURA LAVANDULÆ COMPOSITA. COMPOUND TINCTURE OF LAVENDER.

Oil of Lavender, 45 minims; Oil of Rosemary, 5 minims; Cinnamon Bark, bruised, 75 grains; Nutmeg, bruised, 75 grains; Red Sanders Wood, 150 grains; Alcohol (90 p.c.), 20 fl. oz. By maceration, adding the Oils at the finish.

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

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

Foreign Pharmacopœias.—Official in Swed., Tinctura Lavandulæ aromatica, Oil of Lavender 2, Oil of Rosemary 1, Saigon Cinnamon 8, Red Sanders Wood 8, Myristica 8, Alcohol (64 p.c.) 800. U.S., Tinctura Lavandulæ Compositum, Oil of Lavender Flowers 8, Oil of Rosemary 2, Saigon Cinnamon 20, Cloves 5, Myristica 10, Red Sanders 10, Alcohol and Water, each, a sufficient quantity to make 1000. Jap., Tinctura Lavandulæ Compositum similar to U.S.

Not Official.

LEPTANDRA.

CULVERS ROOT.

The Rhizome and Rootlets of *Veronica Virginica*, L.

A cathartic, and stimulates the flow of bile.

An Alcoholic **Extract**, average dose, 0·25 gramme (4 grains), and **Fluid Extract** (1 in 1), average dose, 1 c.c. (15 minims), are both official in U.S.

Leptandrin.—An eclectic remedy, used as an alterative, ¼ to ½ grain = 0·016 to 0·032 gramme; as a purgative, 2 to 4 grains = 0·13 to 0·26 gramme.

LIMONIS CORTEX.

LEMON PEEL.

FR., ECORCE DE CITRON; GER., CITRONENSCHALE; ITAL., SCORZA DI LIMONE; SPAN., LIMON.

The fresh outer part of the pericarp of the Fruit of *Citrus Medica*, L., var. *Limonum*, Hook. f.

Commercially the peel is cut in December, and is more readily obtainable at that time.

Ind. and *Col. Add.* authorises the use of **Dried Lemon Peel** in India and the Colonies, when Fresh Lemon Peel is not obtainable.

Medicinal Properties.—Bitter stomachic and tonic. Added to stomachic medicines. Chiefly used, however, to impart flavour to other medicines.

Official Preparations.—Of the **peel**, Oleum Limonis, Syrupus Limonis and Tinctura Limonis. Used in the preparation of Infusum Aurantii Compositum and Infusum Gentianæ Compositum. The **oil** is contained in Linimentum Potassii Iodidi cum Sapone, Spiritus Ammoniæ Aromaticus, Tinctura Guaiaci Ammoniata and Tinctura Valerianæ Ammoniata.

Not Official.—Terpeneless Oil of Lemon, Citral.

Foreign Pharmacopœias.—Official in Fr. (Citron), Ger., Hung., Ital. (Cedro and Limone) Jap., Port. (Limao), Russ., Swiss and U.S. Not in the others.

Descriptive Notes.—Only the fresh peel is official. On its inner surface there should be only a small amount of the white spongy portion of the rind. In the *P.G.* the rind, separated in spiral strips and dried, is official. The larger rough, thick-skinned fruits of *Citrus Medica*, L., the citron or cedrat of the French, are sometimes sold as lemons, but are rather less fragrant and contain less juice. These are usually imported in July and August. Lemons vary much in flavour, the Messina lemons having the purest lemon flavour, those of Palermo having a slight additional musk and verbena odour; these and the Murcia lemons, which have a particularly fine flavour and are sometimes very large, weighing from 12 to 19½ oz., a large one yielding 2½ oz. of peel, reach England from November to April. A box of Messina Lemons contains 300 to 360 fruits; a box of Murcia Lemons only 200. Naples lemons are imported from April to August, but are inferior to the Sicilian kinds. Malaga lemons, which have thick skins and numerous seeds, and proportionately less juice, arrive in September and October. Lemons should be chosen with a thin rind and of medium size, as they are richer in juice and are likely to keep better, the rind having been reduced in thickness by a process of curing or drying before packing, thus rendering them less likely to become mouldy.

Tests.—Lemon Peel yields not more than 5 p.c. of ash.

Preparations.

OLEUM LIMONIS. OIL OF LEMON.

FR., ESSENCE DE CITRON; GER., CITRONENÖL; ITAL., ESSENZA DI CEDRO; SPAN., ESENCIA DE LIMON.

The Volatile Oil obtained from fresh Lemon Peel. A light yellow liquid with a pleasant odour and an aromatic, mild, somewhat bitter after-taste.

The Oil consists of about 90 p.c. of the terpenes Dextro- and Lævo-Limonene, the Dextro-Limonene being the more important.

The terpene Phellandrene is also present in small quantity in the Oil. Pinene is not present. The odour and flavour of the Oil are dependent upon the oxygenated bodies, and are due chiefly to the aldehyde of Geraniol, Geranaldehyde, $C_{10}H_{16}O$, eq. 150·98, which is known commercially as Citral, and which is present to the extent of 3 to 4 p.c. *See* under Tests. A second aldehyde, Citronellal, is also present. An ester of Geraniol (Geranyl Acetate) is present in the Messina and Palermo Oils, whilst the latter Oil contains also a Linalyl ester (Linalyl Acetate), to which the difference in odour between the Palermo and Messina Oils has been partly attributed. A very small quantity of a sesquiterpene boiling at 240° to 242° C. (464° to 467·6° F.) is present. Octyl and Nonyl aldehydes have been detected in Lemon Oil and also Methyl Heptenone, Anthranilic Acid Methyl-Ester, Citraptene and a Resin. Octyl and Nonyl aldehydes must be regarded as important constituents, as they play an important part in the aroma of the Oil. *See* also Citral.

Its flavour and aroma suffer much from keeping; it keeps the aroma much better if mixed (when fresh) with 10 p.c. (by measure) of Absolute Alcohol. The presence of Ethylic Alcohol can readily be detected by the diminution in volume of the Oil on shaking with Water. The Oil should evaporate from paper without leaving a stain.

Solubility.—In all proportions of Glacial Acetic Acid and Absolute Alcohol; 1 in 12 of Alcohol (90 p.c.).

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

Foreign Pharmacopœias.—Official in Austr., Oleum Citri, Belg., Essentia Citri, Dan., Ætheroleum Citri, Ger. and Jap., Oleum Citri (sp. gr. 0·858 to 0·861); Dutch (sp. gr. 0·850 to 0·860), Hung. (sp. gr. 0·840 to 0·870), Russ. (sp. gr. 0·855 to 0·865), and Swiss (sp. gr. 0·857 to 0·861), all Oleum Citri; Ital., Essenza di Cedro (sp. gr. 0·857 to 0·860); Fr., Essence de Citron (sp. gr. 0·857 to 0·862); Mex., Aceite Volatil de Limon (sp. gr. 0·849); Norw. (sp. gr. 0·850 to 0·865) and Swed. (sp. gr. 0·855 to 0·861), Ætheroleum Citri; Port., Essencia de Limao, (sp. gr. 0·846 to 0·856); Span., Esencia de Limon (sp. gr. 0·852 to 0·856); U.S., Oleum Limonis (sp. gr. 0·851 to 0·855 at 25° C. (77° F.)).

Tests.—Lemon Oil is officially required to possess a sp. gr. of 0·857 to 0·860; the *U.S.P.* requires 0·851 to 0·855 at 25° C. (77° F.), and the *P.G.* 0·858 to 0·861. The sp. gr. of the Oil is usually 0·856 to 0·858 and occasionally 0·860. The optical rotation is from + 58° to + 63° in a tube 100 mm. in length. The official figure is not less than + 59°. The *U.S.P.* required that its optical rotation should not be less than + 60° at a temperature of 25° C. (77° F.); this minimum rotation figure was considered too high, and with the 1907 season's Oil was virtually unattainable. The figure was altered in the list of Additions and Corrections (1907) to not less than +58°. The *P.G.* does not include a rotation figure. The refractive index of the Oil is not included in either the *B.P.*, *U.S.P.* or *P.G.*

It is from 1·473 to 1·483. Neither the *B.P.* nor *P.G.* requires the Oil to contain any definite percentage of Geranaldehyde (Citral), and no method of determination is given. The *U.S.P.* requires that it shall yield not less than 4·0 p.c. of aldehyde calculated as Citral, when quantitatively determined by means of the following volumetric process, which is based upon the interaction of the aldehyde and a neutral 20 p.c. w/v Sodium Sulphite Solution, whereby Citral Dihydrosulphonic Acid is produced and a corresponding amount of Sodium Hydroxide is liberated, which is determined by titration with Semi-normal Volumetric Hydrochloric Acid Solution, using Rosolic Acid Solution as an indicator of neutrality. A control experiment with the reagents alone, without the Lemon Oil, is carried out simultaneously, the number of c.c. of Semi-normal Volumetric Acid required in this blank experiment being deducted from the number obtained in the actual determination. 1 c.c. of Semi-normal Volumetric Hydrochloric Acid Solution corresponds to 0·03802 gramme of Citral. Great diversity of opinion exists amongst authorities on essential oils, not only with regard to the actual amount of Citral contained in genuine Lemon Oils, but also with regard to the relative reliability of the various processes which have been suggested from time to time for its determination. The balance of opinion (more particularly amongst English authorities) appears to be that the standard of 5 to 7 p.c. of Citral cannot be maintained, and that the true percentage is nearer 3 to 4 p.c. Leaving chemical considerations out of the question altogether, Terpeneless oils are found to contain about 50 p.c. of Citral, which should mean that the yield of Terpeneless oil from Oil of Lemon should be about 14 p.c., whereas the manufacturers find that not more than half this amount is obtained. The determination of the aldehyde by the direct measurement of the portion unabsorbed by Sodium Bisulphite Solution is most conveniently carried out by mixing a measured quantity of 50 c.c. of the Oil with 75 c.c. of a 40 p.c. w/v Sodium Metabisulphite Solution and 25 c.c. of Sodium Sulphite (made by exactly neutralising the Sodium Bisulphite Solution with a 10 p.c. w/v Sodium Hydroxide Solution). The mixture is heated to 70° C. (158° F.) and shaken for one hour. Sufficient Water is then added to bring the Oil into the graduated portion of the flask and the unabsorbed portion is read off, a correction being made for the solubility of the Terpenes. This method has been adversely criticised, but is stated to give approximate results. The Hydroxylamine process has been found to give totally unreliable results. The Cyanacetic Acid method yields results which are invariably too high, and is useless when small percentages of Citral are concerned. The volumetric process with Sodium Bisulphite Solution (Sadtler's process), virtually that adopted by the *U.S.P.*, is referred to above. Messrs. Schimmel have adversely criticised the process, stating that the clearness of the end reaction leaves something to be desired.

A method somewhat similar to Sadtler's process has been recommended (*C.D.* '05, ii. 408) for the determination of Citral. It is based on the reaction of Citral with Potassium or Sodium Sulphite

Solution containing sufficient excess of the Hydrogen Sulphite for the solution to remain acid after the absorption. The solution is prepared by dissolving 400 grammes of crystallised Potassium or Sodium Sulphite in 1 litre of Water and adding sufficient Potassium or Sodium Hydrogen Sulphite Solution to make each 25 c.c. sufficiently acid to neutralise 20 c.c. of Semi-normal Potassium Hydroxide Solution. A measured quantity of 5 c.c. of the Oil is heated with sufficient of this solution in a closed flask for three hours on the water-bath and the residual acid is then titrated. Three molecular equivalents of acid are equivalent to one molecular equivalent of Citral, and consequently 1 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution corresponds to 0·02516 gramme of Citral. The process has been criticised by Messrs. Schimmel in their semi-annual report, October to November, 1905; they find the process open to the same objection as Sadtler's process, viz., the indefinite nature of the end reaction, and did not succeed in the preliminary neutralisation of the solution as directed.

The more generally occurring adulterants of Lemon Oil are Turpentine Oil, Lemon Oil terpenes, Turpentine Oil to which Lemon Grass Oil Citral has been added, Turpentine Oils plus the addition of a little inferior Orange Oil, and Cedarwood Oil. Turpentine Oil is readily detected by distilling and examining the first 10 p.c. of distillate. This distillate is required to possess a rotation differing by not more than 2° from that yielded by the original Oil. This limit is considered very severe, genuine Lemon Oils often showing a greater difference. Lemon Oil terpenes are very difficult to detect. Their presence may be ascertained by fractional distillation and the determination of the optical rotation of fractions, and also by the reduction in the Citral content. To meet the reduction in Citral strength caused by the addition of Lemon Oil terpenes, Citral from Lemon Grass Oil has been added. It may be detected by the marked verbena odour communicated to the residue after about 90 p.c. of the Oil has been distilled off *in vacuo*. A method of fractional distillation, which it is claimed will show any adulteration, is given (*J.S.C.I.* '01, 1179). A measured quantity of 100 c.c. of the Oil is put into a distilling flask having three bulbs blown in the neck, and fitted with a cork and thermometer. It is connected with a condenser, fitted with a suitable receiver, having two vessels graduated at 10 c.c. and 80 c.c. respectively. It is exhausted, a pressure of not more than 15 mm. being maintained. The flask is gently heated by means of an oil-bath. The first 10 c.c. should not take more than seven minutes to distil. The next vessel is put into position, and the distillation continued until 80 c.c. have distilled over. The pressure is then relieved, and the residual oil in the flask is distilled over with steam, and the quantity obtained carefully noted. The optical rotation and the refractive indexes of the three fractions are determined, respectively, by the polariscope and Zeiss refractometer.

Turpentine Oil may be detected by the optical rotation, the diminution in the percentage of aldehydes, the effect upon the solubility of the Oil in Alcohol, and an examination of the portion unabsorbed by Sodium Bisulphite. The presence of Citral from Lemon Grass Oil may be ascertained by a determination of the optical rotation and the marked verbena odour of the absorbed aldehydes.

The method adopted by Burgess and Child for ascertaining the solubility of a Terpeneless oil, and to which they refer as the solubility number, is to dissolve a measured quantity of 1 c.c. of the Oil in 20 c.c. of Alcohol (94 p.c.), and then to add, from a burette, Distilled Water until a permanent milkiness ensues; the solubility number is the number of c.c. of Water required to produce such turbidity.

SYRUPUS LIMONIS. Syrup of Lemon.

Fresh Lemon Peel, in thin slices or grated, 1; Alcohol (90 p.c.), a sufficient quantity; Lemon Juice, 25; Refined Sugar, 38. Macerate the Lemon Peel in 1½ of the Alcohol for seven days; press; filter; add sufficient of the Alcohol to produce 2. In the Lemon Juice, clarified by subsidence, dissolve the Refined Sugar by the aid of gentle heat. When the resulting syrup is cold, mix with it the 2 of Alcoholic liquid. The product should weigh 65.

(1 of Peel and 25 of Juice in 65)

This makes a turbid syrup. It is not possible to completely clarify it by subsidence. It has been suggested to filter the juice through Talc, but this removes not only the turbidity but also some of the flavour. It does not filter readily through flannel or paper, but if the juice is heated nearly to 212° F. (100° C.) and strained through flannel before dissolving the sugar, the resulting syrup is bright and clear.

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

Foreign Pharmacopœias.—Official in Fr. (Sirop d'Acide Citrique) Citric Acid, 1; Simple Syrup, 97; Alcoolature de citron, 2; Ital., Bruised Peel 2, Sugar 19, Distilled Lemon Water 12; Mex. (Jarabe de Limon), Lemon Juice 10, Syrup 100; Port. (Xarope de Casca de Limao), Fresh Lemon Peel 1, Boiling Water 35, Sugar 65; Span. (Jarabe de Limon), Lemon Juice 5, Sugar 9; and Swiss, Citric Acid 2, Water 2·5, Syrup 94, Spirit of Lemon 1·5. For other Pharmacopœias, *see* Acidum Citricum.

TINCTURA LIMONIS. Tincture of Lemon.

Macerate 5 of Fresh Lemon Peel with 20 of Alcohol (90 p.c.) Now 1 in 4, *B.P.* 1885 was 1 in 8.

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

Foreign Pharmacopœias.—Official in Belg. (Spiritus Citri), 1 Oil in 100; Dutch (Spiritus Citri), 4 of Fresh Peel in 10 (distilled); Fr. (Alcoolature de Citron), 1 Fresh Peel to 2 of Alcohol; Jap. (Spiritus Citri), 1 Oil in 10; Mex. (Alcoholato de Cortezas de Limon), Fresh Peel 2, Alcohol (80°) 10, Water 2, distil; Span. (Alcohol de Corteza de Limon), Peel 1, and Alcohol (80 p.c.) 6, distil; Swiss (Spiritus Citri), 12 of Fresh Peel in 100 (distilled); U.S. (Tinctura Limonis Cortex), Fresh Lemon Peel 1, Alcohol (95 p.c.), to produce 2. *B.P.C.* (Tinctura Limonis Fortis), Fresh Lemon Peel 1, Alcohol (90 p.c.) 1.

Tests.—Tincture of Lemon has a sp. gr. of 0·875 to 0·880; contains from 1 to 2 p.c. w/v of total solids and about 76 p.c. w/v of Absolute Alcohol.

Not Official.

TERPENELESS OIL OF LEMON.—A Terpeneless Oil of Lemon is an Oil from which practically the whole of the terpenes have been removed. When carefully prepared it is free from Limonene and contains very little of the Stearoptene of the original Oil. The relative yield of the Terpeneless Oil is about 4 to 6 p.c. The Oil contains about 50 p.c. of Geranaldehyde (Citral) together with Citronellal, Geranyl Acetate, and Linalyl Acetate. Octyl and Nonyl Aldehydes, which are important constituents of Lemon Oil, acquire an additional importance in the Terpeneless Oil, on account of the modification they effect in the aroma and flavour of the Oil. Anthranilic Acid Methyl-Ester also forms a constituent of the Oil.

Tests.—Terpeneless Lemon Oil has a sp. gr. of 0·895 to 0·899, an optical rotation in a 100 mm. tube of $-5°$ to $-8°$, a refractive index in a Zeiss refractometer of 1·481 to 1·482.

The percentage of Geranaldehyde (Citral) should amount to not less than 40 p.c. nor more than 50 p.c. It may be determined by measuring the unabsorbed portion of the Oil after treatment with Sodium Bisulphite, or by the Sodium Sulphite method. Both processes are described in the large type under 'Oleum Limonis.'

The Oil may contain Terpenes, due to imperfect separation or intentional adulteration, and Lemon Grass Oil Citral.

OLEUM GRAMINIS CITRATI. Oil of Lemon Grass. *Syn.* Indian Oil of Verbena.—The Oil distilled from *Andropogon Citratus*, dose ½ to 3 minims = 0·03 to 0·18 c.c., is official in the *Ind.* and *Col. Add.* for India, the Eastern Colonies and the West Indian Colonies.

CITRAL. GERANIAL. $C_{10}H_{16}O$, eq. 150·98.—A pale, yellow, mobile, optically inactive Oil, consisting of the high boiling point fractions from the distillation of Lemon Oil, having a penetrating lemon odour, and possessing a flavouring power about 15 times as great as the original Oil.

Sp. gr. 0·895 to 0·899; boiling point, 228° to 229° C.

It gives the aldehyde reactions with Bisulphites, and on reduction yields the alcohol **Geraniol.**

It may be used to increase the flavour of Oil of Lemon, by mixing it with the latter in the proportion of 1 to 14.

Teinture d'Essence de Citron Composée (Eau de Cologne).—Oil of Bergamot, 10; Oil of Orange, 10; Oil of Lemon, 10; Oil of Orange Flower, 2; Oil of Rosemary, 2; Alcohol (90 p.c.), 1000.—Fr.

LIMONIS SUCCUS.

LEMON JUICE.

Fr., Suc de Citron; Ger., Citronensaft; Ital., Succo di Limone;
Span., Zumo de Limon.

The freshly expressed Juice of the ripe Fruit of *Citrus Medica* var. *Limonum.* Contains 30 to 40 grains of Citric Acid to the fl. oz. It varies with the time of year. The acidity decreases as the season advances from November to April.

Lemon Juice is extremely liable to fermentation, and requires the addition of Alcohol to keep it; about 15 p.c. of Proof Spirit is sufficient.

Medicinal Properties.—Refrigerant; when diluted, a particularly useful beverage in prevention and treatment of scurvy (3 or 4 oz. daily); relieves thirst in febrile and inflammatory affections. In acute rheumatism, ½ to 1 pint = 284 to 568 c.c. daily.

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

Official Preparation.—Syrupus Limonis, p. 726. Used in the preparation of Acidum Citricum.

Foreign Pharmacopœias.—Official in Dutch (Succus Citri Artificialis), Citric Acid 1, Water 8, Spirit of Lemon 1; Fr.; Mex. (Jugo de Limones); Span. (Zumo de Limon); U.S., from 7 to 9 p.c. of Citric Acid; Swiss (Succus Citri facticius), Citric Acid 10, Water 89, Spirit of Lemon 1.

Tests.—Lemon Juice has a sp. gr. of 1·030 to 1·040; contains from 10 to 14 p.c. w/v of total solids, and when evaporated to dryness and ignited leaves not more than 3 p.c. w/v of ash.

It is officially required to contain from 7 to 9 p.c. w/v of Citric Acid, equivalent to from 30 to 40 grains per fl. oz. The acidity may be conveniently determined by titrating 10 c.c. of the juice with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality; about 10·1 c.c. will be required, 1 c.c. of Volumetric Sodium Hydroxide Solution = 0·0695 gramme of Citric Acid. The *U.S.P.* requires that 10 c.c. of the juice shall neutralise at least 10 c.c. of Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator. This corresponds to 6·95 p.c. of Citric Acid. Lemon Juice is not official in the *P.G.*

No official tests are given for impurities. It should evolve no odour of Sulphurous Acid when warmed. When neutralised with Potassium Hydroxide Solution, then rendered faintly acid with diluted Hydrochloric Acid and shaken with Ether, the ethereal solution, when washed with a few c.c. of Water, should yield no purple-violet coloration when shaken with Water containing a drop of Ferric Chloride T.S., showing the absence of Salicylic Acid. Barium Chloride Solution added to the filtered juice should cause no turbidity or precipitate. This test for Sulphuric Acid and Sulphates is included in the *U.S.P.*, as well as the following for Acetic and Tartaric Acids respectively. When warmed with an equal volume of Sulphuric Acid and a few drops of Alcohol (94·9 p.c.) it should not evolve an odour of Ethyl Acetate (Acetic Ether). Upon the addition of a 1 in 3 Potassium Acetate Solution, and Alcohol (94·9 p.c.) in excess, it should not yield a white crystalline precipitate of Potassium Hydrogen Tartrate.

100 c.c. of average Lemon Juice require for neutralisation about 11·4 grammes of Potassium Bicarbonate, about 9·5 grammes of Sodium Bicarbonate, and about 16·5 grammes of Sodium Carbonate, or, if the Imperial quantities are adopted, 110 minims require for neutralisation about 11½ grains of Potassium Bicarbonate, about 9½ grains of Sodium Bicarbonate, and about 16½ grains of Sodium Carbonate.

ACIDUM CITRICUM.—*See* ACIDUM CITRICUM.

LINUM.

LINSEED.

FR., LIN; GER., LEINSAMEN; ITAL., LINO; SPAN., LINO.

The dried ripe Seeds of *Linum usitatissimum*, L.

The envelope or testa abounds in a peculiar gummy matter or mucilage, readily imparted to hot Water.

Medicinal Properties.—Demulcent. Employed in faucal, pharyngeal and bronchial catarrh, dysentery, diarrhœa, and inflammatory affections of the urinary passages. In the form of Linseed Poultice it is applied to inflamed parts.

Official Preparations.—Linum Contusum and Oleum Lini.

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

Descriptive Notes.—Linseed varies much in size, the varieties imported from subtropical countries being distinctly larger than those cultivated in temperate or cold climates. Thus, of Russian, Dutch, English, and ordinary Calcutta Linseed, twelve or fourteen seeds, and of Archangel Linseed even seventeen seeds, weigh one grain; whilst of Bombay, Sicilian, and Ionian Linseed six or seven only are equal to a grain in weight; in other words, the last three are almost twice the size of the Linseed of temperate climates. For use in medicine the English and Dutch Linseeds are to be preferred, since they are usually most free from weed seeds, and from dirt. Most of the different varieties contain weed seeds distinctive of the country where they are produced, and can be recognised by these seeds, but any samples of Linseed containing more than 4 p.c. of weed seeds may be considered to be adulterated. Official Linseed is stated to be $\frac{1}{6}$ to $\frac{1}{4}$ in. in length (4 to 6 mm.), (3 to 5, *U.S.P.*), ovate and somewhat obliquely pointed, the surface glabrous and minutely pitted; of a brown colour, inodorous; with a mucilaginous taste. The mucilage exists in the epidermal cells, and is formed at the expense of starch, which is found only in the young seed in these cells. The seeds contain about one-tenth of their weight of mucilage (6 p.c. Vogl), which can be precipitated in white flakes by Alcohol, but cannot be filtered until after boiling. Russian Linseed is largely used for the manufacture of Linseed Oil and for Linseed Cake, which is obtained by expression of the fixed Oil, and is employed for feeding purposes, since it contains up to 25 p.c. of proteids. Russian Linseed is often extensively adulterated with weed seeds, and even when sifted retains sufficient dirt attached to the surface to prevent the hand readily passing through a parcel of it, whereas English and Dutch permits it readily, and this test is used as a rough means of distinguishing these Linseeds. As the mucilage is contained in the epidermal cells, the seed is used in the whole state for making the decoction known as Linseed Tea. The principal features of powdered Linseed are the thin-walled, short prismatic cells, containing mucilage; yellowish spindle-shaped sclerenchymatous cells, crossed at right angles with a layer of thin-walled, elongated, compressed, colourless cells; flattened polygonal cells with porous walls, containing a brown pigment; and endosperm cells, containing characteristic aleurone grains and drops of oil. It is best examined in strong Alcohol, and Water gradually added to show the mucilage cells.

Preparations.

LINUM CONTUSUM. Crushed Linseed.

Linseed reduced to a coarse powder.

Foreign Pharmacopœias.—Official in Belg., Fr. and Ital., should contain 30 p.c. of Oil; Port., not less than 25 p.c. of Oil. Not in the others.

Tests.—Crushed Linseed is officially required to yield, when extracted with Carbon Bisulphide, not less than 30 p.c. of Oil. This is also the standard adopted by the *U.S.P.*, which also adds 'all of which is saponifiable.' The extracted Oil might with advantage be required to answer the tests for Oleum Lini. Good commercial samples, examined in the author's laboratory, yielded from 30 to 42 p.c. of oil. The *B.P.* statement that it should not yield the tests characteristic of Starch is very indefinite. Linseed contains a large proportion of Oil possessing a high Iodine absorption; if the Iodine test is applied, it is preferably carried out on the portion remaining after the extraction of the Oil with Carbon Bisulphide. The *U.S.P.* performs the test on the crushed Linseed, but gives very explicit instructions for carrying it out. A weighed quantity of 0·1 gramme is directed to be mixed with 20 c.c. of Water, the mixture heated to boiling, cooled, and diluted with cold Water to 100 c.c. The addition of 0·5 c.c. of Iodine T.S. (2·0 p.c. w/v) should not produce more than a pale blue colour. The ash of crushed Linseed varies from 3 to 4 p.c., and should not exceed 5 p.c. It is officially required to leave, when incinerated with free access of air, not more than 5·0 p.c. of ash. No ash limit appears in the *U.S.P.* The *P.G.* includes the seeds but not the crushed seeds, but no tests are given. The 1890 *U.S.P.* required a yield of not less than 25 p.c. of Oil extractable by Carbon Bisulphide, which has been raised to 30 p.c. in the 8th Decennial Revision.

OLEUM LINI. Linseed Oil.

A colourless, but more usually pale yellow, oily liquid, possessing a characteristic odour and unpleasant taste. It is a drying Oil, and tends to thicken and darken in colour on exposure to light and air. It is the Oil expressed from Linseed at ordinary temperatures.

For medicinal purposes it should be procured as fresh as possible.

Solubility.—Of a freshly expressed sample, 1 in 40 of Absolute Alcohol; 1 in $1\frac{1}{4}$ of Ether.

Medicinal Properties.—Laxative; it also acts mechanically as an **enema** for removing impacted fæces. A good application to burns in the form of **Carron Oil,** *see p.* 289.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 0·932 to 0·937; Belg., Ger., Hung., Norw., Russ. and Swed., sp. gr. 0·936 to 0·940; Dan., sp. gr. 0·930 to 0·940; Dutch, sp. gr. 0·930 to 0·935; Ital., sp. gr. 0·935 to 0·940; Jap., sp. gr. 0·930 to 0·940; Port. (Oleo de Linhaca), sp. gr. 0·930;

Span. (Aceite de Linaza); Swiss, sp. gr. 0·930 to 0·937 at 15° C. and 0·880 to 0·881 at 98° C.; U.S., sp. gr. 0·925 to 0·935 at 25° C. (77° F.). Hung., also Oleum Lini Lotum.

Tests.—Linseed Oil has a sp. gr. of 0·930 to 0·936; the *B.P.* states 0·930 to 0·940, the *U.S.P.* 0·925 to 0·935 at 25° C. (77° F.); *P.G.* 0·936 to 0·940. All three Pharmacopœias are agreed that it does not congeal at temperatures above −20° C. (−4° F.). It is a drying Oil, and gradually thickens by exposure to the air, forming a hard transparent varnish; this feature is recorded in the *B.P.* and *U.S.P.*, but not in the *P.G.* Neither the Saponification value nor the Iodine absorption is given in the *B.P.*, both should be included. The Saponification value usually ranges from 190 to 195, and should not be less than 187, and the Iodine absorption from 170 to 188. The *U.S.P.* gives the Saponification value as 187 to 195 and the Iodine value as not less than 170. The *P.G.* does not include a Saponification value, but requires that the Oil shall absorb not less than 150 p.c. of Iodine.

The more generally occurring adulterations are Mineral Oils, Rosin, and Rosin Oils. Mineral and Rosin Oils are unsaponifiable, and their presence may be detected by the Potassium Hydroxide test described below. If after saponification the Alcohol be evaporated off and the residual soap be dissolved in hot Water, cooled and shaken with Ether, the ethereal solution may be separated, evaporated to dryness and the unsaponifiable residue weighed. Rosin Oil may be detected by dissolving a portion of this residue in Carbon Bisulphide and adding a few drops of a Carbon Bisulphide Solution of Stannous Bromide containing an excess of Bromine. The appearance of a violet or purple coloration is indicative of the presence of Rosin Oil. The reagent may be prepared by allowing Bromine to fall drop by drop on some granulated Tin until the permanent coloration of the product shows that the Bromine is in excess. A further moderate quantity of Bromine is then added, and the mixture, when cold, diluted with three or four times its measure of Carbon Bisulphide.

The *U.S.P.* includes a test with Glacial Acetic Acid (*see* below) for the detection of Rosin Oils. The Oil should not be more than faintly acid in reaction towards blue Litmus paper moistened with Alcohol (94·9 p.c.). The Acid value should be less than 5, though old oil may give figures as high as 7. Linseed Oil contains a small percentage of unsaponifiable matter, which should not amount to more than 2·5 p.c., and usually is considerably less. Linseed Oil, when issuing from the seed whilst pressing, has scarcely any of the odour or taste of the Linseed Oil of the shops, but acquires it in a very short time on exposure to the air. For medicinal purposes it should be procured as fresh as possible. Boiled Linseed Oil is used in the arts as a drying Oil, and for certain purposes Litharge and Manganese are added during the boiling. The boiled Oil may therefore contain both Lead and Manganese. It may be detected by the increased sp. gr. and the great decrease in the Iodine absorption.

The rise of temperature on treating the Oil with Sulphuric

Acid (Maumené's test) is a useful constant for the Oil, it should not be less than 114° C. (237·2° F.).

Potassium Hydroxide.—If 27 parts of Potassium Hydroxide T.S. and 2 parts of Alcohol (90 p.c.) be added to 20 parts of Linseed Oil, warmed in a deep tin or porcelain vessel, and the mixture stirred and again warmed until saponification is complete, the soap formed should be soluble in Water or Alcohol (90 p.c.) without residue, *P.G.*; it should be completely saponifiable with Alcoholic Potassium Hydroxide T.S., and the resulting soap should be completely soluble in Water without leaving an oily residue, *U.S.P.*

Glacial Acetic Acid.—2 c.c. of the Oil warmed and shaken in a test-tube with an equal volume of Glacial Acetic Acid should yield, on cooling and the addition of 1 drop of Sulphuric Acid, a greenish colour. A violet colour indicates the presence of Rosin or Rosin Oils, *U.S.P.*

Not Official.

CATAPLASMA LINI.—Linseed Meal, 4; Boiling Water, 10. Mix the Linseed Meal with the Water gradually, with constant stirring. In cold weather the basin should be previously rinsed with boiling Water.

Applied to inflamed parts.

Foreign Pharmacopœias.—Official in Fr., Mex., Port. and Span.

Not Official.

LITHIUM.

Li, eq. 6·97.

A silver-white, brilliant, ductile metal, having the density of 0·59.

It is obtained from several minerals—Petalite, Lepidolite, Triphane, and formerly from Triphylline.

Official Preparations.—Lithii Carbonas, Lithii Citras.

Not Official.—Lithii Benzoas, Lithii Bromidum, Lithii Guaiacas, Lithii Hippuras, Lithii Quinas, Lithii Salicylas, Lithii Theobrominæ Salicylas, Lithii Bitartras.

Tests.—Lithium has a sp. gr. of 0·59. The characteristic test for Lithium is the crimson colour which its salts, especially when moistened with Hydrochloric Acid, communicate to a non-luminous flame. An aqueous solution of a Lithium salt affords a precipitate with Sodium Phosphate Solution.

LITHII CARBONAS.

LITHIUM CARBONATE.

Li_2CO_3, eq. 73·49.

Fr., Carbonate de Lithine; Ger., Lithiumcarbonat; Ital., Carbonato di Litio; Span., Carbonato de Litina o Litico.

A light white, amorphous, odourless powder, alkaline in reaction. It may be obtained from native Lithium Silicates.

The salts official in the *B.P.* and the *U.S.P.* are required to contain not less than 98·5 p.c. of pure Lithium Carbonate, the *P.G.* does not specify the percentage.

It should be kept in well-stoppered glass bottles.

Solubility.—About 1 in 70 at 60° F.; in hot Water it is only soluble to about half this extent, a solution saturated in the cold becoming quite turbid on boiling. It should be noticed that using 1 part of Lithium Carbonate to 70 parts of Water solution is very slow, and using these proportions in oz. it requires several weeks' digestion, with frequent shaking, before complete solution is effected.

Medicinal Properties.—Diuretic. Combined with Carbonic Acid, in a diluted solution, as in Lithia Water, it has been given in cases of gout with the view of increasing the alkalinity of the blood, and acting as a solvent of the Sodium Biurate deposits.

Luff has shown that the Lithium salts do not exercise any special solvent effect on Sodium Biurate, and that their administration to gouty subjects with the object of removing uratic deposits in the joints and tissues appears to be useless.—*L.* '98, i. 1609.

He also found that Lithium salts, although they did not delay the initial conversion of the gelatinous Sodium Biurate into the crystalline forms, yet when the conversion was once started it was slowed by the presence of these salts and especially by the Lithium Carbonate. In the treatment of gout the Potassium salts were the most useful, and the Lithium salts ranked next.—*L.* '00, i. 931; *B.M.J.* '00, i. 836.

Cases of cardiac depression and even dilatation, as the result of the excessive and continued consumption of Lithia tablets, which are so persistently vaunted as curative of gout.—*Pr.* '07, i. 166.

1 grain of Lithium Carbonate with $\frac{1}{35}$ grain Sodium Arsenate given in aërated Water has been recommended by Martineau in the treatment of diabetes.—*L.* '87, i. 650.

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

Prescribing Notes.—*Given in aërated Water,* **cachets,** *or Compressed Tablets.* **Varalettes** *are effervescing tablets.*

For the **granular effervescent** *form, see* Lithii Citras.

Official Preparation.—Used in the preparation of Lithii Citras.

Not Official.—Liquor Lithii Carbonatis.

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

Tests.—Lithium Carbonate dissolves slowly in Water and yields a solution which has an alkaline reaction towards red Litmus paper. It dissolves in diluted Hydrochloric Acid with effervescence, yielding a solution which gives the tests distinctive of Lithium given under that heading, and a colourless gas which, passed into Lime Water, affords a white precipitate, which again dissolves if a sufficient excess of the gas be passed through the liquid, or which is soluble with effervescence in Hydrochloric Acid. It is officially required to yield 98·5 p.c. of Lithium Carbonate as gravimetrically determined by neutralising 1 gramme of the salt with Sulphuric Acid, and subsequently heating to redness. The weight of dried Lithium Sulphate should amount to 1·479 grammes. It should be noted that the weight of Lithium Carbonate corresponding to 1·479 grammes of Lithium Sulphate is 0·9946 gramme, calculating out to 99·46 p.c. and not, as officially stated, 98·5 p.c. The *U.S.P.* and the *P.G.* employ volumetric methods of determination. The *U.S.P.* requires the salt to yield 98·5 p.c. of pure Lithium Carbonate as volumetrically determined by the process given in the small type below. The *P.G.* process, also given below, is direct titration. It is performed on the salt dried at 100° C. (212° F.) and indicates 99·24 p.c. of Lithium Carbonate.

The more generally occurring impurities are Aluminium, Ammonium, Arsenic, Copper, Iron, Lead, Magnesium, Potassium, Sodium, Zinc, and Chlorides, for which it is officially required to yield no characteristic reaction, and Calcium and Sulphates, for which it is required to yield only the slightest reactions. The salt when dissolved in diluted Acetic Acid should leave no insoluble residue. In examining for impurities the salt may be dissolved in diluted Hydrochloric Acid. The presence of Iron and Aluminium may be detected by the addition of Ammonia Solution as described in the Ammonia test below. Arsenic, Copper, and Lead may be detected by the Hydrogen Sulphide test, Zinc by the subsequent addition of Ammonia. A standard for Lead of 10 parts per million is suggested (*C.D.* '08, i. 796), and 2 parts per million for Arsenic. Magnesium may be detected by the usual group reagents; Ammonium, by the behaviour on boiling with Liquor Potassæ, Potassium and Sodium in the residue after separation of all other metals and evaporation to dryness. Calcium, Chlorides and Sulphates, may be detected by the tests given below in small type, with Ammonium Oxalate, Silver Nitrate, and Barium Nitrate Solutions, respectively. The *P.G.* requires that 0·2 gramme of Lithium Carbonate dissolved in 1 c.c. of Hydrochloric Acid and evaporated to dryness, should leave a residue which yields a clear solution in 3 c.c. of Alcohol. The *U.S.P.* uses the Amyl Alcohol test, as described below, in fixing a limit of other alkalis.

Acetic Acid.—1 gramme of the salt dissolved in 40 c.c. of diluted Acetic Acid should leave no insoluble residue, *U.S.P.*

Ammonia.—1 part of Lithium Carbonate mixed with 20 parts of Water and Hydrochloric Acid added drop by drop until the salt is dissolved yields a solution which, on the addition of T.S. of Ammonia until it is of akaline reaction, should produce neither turbidity nor precipitation either before or after boiling, *U.S.P.*

Hydrogen Sulphide.—An aqueous solution of the salt (1 : 50) obtained by the aid of Nitric Acid after the addition of excess of T.S. of Ammonia, should be unaffected by T.S. of Hydrogen Sulphide, *P.G.*; a solution obtained as directed in the preceding *U.S.P.* test should not respond to the time-limit test for heavy metals, *U.S.P.*

Silver Nitrate.—A solution (1 : 50) of the salt as above should not become turbid more than opalescent with T.S. of Silver Nitrate, *P.G.*

Barium Nitrate.—A solution (1 : 50) of the salt as above is unaffected by T.S. of Barium Nitrate, *P.G.*

Ammonium Oxalate.—A solution (1 : 50) of the salt as above is unaffected by T.S. of Ammonium Oxalate.—*P.G.*

Amyl Alcohol.—If to 0·2 gramme of the salt contained in a flat-bottomed flask of 50 c.c. capacity a slight excess of Hydrochloric Acid be added and the mixture evaporated almost to dryness on a water-bath, and if 10 c.c. of Amyl Alcohol [boiling point 132° C. (269·6° F.)] be added and the mixture cautiously heated until the lower aqueous layer has evaporated, then upon the addition of 3 drops of Hydrochloric Acid and boiling for three minutes the resulting insoluble residue should weigh not more than 0·003 gramme. The removal of the Water from the Amyl Alcohol mixture is facilitated by passing a current of air through the hot solution, *U.S.P.*

Volumetric Determination.—0·5 gramme of Lithium Carbonate dried at 100° C. (212° F.) should require for neutralisation not less than 13·4 c.c. of

Normal Volumetric Solution of Hydrochloric Acid, *P.G.*; a solution of 0·5 gramme of Lithium Carbonate in 20 c.c. of Normal Sulphuric Acid Volumetric Solution should require not more than 6·6 c.c. of Normal Potassium Hydroxide Volumetric Solution for complete neutralisation, using Methyl Orange Solution as indicator, *U.S.P.*

Not Official.

LIQUOR LITHII CARBONATIS (Lithia Water).—10 fl. oz. of aërated Water contain 5 grains of Lithium Carbonate.

LITHII CITRAS.

LITHIUM CITRATE.

$Li_3C_6H_5O_7$, $4H_2O$, eq. 280·05.

A white crystalline powder, possessing a cool, slightly alkaline taste.

It may be prepared by neutralising Citric Acid with Lithium Carbonate.

It has been recommended that the formula should be altered to $Li_3C_6H_5O_7$, $5H_2O$, eq. 297·93. The 8th Decennial Revision of the *U.S.P.* maintains the same formula as the *B.P.* 1898. Dott states (*C.D.* '05, i. 489) that the formula with four molecules of Water of crystallisation is generally accepted as accurate. It has been pointed out (*C.D.* '05, i. 489) that the *B.P.* is inaccurate in describing the salt as deliquescent. *U.S.P.* describes it as deliquescent in moist air.

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

The solubility in Water is variously given as 1 in 5 to 1 in 25.

Medicinal Properties.—Similar to those of the Carbonate, but the Citrate being more soluble, it is better adapted for fluid administration.

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

Prescribing Notes.—*Generally given in* **solution,** *or in the form of Lithii Citras Effervescens.*

Official Preparation.—Lithii Citras Effervescens.

Not Official.—Lithii Citras Laxativus Effervescens.

Foreign Pharmacopœias.—Official in U.S.; Mex. (Citrato de Litio). Not in the others.

Tests.—Lithium Citrate responds to the tests distinctive of Lithium given under that heading. A 5 p.c. aqueous solution of the salt yields, when boiled with an excess of Calcium Chloride Solution, a white precipitate insoluble in Potassium or Sodium Hydroxide Solution, soluble in Ammonium Chloride Solution. Its aqueous solution is generally faintly alkaline in reaction towards red Litmus paper, but should not redden Phenolphthalein Solution.

It is officially required to lose 19·0 p.c. of moisture when dried at 100° C. (212° F.) and an additional 6·5 p.c. at a temperature of 115·5° C. (240° F.). This statement has been shown (*C.D.* '05, i. 489) to be incorrect. Well-defined crystals, apparently quite dry, lose considerably more than 19·0 p.c. at 100° C. (212° F.). Some large crystals, after exposure for two days to the air, lost 24·8 p.c. under 100° C. (212° F.), and when heated to a temperature of 150° to 160° C. (302° to 320° F.) lost a further 2·8 p.c.

The *B.P.* requires 2 grammes of the salt to leave when burned at a low red heat with a free access of air 0·77 gramme of white residue, corresponding to 98·5 p.c. of the pure Citrate. It is an extremely difficult matter to obtain a white residue, when burned at a low red heat, and, assuming the residue to consist of Lithium Carbonate, the Pharmacopœia figure corresponds to 97·80 p.c. of pure Lithium Citrate, and not 98·5 as officially stated. The *U.S.P.* gravimetric method of determination requires that the salt shall contain not less than 98·44 p.c. nor more than 100·2 p.c. of pure Lithium Citrate. The Carbonate left on cautious ignition is converted into Sulphate, and the complete oxidation of the carbonaceous residue ensured by cautiously re-igniting the residue with a few drops each of Nitric and Sulphuric Acid. The Citrate is not official in the *P.G.*

The Citrate being prepared from Lithium Carbonate, the impurities present in the latter are also liable to be present in the former, and the same methods as are adopted for their detection may also be employed, *see* Lithii Carbonas. Standards are suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and of 1 part per million for Arsenic. The tests for Iron and Aluminium may be carried out on the residue left on ignition after neutralisation with Hydrochloric Acid.

Gravimetric Determination.—0·5 gramme of Lithium Citrate, dried at 150° C. (302° F.), cautiously ignited in a porcelain crucible, the residue cooled, then moistened with a few drops of Nitric and Sulphuric Acids and again cautiously ignited, repeating this operation until the residue of Lithium Sulphate becomes white and of constant weight, it should weigh not less than 0·387 gramme nor more that 0·394 gramme, *U.S.P.*

Ammonia.—Dissolve the residue of Lithium Sulphate remaining from the gravimetric determination in 10 c.c. of boiling Water and acidify with Hydrochloric Acid. The addition of Ammonia Water until the solution has an alkaline reaction should not cause a turbidity or produce a precipitate either before or after boiling, *U.S.P.*

Time-limit Test.—The (1–20) solution acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Amyl Alcohol.—Let the residue obtained by igniting 0·2 gramme of the salt at a red heat be treated with a slight excess of diluted Hydrochloric Acid and the mixture filtered. Then if the filtrate and washings be evaporated and further treated as described under the same heading under Lithium Carbonate, the resulting insoluble residue should weigh not more than 0·002 gramme, *U.S.P.*

Preparation.

LITHII CITRAS EFFERVESCENS. Effervescent Lithium Citrate.

Sodium Bicarbonate, in powder, 58; Tartaric Acid, in powder, 31; Citric Acid, in powder, 21; Lithium Citrate, 5: make into granules. (1 in 20)

Dose.—60 to 120 grains = 4 to 8 grammes.

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

Not Official.

LITHII CITRAS LAXATIVUS EFFERVESCENS.—Lithium Citrate, 10; Sodium Phosphate, dried, 30; Sodium Bicarbonate, 44; Tartaric Acid, 15; Citric Acid, 17·50.—*Bournemouth Formulary*, and *B.P.C.*

LITHII BENZOAS (Li $C_7H_5O_2$, eq. 127·10).—A white powder, or small shining scales, with a faintly acid reaction; the taste is sweet and somewhat saline. It can be prepared by boiling, in Water, 73·49 parts of Lithium Carbonate with 242·26 parts of Benzoic Acid, and evaporating.

It should contain not less than 98·5 p.c. of pure Lithium Benzoate.

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

Solubility.—1 in 2½ of Water; 1 in 15 of Alcohol (90 p.c.).

The solubility of the salt varies with the amount of uncombined Benzoic Acid which it contains. A pure salt prepared by exactly neutralising Lithium Carbonate with its ascertained equivalent of Benzoic Acid gave the above figure. The figure 1 in 14 recorded in the *Pocket Companion* was obtained from a sample containing 8·6 p.c. of free Benzoic Acid. *See* also under Tests.

Medicinal Properties.—Used extensively in gouty conditions.

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

Foreign Pharmacopœias.—Official in Fr., Ital., Span. (Benzoato Litico), and U.S.; Mex. (Benzoato de Litio). Span. has also Benzoato Litico efervescente. Not in the others.

Tests.—Lithium Benzoate fuses when heated, and at a higher temperature chars, evolving vapours having a Benzoin odour, and finally burns away leaving a residue of Lithium Carbonate. It responds to the tests distinctive of Lithium given under that substance. Its aqueous solution is alkaline in reaction towards red Litmus paper, and, if well prepared, is neutral in reaction towards Phenolphthalein Solution, but commercial samples are frequently acid in reaction towards Phenolphthalein Solution, requiring an appreciable quantity of Tenth-normal Volumetric Potassium or Sodium Hydroxide Solution to restore neutrality.

Samples examined in the author's laboratory have contained from 6 to 14 p.c. of uncombined Benzoic Acid. A 5 p.c. aqueous solution yields with Ferric Chloride T.S. a buff coloured precipitate. A concentrated aqueous solution affords with Hydrochloric Acid a white precipitate soluble in Ether and in Potassium and Sodium Hydroxide Solution. If this precipitate be separated, washed till free from mineral acid, and carefully dried it should possess the m.p., respond to the tests for and be free from the impurities mentioned under 'Acidum Benzoicum.'

The salt is official in the *U.S.P.* and is required to contain not less than 97·66 p.c. nor more than 100·2 p.c. of pure Lithium Benzoate as gravimetrically determined by cautiously igniting in a porcelain crucible a weighed quantity of the salt with about twice its weight of powdered anhydrous Ammonium Sulphate, the weight being recorded when constant. The *U.S.P.* 'purity rubric' says it shall contain not less than 98·5 p.c. of pure Lithium Benzoate, which does not correspond with the above gravimetric determination. The percentage of Lithium Benzoate may also be determined from the alkalinity of the residue on ignition, and this method was adopted in *U.S.P.* 1890. The process was not accurate, and was tedious, on account of the difficulty of burning off the carbonaceous matter. The author has found the following method of direct titration both expeditious and accurate:—Dissolve a weighed quantity of 1 gramme of the salt in 50 c.c. of pure Distilled Water, add about 10 c.c. of Ether and a few drops of Phenolphthalein Solution, shake and titrate with Tenth-normal Volumetric Sodium Hydroxide Solution; 1 c.c. of the Tenth-normal Alkali Solution = 0·012113 gramme Benzoic Acid. A few drops of Methyl Orange Solution are added and the titration continued with Tenth-normal Volumetric Sulphuric Acid Solution, 1 c.c. of which = 0·01271 gramme Lithium Benzoate.

LITHII BROMIDUM (Li Br, eq. 86·32).—A white, granular, deliquescent salt, having a sharp and somewhat bitter, saline taste.

It should contain not less than 97 p.c. of pure Lithium Bromide.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool place.

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

Medicinal Properties.—Owing to the low atomic weight of Lithium, this salt contains more Bromide than either Potassium or Sodium Bromide, and consequently has been recommended as a hypnotic for gouty patients, and in epilepsy.

In the insomnia of neurasthenia (30 grains three times a day).—*Pr.* li. 351. In Bright's disease.—*L.* '95, ii. 685. In gouty cases of aural vertigo, especially when preceded by a mercurial purge.—*M.A.* '95, 221.

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

Foreign Pharmacopœias.—Official in Russ. and U.S.; Mex., Bromuro de Litio. Not in the others.

Tests.—Lithium Bromide fuses when heated at a low red heat, and is slowly volatilised at a higher temperature. It responds to the tests distinctive of Lithium given under that heading. Its aqueous solution is slightly alkaline in reaction towards red Litmus paper, and when acidulated with Nitric Acid affords with Silver Nitrate Solution a yellowish curdy precipitate, insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. Chlorine Water added cautiously to the aqueous solution affords a yellowish coloration, and if the liquid be shaken with Chloroform the colour passes into the Chloroform solution. The salt is official in the *U.S.P.* and is required to contain not less than 97·13 p.c. nor more than 103·17 p.c. of pure Lithium Bromide as volumetrically determined by dissolving a weighed quantity of the dried salt in a measured quantity of Water and titrating an aliquot portion of the solution with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator.

The more generally occurring impurities are those also mentioned under Lithium Carbonate, and similar tests may be employed for their detection. The *U.S.P.* includes a test for Potassium with Sodium Cobaltic Nitrite Solution, prepared by dissolving 4 grammes of Cobaltous Nitrate and 10 grammes of Sodium Nitrite in about 50 c.c. of Water, adding 2 c.c. of Acetic Acid and diluting with sufficient Water to produce 100 c.c.; 0·5 c.c. of this solution added to 5 c.c. of a 5 p.c. aqueous Lithium Bromide Solution should not in 10 minutes produce either a turbidity or precipitate. Iodine may be detected by a violet coloration imparted to the chloroformic or Carbon Bisulphide Solution of the Bromine liberated when the aqueous solution of the salt is treated with Chlorine Water and shaken with either of these solvents.

LITHII GUAIACAS.—Is prepared by digesting pure Guaiacum Resin in an aqueous solution of Lithium Oxide, decanting the clear solution, evaporating and scaling it. Composed of Lithium Oxide, 1; Guaiacum Resin, 3.

Given for chronic gout and some forms of rheumatism.

Tests.—Lithium Guaiacate responds to the tests distinctive of Lithium given under that heading. The aqueous solution yields a blue coloration on the addition of a drop of Ferric Chloride T.S

Dose.—5 grains = 0·32 gramme, twice a day; made into a pill with Dispensing Syrup.

LITHII HIPPURAS.—A white micro-crystalline powder, soluble 1 in $2\frac{1}{2}$ of Water. It has been used as a solvent for Uric Acid deposits.

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

Tests.—Lithium Hippurate yields the tests distinctive of Lithium given under that heading. Its neutral aqueous solution yields on the addition of Hydrochloric Acid an immediate crystalline deposit, and with Ferric Chloride T.S. a cream coloured precipitate, soluble in excess of the reagent.

LITHII QUINAS (Lithium Kinate. Urosine).—A whitish or brownish-white, granular, effervescent powder, or in the form of tablets. A 50 p.c. solution is also supplied for dispensing. Employed as a solvent of Uric Acid deposits in gout.—*B.M.J.* '99, i. 1470; '01, ii. 478; *L.* '99, i. 1722; *P.J.* '00. i. 57.

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

Tests.—Lithium Chinate affords the tests distinctive of Lithium given under that heading.

LITHII SALICYLAS $LiC_7H_5O_3$, eq. 142·98.—A deliquescent, white or greyish-white powder, with a faintly acid reaction and a sweetish taste.

It should contain not less than 98·5 p.c. of pure Lithium Salicylate.

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

Solubility.—4 in 3 of Water; 1 in 2 of Alcohol (90 p.c.).

Medicinal Properties.—A remedy for gout and rheumatism.

Is much better than Sodium Salicylate in chronic articular rheumatism.—*B.M.J.* '86, i. 38; '87, i, 695.

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

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Mex. (Salicilato de Litio), Span. and U.S. Span. has also Salicilato de litina efervescente. Not in the others.

Tests.—Lithium Salicylate when strongly heated is decomposed, leaving a residue of Lithium Carbonate and unburnt Carbon, and evolving an odour of Phenol. It yields the tests distinctive of Lithium given under that heading. The aqueous solution is faintly acid in reaction towards blue Litmus paper, and yields with Ferric Chloride T.S. a violet coloration if not too concentrated, and in very strong solutions a deep red colour changing to a deep violet on dilution. A concentrated aqueous solution yields on the addition of Hydrochloric Acid a white crystalline precipitate which, when separated, washed free from mineral acid, and carefully dried, responds to the tests and should be free from the impurities given under 'Acidum Salicylicum.' When warmed with concentrated Sulphuric Acid and a few drops of Methyl Alcohol, the salt evolves an odour of Wintergreen Oil. The salt is official in the *U.S.P.* and *P.G.* The former Pharmacopœia requires it to contain not less than 98·36 p.c. nor more than 100·46 p.c. of pure Lithium Salicylate as gravimetrically determined by cautiously igniting a weighed quantity of the salt in a porcelain crucible with about twice its weight of powdered anhydrous Ammonium Sulphate and recording the weight of the residue when constant. No method of determination is given in the *P.G.*

It is liable to contain the impurities mentioned under Lithium Carbonate, and the same methods as there described may be employed for their detection. The Salicylic Acid should be separated before applying the tests, the tests being carried out on the filtrate from the Salicylic Acid. In addition, the aqueous solution of the salt should be colourless or almost colourless, it should not effervesce on the addition of diluted acids, and when shaken with 15 parts of concentrated Sulphuric Acid, it should not impart any colour to the acid in 15 minutes, indicating respectively the absence of Iron salts, Carbonates and foreign organic matters.

LITHII THEOBROMINÆ SALICYLAS (Lithium Diuretin, Uropherin, Uropherin Salicylate).—A white, odourless powder, readily soluble in Water. Used as a diuretic.

Dose.—15 to 20 grains = 1 to 1·3 grammes.

Tests.—Lithium Theobromine Salicylate affords the tests distinctive of Lithium given under that heading. The aqueous solution affords with Ferric Chloride T.S. a violet coloration.

LITHII BITARTRAS (Lithium Acid Tartrate).—A white, odourless, crystalline powder, readily soluble in Water. It has been used in gouty affections.

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

Uricedin.—A yellowish-brown, granular powder, containing principally Sodium Citrate, Lithium Citrate and Sodium Sulphate. Stated to afford relief in gout more from the pleasant laxative action than from pain-diminishing effects; results in acute gout not thoroughly satisfactory.—*L.* '05, i. 83.

Dose.—60 to 120 grains = 4 to 8 grammes.

LOBELIA.

LOBELIA.

FR., LOBÉLIE ENFLÉE; GER., LOBELIENKRAUT; ITAL., LOBELIA.

The dried flowering Herb of *Lobelia inflata*, Linn.

Imported from North America.

It contains a non-volatile, poisonous alkaloid, **Lobeline,** a volatile Oil, a fixed Oil, a neutral principle, 'Inflatine,' and a characteristic acid, Lobelic Acid; the alkaloid is a powerful emetic.

Medicinal Properties.—In small doses it is depressant, antispasmodic, diaphoretic, diuretic and expectorant. More freely used, it is cathartic and emetic; but as an emetic it is too distressing as well as too hazardous for general use, as it has a powerful effect on the respiration, and may cause death. It is chiefly used in spasmodic asthma, also in laryngeal and bronchial catarrh with thick and scanty secretion, severe croup, and for the paroxysmal dyspnœa of chronic bronchitis and of whooping-cough. In some cases a useful adjunct to diuretics. Its action in asthma is promoted by the addition of Bromide or Iodide.

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

Official Preparation.—Tinctura Lobeliæ Ætherea.

Not Official.—Pulvis Lobeliæ Compositus, Tinctura Lobeliæ.

Antidotes.—In case of poisoning by Lobelia, the most active stimulants should be employed, as well as the stomach-tube. Recumbent position imperative.

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

Descriptive Notes.—The usual form in which the drug is imported consists of rectangular cakes of the chopped herb (1 to $1\frac{3}{4}$ in. thick), compressed and wrapped in paper, or more rarely in the form of the entire herb dried. The official description directs the flowering herb (collected after a portion of the capsules have become inflated, *U.S.P.*). The harvest is collected in August and September, about which time the new crop is obtainable. The stems are often purplish, have alternate leaves, are obovate or oblong, irregularly toothed (serrate-denticulate, *U.S.P.*), and have 1-celled hairs. The capsules are inflated and 2-celled, and contain, when ripe, minute oblong reticulated brown seeds $\frac{1}{50}$ in. long (0·5 to 0·7 mm. long, *P.G.*) by $\frac{1}{240}$ in. in diameter. The transverse section of the stem contains laticiferous vessels in the bast. It has a somewhat irritating odour, and a burning acrid taste is slowly developed when the seeds are chewed. The hairs are more frequent on the under surface of the leaves and on the middle and lower portion of the stem. The edge of the leaf bears small whitish glands. According to Lloyd, preparations of the seed are more uniform and reliable than those of the herb. The distinctive microscopical features of *Lobelia inflata* are the whitish glands on the margin of the leaf, the 1-celled hairs with cuneate cells around their base, the large epidermal cells and the laticiferous cells and the reticulated seed coats. As the seeds are more expensive than the drug, mature capsules are rarely found in the dried herb.

Tests.—Lobelia yields from 5 to 10 p.c. of ash.

Preparation.

TINCTURA LOBELIÆ ÆTHEREA. ETHEREAL TINCTURE OF LOBELIA.

4 of Lobelia, percolated with Spirit of Ether to yield 20.

Now 1 in 5 instead of 1 in 8.

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

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

Tests.—Ethereal Tincture of Lobelia has a sp. gr. of 0·815 to 0·820; contains from 1 to 2 p.c. w/v of total solids and about 65 p.c. w/v of Absolute Alcohol. A determination of the Alcohol may be made by converting it into a crystalline Calcium Chloride product and removing the Ether by a current of air.

Not Official.

PULVIS LOBELIÆ COMPOSITUS.—Potassium Nitrate, 240; Boiling Distilled Water, 240; dissolve, and add to Lobelia, in powder, 240; Stramonium Leaves, in powder, 240; Black Tea, in powder, 240. Mix well, dry, and add Oil of Anise, 1.—*Martindale.*

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

Lobelia, 25; Stramonium, 25; Potassium Nitrate, 25; Oil of Anise, 0·10; Distilled Water, boiling, 25; Tea Leaves, in powder, *q.s.* to produce 100. Same directions as above.

TINCTURA LOBELIÆ.—1 of Lobelia, percolated with Alcohol (60 p.c.), to yield 8. (1 in 8)

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.; but 1 fl. drm. = 3·6 c.c. may be given for asthmatic dyspnœa; repeated every 15 minutes until nausea is produced.

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 3 grammes of the 1 in 10 Tincture.

B.P. '85, but omitted in '98; included in *B.P.C. Formulary* 1901, and incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Norw., Span., Swed., Swiss and U.S., 1 in 10; Hung., Mex. and Port., 1 in 5; all by weight except U.S. U.S. has also Fluidextractum Lobeliæ, 1 in 1, using diluted Acetic Acid as the menstruum.

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

Tests.—Tincture of Lobelia has a sp. gr. of about 0·930; contains about 2 p.c. w/v of total solids and about 50 p.c. w/v of Absolute Alcohol.

Farr and Wright (*C.D.* '93, i. 454) conclude that extraction of alkaloid depends very little upon the strength of Alcohol, and reckon Alcohol (50 p.c.) to be least objectionable. Details of determination process are given, and the figures show the Tincture to vary between 0·027 and 0·044 (average 0·038) p.c. of alkaloid = 0·3 p.c. for average drug.

In the Tincture or an aqueous solution of the drug the alkaloid is destroyed by heat. When evaporation is required the solution must be acidified (*P.J.* (3) xvii. 1037; (3) xviii. 135); but Farr and Wright repeatedly exposed their pure alkaloidal residue to 100° C. without loss of weight, and it continued to give the usual alkaloidal reactions.—*C.D.* '93, i. 454.

LUPULUS.

HOPS.

B.P.Syn.—HUMULUS.

Fr., Houblon; Ger., Hopfen; Ital., Luppolo; Span., Lupulo.

The dried Strobiles of *Humulus Lupulus*, L., collected from cultivated Plants.

Medicinal Properties.—Bitter stomachic, sedative. Has been recommended in the treatment of alcoholism. It sometimes produces sleep when opiates are objectionable. Hops may be used topically as fomentation or poultice in painful inflammatory swellings; and for colic and other internal pains. Hop (which has been carefully dried and preserved) is made into a pillow, to induce sleep.

The Hop pillow probably owed any reputation it ever had to its coolness and the suggested purpose of its use rather than to any direct influence of the odour. —*L.* '08, i. 427.

Incompatibles.—Mineral acids, metallic salts.

Official Preparations.—Infusum Lupuli and Tinctura Lupuli. *See* also Lupulinum.

Not Official.—Extractum Lupuli.

Foreign Pharmacopœias.—Official in Fr. (Houblon), Mex. (Lupulo), Port., Span. and U.S. Not in the others.

Descriptive Notes.—In this country hops are chiefly cultivated in Kent, Hertford, Sussex, Hants, Surrey and Worcester, and are imported occasionally from Bavaria, Belgium, Holland, the United States and Canada. Many varieties are in cultivation, differing chiefly in shape and size, and slightly in flavour and bitterness. Usually hops are subjected to the vapour of Sulphurous Acid to prevent the brownish coloration and the development of the Valerianic Acid odour which takes place in old hops. The strobiles in commerce vary in length from ¾ to 1½ in. (19 to 37 mm.); *B.P.* and *U.S.P.* about 30 mm. They are oval or oblong-oval in outline, and consist of imbricated membranous stipules and bracts, each bract having in its axil a small rounded fruit or achene, which, as well as the bracts and stipules, bear numerous yellow glands, in which the bitter taste and the odour principally reside. The best test of the freshness of hops is the odour, which becomes distinctly valerianic in hops that have been kept long. The amount of Lupulin present should be noted, especially if strobiles are much broken, as it is said to be the practice in some places to sift out as much Lupulin as possible for separate sale. The quality of hops has been judged by the amount of extract yielded to Benzol, which varies from 12 to 19 p.c.; Worcester hops yielded 17·1 p.c.; Sussex 16 p.c.; Kent 14·6 p.c.; and the highest percentage was obtained from Californian hops. From unsulphured hops the extract is green, from sulphured hops brown. On distillation with Water, hops yield 0·9 p.c. of volatile oil. Besides the bitter principle, Lupulite, hops contain Lupulotannic Acid and three resins.

Tests.—The ethereal extract obtained from Hops varies from 9 to 15 p.c. and consists of oil, resin and bitter principle. The ash varies from 5 to 7 p.c. and should not exceed the latter figure.

Preparations.

INFUSUM LUPULI. Infusion of Hops.

Hops, freshly broken, 1; Distilled Water, boiling, 20; infuse 15 minutes; strain. (1 in 20)

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

Foreign Pharmacopœias.—Official in Fr. and Mex., 1 in 100. Not in the others.

TINCTURA LUPULI. Tincture of Hops. *N.O.Syn.*—Tinctura Humuli.

4 of Hops, macerated with 20 of Alcohol (60 p.c.). (1 in 5)

B.P. '85 was 1 in 8.

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

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

Tests.—Tincture of Hops has a sp. gr. of 0·930 to 0·935; contains about 4 p.c. w/v of total solids and about 56 p.c. w/v of Absolute Alcohol.

LUPULINUM. Lupulin.

Glands obtained from the Strobiles of *Humulus Lupulus.*

Medicinal Properties. Bitter stomachic, sedative.

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

Prescribing Notes.—*Given in* **cachets** *or* **pills.** *A good pill can be made by means of Alcohol* (90 *p.c.*), *q.s.*

Not Official.—Extractum Lupulini, Fluidextractum Lupulini, Oleoresina Lupulini and Tinctura Lupulini.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung., Ital., Port., Span., Swiss and U.S.

Descriptive Notes.—The Lupulin of commerce is obtained by stripping the bracts off the strobiles, and separating the powder by a sieve, or by sifting the deposit of Lupulin that forms at the bottom of the hop kilns and hop pockets. The grains of Lupulin are officially described as consisting of a single layer of cells, the cuticle of which has been raised by the secretion of oil or oleoresin. The strobiles yield about 8 to 12 p.c. of Lupulin which, when incinerated, leaves about 7·3 p.c. of ash. It may contain, as impurities, debris of the bracts and sand or earthy matter, the amount of which can be roughly estimated by floating the Lupulin on Water, when the heavier matter will sink to the bottom. The contents of the glands (about 75 p.c.) are liquid at first, concreting into a mass in the centre, and consist of Myricyl Palmitate, resin, a bitter principle named Lupulite, or Lupamarin, and an essential oil containing Valerol, which changes gradually to Valerianic Acid. When fresh it is of a greenish or yellow colour from dried hops, but of brownish-yellow colour from sulphurated hops, and becomes darker on keeping and acquires a distinct odour of Valerianic Acid. When triturated in a mortar the glands are ruptured and can be worked into a plastic mass.

Tests.—Lupulin is officially required to contain not more than 40 p.c. of matter insoluble in Ether; the *U.S.P.* requires that it shall contain not less than 60 p.c. of matter soluble in Ether. The official limit of ash is not more than 12 p.c., that of the *U.S.P.* not more than 10 p.c. It has been suggested (*Y.B.P.* '03, 245) that the ash standard should be raised to 'not exceeding 14 p.c.' Eight samples examined in the author's laboratory gave 28·2, 33·8, 29·9, 27·9, 20·6, 12·1, 18·7, and 25·4 p.c. of ash. The Report of the Committee of Reference in Pharmacy states, 'presumably this drug will be omitted in the next *B.P.*, as it is practically never used.' The proposed raising of the ash figure would admit more rubbish than at present. The figure of 10 p.c. is certainly high enough if the drug is to be retained. It is official in the 8th Decennial Revision of the *U.S.P.*

Not Official.

EXTRACTUM LUPULI.—Hops extracted with Alcohol and subsequently with boiling Water by a process similar to that of Extractum Jalapæ.
16 oz. Hops yield 4 to 5 oz. Extract.

Dose.—5 to 15 grains = 0·32 to 1 gramme.
B.P. '85, but omitted in '98; now incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex. and Port. have alcoholic Extracts, but not made the same way; U.S. has a **Fluidextract** from Lupulin.

EXTRACTUM LUPULINI.—Lupulin exhausted with Alcohol (90 p.c.) yields about 50 p.c. of Extract.

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

FLUIDEXTRACTUM LUPULINI.—Prepared with Alcohol (95 p.c.), so that 1 fl. oz. represents 1 oz. of Lupulin.—*U.S.P.*

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

OLEORESINA LUPULINI.—Exhaust Lupulin with Acetone; distil off most of the Acetone on a water-bath, and complete by exposure to the air.—*U.S.P.*

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.
This has been incorporated in the *B.P.C.*

TINCTURA LUPULINI.—Lupulin, 1; Alcohol (90 p.c.), *q.s.* to yield 8.

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

Not Official.

LYCOPODIUM.

The Spores of *Lycopodium clavatum*, L., and other species of *Lycopodium*; a fine powder, pale yellowish, very mobile, inodorous, tasteless, floating upon Water and not wetted by it, but sinking on being boiled with it, and burning quickly when thrown into a flame.

It has been used in dispensing chiefly as powder to envelop hygroscopic pills.

Recommended in incontinence of urine, and irritability of bladder, in the form of **Tinctura Lycopodii** (1 in 10 of Alcohol 90 p.c.)

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

Used as a dusting powder for eczema, and to prevent chafing of skin; also as a basis for insufflations and snuffs.

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

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.

Not Official.

MAGNESIUM.

MAGNESIUM.

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.

MAGNESIA LEVIS.

LIGHT MAGNESIA.

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.