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THE ESSENTIALS OF MATERIA MEDICA AND THERAPEUTICS.

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THE

ESSENTIALS

OF

MATERIA MEDICA

AND

THERAPEUTICS.

BY

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TENTH EDITION.

REVISED AND EDITED, UNDER THE SUPERVISION OF THE AUTHOR,

BY E. BUCHANAN BAXTER, M.D. LOND.,

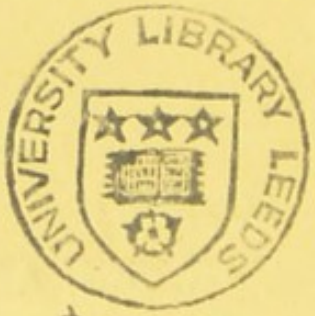
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PREFACE.

THE continued popularity of the present Work affords sufficient proof of its supplying a real want. The Author has endeavoured to render it more worthy of the acceptance of practitioners and students of medicine, without in any way altering its character or adding sensibly to its bulk.

The "Additions to the British Pharmacopœia," published in May, 1874, by authority of the General Medical Council, are incorporated with the present edition; moreover several drugs, now in vogue, but not yet officinal, have been introduced. The chemistry has been revised throughout; and while both nomenclatures have been retained in the heading of each article, in harmony with the British Pharmacopœia; in the formulæ representing chemical transformations, the new nomenclature, which is readily recognisable by difference of type, has been invariably employed. The articles on the physiological and therapeutic action of some of the more important

remedies have been enlarged, and in several instances entirely re-written. A general revision of the whole work has led to the introduction of numerous minor alterations and corrections.

The task of re-editing the book has been mainly entrusted to my friend and former pupil, Dr. Baxter, who has devoted a large amount of time and attention to the study of the physiological and therapeutic action of many important medicines, and upon whose ability and accuracy I can fully rely.

10, Harley Street,
Cavendish Square, W.
June, 1874.

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ARTICLES * INCLUDED IN THE BRITISH PHARMACOPŒIA OF 1867, BUT NOT IN THAT OF 1864.

(Those printed in italics were included in one or more of the Pharmacopœias of London, Edinburgh, and Dublin.)

Acetum Cantharidis, Lond.
,, *Scillæ, Lond., Edin., Dubl.*
Acidum Carbolicum
Adeps Benzoatus
Ammonii Bromidum
Amygdala amara, Edin.
Atropiæ Sulphas, Lond.
,, Sulphatis Liquor
Bismuthi Carbonas
Bismuthi et Ammoniæ Citratis Liquor
Cadmii Iodidum
,, Iodidi Unguentum
Canellæ Albæ Cortex, Lond., Edin., Dubl.
Cerii Oxalas
Charta Epispastica
Collodium Flexile
Confectii Opii, Lond.
Decoctum Ulmi, Lond.
Emplastrum Cerati Saponis
,, Plumbi Iodidi
Essentia Anisi, Dubl.
,, *Menthæ Piperitæ, Dubl.*
Extractum Lactucæ, Lond.
,, Mezerei Æthereum
,, *Papaveris, Lond., Edin.*
,, *Pareiræ, Lond., Edin.*
,, Physostigmatis
Glycerinum Acidi Carbolici
,, ,, Gallici
,, ,, Tannici
,, Amyli
,, Boracis
Infusum Aurantii compositum, Lond.
,, *Gentianæ compositum, Lond.*
Lactuca, Dubl.
Linimentum Potassii Iodidi cum Sapone
,, Sinapis compositum
Liquor Ammoniæ Acetatis, Lond., Edin.
,, *Ammoniæ Citratis, Lond.*
,, Arsenici Hydrochloricus
,, Atropiæ Sulphatis
,, Bismuthi et Ammoniæ Citratis
,, Ferri Perchloridi (same strength as Tinctura Ferri Perchloridi)
,, *Hydrargyri Perchloridi, Lond.*
,, Iodi.
,, Lithiæ effervescens
,, Magnesiæ Carbonatis
,, *Morphiæ Acetatis, Lond., Dubl.*
,, *Potassæ effervescens, Lond.*, 1836
,, *Sodæ effervescens, Lond.*, 1836
,, *Zinci Chloridi, Dubl.*
Lotio Hydrargyri Flava
,, ,, Nigra
Mistura Ferri Aromatica, Dubl.
,, Sennæ Composita
,, *Spiritûs Vini Gallici, Lond.*
Morphiæ Acetas, Lond., Edin., Dubl.
,, *Acetatis Liquor, Lond., Dubl.*
Oleum Sinapis
Oleum Theobromæ

* From the British Pharmacopœia.

Ovi Vitellus, Lond.
Oxymel Scillæ, Lond.
Physostigmatis Faba
,, Extractum
Pilula Aloes et Ferri, Edin.
Pilula Conii Composita, Lond.
,, *Ipecacuanhæ cum Scilla, Lond.*
,, Quiniæ
Plumbi Iodidum, Lond., Edin., Dubl.
Plumbi Iodidi Emplastrum
,, *Iodidi Unguentum, Lond., Dubl.*
Pulvis Opii Compositus
Pyrethri Radix, Lond., Edin.
,, Tinctura
Rhamni Succus, Lond., Edin.
Sodæ Citro-tartras effervescens
,, *Sulphas, Lond., Edin., Dubl.*
Spiritus Ammoniæ Fœtidus, Lond., Edin., Dubl.
Spiritus Vini Gallici, Lond.
,, ,, ,, *Mistura, Lond.*
Sulphuris Iodidum, Lond., Dubl.
,, *Iodidi Unguentum, Lond.*
Sumbul Radix
,, Tinctura
Suppositoria Hydrargyri
,, Plumbi Composita
Syrupus Rhamni, Lond., Edin.
,, Rhei
Tinctura Chloroformi Composita
,, *Cubebæ, Dubl.*
Tinctura *Ferri Acetatis, Dubl.*
,, *Opii Ammoniata, Edin.*
,, Pyrethri
,, *Quassiæ, Edin.*
,, Sumbul
,, Veratri Viridis
,, Zingiberis Fortior
Trochisci Ferri Redacti
,, Ipecacuanhæ
,, Potassæ Chloratis
,, *Sodæ Bicarbonatis, Lond.*
Unguentum Cadmii Iodidi
,, Hydrargyri compositum
,, *Picis Liquidæ, Lond., Edin., Dubl.*
,, *Plumbi Acetatis, Lond.*
,, ,, *Iodidi, Lond., Dubl.*
,, Potassæ Sulphuratæ
,, *Sulphuris Iodidi, Lond.*
Vapor Acidi Hydrocyanici
,, Chlori
,, Coniæ
,, Creasoti
,, Iodi
Veratri Viridis Radix
,, ,, Tinctura
Vinum Aurantii
,, Ferri Citratis
,, Quiniæ
,, *Rhei, Dubl., Edin.*

ARTICLES INCLUDED IN THE BRITISH PHARMACOPŒIA OF 1864, BUT OMITTED IN THAT OF 1867.

Catechu Nigrum
Cocculus
Nitrite of Soda
Spiritus Pyroxylicus Rectificatus
Unguentum Cocculi

Articles included in the New Edition of the British Pharmacopœia (1874), but not in that of 1867.

Aether Aceticus
Ammoniæ Nitras
Amyl Nitris
Aqua Chloroformi
Areca
Aurantii Fructus
Bismuthi Oxidum
Calcis Hypophosphis
Charta Sinapis
Chloral Hydras
Extractum Glycyrrhizæ Liquidum
Gutta-percha
Hydrargyri Oxidum Flavum
Injectio Morphiæ Hypodermica
Laricis Cortex
Liquor Gutta-percha
Liquor Magnesiæ Citratis
Oleum Phosphoratum
Pepsin
Pilula Phosphori
Pilula Scammonii Composita
Pulvis Elaterii Compositus
Pulvis Glycyrrhizæ Compositu
Sapo Animalis
Sodæ Hypophosphis
Succus Belladonnæ
Succus Hyoscyami
Suppositoria Acidi Carbolici cum Sapone
,, Morphiæ cum Sapone
,, Acidi Tannici cum Sapone
Syrupus Chloral
Tinctura Aurantii Recentis
Tinctura Laricis
Tinctura Quiniæ Ammoniata

MATERIA MEDICA.

INTRODUCTION.

In the various preparations contained in the first part of this work, constant reference is made to weights and measures, temperature, &c.; and it is therefore important that these should be clearly understood.

In the British Pharmacopœia the weights employed differ from those previously used in any other similar work; the apothecaries' weight of the London and Edinburgh Pharmacopœia has been abolished, and the avoirdupois pound and ounce adopted, together with the troy grain; the subdivisions of the avoirdupois ounce introduced into the Dublin Pharmacopœia in 1850, have likewise been discarded, and there is now no intermediate weight between the ounce and grain. The measures remain the same as those of the London, Edinburgh, and Dublin Pharmacopœias. The weights and measures of the British Pharmacopœia are as follows:—

WEIGHTS.

1 Grain	gr.	= weight of $\frac{1}{252{\cdot}456}$	cubic inch of pure water.
1 Ounce	oz.	=	437·5 grains.
1 Pound	lb.	= 16 ounces =	7000 ,,

MEASURES OF CAPACITY.

1 Minim	min.		
1 Fluid drachm	fl. drm.	=	60 minims.
1 Fluid ounce	fl. oz.	=	8 fluid drachms.
1 Pint	O.	=	20 fluid ounces.
1 Gallon	C.	=	8 pints.

MEASURES OF LENGTH.

1 line = $\frac{1}{12}$ inch.
1 inch = $\frac{1}{39{\cdot}1393}$ seconds pendulum.
12 ,, = 1 foot.
36 ,, = 3 feet = 1 yard.

Length of pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea . . . . . } 39·1393 inches.

RELATION OF MEASURES TO WEIGHTS.

1 Minim is the measure of . . . . 0·91 grains of water.
1 Fluid drachm ,, . . . 54·68 ,,
1 Fluid ounce ,, 1 ounce or . 437·5 ,,
1 Pint ,, 1·25 pounds or 8750·0 ,,
1 Gallon ,, 10 pounds or 70,000·0 ,,
1 Cubic inch of distilled water, in air, at 62°=252·456 grs.

WEIGHTS AND MEASURES OF THE METRICAL SYSTEM.

WEIGHTS.

1 Milligramme = the thousandth part of one gram. or 0·001 gram.
1 Centigramme = the hundredth ,, 0·01 ,,
1 Decigramme = the tenth ,, 0·1 ,,
1 Gramme = weight of a cubic centimetre of water at 4° C. 1·0 ,,
1 Decagramme = ten grammes ,, 10·0 ,,
1 Hectogramme = one hundred grammes ,, 100·0 ,,
1 Kilogramme = one thousand grammes ,, 1000·0 ,,

MEASURES OF CAPACITY.

1 Millitre = 1 cub. centim. or the mea. of 1 gram. of water.
1 Centilitre = 10 ,, 10 ,, ,,
1 Decilitre = 100 ,, 100 ,, ,,
1 Litre = 1000 ,, 1000 ,, (1 kilo.)

MEASURES OF LENGTH.

1 Millimetre = the thousandth part of one metre or 0·001 metre.
1 Centimetre = the hundredth ,, 0·01 ,,
1 Decimetre = the tenth part ,, 0·1 ,,
1 Metre = the ten-millionth part of a quarter of the meridian of the earth.

RELATION OF THE WEIGHTS OF THE BRITISH PHARMACOPŒIA TO THE METRICAL WEIGHTS.

1 Pound = 453·5925 grammes.
1 Ounce = 28·3495 ,,
1 Grain = 0·0648 ,,

RELATION OF MEASURES OF CAPACITY OF THE BRITISH PHARMACOPŒIA TO THE METRICAL MEASURES.

1 Gallon	= 4·543487	litres.	
1 Pint	= 0·567936	,,	or 567·936 cubic centimetres.
1 Fluid ounce	= 0·028396	,,	28·396 ,,
1 Fluid drachm	= 0·003549	,,	3·549 ,,
1 Minim	= 0·000059	,,	0·059 ,,

RELATION OF THE METRICAL WEIGHTS TO THE WEIGHTS OF THE BRITISH PHARMACOPŒIA.

1 Milligramme	=	0·015432 grs.
1 Centigramme	=	0·15432 ,,
1 Decigramme	=	1·5432 ,,
1 Gramme	=	15·432 ,,
1 Kilogramme	=	2 lbs. 3 oz. 119·8 grs. or 15432·348 grs.

RELATION OF THE METRICAL MEASURES TO THE MEASURES OF THE BRITISH PHARMACOPŒIA.

1 Millimetre	=	0·03937	inches.
1 Centimetre	=	0·39371	,,
1 Decimetre	=	3·93708	,,
1 Metre	=	39·37079	,, or 1 yard 3·7 inches.
1 Cubic centimetre	=		15·432 grain measures.
1 Litre	=	1 pint 15 oz. 2 drs. 11 m.	or 15432·348 grain measures.

All liquids are ordered by measure unless it is stated otherwise.

It will be seen that the solid drachm and the scruple have been omitted from the Pharmacopœia; if the signs ʒj and ℈j are still made use of, they will represent sixty and twenty grains respectively, and not the eighth and twenty-fourth part of the avoirdupois ounce.

The avoirdupois fluid ounce corresponds to the solid ounce, in the case of distilled water at 60° Fah.; that is, one fluid ounce weighs exactly an ounce. A minim of distilled water, however, does not weigh one grain, as the fluid ounce is divided into 480 minims; the solid ounce into 437·5 grains only.

GROUPS OF PHARMACOPŒIA PREPARATIONS.

The following remarks concerning certain groups of pharmaceutic preparations contained in the British Pharmacopœia may prove of service to the reader, by enabling him to discover at a glance the nature of their more important general characters, and facilitating the understanding of some peculiarities in nomenclature and methods of preparation found in many of them.

Acida. Acids. Among this group, directions are found for making certain *dilute acids,* and the same rule has in most instances been followed ; for example, Acidum Hydrochloricum Dilutum, Acidum Nitricum Dilutum, Acidum Nitro-hydrochloricum Dilutum, Acidum Phosphoricum Dilutum, and Acidum Sulphuricum Dilutum, will be seen to have nearly the same neutralizing powers, measured, except in the case of dilute phosphoric acid, by the amount of an alkaline solution which they are capable of saturating. Acidum Sulphuricum Aromaticum, which is really a dilute acid, is somewhat weaker; and Acidum Aceticum Dilutum has been so formed as to assimilate it closely in strength with Acetum, or vinegar. Acidum Hydrocyanicum Dilutum hardly belongs to the same category of medicines, as it is not employed on account of its acid properties.

Alkaloidea. Alkaloids. Many alkaloids are made officinal, as Aconitia, Atropia, Morphia, Quinia, Strychnia, &c. ; the alkaloid is generally the chief active principle of the plant in which it is contained. Chemically these bodies are of considerable interest, and they are found to be analogues of ammonia. Most of the alkaloids contain carbon, oxygen, hydrogen, and nitrogen ; some few, not officinal, though contained in officinal plants, contain carbon, hydrogen, and nitrogen only ; such as Conia and Nicotina ; these latter are liquid at ordinary temperatures. The methods of separating many of the alkaloids are given in the Pharmacopœia, but these differ so much from each other that no general rule can be laid down. The explanation of each process will be given under the particular alkaloid.

Aquæ. Waters. The waters of pharmacy consist of water holding in solution very small quantities of oils or other volatile principles. In the British Pharmacopœia two principal methods are adopted for making these preparations. In the first, the part of the plant is ordered to be placed with water in a retort, and a certain quantity of water brought over by distillation : this is the case with the dill, caraway, cinnamon, fennel, cherry-laurel, pimento, rose, and elder-flower waters.

The second method consists in distilling the volatile oils, previously obtained from the plants, with water ; peppermint and spearmint waters are thus prepared.

Aqua Camphoræ, formerly termed Mistura Camphoræ, is made simply by allowing water to dissolve as much camphor as it is capable of taking up ; Aqua Chloroformi is a very dilute solution of Chloroform in water ; and Aqua Destillata is only water dis-

tilled with such precautions, as to ensure its freedom from any appreciable or important amount of foreign matters.

Cataplasmata. Cataplasms or Poultices. Cataplasms are soft, moist, local applications, employed sometimes solely for the sake of their moisture and temperature, but more frequently, in addition to these properties, on account of certain peculiar active remedies contained in them.

The basis of the cataplasms in the British Pharmacopœia is linseed meal, either alone or united with bread or flour; boiling water is employed for mixing the ingredients, except in the case of Cataplasma Fermenti, when water at 100° Fah. is made use of, in order that the catalytic powers of the ferment may not be injured by the heat. Olive oil is added to the Cataplasma Lini as a substitute for the natural oil which has been removed from the linseed by expression.

Confectiones. Confections, Electuaries, or Conserves. Confections are used sometimes merely as a basis for pill masses, &c., sometimes for the exhibition of sparingly soluble remedies which require to be administered in bulky doses. Honey or sugar, or both these substances, form a prominent part of all confections.

Decocta. Decoctions. A decoction is a watery solution of a medicinal substance prepared by boiling. The length of time ordered in the Pharmacopœia is in most instances from ten to twenty minutes; in some cases boiling for an hour is directed, and, in one instance, Decoctum Granati Radicis, two pints are to be reduced to the bulk of a pint. The length of time should be proportionate to the solubility of the active matter of the drug; but prolonged boiling is often objectionable from rendering this portion less active, or even inert. In two decoctions only, namely, Decoctum Aloes Compositum and Decoctum Sarsæ Compositum, are the preparations made compound by the introduction of more than one active drug. Only those medicines should be used in the form of decoction which contain active principles not injured by the boiling temperature; if volatile oils are present, they are dissipated in the process. Decoctions should be strained when hot, as a deposit of active matters occasionally takes place when the preparation becomes cold, as in Decoctum Cinchonæ Flavæ.

All the decoctions are prepared from vegetable substances.

Essentiæ. Essences. There are two preparations under the above heading, Essence, in the British Pharmacopœia, viz., the Essence of Anise and of Peppermint, in each of which the volatile oil of the plant is dissolved in four parts by volume of Rectified Spirit,—

hence the essences are only alcoholic solutions of the volatile oils. Many other essences are known in commerce, as the Essence of Almonds, for example.

Extracta. Extracts. Many kinds of extracts are found in the British Pharmacopœia.

1. Some consist of the fresh juice, reduced to the state of solid extract by evaporation : these are commonly termed fresh or green extracts, and are ordered to be prepared in the following manner. The juice obtained from the fruits of the plant, leaves and flowering tops, &c., is first heated to 130°, in order to coagulate the *green colouring matter*, filtered and heated to 200°, at which temperature the *albumen* is coagulated. After being again filtered to remove the albumen, the juice is evaporated at a temperature not exceeding 140° to the consistence of a thin syrup, and the colouring matter, previously separated by the first coagulation, is added, and the whole evaporated to the proper consistence of an extract.

It will be observed, if the details of the process be examined, that the colour of a green extract is no test of its goodness, for the evaporation of the bulk of the juice may have been carried on at too high a temperature, and yet the product may preserve its green appearance, provided the last part of the process be carefully conducted.

The green extracts of the Pharmacopœia are Extractum Aconiti, Extractum Belladonnæ, Extractum Conii, Extractum Hyoscyami, and Extractum Lactucæ. Extractum Colchici and Extractum Taraxaci, are formed in a similar manner, with the exception that in the preparation of these extracts the temperature of the juice is at once raised to 212° to coagulate the albuminous matters, and the filtered juice afterwards reduced to the proper consistence at a temperature of 160°.

2. A second group of extracts is formed from the drugs in a dry state, by the action of cold or boiling distilled water, by which means all the matters soluble in this menstruum are dissolved, and the fluid afterwards reduced by evaporation to the proper consistence. In this manner the following extracts are prepared :—

Extractum Aloes Barbadensis, Extractum Aloes Socotrinæ, Extractum Anthemidis, Extractum Calumbæ, Extractum Gentianæ, Extractum Glycyrrhizæ, Extractum Hæmatoxyli, Extractum Krameriæ, Extractum Opii, Extractum Papaveris, Extractum Pareiræ, and Extractum Quassiæ.

3. A third group is formed in a similar manner, except that

the active matters are extracted by means of rectified or of dilute spirit, in place of water. This group consists of Extractum Cannabis Indicæ (rectified spirit), Extractum Colocynthidis Compositum (proof spirit), Extractum Jalapæ (first spirit, then cold water), Extractum Lupuli (spirit, then by boiling in water), Extractum Nucis Vomicæ (rectified spirit), Extractum Physostigmatis (rectified spirit), Extractum Rhei (spirit and water), and Extractum Stramonii (proof spirit).

4. In the British Pharmacopœia liquid extracts are introduced; these preparations are made for the most part by macerating the drug in a large quantity of cold water, and extracting by this means such of the active matter as is soluble in this menstruum; afterwards evaporating the watery infusion, and, lastly, adding sufficient spirit to prevent decomposition.

In the Pharmacopœia the following liquid extracts are found: Extractum Belæ Liquidum, Extractum Cinchonæ Flavæ Liquidum, Extractum Ergotæ Liquidum, Extractum Filicis Liquidum, Extractum Glycyrrhizæ Liquidum, Extractum Opii Liquidum, Extractum Pareiræ Liquidum, Extractum Sarsæ Liquidum.

In the case of the liquid extracts of Bael, Ergot, and Pareira, each fluid part represents a solid part of the drug employed.

5. Ether is occasionally employed in lieu of water in the formation of the liquid extracts, especially when the drug contains much oleaginous matter. In the case of Extractum Ergotæ Liquidum it is used to free the preparation from the oil; in that of Extractum Filicis Liquidum it is employed as the solvent of the active matter.

6. Extractum Mezerei Æthereum is a solid extract prepared with rectified spirit and ether. In Extractum Colchici Aceticum, the active principle of the corm is dissolved out by acetic acid.

Glycerina. Glycerines. There is a class of bodies now introduced into the Pharmacopœia in which Glycerine forms the solvent menstruum; they are five in number, and are formed by dissolving Carbolic, Gallic, and Tannic acids, as likewise Starch and Borax in Glycerine. It is probable that these bodies when dissolved in Glycerine, act powerfully upon the part to which they are applied; as Glycerine is readily miscible with aqueous fluids. Glycerine is a very powerful solvent of many substances which are but very sparingly soluble in water, as Arsenious acid, and some salts of the alkaloids.

Infusa. Infusions. There are a few points to be noticed under Infusions.

In the preparation of the majority of them, boiling distilled water is ordered, the time of infusing varying from ten minutes to four hours, according to the solubility of the active ingredients of the drugs ; in some few cases, as in those of the infusions of Chiretta and Cusparia, water at 120° Fah. is made use of ; and in others, as the infusions of Calumba and Quassia, cold distilled water is employed. In the case of calumba the use of cold water is of advantage, as the starch is not dissolved, and hence the infusion will keep much longer, and will not strike a blue colour in the presence of free iodine.

Linimenta. Liniments, Embrocations. A liniment, derived from linio, I anoint, implies strictly a preparation capable of being used in anointing, and therefore of an oily or soapy nature. In the British Pharmacopœia the word is employed in a more extended sense, and includes most of the liquid pharmaceutic preparations which are employed as external remedies, and either rubbed or *painted* upon the part.

The majority of the liniments contain either a fixed or volatile oil or soap, camphor being regarded as a concrete volatile oil; the exception is Linimentum Iodi ; which, unless united with other liniments or oily substances, is best used as a paint, for producing blistering or powerful counter-irritation.

Liquores. Solutions. These preparations are watery solutions, either of inorganic substances or of certain definite active organic principles, and should not be confused either with juices of plants (*succi*), or with liquid extracts : this error is frequently made.

It is important to remember certain points in regard to these preparations.

Those solutions which contain active drugs intended for internal use, contain four grains of the salt or alkaloid in one fluid ounce. This is the case with Liquor Arsenicalis, Liquor Arsenici Hydrochloricus, Liquor Sodæ Arseniatis, Liquor Potassæ Permanganatis, Liquor Atropiæ, Liquor Atropiæ Sulphatis, Liquor Morphiæ Acetatis, Liquor Morphiæ Hydrochloratis, Liquor Strychniæ. The only important exception is Liquor Hydrargyri Perchloridi, which contains half a grain in the fluid ounce. Certain solutions, only used externally, are exceptions to the above rule, in that they are not made with water ; *e.g.*, Liquor Antimonii Chloridi, Liquor Hydrargyri Nitratis Acidus, Liquor Zinci Chloridi, Liquor Epispasticus, Liquor Gutta-percha.

Misturæ. Mixtures. The mixtures of the British Pharmacopœia

for the most part consist of insoluble principles suspended in water by means of gummy or similar matters, which are either contained in the medicinal substances themselves, or added to the mixtures; examples of these two forms are seen in the Mixture of Ammoniacum and the Mixture of Guaiacum. The Gentian and Compound Senna Mixtures and the Mistura Ferri Aromatica, are, however, notable exceptions, being merely watery infusions or solutions of the ingredients, with the addition of a little spirit:—the Senna Mixture is a form of aromatic black draught.

Mucilagines. Mucilages. These are watery preparations of certain substances, which are either wholly or in part soluble in water, forming peculiar semi-tenacious solutions of considerable service in pharmacy, from their power of suspending insoluble ingredients, or of binding them together in a mass. They are also of advantage in sheathing irritated surfaces, as inflamed mucous membranes.

Spiritus. Spirits. Many of the spirits of the British Pharmacopœia differ greatly from the preparations bearing the same name in the London Pharmacopœia. Those made with volatile oils have now a uniform strength, containing one fluid part of the oil to 49 fluid parts of rectified spirit. Of this composition are Spiritus Cajuputi, Spiritus Juniperi, Spiritus Lavandulæ, Spiritus Menthæ Piperitæ, Spiritus Myristicæ, and Spiritus Rosmarini.

Spiritus Chloroformi contains only one fluid part of chloroform to nineteen fluid parts of rectified spirit, and is the correct name for the so-called chloric ether; Spiritus Camphoræ contains one part of camphor to nine parts of rectified spirit.

Spiritus Ætheris is the old compound spirits of ether, with the omission of the oil of wine.

Succi. Juices. These preparations have been for some time used in medicine, and five are now made officinal; Succus Conii, Succus Scoparii, Succus Taraxaci, Succus Belladonnæ, and Succus Hyoscyami. In each instance the expressed juice of the plant has one-third of its volume of rectified spirit added, a quantity found sufficient to preserve it from decomposition. The strength of these juices is liable to vary from the influence of situation, soil, and season upon the plant.

Suppositoria. Suppositories. Preparations newly introduced for the local application of certain drugs; they are four only in number, namely, of tannic acid, mercury, lead and opium, and morphia; these agents are ordered to be made up with oil of

theobroma, lard, and wax, and afterwards divided into cones. In the Addendum of 1874, three new suppositories are introduced, of carbolic acid, morphia, and tannic acid, differing from the above in being made up with curd soap.

Syrupi. Syrups. Fluid preparations, in which sugar forms an important ingredient, and gives a peculiar characteristic consistence to the liquid. Usually they are made use of on account of their sweetness, and to cover the flavour of drugs, but sometimes the sugar preserves the active ingredient from undergoing chemical change, as in the syrup of Iodide of Iron.

Tincturæ. Tinctures. In the British Pharmacopœia this group is very extensive, and it will be observed that in the preparation of the various tinctures, different menstrua are employed, as rectified spirit, proof spirit, compound spirit of ammonia, and spirit of ether.

Rectified Spirit is used whenever the active portion of the drug from which the tincture is made is of sparing solubility in more dilute alcohol. This is the case with some alkaloids, resinous and oily matters. In the Pharmacopœia, *rectified spirit* is used in the tinctures of Aconite, Arnica, Assafœtida, Benzoin, Indian Hemp, Capsicum, Castor, Chloroform, Cubebs, Acetate of Iron, Perchloride of Iron, Iodine, Kino, Lavender, Myrrh, Nux Vomica, Tolu, Veratrum Viride, Fresh orange-peel, Larch Bark, and Ginger.

Aromatic Spirit of Ammonia is employed pharmaceutically with the same object as rectified spirit, namely, to dissolve resins and oily substances, but it is also used with a view to its own medicinal powers ; its alkaline properties render it a potent solvent of resinous acids. It is only ordered for three tinctures, viz., Tinctura Guaiaci Ammoniata, Tinctura Valerianæ Ammoniata, and Tinctura Opii Ammoniata.

Spirit of Ether (a mixture of two parts by volume of rectified spirit and one part of ether) is used to form one tincture, Tinctura Lobeliæ Ætherea, and in this instance the antispasmodic virtues of the ether, rather than its solvent powers, have doubtless led to its employment.

Proof Spirit is used in making the remainder of the tinctures, containing matters partly soluble in water, partly in spirit ; the amount of alcohol in proof spirit is more than sufficient to ensure an absence of all decomposition in the preparations, even when kept for a lengthened period.

Many of the tinctures made with rectified spirit, or with aromatic spirit of ammonia, become milky when added to water, on account of the precipitation of the resinous or oily matters, which are insoluble in water, and a species of emulsion is thus formed. Under these circumstances it is often desirable to have mucilage of acacia rubbed up with the tincture before the addition of the water, and by this means the insoluble matters are held in suspension for a long time.

Trochisci. Lozenges. This group, although long officinal in the Edinburgh, is now (1867) for the first time introduced into an English Pharmacopœia. There are ten different lozenges ; viz., of Tannic Acid, Bismuth, Catechu, Reduced Iron, Ipecacuanha, Morphia, Morphia with Ipecacuanha, Opium, Chlorate of Potash, and Bicarbonate of Soda, each with a definite amount of the active ingredients.

Unguenta. Ointments. It will be observed that cerates are altogether omitted from the Pharmacopœia, but many of the present ointments contain wax, and are similar in character and composition to preparations formerly termed cerates.

In the ointments of the active principles of vegetables, as of Aconitia, Atropia, and Veratria, eight grains of the active principle are contained in about an ounce of the preparation.

Vapores. Inhalations. Five of these preparations have been introduced into the Pharmacopœia, viz., Vapor Acidi Hydrocyanici, Vapor Chlori, Vapor Coniæ, Vapor Creasoti, and Vapor Iodi. They are usually prepared just before they are used, the patient being made to breathe the volatile ingredients which are given out.

A suitable apparatus, or Inhaler, is necessary for their proper administration.

Vina. Wines. In these preparations sherry wine is used as the menstruum instead of rectified or proof spirit. They therefore contain much less alcohol than the tinctures, but sufficient to prevent decomposition of their active ingredients.

Attention to the following directions may prove of some value.

Care must be taken that medicines do not acquire any impurity from the material of the vessels in which they are either prepared or kept ; therefore, unless otherwise ordered, glass, or vitrified ware, such as porcelain or stone, whose surface is not glazed with lead, should be employed.

All acid, alkaline, or metallic preparations, and salts of every kind, should be kept in stoppered glass bottles, and occasionally those made of green or black glass are desirable.

When the saturation of acids or alkalies is ordered, it is supposed that this is determined by the use of litmus or turmeric papers. In applying tests, distilled water should be made use of; and unless otherwise ordered, white bibulous paper should be employed.

In the filtration of liquids, or drying of crystals, degrees of heat are measured by Fahrenheit's thermometer: boiling heat is 212°; a gentle heat between 90° and 100°. Specific gravities are to be taken at the temperature of 60°. In ascertaining the weight of any precipitate, the precipitant should be added in excess, and the precipitate well washed, and afterwards dried at 212°; care, however, is sometimes necessary, in order that the precipitate be not redissolved by the excess of the precipitant.

Crucibles should be made of Hessian or Cornish ware.

Exposure to hot water, or the vapour of boiling water, in a proper vessel, constitutes a *Water Bath.*

A *Sand Bath* consists of sand heated in a suitable vessel.

Symbols and Equivalent Weights of the Elementary Bodies mentioned in the British Pharmacopœia.

ELEMENTARY BODIES.	SYMBOLS AND EQUIVALENTS.	
	Old System.	New System.
Aluminium	Al = 13·75	**Al = 27·5**
Antimony (Stibium)	Sb = 122	**Sb = 122**
Arsenic	As = 75	**As = 75**
Barium	Ba = 68·5	**Ba = 137**
Bismuth	Bi = 210	**Bi = 210**
Boron	B = 11	**B = 11**
Bromine	Br = 80	**Br = 80**
Cadmium	Cd = 56	**Cd = 112**
Calcium	Ca = 20	**Ca = 40**
Carbon	C = 6	**C = 12**
Cerium	Ce = 46	**Ce = 92**
Chlorine	Cl = 35·5	**Cl = 35·5**
Chromium	Cr = 26·55	**Cr = 52·5**
Copper (Cuprum)	Cu = 31·75	**Cu = 63·5**
Gold (Aurum)	Au = 197	**Au = 197**
Hydrogen	H = 1	**H = 1**
Iodine	I = 127	**I = 127**
Iron (Ferrum)	Fe = 28	**Fe = 56**
Lead (Plumbum)	Pb = 103·5	**Pb = 207**
Lithium	L = 7	**L = 7**
Magnesium	Mg = 12	**Mg = 24**
Manganese	Mn = 27·5	**Mn = 55**
Mercury (Hydrargyrum)	Hg = 100	**Hg = 200**
Nitrogen	N = 14	**N = 14**
Oxygen	O = 8	**O = 16**
Phosphorus	P = 31	**P = 31**
Platinum	Pt = 98·5	**Pt = 197**
Potassium (Kalium)	K = 39	**K = 39**
Silver (Argentum)	Ag = 108	**Ag = 108**
Sodium (Natrium)	Na = 23	**Na = 23**
Sulphur	S = 16	**S = 32**
Tin (Stannum)	Sn = 59	**Sn = 118**
Zinc	Zn = 32·5	**Zn = 65**

INORGANIC SUBSTANCES.

Throughout the Work the symbols and formulæ expressing the composition of chemical substances are, as in the Second Edition of the British Pharmacopœia, given both according to the old and new systems of chemical notation: the old being printed in Roman type, the new in heavy Egyptian type.

OXYGEN.

(O. Eq. = 8, or **O.** Eq. = 16.)

Oxygen is a colourless and odourless gas; it forms, on an average, 20·81 per cent. by measure, or 23·01 per cent. by weight, of atmospheric air. The specific gravity is 1·1057, the specific gravity of air being 1. It combines in various proportions with nearly all the elementary substances, and is the great supporter of combustion and respiration. In combination with hydrogen it forms water.

Oxygen may be prepared in various ways; when large quantities are required, it is generally obtained by the action of heat on peroxide of manganese, $3MnO_2 = MnO,Mn_2O_3 + 2O$, pure oxide of manganese yielding about one-ninth of its weight of oxygen. Chlorate of potash may be used for the same purpose, and the decomposition is then as follows:

$$2KClO_3 = 2KCl + 3O_2.$$

A peculiar modification of oxygen, known as Ozone, is produced under certain circumstances, as when a succession of electric sparks is passed through air; a large portion of the oxygen is then converted into ozone, which has a peculiar odour, is much denser than oxygen, and seems to be a more active form of this gas, containing three atoms of that element condensed into one; it can be formed by other means, and in the course of the slow oxidation of phosphorus and other substances, is produced in small quantities.

Ozone is a powerful oxidising agent; it displaces iodine from

its metallic combinations ; starch paper impregnated with a solution of iodide of potassium is generally used to detect its presence in the atmosphere ; the iodine is set free and combines with the starch to form the blue iodide ; it converts the protosalts of manganese into persalts, and the sulphide of lead into sulphate.

Therapeutics. A solution of oxygen in water has been used as a slight stimulant and excitant. Considerable advantages were at first anticipated from the introduction of the gas as a remedial agent, but clinical experience has not confirmed these anticipations. The inhalation of oxygen, which has been tried in certain states of the system accompanied with deficient aëration of the blood, has not been attended with much success, probably in part owing to the difficulty of keeping up its action in cases where it would be likely to prove beneficial.

The physiological action of ozone, from which great things were at one time hoped for, has recently been investigated by Dewar and McKendrick. They find that the inhalation of an atmosphere highly charged with ozone reduces the frequency of the respiratory and cardiac movements, irritates the mucous lining of the air-passages, and renders the blood venous throughout the circulatory system. The latter phenomenon they attribute, at least in part, to the circumstance that the density of ozone being slightly higher than that of the carbonic acid of the blood, the diffusion of the latter gas into the air-cells of the lungs is interfered with.

NITROGEN.

(N. or **N**. Eq. = 14.)

Nitrogen constitutes 79·19 per cent. of the atmosphere by measure, or 76·99 by weight. Sp. gr. 0·9713. It seems to act the part of a diluent in the air, counteracting the too stimulating properties of oxygen. Nitrogen forms acids with three and five equivalents of oxygen ($\mathbf{N_2O_3}$ and $\mathbf{N_2O_5}$) ; the salts known as the nitrites and the nitrates, especially the latter, are much used in medicine. With hydrogen it forms ammonia, with carbon it forms cyanogen, and enters into the composition of all the alkaloids, and many of the other most active medicinal principles, as morphia, quinia, and prussic acid. Water at the ordinary temperature dissolves about $\frac{1}{50}$th of its bulk of nitrogen. It is rarely or never employed in its free state as a therapeutic agent.

HYDROGEN.

(H. or H. Eq. = 1.)

Hydrogen is a colourless inodorous gas, which has never been liquefied, and is but slightly soluble in water. It is the lightest form of matter known, and has a sp. gr. 0·0692. It is easily generated by acting on granulated zinc with dilute hydrochloric, or sulphuric acid, when chloride or sulphate of zinc are also formed. It combines with oxygen to form water (H_2O) and peroxide of hydrogen (H_2O_2). The latter is a liquid of syrupy consistence, and is a very unstable compound; it possesses powerful oxidising properties, bleaches a solution of litmus, and has a somewhat metallic taste.

Therapeutics. Hydrogen possesses but little value as a remedial agent. When mixed with a certain quantity of oxygen and breathed, it imparts a peculiar shrill and sharp tone to the voice. The peroxide of hydrogen whitens the epidermis and epithelium of the tongue, and is supposed to possess some stimulant and disinfecting action upon the system; a dilute solution has been stated to be a valuable remedy in bronchitis, pertussis, and struma, but further investigations are required to establish its value.

CARBON.

(C. Eq. = 6, or C. Eq. = 12.)

An elementary body found pure, or almost so, in the diamond, plumbago, and anthracite; combined with other elements, it enters into almost all vegetable and animal substances. In medicine it is now only employed in the form of charcoal, of which there are two varieties, vegetable and animal.

Carbo Ligni. Wood Charcoal. Wood charred by exposure to a red heat without access of air.

Prep. Obtained by burning wood with a limited supply of air, by which the hydrogen, &c., are burnt off, and the carbon remains. Wood yields from seventeen to twenty-three per cent. It is met with either in the form of the pieces of wood from which it was made, or as a black powder.

Prop. It is odourless and almost tasteless; it possesses the power of absorbing gases and odours to a great extent, especially when recently prepared; besides carbon, it contains some salts, about 2 per cent. It is insoluble in water, and in close vessels is neither melted nor volatilized by the most intense heat.

Off. Prep. CATAPLASMA CARBONIS, Charcoal Poultice. (Wood charcoal, in powder, half an ounce ; bread, two ounces ; linseed meal, one ounce and a half ; boiling water, ten fluid ounces. Mix the water, bread and linseed ; then add half the charcoal and sprinkle the remainder on the surface.)

Therapeutics. Wood charcoal has been employed on account of its absorbing power, as an antiseptic and corrector of acidity and flatus of the stomach and intestines, and to correct the state of the fæces in some diseases. Patients suffering from organic disease of the stomach often find considerable temporary relief from the use of wood charcoal, although it can have no curative effect in such cases : in functional affections of the alimentary canal it is likewise useful, especially when these are accompanied with much flatus and acidity. As an external application it is used in the form of powder or of poultice, to prevent the fœtor of ulcers, &c. Dr. Stenhouse has proposed its use in the manufacture of respirators for those who are subjected to the influence of injurious gases or vapours. Wood Charcoal is also used as a dentifrice.

Dose. Internally from a teaspoonful to a tablespoonful, recently made, and carefully preserved in stoppered vessels. It is sometimes made into biscuits (Bragg's biscuits) and thus employed ; sometimes also it is given in the form of lozenges.

Carbo Animalis. Animal Charcoal. Bone Black.

The residue of ox and sheep bones which have been exposed to a red heat without the access of air, reduced to powder : it contains about 10 per cent. of carbon, the remaining 90 per cent. consisting of phosphate, with a little carbonate, of lime.

Carbo Animalis Purificatus. Purified Animal Charcoal. Bone black, deprived of its earthy salts.

Prep. It is prepared by treating bone black with very dilute hydrochloric acid for two days, at a moderate heat, to remove all the salts ; then washing and drying, and afterwards heating to redness in a covered crucible.

Prop. A black, pulverulent substance, inodorous, and almost tasteless ; absorbs gases and odours, and has also great power in abstracting almost all principles from their solutions, such as alkaloids, bitter and colouring matters, &c. Tincture of litmus, diluted with twenty times its bulk of water, agitated with it and then filtered, passes through colourless. When burned at a high

temperature, with a little red oxide of mercury and free access of air, it leaves a very slight residue.

Therapeutics. Animal charcoal may be used in the same way and for the same purposes as vegetable, in addition to which the author has shown that its antidotal power against vegetable poisons is very great, rendering inert opium, nux vomica, aconite, and almost all the active organic poisons; this property has no relation to its mechanical condition, or mere state of insoluble powder, as has been thought by some, for the gastric juice does not appear to have the power of separating the poison from the charcoal when the combination is introduced into the stomach.

In pharmacy animal charcoal is used to deprive alkaloids and other principles of their colour, &c.

Dose. As an antacid and corrector of fœtor, from a tea-spoonful to a tablespoonful: as an antidote, from half an ounce to two ounces or more, according to the amount of poison taken; it may be suspended in water for a short time, and thus administered. Common bone black in the state of fine powder may be used as an antidote or externally applied; it is much less powerful than the purified charcoal, if estimated by the amount of contained carbon.

SULPHUR.

(S. Eq. = 16, or S. Eq. = 32.)

An elementary body found native as virgin sulphur; also in combination, as sulphides or sulphurets of metals, &c.

Sulphur Sublimatum. Sublimed Sulphur; Flowers of Sulphur.

Sulphur Præcipitatum. Precipitated Sulphur; Lac Sulphuris; Milk of Sulphur.

Prep. *Sublimed* sulphur is generally prepared from the virgin sulphur, by causing it to rise in vapour, which is condensed in a chamber. It may also be made from any metallic sulphide, but is then more liable to contain impurities, as arsenic, &c. The *precipitated* sulphur is directed in the Pharmacopœia to be prepared by boiling five ounces of sublimed sulphur and three ounces of slaked lime in a pint and a half of water, when calcium pentasulphide (CaS_5), and calcium hyposulphite ($CaS_2H_2O_4$) are formed, as shown in the following equation: $3CaH_2O_2+12S=2CaS_5+CaS_2H_2O_4+2H_2O$. The addition of hydrochloric acid to the filtered solution throws down a precipitate of sulphur,

which is washed with distilled water until the washings cease to have an acid reaction or precipitate with oxalate of ammonia; showing that the acid and lime have been removed. The sulphur should be dried at a temperature not exceeding 120°.

Prop. Sublimed sulphur is a citron or bright yellow-coloured gritty powder, without taste or odour, sp. gr. 1·98; it rises in vapour at 600° Fah., is soluble in hot oil of turpentine and bisulphide of carbon, and to a small extent in fixed oils. It burns with a blue flame, and the evolution of sulphurous acid. It does not redden moistened litmus paper, showing that it is not oxidised. Solution of ammonia, agitated with it and filtered, does not on evaporation leave any residue (showing freedom from orpiment, As_2S_3). *Precipitated* sulphur forms a pale yellow powder, free from grittiness; in other respects it resembles sublimed sulphur; neither should give an acid reaction to water. The composition of both kinds of sulphur is the same. When heated to a certain point sulphur assumes a peculiar viscid condition. Under the microscope it is seen to be composed of opaque globules, with no admixture of crystals.

Off. Prep. Of sublimed sulphur.

Confectio Sulphuris. Confection of Sulphur. (Sublimed sulphur, four ounces; acid tartrate of potash, in powder, one ounce; syrup of orange peel, four fluid ounces.)

Unguentum Sulphuris. Ointment of Sulphur. (Sublimed sulphur, one ounce; benzoated lard, four ounces.)

Sulphur is also contained in Emplastrum hydrargyri and Emplastrum ammoniaci cum hydrargyro.

Therapeutics. In small doses sulphur is absorbed into the blood, and acts as a stimulant to the skin and different mucous membranes, partly passing off from the skin as sulphuretted hydrogen, and partly from the kidneys, in an oxidised state, as a sulphate, which can be detected in the urine; probably a small portion is eliminated by the breath in the form of sulphuretted hydrogen. Silver worn on the person of patients taking sulphur becomes blackened. In larger doses it produces a laxative or very mild purgative effect upon the bowels. Externally it is a slight stimulant, and has the power of destroying the *acarus scabiei* or itch insect, and all the vegetable parasites that infest the skin.

Sulphur is given as a stimulant in chronic cutaneous diseases, as impetigo, prurigo; also in chronic bronchitis, when it acts as a stimulating expectorant; as a laxative to children and delicate

persons ; likewise in diseases of the rectum, as piles. Sulphur is a valuable remedy in mercurial ptyalism. Externally it is applied as an ointment in skin affections, especially scabies and vegetable parasitic diseases.

Dose. Of either form of Sulphur. As a stimulant, from 10 gr. upwards. As a laxative, 30 gr. to 60 gr. or more. Of confection, 60 gr. to 120 gr. Formerly sulphur dissolved in olive oil, called balsam of sulphur, was a favourite remedy.

Adulteration. Sublimed sulphur may contain a trace of sulphurous acid from oxidation during sublimation ; it should, however, be free from this, and not redden moistened litmus paper ; and a solution of ammonia which has been agitated with it should not leave any residue ; when washed it is called *sulphur lotum.* The precipitated sulphur contains sometimes from 50 to 70 per cent. of sulphate of lime, arising from sulphuric acid being occasionally used to precipitate it ; this impurity can be detected by its not subliming with heat ; precipitated sulphur when pure does not show any crystals under the microscope, but simply opaque globules.

PHOSPHORUS.

(P. or **P**. Eq.=31.)

Phosphorus. Phosphorus.

Prep. From phosphoric acid or superphosphate of lime (made by acting upon bone ashes with oil of vitriol) by distillation with charcoal, when carbonic oxide is formed and phosphorus set free, which sublimes.

Prop. A waxy-looking substance, which emits white fumes on exposure to the air, and is usually in the form of pipes, from being cast into moulds ; it is almost colourless and transparent when fresh, luminous in the dark, from oxidation and the formation of phosphorous anhydride (P_2O_3), very easily inflamed ; sp. gr. 1·77 ; melts at 110° F. ; insoluble in water ; soluble in ether, oils, and true naphtha ; entirely soluble in boiling oil of turpentine and bisulphide of carbon. It burns with a bright flame, producing dense fumes of phosphoric anhydride (P_2O_5) ; becomes opaque and reddish on the surface when old, from the formation of a suboxide, to prevent which it should be kept in water and in the dark. Phosphorus also exists in a peculiar allotropic condition, known as amorphous or red phosphorus, in the form of a red powder, which may be exposed to the air without giving off any

fumes, and may be heated in the open air till the temperature reaches 500° F., at which point it takes fire. This variety is not soluble in bisulphide of carbon.

Off. Prep. OLEUM PHOSPHORATUM. Phosphorated Oil. Take of phosphorus and oil of almonds, of each a sufficiency. Heat the oil to 300°, and keep it at this temperature for fifteen minutes; cool, and filter. Put four fluid ounces of this oil with twelve grains of phosphorus into a stoppered bottle, immerse the bottle in hot water until the oil has acquired a temperature of 180°, and shake till the phosphorus is entirely dissolved. The resulting product should be clear and colourless, or but slightly coloured; phosphorescent in the dark. The oil of almonds is heated in the first place, to destroy certain organic impurities which, unless removed, would cause the gradual deposition of the phosphorus. The preparation contains $\frac{1}{32}$ gr. of phosphorus in five min.

PILULA PHOSPHORI. Phosphorus Pill. (Phosphorus, two grains; Balsam of Tolu, 120 grains; yellow wax, sixty grains.) Rub the phosphorus with the balsam of Tolu under water, kept at 140°, till no particles of phosphorus are visible. Then add the wax, and as it softens, mix it thoroughly with the other ingredients. Allow the mass to cool, without exposure to the air, and keep it in a bottle immersed in cold water. Soften the mass with a few drops of rectified spirit when it is made into pills. Five grains of the pill contain $\frac{1}{18}$ gr. of phosphorus.

Therapeutics. In poisonous doses, phosphorus causes symptoms resembling those of acute atrophy of the liver, such as jaundice, vomiting, hœmorrhages, &c. After death, fatty metamorphosis of the liver, muscles, and other organs, is found. Even in medicinal doses, dangerous symptoms may be caused by the drug. Dr. Anstie records a case in which doses of $\frac{1}{30}$ gr. in pills caused burning pain at the epigastrium and hœmaturia. Introduced under the skin of an animal, phosphorus causes no local irritation. The fumes of phosphorus produce on individuals exposed to them for a lengthened period, a peculiar disease, necrosis of the jaw-bone, probably from phosphorous anhydride being present; this disease was more common twenty years since than at present, before the amorphous form of phosphorus was employed in manufactures.

Phosphorus is said to act as a powerful stimulant and aphrodisiac. It has been employed on the Continent in low fevers, cholera, &c., and in this country in the treatment of phthisis, but without much good effect. Its chemical analogy with arsenic has

led to its administration in cases of intercostal and trigeminal neuralgia, occasionally with striking results; also in psoriasis and eczema. It has also been used in the treatment of goitre.

Dose. Gr. $\frac{1}{40}$ to gr. $\frac{1}{10}$ dissolved in ether or olive oil. If given dissolved in ether, the phosphorus is apt to form a coating on the tongue from the evaporation of the volatile menstruum. Of phosphorated oil, 3 min. to 10 min.; it is best given in the form of capsules after meals. Of phosphorus pill, 3 grs. to 6 grs.

See also Calcis Hypophosphis and Sodæ Hypophosphis.

IODINE.

(I. or **I.** Eq. = 127.)

Iodum. Iodine. Iodine, in crystals (so named from ἰωδης, violet.)

Prep. Iodine is prepared from kelp, the vitrified ashes of sea-wrack, found in the Western Islands, north of Scotland and Ireland; from the solution of this substance, after the crystallization of most of the salts, as the carbonate of soda, &c., a liquor remains, containing the iodides of sodium, potassium, magnesium, &c.; this, when treated with sulphuric acid, gives off carbonic acid, sulphurous acid, and sulphuretted hydrogen, while sulphate of soda, mixed with free sulphur, crystallises out; then to the still acid solution there is added peroxide of manganese, the whole is heated, and the iodine which sublimes is collected in receivers. The last decomposition may be thus represented, sulphates of soda and manganese remaining in the retort:

$$2NaI + MnO_2 + 2H_2SO_4 = Na_2SO_4 + MnSO_4 + 2H_2O + I_2.$$

Prop. Black scales, or laminar crystals, with metallic lustre, sp. gr. 4·95, odour similar to chlorine, melts when heated, then sublimes in a beautiful violet vapour without leaving any residue; slender colourless crystals, with a pungent odour, should not be sublimed in the early part of the process, showing the absence of iodide of cyanogen. Soluble in rectified spirit and ether, but slightly so in pure water, about $\frac{1}{7000}$ part; much more soluble in a watery solution of iodide of potassium and chloride of sodium. The aqueous solutions precipitate starch of a dark-blue colour. In free alkaline solutions iodine dissolves and forms iodides and iodates.

Off. Prep. Linimentum Iodi. Liniment of Iodine. (Iodine, one ounce and a quarter; iodide of potassium, half an ounce;

camphor, a quarter of an ounce; rectified spirit, ten fluid ounces.)

Liquor Iodi. Solution of Iodine. (Iodine, twenty grains; iodide of potassium, thirty grains; water, a fluid ounce.)

Tinctura Iodi. Tincture of Iodine. (Iodine, half an ounce; iodide of potassium, a quarter of an ounce; rectified spirit, twenty fluid ounces.)

Unguentum Iodi. Ointment of Iodine. (Iodine, thirty-two grains; iodide of potassium, thirty-two grains; proof spirit, one fluid drachm; prepared lard, two ounces.)

Vapor Iodi. Inhalation of Iodine. (Tincture of iodine, one fluid drachm; water, one fluid ounce. Mix.) Heat slightly, and inhale the rising vapour.

Therapeutics. When applied externally, free iodine acts as an irritant, or vesicant, according to the mode of using it; and when rubbed in for some time, it is absorbed, and influences the neighbouring parts, and also the system at large; when the diluted vapour is inhaled, it acts topically on the mucous membrane of the respiratory passages. Internally, free iodine produces irritation of the mucous membrane of the alimentary canal, causing, in large doses, heat and pain at the epigastrium, and vomiting; so that the amount of the element capable of being thus administered is very limited. When the full influence of iodine upon the system is desirable, the drug is usually given in combination, more especially as iodide of potassium, a salt which produces but little local irritation. Iodine, either free or combined, is rapidly absorbed into the blood, and can be detected in many of the secretions, especially in the urine; the constitutional effects produced are increased activity of most of the secreting and excreting organs, as the kidneys, mucous membranes, and skin; it also powerfully influences the glandular and absorbent systems, a fact which is observed when such parts are enlarged, as in bronchocele, and in scrofulous glands of the neck and abdomen; iodine is stated occasionally to cause the wasting of even healthy glands, as the breasts and testes. Iodine has a powerful alterative action, as exhibited in its influence over scrofulous affections and tertiary syphilis. When given in large medicinal doses, the mucous membranes of the nose, frontal sinus, eyes, pharynx, often become much irritated, and catarrhal symptoms, coryza, &c., are induced; occasionally much depression ensues from its administration, accompanied by a low febrile state of system.

Iodine and iodide of potassium are administered in very many diseases, as the different forms of scrofula, bronchocele and other glandular enlargements, hypertrophy and induration of organs or other structures, produced by inflammation, as, *e. g.*, hypertrophy of the spleen, liver, uterus, &c.; in chronic skin affections, syphilitic or not; for the relief of other tertiary syphilitic symptoms, such as nodes, ulcers, gummata, &c., and also in chronic forms of rheumatism and gout; in dropsies as a diuretic; in some forms of amenorrhœa, as an emmenagogue; and in various obstinate mucous discharges, as leucorrhœa, as an alterative.

Externally iodine is used in chronic skin diseases and over enlarged and indurated parts and diseased joints, to alter action or cause absorption, or as a parasiticide; for this purpose it may be applied in the form of the liniment, solution, tincture, or ointment. As a speedy vesicant, the liniment may be painted over the part two or three times; one application, however, is sometimes sufficient. Vapor iodi may be used as an inhalation in some forms of chronic bronchitis and phthisis. (*See* Iodide of Potassium.)

Dose. Of iodine (free) ½ gr., gradually increased; of the tincture of iodine, 5 min. to 20 min.

Adulteration. Water is often present, also iodide of cyanogen; besides these, fixed impurities, as plumbago, black oxide of manganese, charcoal, iron, &c. The first two are volatile; water can be detected by finding whether bibulous paper is moistened by the iodine; iodide of cyanogen by distilling at a very low temperature, when this salt sublimes in white crystalline needles before the iodine comes over; the fixed impurities are left after sublimation. The Pharmacopœia gives the following quantitative test: 12·7 grains, dissolved in an ounce of water containing 15 grains of iodide of potassium, require for complete decoloration 1000 grain-measures of the volumetric solution of hyposulphite of soda. In this process, iodide of sodium (**NaI**), which is colourless, and also tetrathionate of soda ($Na_2S_4O_6$), are formed. The following formula will serve to illustrate the changes which occur: $2Na_2S_2O_3+I_2=2NaI+Na_2S_4O_6$.

Sulphuris Iodidum. Iodide of Sulphur. S_2I_2.

Prep. (Sulphur, one ounce; iodine, four ounces. Rub them together in a wedgwood mortar, put them into a flask, heat gently till the mass is uniformly dark, then increase the heat to produce

liquefaction. Cool, and then remove the mass by breaking the flask, reduce it to pieces, and keep in a well-stoppered vessel.)

Prop. A bluish-black crystalline metallic-looking substance, not unlike sulphide of antimony in appearance, having the odour of iodine, and staining the skin yellow. Soluble in about sixty parts of glycerine; insoluble in water, but decomposed when boiled with it, and, if properly prepared, should give, when so boiled, 20 per cent. residue of sulphur.

Off. Prep. Unguentum Sulphuris Iodidi. Ointment of Iodide of Sulphur. (Iodide of sulphur, thirty grains; prepared lard, an ounce.)

Therapeutics. Applied externally in the form of an ointment, it acts in a manner very similar to iodine, and has been employed in some obstinate chronic skin diseases, as lepra, acne indurata, &c. Internally it possesses no particular value, but has occasionally been given as an alterative.

Dose. ½ gr. to 2 gr. or more.

BROMINE.

(Br. or **Br.** Eq. = 80.)

Bromum, Bromine (so named from *βρωμος*, a stench). An elementary body contained in combination with metals in sea water and sea plants.

Prep. From bittern, the liquor left from sea water, after the crystallization of common salt; it is present as bromide of magnesium, and can be obtained by passing a current of chlorine gas through the liquor, which unites with the magnesium, and liberates the bromine; this is taken up by shaking with ether, which dissolves the bromine, and rises with it to the surface. Subsequent purification is required, usually effected by converting the bromine into bromide of potassium, and again liberating the bromine by means of manganese dioxide and sulphuric acid.

Prop. A dark brownish-red liquid by reflected, but hyacinth-red by transmitted light through thin layers; of an intensely disagreeable acrid odour and taste, very volatile. At the common temperature of the air it gives off red fumes, and it boils at 117°. Agitated with solution of soda in such proportion that the fluid remains very slightly alkaline, it forms a colourless liquid, which

if coloured by a further addition of a little bromine, does not become blue on the subsequent addition of a cold solution of starch, showing the absence of iodine, as bromine precipitates starch of an orange colour ; sp. gr. 2·966 ; soluble in ether, alcohol, and slightly in water.

Therapeutics. Bromine in a free state is only employed as a caustic. Its vapour is powerfully irritating, and the odour so offensive as to render its use almost impracticable, even if it were desirable to exhibit it in this form ; dissolved in water it has sometimes been applied externally, but with no marked advantage over other remedies, such as iodine.

In combination bromine is very largely employed, especially in the form of bromide of potassium and bromide of ammonium, both of which salts are now officinal.

Bromide of potassium was first used in medicine by the late Dr. R. Williams, for the purpose of causing absorption of the products of inflammation, &c., as in cases of enlarged spleen and hypertrophied liver. It was introduced into the London Pharmacopœia of 1836, but as it was little used, it was omitted from the Pharmacopœia of 1851. After this it was again employed as a remedy, and about the year 1854, the author made somewhat extensive trials of it, in cases of syphilitic skin disease, in patients who were found to be intolerant of the action of iodine. In these trials he found that it caused much drowsiness, and in very large doses, want of power over the extremities ; he also was informed by several patients that it had a great effect upon the sexual functions, acting as an antaphrodisiac, causing loss of virile power, and diminished venereal desire. Its prolonged administration often causes an eruption of acne. In 1857 Sir Charles Locock showed its efficacy in epilepsy connected with hysteria, and in nymphomania. Previously to these dates it had been stated to produce anæsthesia of the palate and fauces. Experimental enquiries as to the physiological action of the salt have led to the most contradictory results. In fact it is still undecided how far its sedative effect on the nerve-centres, and its depressant action on the heart, are due to bromine, and how far to the alkali-metal with which the bromine is combined. The value of the drug may thus be said to rest solely upon clinical evidence. Bromide of potassium never gives rise to any of the symptoms which the iodide is so apt to produce, namely, coryza, sore-throat, and the peculiar metallic taste in the mouth ; when such occur during its exhibition, the adulteration of the bromide with iodide may be suspected, a circumstance which the author, about

twelve years since, showed to be very common, though not often intentional.

Bromide of potassium may be employed for many purposes :—

1st. For its alterative effects, as in skin affections connected with syphilis, especially when patients cannot bear the exhibition of iodine ; also to cause the removal of glandular swellings, and in enlarged spleen ; in fact, it possesses some of the alterative powers of the iodides, but is less powerful.

2nd. This remedial agent has of late been very extensively used in diseases of the nervous system, and it is undoubtedly of great value in these affections.

a. As a soporific in some forms of sleeplessness, occurring after acute disease, and when opium causes excitement, and henbane or belladonna fail to induce sleep. It is still a desideratum to discover the exact form of sleeplessness which is relieved by this remedy.

b. In convulsive nervous affections, as chorea and epilepsy, hysteria, laryngismus stridulus, spasmodic asthma. In many cases of epilepsy it has been found of the greatest value, diminishing the frequency of the attacks, and sometimes even arresting them altogether ; in epileptiform convulsions connected with hysteria it often acts as a specific.

c. In the agitation of delirium tremens, and the analogous state which sometimes occurs during the course of the specific fevers, the bromide has proved very useful.

d. It is also of much value in the treatment of affections of the generative organs, and probably in such cases through its influence on the nervous system ; thus, in many cases of troublesome priapism it proves completely effectual, as also in nymphomania ; it is likewise useful in menorrhagia ; more especially when this occurs at the period when the cessation of the catamenia is approaching.

3rd. Bromide of potassium has also been proposed as a remedy in the treatment of many other diseases, as of the throat and larynx ; and Sir James Simpson and Dr. Begbie have asserted that this salt has considerable power in checking the formation of sugar in saccharine diabetes.

Dose. Of bromide of potassium, 5 gr. to 30 gr. ; of bromide of ammonium, 2 gr. to 20 gr.

Adulteration Bromine sometimes contains iodine, which is readily detected by the tests for the latter element.

CHLORINE.

(Cl. or Cl. Eq.=35·5.)

Free chlorine occurs in the form of a greenish-coloured gas, having a peculiar acrid odour, very soluble in water, especially when cold; it possesses intense chemical powers, bleaches all vegetable colours, and acts as a powerful disinfectant, probably by decomposing the organic particles producing disease. For this purpose it can be evolved from chlorinated lime by the addition of some acid. It is ordered in the Pharmacopœia to be prepared by taking of hydrochloric acid, six fluid ounces; black oxide of manganese, in fine powder, an ounce; and water, a sufficiency. Put the oxide of manganese into a gas bottle, pour on the hydrochloric acid, diluted with two ounces of water, and apply a gentle heat, and by suitable tubes cause the liberated gas to pass through two ounces of water in a wash-bottle, when it is fit for use; the decomposition may be represented thus:

$$4HCl + MnO_2 = MnCl_2 + 2H_2O + Cl_2.$$

Liquor Chlori.. Solution of Chlorine. Chlorine gas dissolved in water.

Prep. (By preparing chlorine as above, passing the washed gas, as long as it continues to be given off, to the bottom of a three-pint bottle containing thirty ounces of water.)

Prop. It is a liquid, having a slight green colour, with a very strong odour of chlorine, and immediately discharging the colour of a dilute solution of sulphate of indigo; when exposed to the light it is decomposed, with the formation of hydrochloric acid and oxygen, and hence should be used recently prepared. Sp. gr. 1·003, leaves no residue on evaporation. When 20 grains of iodide of potassium, dissolved in an ounce of distilled water, are added to a fluid ounce of this preparation, the mixed solution acquires a deep red colour (from the liberation of iodine), which requires for its discharge 750 grain-measures of the volumetric solution of hyposulphite of soda, equivalent to 2·66 grains of chlorine.

Vapor Chlori. Inhalation of Chlorine.

Prep. Take of chlorinated lime, 2 ounces; cold water, a sufficiency; put the powder into a suitable apparatus, moisten it with the water, and let the vapour which arises be inhaled.

Use. The vapour of chlorine is employed when we wish for the local action of chlorine upon the mucous membranes of the

mouth and fauces, and likewise upon the lining of the bronchial tubes.

Therapeutics. Free chlorine in the form of vapour acts as a powerful stimulant or irritant, according to its state of dilution, upon any part with which it comes in contact; and it has been thus used in the treatment of chronic bronchitis and phthisis, and in some forms of pulmonary abscess accompanied with fœtid expectoration; it may also be employed in chronic laryngeal affections. In some of these diseases it has appeared to be serviceable, but recent observations have not shown that it possesses any real influence in checking the progress or development of tubercle in the lungs.

When dissolved in water as liquor chlori, it may be used either to produce its topical effects, or on account of its remote or constitutional effects after absorption into the blood. Topically, when the solution is much diluted, it is used as a gargle in various diseases of the mouth, as in ptyalism, cancrum oris, aphthæ; in ulceration of the tonsils, such as occurs in scarlatina, diphtheria, &c.

As a lotion, to cancerous and other foul ulcers of any part, and also in some skin diseases.

The effects after absorption have not been clearly made out; it is supposed to possess some alterative and antiseptic action, especially influencing the function of the liver, and the chlorine vapour bath has been used for this influence upon the system, as likewise sponging with the solution of chlorine; probably liquor chlori acts in a manner similar to the nitro-hydrochloric acid, in which mixture of acids, a body, not unlike free chlorine in its action, is slowly developed. (See Liquor Sodæ Chloratæ.)

Chlorine when united to the metals, as in common salt, produces no very specific action upon the animal economy; the fact that the chlorides are essential components of the blood and other fluids of the body may explain their little powers when given as medicines. (See Sodii Chloridum.)

Dose. 10 min. to 30 min. freely diluted.

WATER.

Aqua. Water.

Natural water (H_2O), the purest that can be obtained, cleared if necessary by filtration; free from odour, taste, and visible impurity. If pure it leaves no residue when evaporated, but it is very difficult to ensure absolute purity.

Off. Prep. AQUA DESTILLATA. Distilled Water. HO, or H_2O.

Prep. Made by distilling water in a still, rejecting the first portion.

Prop. & Comp. A limpid colourless fluid, devoid of taste and smell, not altered by the addition of lime-water, chloride of barium, nitrate of silver, oxalate of ammonia, or sulphuretted hydrogen, indicating freedom from carbonic acid or carbonates, sulphates, chlorides, and most organic matter, lime and ordinary metallic impurities, as copper, lead, &c.

Use. It is ordered to be used in making almost all pharmaceutical preparations, but common water is frequently substituted; in some cases this neglect is important, as insoluble and inert compounds are formed, and the solvent power of distilled water for some substances exceeds that of common water.

MINERAL WATERS.

All water found on the earth's surface contains more or less foreign matter. The purest is melted snow or rain water, collected at a distance from towns. The most common impurities are salts of lime, as the sulphate, and the carbonate held in solution by an excess of carbonic acid. Besides these, water always contains a certain amount of gases dissolved in it, as common air, or rather air rich in oxygen and carbonic acid. The nature of the saline impurities varies much with the kind of soil through which the water flows; for some substances, as silex, are almost insoluble, whereas limestone and gypsum dissolve to a considerable amount, the former especially, when the water is impregnated with carbonic acid. When these foreign matters exist in the water to an extent sufficient to impart a sensible taste, it is called a mineral water: these have been divided into five classes, depending on their chemical composition.

The following are the most important:—

CLASS I.—*Chalybeate or Ferruginous Waters.*

These waters owe their efficacy to the iron contained in them; in many waters traces of iron exist, but such only are named chalybeate as possess sufficient of this metal to endow them with decided medicinal powers. In some springs, the iron exists in the form of carbonate held in solution by excess of carbonic acid; when such are exposed to the air, peroxide of iron is soon

formed and deposited; others contain sulphate of iron, often associated with sulphate of alumina, sometimes with chloride of iron.

The most important chalybeate waters in which carbonate of iron is found, are those of Pyrmont, Spa, Schwalbach, St. Moritz, Tunbridge Wells, and Harrowgate.

Iron exists as a sulphate in the waters of Sand Rock (Isle of Wight), Brighton, &c.

Therapeutics. Chalybeate waters are useful in anæmic conditions of the system; those containing the carbonate of iron are generally preferred, agreeing better with the stomach, and being less astringent. Individuals of plethoric habit should avoid chalybeate waters.

Class 2.—*Acidulous or Carbonated Waters.*

These waters contain a large amount of carbonic acid, which gives them their acidity, and causes them to sparkle; they usually hold in solution carbonates of lime, soda, and magnesia, which often become deposited on exposure from the escape of the carbonic acid, which acted as the solvent. The most celebrated of these waters are those of Neuenahr, Seltzer, and Ilkestone, near Nottingham.

Therapeutics. The waters are useful in atonic forms of dyspepsia, the free carbonic acid improving the tone of the stomach; they also, from the alkaline salts they possess, act as alteratives, increasing the secretion of the kidneys and skin, and are often valuable in chronic visceral diseases, gout, rheumatism, and some calculous affections.

Class 3.—*Saline Waters.*

These waters contain various salts, as sulphates of soda, magnesia, and lime; chlorides of sodium, calcium, and magnesium; carbonates of lime and soda, &c. Hence they may be subdivided:

Some, containing chiefly sulphates of magnesia and soda, are named *purging saline waters,* as those of Cheltenham, Leamington, Purton, Seidlitz, Carlsbad, Püllna, and Friedrichshall bitter water.

Some, having carbonate and sulphate of lime for their principal ingredients, are called *calcareous waters,* as those of Buxton, Bath, and Bristol.

Others contain chiefly chlorides, with, now and then, traces of iodine and bromine, called *salt waters,* as those of Wiesbaden,

Baden-Baden, and Kreutznach. Sea water also belongs to this division.

Lastly, some saline waters are noted for the amount of alkaline carbonates they contain; these are termed *alkaline waters*, as those of Vichy and Ems, &c.

Therapeutics. The purging waters are indicated in cases where congestion of the portal system is present, whether from organic visceral disease or not; the calcareous waters in chronic gout and rheumatism, and some skin affections: they act as powerful stimulants and alteratives, increasing the urinary and cutaneous excretions; the simple saline waters are more adapted for scrofulous affections, as glandular enlargements, &c.; and the alkaline waters in gout, and urinary diseases connected with excessive formation of uric acid, as they tend to induce a less acid condition of urine.

Class 4.—*Sulphuretted or Hepatic Waters.*

All contain sulphuretted hydrogen in solution, and are readily known by their odour; the most celebrated are those of Harrowgate, Moffat, Cheltenham, Aix-la-Chapelle, Borcet, and Aix in Savoy: many of these contain an alkaline sulphuret as well as sulphuretted hydrogen.

Therapeutics. These waters act as stimulants, especially on the skin and uterine system, and are used chiefly in chronic skin diseases, certain cases of chronic rheumatism, and uterine affections, &c.

Class 5.—*Indifferent Thermal Waters.*

These waters contain a proportion of mineral matter so small as to be therapeutically insignificant. Their temperature varies from 70° to 150° F. To this group belong the waters of Gastein, Wildbad, Schlangenbad, Teplitz, Plombières, Bagnères de Bigorre, &c.

Therapeutics. These waters are chiefly used in the form of baths, exerting a sedative influence in various affections of the nervous system, such as hysteria, some forms of neuralgia and functional paralysis. They are likewise employed in the treatment of uterine disorders, and joint affections of a gouty or rheumatic character. Taken internally, they are said to be of use in chronic catarrh of the stomach, gravel, and other urinary affections, &c.

ACIDS.

ACIDS EMPLOYED IN MEDICINE OR FOR TESTS, ARRANGED ALPHABETICALLY.

Acidum Aceticum. Acetic Acid. An acid liquid, prepared from wood by destructive distillation; 100 parts by weight contain 33 parts of the acetic acid, HO, $C_4H_3O_3$, or $HC_2H_3O_2$, corresponding to 28 parts of anhydrous acetic acid, $C_4H_3O_3$, or $C_4H_6O_3$.

Prep. When wood is heated in close vessels, as in iron retorts, amongst the volatile products of its destruction, a large amount of acetic acid distils over, mixed with wood spirit and various hydrocarbons; from this fluid, after redistillation, and neutralization with carbonate of soda, acetate of soda is separated by crystallization, and purified by several re-crystallizations; this salt, heated with sulphuric acid and water, yields acetic acid mixed with water, and forms the product under consideration.

Prop. A colourless liquid with a very pungent odour and strong acid taste, sp. gr. 1·044. It is volatile, and leaves no residue when evaporated. 182 grs. require for neutralization 1000 measures of the volumetric solution of soda. It gives no precipitate with sulphuretted hydrogen, chloride of barium, or nitrate of silver. These tests indicate a freedom from metallic impurities, sulphuric or hydrochloric acids. If a fluid drachm of it, mixed with half an ounce of distilled water, and half a drachm of pure hydrochloric acid, be put into a flask with a few pieces of granulated zinc, and, while the effervescence continues, a slip of blotting paper, wetted with a solution of subacetate of lead, be suspended in the upper part of the flask, above the liquid, for about five minutes, the paper will not become discoloured, showing the absence of sulphurous acid, which would thus produce sulphuretted hydrogen and decompose the subacetate.

Off. Prep. Acidum Aceticum Dilutum. Dilute Acetic Acid. (Acetic acid, one pint; distilled water, seven pints.)

The sp. gr. is 1·006. One fluid ounce requires for neutralization 313 grain-measures of the volumetric solution of soda, corresponding to 3·63 per cent. of anhydrous acetic acid; one fluid ounce therefore corresponds to 16 grains of anhydrous acid.

Oxymel. Oxymel. (Clarified honey, forty ounces; acetic acid, five fluid ounces; distilled water, five fluid ounces.)

Therapeutics. When freely diluted, acetic acid, given inter-

nally, acts as a refrigerant, but is seldom employed for this purpose. Externally, in its strong form, it is used as a rubefacient: sometimes as a vesicant and escharotic; but the glacial acid is more effective for such purposes; much diluted, it may be used to sponge the surface in fevers, to check excessive perspiration, also in cooling lotions. Acetic acid is more frequently employed on account of its solvent powers, than for any therapeutic value it may possess, as in the preparation of Liquor Epispasticus.

Dose. Of dilute acetic acid, 1 fl. drm. to 2 fl. drm. diluted still more. Of oxymel 1 fl. drm. to 2 fl. drm.

Adulteration. Foreign acids and metallic impurities, as copper, detected by the above tests.

Acidum Aceticum Glaciale. Glacial Acetic Acid. Concentrated acetic acid, corresponding to at least 84 per cent. of anhydrous acetic acid, $C_4H_3O_3$, or $\mathbf{C_4H_6O_3}$.

Prep. This is prepared by distilling acetate of soda, from which the water has been expelled by heat, with sulphuric acid, by which means sulphate of soda is formed, and acetic acid distils over. If the product shows any sulphurous acid when tried by the subacetate of lead and hydrochloric acid test, it is shaken with black oxide of manganese and redistilled. Any sulphurous acid is thus converted into sulphuric acid, and remains in combination with the manganese.

Prop. A colourless liquid at the mean temperature of our air, with a pungent acetous odour, converted when cooled to 34° into colourless prismatic crystals, which remain crystalline till the temperature rises to about 48°. Sp. gr. 1·065, which is increased by adding 10 per cent. of water. In consequence of this anomaly, the density alone cannot be relied on as a test of the strength of acetic acid, as between 1·063 and 1·077 the same density may indicate two very different strengths; monohydrated acetic acid and the same acid diluted with an equal weight of water having both the sp. gr. 1·063. Sixty grains by weight of glacial acetic acid require for neutralization at least 990 grain-measures of the volumetric solution of soda. The absence of sulphurous acid is indicated by the subacetate of lead test.

Off. Prep. It is used in the preparation of Mistura Creasoti, and Acetum Cantharidis.

Therapeutics. Glacial acetic acid acts as a caustic irritant, vesicant, and escharotic. It is chiefly used as an external application.

Acetum. Vinegar. An acid liquor, prepared from malt and unmalted grain, by the acetous fermentation.

Prep. The alcohol contained in the malt (?) under certain conditions, absorbs oxygen, and is converted into acetic acid which is contained in the vinegar. The change is thus shown: alcohol $C_2H_6O+O_2=C_2H_4O_2+H_2O$.

Prop. A brown liquid, with a distinctive odour. Sp. gr. from 1·017 to 1·019. One fluid ounce requires at least 402 grain-measures of the volumetric solution of soda for its neutralization, corresponding to 4·6 per cent. of anhydrous acetic acid. If ten minims of the chloride of barium solution be added to a fluid ounce of the vinegar, and the precipitate, if any, be removed, a further addition of the test will give no precipitate, indicating that not more than a $\frac{1}{1000}$ part of sulphuric acid is present, the greatest amount legally permitted.

Sulphuric acid causes no change of colour, showing the absence of metallic impurities.

Therapeutics. The action of vinegar is the same as that of dilute acetic acid of equal strength.

Dose. Of vinegar, 1 fl. drm. to 2 fl. drm. diluted.

Adulteration. Sulphuric acid may be added to vinegar, and metallic impurities may be present from the vessel in which it is kept. It should be scarcely affected by chloride of barium, or oxalate of ammonia, and not at all by sulphuretted hydrogen.

Acidum Arseniosum. Vide Preparations of Arsenic.

Acidum Benzoicum. Vide Gum Benzoin.

Acidum Carbonicum. (Not officinal.) Carbonic Acid. CO_2. (Solution in water.) Aërated water.

Prep. By acting upon carbonate of lime, as chalk, marble, &c., with dilute hydrochloric acid, and passing the gas through water under pressure.

Prop. A colourless gas, heavier than air, soluble in its own volume of water; the solubility much increased by pressure. The solution is acid in reaction, sparkling when exposed to air from the escape of the gas. Water containing this acid has the power of holding in solution carbonates of magnesia, lime, iron, &c.

Therapeutics. The gas directed in a stream upon a painful ulcerated surface, is stated to allay the pain. When taken into

the stomach, aërated water diminishes irritability if present, and hence allays sickness; and carbonic acid is often given in the form of effervescing medicines made with an acid and bicarbonate of an alkali, and in the granular effervescing salts of different kinds now so largely used. The water may also be usefully employed in dissolving saline remedies, as phosphates, carbonates of potash, soda, and lithia, &c., when it is desired to continue their use for a lengthened period.

Much of such water is now prepared in the Gasogene apparatus, of English and French construction.

Acidum Citricum. Citric Acid. 3HO, $C_{12}H_5O_{11}$ + 2HO, or $H_3C_6H_5O_7.H_2O$. An acid obtained from lemon juice, or the juice of the fruit of Citrus Limetta, the Lime.

Prep. Lemon juice, four pints; prepared chalk, four and a half ounces; sulphuric acid, two and a half fluid ounces; distilled water, a sufficiency. Add the chalk to the lemon juice at its boiling point; wash the precipitate of citrate of lime with hot water till there is no more colour dissolved. Add the sulphuric acid, diluted, to the precipitate diffused in a pint of water. Boil, filter the liberated citric acid from the insoluble sulphate of lime, and concentrate to a density of 1·21; cool, and after twenty-four hours decant from other crystals of sulphate of lime which will have formed, and further concentrate till a film forms on the surface; cool and crystallize.

Prop. Large transparent colourless crystals, right rhombic prisms, of an agreeable acid taste, decomposed by heat, very soluble in water, and less so in spirit; insoluble in pure ether. The crystals dissolve in three-fourths of their weight of cold, and in half their weight of boiling, water. An aqueous solution of 34 grains to the ounce resembles lemon juice closely, and gets mouldy on keeping. It does not render lime-water turbid (citrate of lime is, however, a sparingly soluble salt), and causes no precipitate with any salt of potash except the tartrate, from which it throws down the acid tartrate of that base. The aqueous solution is not darkened by sulphuretted hydrogen, nor precipitated by chloride of barium, showing the absence of metallic impurities and sulphates. Seventy grains of the acid dissolved in water are neutralized by 1000 grain-measures of the volumetric solution of soda.

Therapeutics. Citric acid given internally appears to act as a refrigerant, but there is no clinical evidence of its being able to

diminish febrile heat; it merely allays thirst and irritation of the skin.

Dose. 10 gr. to 30 gr. or more, dissolved in water and sweetened.

Free citric acid is contained in Vinum Quiniæ, Succus Limonis, and Syrupus Limonis.

Adulteration. Traces of sulphuric acid may be present, also tartaric, both detected by the tests and characters given above.

Acidum Hydrochloricum. Hydrochloric Acid. Hydrochloric acid gas (HCl, or **HCl**) dissolved in water, and forming 31·8 per cent. by weight of the solution.

Prep. By the action of sulphuric acid and water on chloride of sodium (common salt) in a glass retort, sulphate of soda and hydrochloric acid are formed; the latter distils over, and is collected in a receiver containing water, which absorbs the gas rapidly.

Prop. A nearly colourless transparent liquid, with a suffocating odour, and very sour taste, giving off white acrid fumes when exposed to air; sp. gr. 1·16; entirely dissipated by heat. It gives with nitrate of silver a curdy white precipitate (chloride of silver), soluble in excess of ammonia, but not in nitric acid. 114·8 grains by weight, mixed with half an ounce of distilled water, require for neutralization 1000 grain-measures of the volumetric solution of soda.

Hydrochloric acid has no action on gold leaf, even when boiled with it; this is shown by the acid, after digestion on the metal, not giving any precipitate with protochloride of tin; nor does the acid decolorize a solution of sulphate of indigo, indicating the absence of free chlorine. When diluted with 4 volumes of distilled water it gives no precipitate with chloride of barium or sulphuretted hydrogen, and does not tarnish bright copper foil when boiled with it, proving the absence of sulphates, and earthy or metallic matter. If a fluid drachm, mixed with half an ounce of distilled water, be put into a flask with a few pieces of granulated zinc, and during the effervescence a piece of blotting-paper moistened with a solution of subacetate of lead, be suspended in the upper part of the flask, above the liquid, for a short time, the paper will not become discoloured, showing the absence of sulphurous acid.

Off. Prep. Acidum Hydrochloricum Dilutum. Dilute Hydrochloric Acid. (Hydrochloric acid, eight fluid ounces; distilled

water, a sufficiency. Dilute the acid with sixteen ounces of the water, then add more water, so that at 60° it shall measure 26½ fluid ounces.)

Its sp. gr. is 1·052 ; six fluid drachms require for neutralization 1000 grain-measures of the volumetric solution of soda, equivalent to 10·58 per cent. of real acid. Six fluid drachms contain one equivalent, or 36·5 grains of hydrochloric acid (**HCl**).

Therapeutics. Externally it acts as a powerful caustic, and produces a white stain on the skin, which afterwards sloughs. (It has been described as white gangrene when it occurred in a case of malingering.) Internally, in a concentrated state, it is an acrid poison ; in a dilute form, a refrigerant, tonic, and astringent. It is given in some forms of atonic dyspepsia, from an idea of its being the acid of the gastric juice ; also in low states of the system, as in the petechial form of exanthematous diseases. It is also used as a gargle in ulceration of the throat, and in diphtheria.

Dose. Of dilute hydrochloric acid, 10 min. to 30 min. diluted freely.

Adulteration. Sulphuric acid, chlorine, and iron, for which the tests are given. The commercial acid is generally coloured from the presence of the latter impurities.

Acidum Nitro-Hydrochloricum Dilutum. *See* Officinal Preparations of Acidum Nitricum.

Acidum Hydrocyanicum Dilutum. Dilute Hydrocyanic Acid, or Prussic Acid. Hydrocyanic acid (HC_2N, or **HCN**) dissolved in water, and constituting 2 per cent. by weight of the solution.

This acid contains rather more than half as much anhydrous acid as Acidum Hydrocyanicum.—*Edinburgh.*

Prep. Ferrocyanide of potassium, two ounces and a quarter ; sulphuric acid, one fluid ounce ; distilled water, thirty fluid ounces, or a sufficiency. Mix the acid with four fluid ounces of the water, and to these, placed in a retort, when they have cooled, add the ferrocyanide of potassium, first dissolved in half-a-pint of the water. Put them into a retort, and adapt this to a receiver, containing eight ounces of the water, which must be kept carefully cold. Distil with a gentle heat till the fluid in the receiver measures seventeen ounces ; lastly, add three ounces, or as much water as may be necessary to bring the acid to the required

strength, so that one hundred grains (or 110 minims) of it, precipitated with a solution of nitrate of silver, shall yield ten grains of dry cyanide of silver. When the above proportions are observed in this preparation, the chief changes are, that the ferrocyanide is decomposed in such a manner that half its cyanogen passes over as free hydrocyanic acid, while a yellowish-white precipitate is formed of $K_2Fe_2Cy_6$, together with crystals of sulphate of potash, thus:

$$2K_4FeCy_6,3H_2O+3H_2SO_4=K_2Fe_2Cy_6+3K_2SO_4+3H_2O+6HCy.$$

Prop. A colourless liquid of peculiar odour and taste, entirely volatilized by heat, with a very slight acid reaction, and the reddening produced on litmus paper fugitive in character. Sp. gr. 0·997. Treated with a minute quantity of a mixed solution of sulphate and persulphate of iron, and afterwards with potash, and finally acidulated with hydrochloric acid, it forms Prussian blue. With nitrate of silver it gives a white precipitate (cyanide of silver), entirely soluble in boiling concentrated nitric acid. 270 grains of it, rendered alkaline by solution of soda, require 1000 grain-measures of the volumetric solution of nitrate of silver to be added, before a permanent precipitate begins to form, which corresponds to 2 per cent. of anhydrous acid. For the explanation of this test, see Appendix, under Vol. Sol. of Nitrate of Silver.

The dilute acid, when pure, is not coloured by sulphuretted hydrogen or precipitated by chloride of barium, showing the absence of metallic taint or sulphuric acid, and no red colour is produced on the addition of the iodo-cyanide of potassium and mercury, showing the absence of any foreign acid.

The acid known under the name of Scheele's prussic acid contains 4 per cent. of anhydrous acid.

The anhydrous acid is colourless, with a more intense odour than the dilute, sp. gr. 0·697, very volatile, and rapidly decomposed into a carbonaceous-looking matter. The dilute acid can be much longer preserved when a little mineral acid is present, as a trace of sulphuric or hydrochloric acid.

Off. Prep. Vapor Acidi Hydrocyanici. Inhalation of Hydrocyanic Acid. (Diluted hydrocyanic acid 10 min. to 15 min., cold water, 1 fl. drm. Mix in suitable apparatus, and let the vapour be inhaled.)

Therapeutics. Anhydrous prussic acid is one of the most intense and rapid poisons known Its effects are the same whether it be

inhaled, injected into the blood or subcutaneously, or applied to any of the mucous surfaces. It may cause death in two ways:

1. A large dose proves fatal in a few seconds. The animal falls as if struck by lightning, with or without a cry; its pupils are widely dilated. The nerve-centres and heart appear to have their functions instantaneously arrested.

2. A smaller, but still fatal dose, causes death by apnœa. The breathing is slow and gasping, the heart's action and pulse almost imperceptible; the pupils are dilated; consciousness is abolished. Death is usually preceded by suffocative convulsions. The dyspnœa is probably due to paralysis of the respiratory centre in the medulla oblongata; moreover, the acid combines with the hæmoglobin of the red corpuscles, and may perhaps interfere with the giving-up of oxygen to the tissues. In this form of poisoning, recovery is still possible. The first measure to be adopted is artificial respiration, which must be kept up steadily for some length of time. An auxiliary measure is the subcutaneous injection of atropia, which Preyer regards as a physiological antidote to hydrocyanic acid. (*See* Atropia.)

When much diluted, and in medicinal doses, it allays pain and spasm, and if the dose be large, it induces giddiness, &c. It is given in painful affections of the stomach and intestines, as in gastrodynia, enterodynia, pyrosis, and vomiting; also in chest affections, as pertussis, asthma, and other cases where the character of the cough is nervous; occasionally it is used to allay palpitation of the heart, especially when connected with dyspepsia, and the author is of opinion that it is in cases of functional palpitation that its efficacy is most marked; in fact, that it is of comparatively little service in organic cardiac diseases. Hydrocyanic acid has been also used in certain affections of the nervous system, as in chorea, hysteria, neuralgia, epilepsy, and tetanus. The vapour may be employed to produce the local action upon the lungs in chest affections.

Externally applied it allays irritation of the skin, and when freely diluted may be used in the form of lotion in cutaneous affections accompanied with much itching; also to allay pain in some forms of neuralgia;—great care should be taken that the skin is not abraded, as it might produce even fatal results.

Dose. Of dilute hydrocyanic acid 2 min. to 8 min.

Externally, in the form of lotion, 1 fl. drm. or more may be

added to 10 oz. of water, lead lotion, or almond emulsion; glycerine may also be usefully added to the lotion, as it retards evaporation and prolongs the effect of the acid upon the part.

Scheele's acid is twice the strength of the Pharmacopœia acid; it should not be employed in medicine. Aqua Lauro-Cerasi, or cherry-laurel water, which owes its activity to hydrocyanic acid, is described under Lauro-Cerasus.

Incompatibles. It is often prescribed with alkalies, as liquor potassæ, &c.; then a cyanide of the metal is formed, which acts in the same manner as the acid. The cyanates are not poisonous; they appear in the urine as carbonates.

Acidum Nitricum. Nitric Acid; Aqua fortis. Containing 70 per cent. by weight of nitric acid, HO,NO_5, or $\mathbf{HNO_3}$, corresponding to 60 per cent. of anhydrous nitric acid, NO_5, or $\mathbf{N_2O_5}$.

Prep. By the action of sulphuric acid in excess upon nitrate of potash in a glass retort, when nitric acid and bisulphate of potash are formed; the former, being volatile, distils over. $\mathbf{KNO_3 + H_2SO_4 = KHSO_4 + HNO_3}$.

Prop. A colourless transparent liquid, with a strongly acrid odour, and intensely acid taste; with a sp. gr. of 1·42, and a boiling-point of 250°; it fumes in the air, and entirely volatilizes with heat. If it be poured over copper filings, dense red vapours are immediately formed; but if mixed with an equal volume of water, and then added to the copper, it gives off a colourless gas, (**NO**) which, upon contact with air, becomes an orange vapour ($\mathbf{NO_2}$), and when conducted into a solution of sulphate of iron, communicates to it a dark-brown colour. When diluted with six parts of water, it gives no precipitate, either with nitrate of silver, or chloride of barium. If distilled, the product is uniform throughout the process. Ninety grains by weight of it mixed with half an ounce of distilled water, require for neutralization 1000 grain-measures of the volumetric solution of soda.

Off. Prep. Acidum Nitricum Dilutum. Dilute Nitric Acid. (Nitric acid, six fluid ounces; dilute it with twenty-four fluid ounces of water, then add more water, so that at a temperature of 60° it shall measure thirty-one fluid ounces.)

Colourless; sp. gr 1·101. Six fluid drachms require for neutralization 1000 grain-measures of the volumetric solution of soda, corresponding to 14·95 per cent. of anhydrous nitric acid ($\mathbf{N_2O_5}$).

Acidum Nitro-Hydrochloricum Dilutum. Dilute Nitro-

Hydrochloric Acid. (Nitric acid, three fluid ounces ; hydrochloric acid, four fluid ounces ; distilled water, twenty-five fluid ounces.) Sp. gr. 1·074. Six fluid drachms require for neutralization 920 grain-measures of the volumetric solution of soda.

Therapeutics. Externally, as a caustic, strong nitric acid is employed as an application to phagedenic sores, and for the destruction of warts, care being taken to protect the surrounding parts; also for the removal of hæmorrhoids ; it produces a yellow stain on the skin, from the production of picric acid, and causes sloughing. In the diluted form, it has been used as an application to ulcers, and also to diseases of the skin, as in cancrum oris. Injected in a very dilute state into the bladder, it has proved effectual in the solution of phosphatic calculi.

Internally it may be given as a refrigerant and tonic in cases similar to those for which sulphuric acid is administered, as in febrile diseases, and for preventing phosphatic deposits : it is also very useful as a stomachic tonic in some forms of dyspepsia. Nitric acid seems to possess powers not connected simply with its acid properties, for in certain scrofulous states of the system, and in syphilis, occurring in habits where mercury cannot be given, it often proves very serviceable. Nitric acid also appears to have some influence over the liver, and in certain torpid conditions of that organ may be given with advantage. It is also given in some forms of cutaneous disease as an alterative.

Dilute nitro-hydrochloric acid has an action similar to that of a solution of chlorine, and is used as a tonic and stomachic in dyspepsia ; also in phosphatic deposits in the urine. It is thought to have a considerable influence over the action of the liver, and to possess alterative powers. It is employed in chronic hepatitis, syphilitic cachexia, &c. Externally it is used as a bath in the above-named diseases.

Dose. Of the strong nitric acid, 1 min. to 3 min. ; of the dilute, 10 min. to 30 min. freely diluted.

Of dilute nitro-hydrochloric acid, 5 min. to 20 min. freely diluted. As a bath, 6 fl. oz. to each gallon of water (in a wooden vessel).

Adulteration. Chiefly sulphuric and hydrochloric acids, detected by the barium and silver tests above given.

Acidum Phosphoricum Dilutum. Dilute Phosphoric Acid. Phosphoric Acid, $3HO,PO_5$, or H_3PO_4, dissolved in water and corresponding to 10 per cent. by weight of anhydrous phosphoric acid, PO_5, or P_2O_5.

Prep. (Phosphorus, four hundred and thirteen grains; nitric acid, six fluid ounces; distilled water, a sufficiency. To the acid mixed with water, placed in a retort in a sand-bath, add the phosphorus; then apply heat until five fluid ounces have distilled over; put these again into the retort, and renew and continue the distillation until the phosphorus has entirely dissolved. Transfer the contents of the retort to a porcelain capsule, and evaporate the liquid, raising the heat a little towards the close of the process, until bubbles of orange vapour cease to form, and a colourless liquid of a syrupy consistence is obtained. Lastly, add to the acid, when it has cooled, as much distilled water as may be requisite to make it accurately measure a pint.) When nitric acid diluted with water acts with the acid of heat upon phosphorus in a glass retort, the acid is decomposed into oxygen, which unites with the phosphorus to form phosphoric anhydride, and nitric oxide gas, which escapes; a portion of the nitric acid distils over, and is returned into the body of the retort; the liquid which remains in the retort when all the phosphorus is dissolved, is then evaporated to a small quantity, in order to drive off any undecomposed nitric acid, and the syrupy solution of phosphoric acid afterwards diluted to the proper strength.

Prop. A colourless liquid, without odour, of an agreeable acid taste; sp. gr. 1·08. It does not precipitate chloride of barium or nitrate of silver acidulated with nitric acid, nor is it coloured by sulphuretted hydrogen either before or after strips of silver or copper have been digested in it; these tests show the absence of sulphuric acid, chlorides, metallic impurities, or nitric acid. With ammonio-nitrate of silver phosphoric acid gives a canary-yellow precipitate soluble in ammonia, and in dilute nitric acid. When evaporated it leaves a residue which melts at a low red heat, and upon cooling exhibits a glassy appearance. It is not precipitated by a solution of albumen, which shows that it is not the monobasic variety of the acid. When mixed with an equal volume of pure sulphuric acid and then introduced into the solution of sulphate of iron, it does not communicate to it a dark colour, showing the absence of nitric acid. Mixed with an equal volume of solution of perchloride of mercury, and heated, no precipitate is formed, showing the absence of pyrophosphates.

355 grains poured upon 180 grains of litharge in fine powder, leave after evaporation a residue, chiefly phosphate of lead, which heated to dull redness weighs 215·5 grains. Six fluid drachms therefore correspond to 35·5 grains of anhydrous phosphoric acid (half an equivalent of PO_5, or a quarter of an equivalent of P_2O_5)

Therapeutics. Dilute phosphoric acid acts in a similar manner to dilute sulphuric acid, but is much less powerfully astringent. It has been asserted to allay thirst in diabetes, and is supposed to exert an influence on the growth of osseous tumours. Phosphoric acid may be administered in much larger doses than the other mineral acids, and it seems probable that it would be the acid most adapted for the treatment of affections connected with the excretion of alkaline urine. Phosphoric acid has also been given in scrofulous affections, and it is stated with advantage.

Dose. 10 min. to 30 min. and upwards, freely diluted.

Adulteration. Sulphuric acid, hydrochloric acid, and metallic impurities detected by the above tests.

Acidum Sulphuricum. Sulphuric Acid ; Oil of Vitriol. An acid containing 96·8 per cent. by weight of HO,SO_3, or H_2SO_4, and corresponding to 79 per cent. of anhydrous sulphuric acid, SO_3, or SO_3.

Prep. Made by passing sulphurous anhydride, generated by burning sulphur, into leaden chambers, where it meets with steam and nitrous anhydride ; from the latter it absorbs an atom of oxygen, and is thereby converted into sulphuric anhydride ; and this combines with water to form sulphuric acid. ($SO_2+H_2O+N_2O_3=H_2SO_4+2NO$).

Prop. An oily-looking colourless liquid ; sp. gr. 1·843, having no odour, but an intensely burning acid taste, chars most vegetable substances and becomes darkened, absorbs water rapidly, and when mixed with it evolves great heat. Diluted with an equal measure of water it generally gives a slight white precipitate of sulphate of lead (derived from the leaden chambers), which is held in solution by the strong acid ; when diluted with water it gives a copious precipitate with chloride of barium. Diluted with six parts of water, it should give no yellow precipitate with sulphuretted hydrogen, indicating the absence of arsenic, &c. 50·6 grains by weight, mixed with an ounce of distilled water, require for neutralization 1000 grain-measures of the volumetric solution of soda. It leaves no residue when evaporated in a platinum crucible. When a solution of sulphate of iron is poured upon oil of vitriol, no purple ring is formed at the surface of the two solutions ; this shows the absence of nitrous acid.

Off. Prep. Acidum Sulphuricum Aromaticum. Aromatic Sulphuric Acid. (Sulphuric Acid, three fluid ounces ; rectified

spirit, two pints; cinnamon, in coarse powder, two ounces; ginger, in coarse powder, one ounce and a quarter. Prepared by maceration and digestion.) Sp. gr. 0·927. Six fluid drachms required for neutralization 830 grain-measures of the volumetric solution of soda, corresponding to 10·91 per cent. of anhydrous sulphuric acid. Six fluid drachms therefore correspond to 33·2 grains of anhydrous acid.

Acidum Sulphuricum Dilutum. Dilute Sulphuric Acid. (Sulphuric acid, seven fluid ounces; dilute it with 77 fluid ounces of water, and when the mixture has cooled to 60° add more water, so that it shall measure 83½ fluid ounces.) Sp. gr. 1·094. Six fluid drachms require for neutralization 1000 grain-measures of the volumetric solution of soda, corresponding to 10·14 per cent. of anhydrous sulphuric acid. Six fluid drachms therefore correspond to 40 grains of the anhydrous acid (one equivalent of SO_3, or half an equivalent of $\mathbf{SO_3}$).

Therapeutics. Externally the strong acid is a most powerful caustic, rapidly destroying all the tissues with which it comes in contact; internally, when much diluted, it acts as a refrigerant, tonic, and astringent. It is used to allay thirst in fever, especially when of a hectic character, to check excessive sweating in phthisis, to diminish passive mucous discharges and hæmorrhages, to improve digestion, and brace up the system in debility. Given for some time it increases the acidity of the urine, and may be employed in phosphatic deposits. It has likewise been found serviceable in some chronic skin diseases connected with a low state of system, as in pompholyx diutinus, &c. Recently it has been much extolled for checking diarrhœa.

Dose. Of dilute sulphuric acid, 5 min. to 30 min., freely diluted; of aromatic sulphuric acid, 5 min. to 30 min.

Adulteration. Water, indicated by a lower specific gravity. Lead, detected on dilution; arsenic, from the use of impure sulphur in the manufacture; and hydrochloric acid, from impurities in the nitre made use of, are sometimes present. Oil of vitriol often becomes much discoloured from a trace of organic matter, such as wood, cork, &c.

Acidum Sulphurosum. Sulphurous Acid. Sulphurous acid gas, SO_2, or $\mathbf{SO_2}$, dissolved in water, and constituting 9·2 per cent., by weight, of the solution.

Prep. By distilling sulphuric acid with wood charcoal in

coarse powder, when the carbon combines with part of the oxygen of the sulphuric acid to form carbonic acid, and leaves sulphurous acid.

Prop. The solution is colourless, with a suffocating odour of burning sulphur; sulphurous acid is a powerful deoxidizing agent, liberating iodine from iodic acid, decomposing sulphuretted hydrogen, &c.

When evaporated, the solution leaves no residue; it gives no precipitate, or a very slight one, with chloride of barium, indicating that no sulphuric acid is present, but a copious one if solution of chlorine be also added (sulphate of barium). Sp. gr. 1·04. 34·7 grains by weight, mixed with an ounce of water and a little mucilage of starch, does not acquire a permanent blue colour with the volumetric solution of iodine, until 1000 grain-measures of the latter have been added, representing about 5¼ grains of sulphurous acid.

The formula representing the decomposition which ensues in the use of this volumetric test, is as follows: $SO_2+2H_2O+I_2=H_2SO_4+2HI$; therefore, no blue colour appears until more than two equivalents of iodine has been added to each equivalent of sulphurous acid, or 3·2 grains of sulphurous acid require 12·7 grains of iodine, or 1000 measures of its volumetric solution.

Therapeutics. Sulphurous acid has a destructive influence on vegetable life, and upon this its therapeutic value, probably, for the most part depends. Externally applied, it causes irritation and redness, and has been used for the treatment of skin affections, especially when parasitic; *e.g.*, in the various forms of tinea, pityriasis versicolor, favus, &c. It is a valuable application to fœtid sores and raw surfaces. It may be used in solution, more or less diluted with glycerine, or applied as vapour from burning sulphur.

Internally it is not often given in the free state; the solution, in the form of spray, is very useful in ulcerative stomatitis and tonsillitis; also for removing the fœtid sordes by which the mouth is blocked up in the malignant forms of fever.

See Sodæ Sulphis, and Sodæ Hyposulphis.

Dose. ½ fl. drm. to 1 fl. drm. A strong solution of the acid may be diluted with about an equal bulk of glycerine or some other liquid, aud painted on the affected skin.

Acidum Tartaricum. Tartaric Acid. $2HO,C_8H_4O_{10}$, or $H_2C_4H_4O_6$.

Prep. From the acid tartrate of potash (cream of tartar) by the

addition of chalk, whereby an insoluble tartrate of lime is formed with half the acid in the acid tartrate, and a neutral tartrate of potash left in solution, the acid of which is afterwards likewise formed into tartrate of lime by decomposition of the potash salt with chloride of calcium. Lastly, tartaric acid is separated from the purified tartrate of lime by decomposition with sulphuric acid. The formulæ representing the decompositions which occur in the above process may be thus exhibited :

1st part of process,—

$$2(KHC_4H_4O_6)+CaCO_3=CaC_4H_4O_6+K_2C_4H_4O_6+CO_2+H_2O.$$

2nd part of process,—

$$K_2C_4H_4O_6+CaCl_2=CaC_4H_4O_6+2KCl.$$

3rd part of process,—

$$CaC_4H_4O_6+H_2SO_4=H_2C_4H_4O_6+CaSO_4.$$

Prop. In colourless transparent crystals, oblique rhombic prisms, with a sour but agreeable taste, decomposed entirely by heat, soluble in water and in rectified spirit, the solution precipitating acid tartrate of potash from any neutral salt of potash. The solution should not give a precipitate with sulphate of lime, oxalate of ammonia, or sulphuretted hydrogen, showing the absence of oxalic acid, lime, or other fixed impurities. Seventy-five grains (half the equivalent in grains of tartaric acid, as this acid is bibasic) dissolved in water require for saturation 1000 grain-measures of the volumetric solution of soda.

Therapeutics. Tartaric acid acts in the same way as citric acid, diminishing thirst in fevers: it is more commonly given for such purposes in the form of cream of tartar, or with bicarbonate of soda, in an effervescing state.

Dose. 10 gr. to 30 gr. or more, dissolved in water and sweetened.

Adulteration. Sulphuric acid may be present from imperfect preparation. Acid tartrate of potash and alum have occasionally been added.

AMMONIUM AND ITS SALTS.

($2NH_4$.)

When pure, ammonia is a colourless gas, capable of being liquefied; of very pungent odour, the fumes producing an alkaline reaction; it forms salts with acids, and by most chemists these salts are regarded as containing a hypothetical radical called

ammonium (NH_4); thus sal ammoniac may be regarded as a chloride of ammonium (NH_4Cl). Gaseous ammonia is sometimes made use of therapeutically, evolved usually from liquor ammoniæ, in which it is contained.

Ammoniæ Liquor Fortior. Strong Solution of Ammonia. Ammoniacal gas (NH_3), dissolved in water and constituting 32·5 per cent. of the solution.

Prep. Three pounds of chloride of ammonium and four pounds of slaked lime are mixed, put in an iron pot, and connected with a series of wash bottles, and lastly with a matrass containing twenty-two ounces of water. Heat is applied to the metal pot till no more gas escapes. The process being terminated, the matrass will contain about forty-three fluid ounces of strong solution of ammonia. ($2NH_4Cl + CaH_2O_2 = CaCl_2 + 2NH_4HO$.)

Prop. The strong solution has a sp. gr. 0·891, is colourless, giving off pungent fumes when exposed to air, and has a strong alkaline reaction. When diluted with four times its volume of distilled water no colour or precipitate should be produced by sulphuretted hydrogen or lime water, by oxalate of ammonia, or ammonio-sulphate of copper: showing the absence of most ordinary metallic impurities, carbonic acid, lime, or arsenic; the solution, when treated with an excess of nitric acid is not rendered turbid by nitrate of silver or chloride of barium, indicating freedom from chlorides and sulphates. 52·3 grains require for neutralization 1000 grain-measures of the volumetric solution of oxalic acid. One fluid drachm contains 15·83 grains of ammonia, NH_3.

Off. Pref. Liquor Ammoniæ. Solution of Ammonia. (Strong solution of ammonia, twenty fluid ounces; distilled water, forty fluid ounces) Sp. gr. 0·959. 85 grains by weight require for neutralization 500 grain-measures of the volumetric solution of oxalic acid, corresponding to 10 per cent. by weight of ammonia, NH. One fluid drachm contains 5·2 grains of ammonia. It is about one-third of the strength of the strong solution.

Linimentum Ammoniæ. Liniment of Ammonia. (Solution of ammonia, one fluid ounce; olive oil, three fluid ounces.) Strong solution of ammonia is an important ingredient in Linimentum Camphoræ Compositum.

Spiritus Ammoniæ Fœtidus. *See* Assafœtida.

Therapeutics. In medicinal doses free ammonia, as exhibited in

any of its preparations, produces warmth at the epigastrium, and acts as an antacid ; increases the force and frequency of the pulse, allays spasm, and promotes the secretions from the skin and mucous membranes, especially the bronchial. In larger doses throbbing and pain in the head, with heaviness, are induced ; and in still larger medicinal doses, emetic effects ; beyond this poisonous irritant symptoms may be caused. The action of ammonia differs much from that of alcohol, probably influencing the ganglionic and spinal systems rather than the brain proper, and increasing the functions of the secreting and excreting organs. It does not render the urine alkaline, but perhaps a portion appears in that fluid as nitric acid. Externally applied, ammonia is rubefacient, and even vesicant.

Ammonia is given to rouse the system in syncope ; to diminish spasm in hysteria ; to relieve nervous headache, the after-effects of alcohol, and delirium tremens ; also as a stimulant in low states of the system, as typhoid forms of fever ; in pneumonia and bronchitis, in which the expectorant power is also useful ; as a stimulant and antacid in low forms of dyspepsia connected with increased secretion of acid and flatulence in the stomach.

Externally it is applied to the mucous membrane of the nose in syncope and insensibility (in such cases care should be taken not to use too strong solutions) ; occasionally also it is inhaled, *very much diluted*, as an expectorant in chronic bronchitis. On the skin it is used, combined with volatile or essential oils, in most cases where a counter-irritant effect is desired to be produced by means of an embrocation, as over painful parts, stiff joints, &c. Liquor ammoniæ fortior, rubbed up with lard, will vesicate rapidly, if evaporation be prevented.

Ammonia may be used with advantage in poisoning with prussic acid, digitalis, tobacco, colchicum, and other sedative drugs.

Dose. Of solution of ammonia (not the strong) 10 min. to 30 min., well diluted. The dose of the strong solution is one-third of that amount.

Ammoniæ Carbonas. Carbonate of Ammonia: $2NH_4O,3CO_2$ $(+3HO)$ or $\mathbf{N_4H_{16}C_3O_8(3H_2O)}$.

Synonym. Ammoniæ Sesquicarbonas. *Lond. Dub.*

Prep. By heating a mixture of chloride of ammonium and chalk, when chloride of calcium, and carbonate of ammonia, are formed ; the latter rises in vapour, and is condensed. The exact

changes are not, however, quite so simple, for a neutral carbonate of ammonium is not the result. It is sometimes made from sulphate of ammonium and chalk; the sulphate being formed by the addition of gypsum or sulphuric acid to gas liquor or bone spirit.

Prop. Colourless, almost transparent, crystalline masses, with a powerful ammoniacal odour and acrid taste; strongly alkaline, volatilizes with heat, soluble in water, more sparingly in spirit; and readily dissolved by acids with effervescence. Exposed to air the odour is dissipated from the continued volatilization of the neutral carbonate at the ordinary temperature, and a white opaque powder of acid carbonate is left. The solution, when saturated with nitric acid, is not precipitated by chloride of barium or nitrate of silver, showing the absence of sulphates and chlorides. Fifty-nine grains, dissolved in an ounce of water, will be neutralized by 1000 grain-measures of the volumetric solution of oxalic acid. Twenty grains of the salt neutralize twenty-three and a half of citric, and twenty-five and a half of tartaric, acid.

Off. Prep. Spiritus Ammoniæ Aromaticus. Aromatic Spirit of Ammonia. (Carbonate of ammonia, eight ounces; strong solution of ammonia, four fluid ounces; volatile oil of nutmeg, four fluid drachms; oil of lemon, six fluid drachms; rectified spirit, one hundred and twenty fluid ounces; water, sixty fluid ounces: mix and distil one hundred and forty ounces.) The proportions of ammonia and carbonic acid in this preparation are such as to insure the formation of a neutral carbonate of ammonia. Its specific gravity is 0·870. Often called Sal Volatile.

Therapeutics. Carbonate or sesquicarbonate of ammonia, when fresh, acts both internally and externally in the same manner as free ammonia (*vide* Liq. Ammoniæ); occasionally, but very seldom, it is used as an emetic; when old, or after exposure, it acts much less powerfully as an excitant, but resembles the other ammoniacal salts.

Dose. Of the salt, as a stimulant, 3 gr. to 10 gr. or more. As an emetic 30 gr. may be given well diluted; occasionally useful as an emetic in asthenic bronchitis with deficient expectoration. Of aromatic spirits of ammonia, ½ fl. drm. to 1 fl. drm.

Adulteration. The salt may be deficient in volatile carbonate of ammonia on account of previous exposure; sulphates or chlorides may be present; these are detected by the tests given above.

Ammonii Chloridum. Chloride of Ammonium ; Sal Ammoniac. NH_4Cl, or $\mathbf{NH_4Cl}$.

Prep. Generally prepared from gas liquor, by adding hydrochloric acid to neutralization, evaporating the liquid, and purifying the crystals by sublimation. Or the ammonia of the gas liquor may be neutralized with sulphuric acid, and the sulphate of ammonium, mixed with sodium chloride, sublimed ; sulphate of soda remaining behind, while the sal-ammoniac rises in the form of vapour. ($2\,\mathbf{NaCl}+(\mathbf{NH_4})_2\mathbf{SO_4}=2\mathbf{NH_4Cl}+\mathbf{Na_2SO_4}$).

Prop. Hemispherical cakes, or pieces of such, which have a peculiar tough, fibrous structure, difficult to powder ; crystallizes from solution in octahedra : the salt is devoid of odour, but has a strong saline taste ; soluble in water, the solution being neutral ; soluble also in rectified spirit : when its aqueous solution is heated with potash, soda, or lime, free ammonia is evolved ; when treated with nitrate of silver it forms a copious curdy precipitate (chloride of silver). It volatilizes with heat, and leaves no residue.

Therapeutics. Its action is not well understood ; it produces no primary stimulant effect, but probably, after absorption, increases the secretions of the skin and mucous membranes : by some it is considered cholagogue ; by others it is regarded as emmenagogue ; and there is good evidence of its action on the nervous system, as seen in its power of relieving pain in certain forms of neuralgia. It has been used as a substitute for mercury, in chronic inflammatory diseases, from an idea that it causes absorption of deposited lymph ; it is also useful in many cases of chronic bronchitis, with profuse expectoration. Externally it is slightly stimulant, and is supposed to have the power of dispersing tumors.

Chloride of ammonium is not much used in Great Britain, but has been extensively employed in Germany and Russia in neuralgia and chronic rheumatism, and as an alterative ; it is applied externally to swollen parts, as glandular enlargements, &c. ; occasionally, from the cold produced during its solution, it is used as a refrigerant to the head.

Dose. 5 gr. to 30 gr.

Adulteration. Iron and lead are apt to be present in the commercial salt, from the apparatus employed in its manufacture ; the former may arise from sublimation of chloride of iron ; it stains the salt red ; neither sublime by moderate heat : the former is detected by the addition of a few drops of nitric acid and ferrocyanide of potassium, giving rise to prussian blue ; the latter

by a solution of iodide of potassium. Sometimes chloride of calcium is present, causing it to deliquesce.

Ammonii Bromidum. Bromide of Ammonium. NH_4Br, or $\mathbf{NH_4Br}$.

Prop. In colourless crystals, which become slightly yellow from decomposition and liberation of bromine, when exposed to the air, and have a pungent saline taste. Soluble in water, less so in spirit. Sublimed unchanged when heated. No blue colour is produced when its aqueous solution, together with a drop of bromine or chlorine water, are mixed with mucilage of starch, showing the absence of an iodide.

Therapeutics. Bromide of ammonium has been given in the same cases for which the potassium salt has been used, and is preferred by some. It possesses all the peculiar powers of bromine. (See Bromum, p. 26.)

Dose. 2 gr. to 20 gr.

Liquor Ammoniæ Acetatis. Solution of Acetate of Ammonia. Acetate of Ammonia, $NH_4O,C_4H_3O_3$, or $\mathbf{NH_4C_2H_3O_2}$, dissolved in water.

Prep. To three and a quarter ounces of carbonate of ammonia, add ten fluid ounces of acetic acid, or enough to form a neutral solution, and make up to three pints with water.

Prop. A colourless solution, without odour, but with strong saline taste; neutral in reaction; treated with potash, it evolves ammonia, and with sulphuric acid, acetic vapours.

Therapeutics. It is not a topical stimulant, like free ammonia and its carbonate, but it increases the secretions, especially of the skin, sometimes of the kidneys also; it is very commonly and largely used in the treatment of febrile states of the system, as a diaphoretic and refrigerant. It is stated, and on considerable clinical evidence, to relieve painful menstruation when given in large doses.

Dose. 2 fl. drm. to 6 fl. drm., freely diluted; even more may be given in dysmenorrhœa.

Adulteration. It should not contain free acid or alkali, nor be given with fixed alkalies, lime, or magnesia, as ammonia is then set free.

Liquor Ammoniæ Citratis. Solution of Citrate of Ammonia. Citrate of Ammonia, $3NH_4O,C_{12}H_5O_{11}$, or $3NH_4C_6H_5O_7$, dissolved in water.

Prep. Dissolve three ounces of citric acid in one pint of water, and add strong solution of Ammonia until the liquid is neutral to test-paper.

Therapeutics. Same as Acetate of Ammonia.

Dose. 2 fl. drm. to 6 fl. drm.

Ammoniæ Benzoas. Benzoate of Ammonia. *See* Acidum Benzoicum.

Sulphide of Ammonium. Appendix. NH_4HS.

Prep. To be made by passing sulphuretted hydrogen gas through a solution of ammonia to saturation.

Prop. A greenish-yellow transparent liquid, with intensely disagreeable and pungent odour. Sp. gr. 0·999. Often used as a test, as it precipitates many metals.

Therapeutics. In large doses it acts as a powerful depressant on the nervous system, causing giddiness, drowsiness, and faintness, with nausea; in smaller ones it produces upon the secreting organs increased action, more especially seen on the bronchial mucous membrane and skin. It is used occasionally as a sudorific and expectorant in chronic skin diseases, rheumatism, and bronchitis; also in diabetes, in which it has been stated to diminish the morbid appetite, but it does not diminish the excretion of sugar. Dangerous if given incautiously, and not much employed.

Dose. 3 min. upwards, carefully increased, dropped into water at the time of administration, as it soon decomposes and deposits sulphur.

Incompatibles. Almost all metallic and acid solutions.

Ammoniæ Nitras. Nitrate of Ammonia. NH_3,NO_5,HO, or NH_4NO_3.

Prep. By neutralising dilute nitric acid with ammonia or carbonate of ammonia, and evaporating the solution till crystals are obtained. The crystals are then kept fused at a temperature not exceeding 320° till all the water is driven off.

Prop. White, crystalline masses, deliquescent, with an acrid, bitter taste. Soluble in less than its own weight of water;

sparingly soluble in rectified spirit. The aqueous solution gives no precipitate with nitrate of silver or chloride of barium (absence of chlorides and sulphates). Heated with caustic potash, it evolves ammonia ; with sulphuric acid, it emits nitrous fumes. Fuses at 320° ; at from 350° to 450° it is resolved into nitrous oxide gas and water. ($NH_4NO_3 = N_2O + 2H_2O$.)

Use. Employed in the manufacture of nitrous oxide. Not used medicinally.

Ammoniæ Phosphas. Phosphate of Ammonia. $2NH_4O$, HO,PO_5, or $(NH_4)_2HPO_4$.

Prep. By mixing solutions of phosphoric acid and ammonia, and collecting the crystalline product which results.

Prop. In large transparent prisms, which effloresce on exposure to air ; it is soluble in water, insoluble in rectified spirit ; heated with potash it evolves ammonia ; it gives a canary-coloured precipitate with nitrate of silver. If 20 grains of this salt be dissolved in water and the solution of ammonio-sulphate of magnesia be added, a crystalline precipitate (ammonio-magnesian phosphate) falls, which when well washed upon a filter with solution of ammonia diluted with an equal volume of water, dried and heated to redness, leaves 16·8 grains.

Therapeutics. Phosphate of ammonia, when in solution, is capable of dissolving a considerable amount of urate of soda ; and clinical experience has shown that it is of value in the treatment of certain urinary diseases, where a tendency to uric acid calculi exists, and also in certain conditions of the gouty habit.

Dose. 5 gr. to 20 gr. freely diluted.

The **Iodide of Ammonium** has been sometimes used in medicine, and seems to have nearly the same action as the iodide of potassium ; it forms a white crystalline salt, and may be given in the same doses as the last-named salt. (See Iodine, p. 23.)

METALLIC PREPARATIONS (ALPHABETICALLY ARRANGED).

ALUMINUM.

(Al. Eq. = 13·75 or Al. Eq. = 27·5.)

This metal does not exist native, but is formed artificially from certain of its compounds. It has a steel-grey colour, sp. gr. 2·67,

and is not readily oxidized. It forms only one oxide (Al_2O_3), a very weak base, which occurs pure in the sapphire, and combined with silica in clay, schists, &c.

Alumen. Alum. Sulphate of Alumina and Ammonia, crystallized. $NH_4O,SO_3,Al_2O_3,3SO_3+24HO$, or $NH_4Al(SO_4)_2$, $12H_2O$.

Prep. Usually made by burning alum schist, which contains metallic sulphides as well as alumina, and subsequent exposure to air, by which means sulphuric acid is formed; this unites with the alumina, and the after-addition of sulphate of ammonia to the solution, causes the formation and crystallization of the alum.

Prop. It forms transparent, white, regular octahedral crystals, having an acid sweet astringent taste and a decidedly acid reaction; it is slightly efflorescent in dry air, from a loss of some of its water of crystallization. Alumina is precipitated from a solution of alum by the addition of alkalies and their carbonates, but re-dissolved by excess of the former, and the mixture evolves ammonia, especially when heated. A solution of alum gives also an immediate precipitate with chloride of barium (sulphate of barium); it should not be coloured blue by a mixture of ferrocyanide and ferricyanide of potassium (indicating that neither protoxide nor peroxide of iron is present).

Off. Prep. Alumen Exsiccatum. Dried Alum. It is simply alum deprived of its water by heat, which first fuses the salt, and then drives off the water of crystallization; this forms 47 per cent. of its weight. Dried, or burnt alum, as it is commonly termed, occurs as a white or light spongy mass, which unites with water with some intensity, but is very sparingly soluble in it. It is usually reduced to powder before being employed as a medicinal agent.

Therapeutics. Alum acts as an astringent, and if applied as alumen exsiccatum, or burnt alum, it is a slight escharotic. Internally it first acts upon the mucous membrane of the stomach and intestines as a direct astringent; it is afterwards absorbed, and produces remote astringent effects on the various tissues and secreting organs. In large doses it is purgative. It is employed topically as a gargle or injection in sore throat, leucorrhœa, &c.; in acute ophthalmia, especially of new-born children, as a lotion; internally in hæmorrhages and passive discharges; sometimes in colica pictonum as a purgative. Alum has also gained repute in the treatment of hooping-cough.

Dose. Of alum 10 gr. to 20 gr. as an astringent, alone or com-

bined with kino, &c.; from 30 gr. to 60 gr. may be given as a purgative. Dried alum is for external use only.

Incompatibles. Alkalies and their carbonates, tannic acid, or infusions and decoctions containing it; tartrates, salts of lead, barium, lime, cause precipitates in solutions of alum.

ANTIMONIUM. ANTIMONY.

(Sb, or **Sb.** Eq. = 122.)

This element is not employed in medicine in its metallic state; all the preparations are prepared from the native or black tersulphide, the most abundant ore. The symbol **Sb.** is derived from *Stibium*, a Latin name for antimony.

Antimonium Nigrum. Black Antimony. Native Sulphide of Antimony, SbS_3, or Sb_2S_3, purified from siliceous matter by fusion, and afterwards reduced to fine powder.

Prop. It occurs in crystalline metallic-looking powder of a steel-grey colour. It is soluble in boiling hydrochloric acid, giving off sulphuretted hydrogen; the solution is precipitated when thrown into water, a white oxychloride of antimony being formed.

Off. Prep. Not used as a drug, but employed in the preparation of Antimonium Sulphuratum and Liquor Antimonii Chloridi.

Antimonium Sulphuratum. Sulphurated Antimony.

Synonym. Antimonii Oxysulphuretum. *Lond.*
„ Sulphuretum Aureum. *Edin.*
„ „ Precipitatum. *Dub.*

Sulphide of Antimony, SbS_3, or Sb_2S_3, with a small and variable amount of Oxide of Antimony, SbO_3, or Sb_2O_3.

Prep. Ten ounces of black antimony (Sb_2S_3) are boiled for two hours with four and a half pints of solution of soda, with constant stirring and addition of water to maintain the same bulk, when the two substances act on one another, oxide of antimony and sulphide of sodium being formed (thus: $Sb_2S_3 + 6NaHO = Sb_2O_3 + 3Na_2S + 3H_2O$), and the sulphide of sodium combines with and dissolves some of the undecomposed sulphide of antimony, while the oxide of antimony does the same with the undecomposed soda.

The solution is strained through calico, and before it cools dilute sulphuric acid is added in slight excess, which decomposes

the sulphide of sodium (thus precipitating the sulphide of antimony which the latter held in solution) and combines with the soda which retained the oxide of antimony, the latter being in great part reconverted into sulphide. The following decomposition explains part of the process :—

$$3Na_2S+Sb_2O_3+3H_2SO_4=Sb_2S_3+3Na_2SO_4+3H_2O.$$

The precipitate is collected on a calico filter, the sulphate of soda washed away with water, and the precipitate dried at a temperature not exceeding 212°.

Prop. A bright orange or golden red powder, without odour and with slight taste ; insoluble in water, almost entirely soluble in hydrochloric acid with evolution of sulphuretted hydrogen, a little sulphur remaining undissolved ; it is also readily dissolved by caustic soda or potash. Sixty grains of this preparation dissolved in hydrochloric acid and dropped into water give a white precipitate of oxychloride of antimony, which when washed and dried weighs about 53 grains.

Off. Prep. It forms a part of Pilula Hydrargyri Subchloridi Composita.

Therapeutics. It possesses the same properties as other antimonial preparations, *vide* Antimonium Tartaratum ; is rather uncertain in action from its slight solubility, and is seldom used except as an alterative in the compound calomel pill.

Dose. 1 gr. to 5 gr. as an alterative ; 10 gr. and upwards as an emetic (not used as such).

Antimonium Tartaratum. Tartarated Antimony.

Synonym. Antimonii Potassio-Tartras. *Lond.* Often termed Tartar Emetic. $KO,SbO_3,C_8H_4O_{10}+2HO$, or $KSbC_4H_4O_7.H_2O$, a tartrate of potash and antimony.

Prep. By mixing five ounces of oxide of antimony with six ounces of acid tartrate of potash in fine powder, and a little water so as to form a paste, and setting the mass aside for twenty-four hours ; afterwards boiling it in water for a quarter of an hour, filtering the solution, and allowing the clear filtrate to crystallize. In this process the following changes occur :

$$Sb_2O_3+2KH,C_4H_4O_6=2KSbC_4H_4O_7+H_2O.$$

Prop. Colourless transparent crystals, exhibiting triangular faces (rhombic octahedra) with slight metallic taste. The crystals effloresce slightly in dry air ; are soluble in about 20 parts of cold

water, or in 2 parts of boiling water; partially soluble in proof spirit and insoluble in alcohol: they decrepitate and blacken upon the application of heat. The watery solution decomposes readily with the formation of algæ; is precipitated orange-red by sulphuretted hydrogen, not by ferrocyanide of potassium, chloride of barium, or nitrate of silver, unless the solution is concentrated. The watery solution gives a white precipitate of acid tartrate of potash with hydrochloric acid, which is not formed if tartaric acid be previously added, as that salt is soluble in it. Twenty grains dissolve without residue in a fluid ounce of distilled water at 60°, and the solution gives with sulphuretted hydrogen an orange precipitate, which when washed and dried at 212° weighs 9·91 grains.

Off. Prep. Vinum Antimoniale. Antimonial wine. (Tartarated antimony, forty grains; sherry wine, twenty ounces.) Two grains of the salt are contained in each ounce of the wine.

Unguentum Antimonii Tartarati. Ointment of Tartarated Antimony. (Tartarated antimony, in fine powder, a quarter of an ounce; simple ointment, one ounce.) The ointment contains one part of antimonial salt in five parts of the preparation.

Therapeutics. Internally, in small doses, tartar emetic acts on the skin and mucous membranes, and is diaphoretic, expectorant, and probably cholagogue. In larger doses it acts at first as an emetic, sometimes as a purgative; if continued, tolerance becomes established, and it then produces a powerful sedative effect upon the vascular system (not the heart especially) and upon all the muscles. Externally it is powerfully irritant, and produces pustules having the character of those in Variola; occasionally when thus applied it becomes absorbed, and hence may be dangerous in very young subjects.

Tartar emetic is used in febrile affections to promote secretions; in severe inflammation, as in acute pneumonia and bronchitis, as a vascular depressant; also in the reduction of dislocations; not unfrequently as an addition to purgative medicines. It is employed as an emetic, being adapted to cases in which depression of the circulation is not objectionable. At the present time the preparations of antimony are comparatively little used: the author does not remember to have prescribed them for some years, whereas thirty years ago he was in the habit of seeing them daily administered in various inflammatory diseases; so great is the change of opinion with regard to the use of vascular depressants which has taken place in the opinions of the medical

profession: it is possible the revulsion has been too great, and that they might be advantageously given in some forms of disease.

Externally, in the form of ointment, or hot aqueous solution, tartar emetic is used as a powerful counter-irritant in head and abdominal affections, also over diseased joints, and other chronically inflamed parts.

Dose. Of tartar emetic; as a diaphoretic, expectorant, &c., $\frac{1}{15}$ gr. to $\frac{1}{6}$ gr.; as a vascular depressant or sedative, $\frac{1}{6}$ gr. to 2 gr.; as an emetic, 1 gr. to 3 gr.

The wine is objectionable in cases where large doses of the salt are required for its depressant effect, but is a useful form for administration in doses of 15 min. to 40 min. in febrile affections, &c.

Incompatibles. Acids, alkalies, and their carbonates, cause precipitates in the solutions of this salt; also some earthy and metallic preparations, as those of lime, lead, &c.; but caustic alkalies in excess re-dissolve the precipitate. Astringent vegetable infusions throw down an insoluble tannate of antimony.

Adulteration. Cream of tartar is the only adulteration likely to be met with; this can be detected by its being less soluble in water than tartar emetic, and by finding that upon the addition of a small quantity of carbonate of soda to a boiling solution of the suspected salt, the precipitated oxide of antimony, which is at first thrown down, becomes re-dissolved from the presence of the free acid of the acid tartrate of potash. Iron is sometimes present.

Antimonii Oxidum. Oxide of Antimony. SbO_3, or Sb_2O_3.

Prep. This is prepared by pouring a solution of terchloride of antimony into water, and treating the resulting precipitate of oxychloride of antimony with carbonate of soda, by which means oxide of antimony and chloride of sodium are formed. The oxide is afterwards washed and dried at a heat not exceeding 212°.

Prop. A white powder, fusible at a low red heat, and readily dissolved by hydrochloric acid. The solution, dropped into distilled water, gives a white deposit, changed to orange yellow by sulphuretted hydrogen. Oxide of antimony does not yield any sublimate when fused in a test tube, showing the absence of arsenious acid; and it dissolves entirely when boiled with an excess of the acid tartrate of potash.

Off. Prep. Pulvis Antimonialis. Antimonial Powder. (Oxide

of antimony, one ounce ; phosphate of lime, two ounces.) This is intended as a substitute for "James' Powder."

Therapeutics. The oxide of antimony is analogous in its action to tartar emetic ; but on account of the slowness with which it dissolves in the stomach, it is less likely to cause local irritation, and it may be employed with advantage when the diaphoretic and slightly alterative effects of antimony are required.

Dose. Of oxide of antimony, 1 gr. to 5 gr. ; of antimonial powder, 3 gr. to 15 gr.

Antimonii Chloridi Liquor. Solution of Chloride of Antimony. Terchloride of antimony ($SbCl_3$), dissolved in hydrochloric acid.

Prep. Made by dissolving one pound of black antimony in four pints of hydrochloric acid with the aid of heat, and reducing the solution to two pints.

Prop. & Comp. A heavy liquid, of a yellowish-red colour ; sp. gr. 1·47. A little of it dropped into water gives a white precipitate of oxychloride, which becomes orange when treated with sulphuretted hydrogen. The solution, filtered from the white precipitate, gives rise to a copious deposit when treated with nitrate of silver. These reactions show that antimony and chlorine are present in the solution. One drachm, mixed with a solution of a quarter of an ounce of tartaric acid in four ounces of water, gives a precipitate with sulphuretted hydrogen, which, when washed and dried at 212°, weighs at least twenty-two grains, indicating the amount of antimony.

Therapeutics. The solution of chloride of antimony is a powerful caustic and escharotic. It is applied sometimes to cancerous growths, and also to poisoned wounds, to the bites of venomous serpents, &c. It is never administered internally, but is used in the preparation of the oxide of antimony.

ARGENTUM. SILVER

(Ag, or **Ag**. Eq.=108.)

Argentum Purificatum. Refined Silver.

Silver, in its metallic state, is not used in medicine, except as a coating for pills, but is introduced into the Pharmacopœia for the purpose of making the nitrate of silver ; when pure, it is very white and malleable, sp. gr. 10·50 ; it is acted on readily by sul-

phuretted hydrogen, and becomes black, but is not oxidized in the air; it is soluble in nitric acid. Silver leaf is the form made use of if the metal is employed as a test. If ammonia be added in excess to a solution of the metal in nitric acid, the resulting fluid exhibits neither colour nor turbidity.

Argenti Nitras. Nitrate of Silver. AgO,NO_5, or $AgNO_3$.

Prep. Three ounces of refined silver are dissolved by the aid of a gentle heat in two fluid ounces and a half of nitric acid, previously diluted with five ounces of water; the clear solution is then evaporated and allowed to crystallize.

Prop. In colourless right rhombic prisms: when fused, in the form of small white pencils or sticks, crystalline in structure. It is soluble in its own weight of water at 60° Fah., insoluble in alcohol, but soluble in rectified spirit. It gives a copious white precipitate with hydrochloric acid, which becomes dark by exposure to light; soluble in solution of ammonia, but not in nitric acid. A small fragment heated on charcoal with the blowpipe, first melts and then deflagrates, leaving behind a dull white metallic coating. Ten grains dissolved in distilled water give with hydrochloric acid a precipitate which when washed and dried weighs 8·44 grains, and the filtrate when evaporated by a water bath leaves no residue; indicating the proper amount of the metal, and the absence of impurities. It stains the skin black, and forms insoluble compounds with animal tissues. It should be kept from the light.

Therapeutics. Externally it is astringent, irritant, vesicant, or even escharotic, according to the mode of its application; it may be used in solution of the strength of from half a grain to half a drachm to the fluid ounce, or in the solid form. Internally, in small doses, it acts as an astringent and alterative to the mucous membrane of the stomach and intestines, is absorbed and produces remote astringent effects, and also influences the nervous system as a tonic; when long continued, it may stain the surface of the body of a blue or leaden hue, from the reduction of the metal and its deposition on the surface of the true skin, but such an effect has not been known to occur under less than three months' continuous use of the drug, often not till after a year.

Externally it is used to poisoned wounds, pustules, ulcers (venereal or other), and erysipelatous inflamed parts; also to diminish

or destroy morbid growths; occasionally it is rubbed on the skin, to produce vesication. In solutions of different strengths, it is used as a lotion, injection, or collyrium.

Internally, it is often of great value in gastric affections of a chronic inflammatory character, accompanied by gastrodynia, pyrosis, or vomiting, and even in organic and malignant diseases of the stomach it often gives much temporary relief; it is likewise useful in some cases of diarrhœa: from its action on the nervous system it has been largely used in the treatment of epilepsy, and frequently with considerable effect in checking the number of fits; sometimes it is given in chorea.

Dose. $\frac{1}{4}$ gr. to $\frac{1}{2}$ gr. or more, made into a pill with crumb of bread or some ingredient which does not decompose the salt.

Incompatibles. Its solution should be made with distilled water, as the chlorides decompose the silver salt; nitrate of silver is seldom given in the form of solution on account of its very disagreeable taste, and its decomposing almost all vegetable infusions which could be prescribed with it; probably the chloride of silver and other insoluble compounds would act as therapeutic agents.

Adulteration. It is apt to contain copper and lead, or, when in the fused form, nitrate of potash: if copper, its solution, after complete precipitation by common salt, will be blackened by sulphuretted hydrogen; if lead, the precipitate formed by the addition of common salt is not entirely dissolved by ammonia; if nitre or any other substance, then the silver salt will not answer to the quantitative test given above.

Argenti Oxidum. Oxide of Silver. AgO or Ag_2O.

Prep. A solution of half an ounce of nitrate of silver in four fluid ounces of distilled water, is poured into three and a half pints of lime water, and the mixture well shaken, and set aside to allow the deposit to settle; the supernatant fluid having been drawn off, the deposit should be collected on a filter, washed with distilled water, and afterwards dried at a temperature not exceeding 212° Fah., and kept in a stoppered bottle.

In this process, the change is one of simple transfer of the nitric acid from the silver to the calcium.

Prop. A dark olive-brown powder, becoming black by age; insoluble in water, but soluble in ammonia and likewise in nitric acid without the evolution of any gas, forming a solution with the

characteristics of nitrate of silver; readily decomposed by heat, and even by the action of light, when long continued, into metallic silver and oxygen.

Twenty-nine grains of oxide of silver yield 27 grains of metallic silver when heated to redness. The molecular equivalent of the oxide is 232, and of metallic silver 216; and 232 is to 216 as 29 to 27.

Therapeutics. Very similar to the nitrate, except that the topical action is slight; after absorption, its effects are probably the same. It has been asserted to be a very valuable astringent in hæmorrhages. It may be used when the remote action of silver is required, as in diseases of the nervous system, as a nervine tonic, and in dyspepsia on account of its influence on the mucous surface of the stomach.

Dose. ½ gr. to 2 gr., in the form of pill.

Incompatibles. Oxide of silver, from the readiness with which it parts with its oxygen, decomposes many organic substances. It is particularly incompatible with creasote, with which it forms a compound liable to spontaneous combustion.

The **Chloride of Silver** has also been given as a remedy: its action is probably similar to that of the oxide.

ARSENICUM. ARSENIC.

(As, or **As.** Eq. = 75.)

Arsenic occurs chiefly in the form of arseniuret of iron, nickel, or cobalt. Metallic arsenic is not employed in medicine; when pure, it is dark steel-coloured, with metallic lustre, crystalline, and brittle; sp. gr. 5·8; very volatile, and when heated gives off an odour like garlic; it forms two oxides, and combines readily with sulphur.

Acidum Arseniosum. Arsenious Acid; White Arsenic. AsO_3, or As_2O_3.

Prep. Usually collected in flues during the smelting of the arseniurets, and afterwards purified by introducing some of the commercial arsenious acid into a thin porcelain capsule, and covering the capsule with a glass flask filled with cold water and fitting pretty closely, then applying the heat of a lamp. The arsenious acid being volatile, rises in the form of vapour, and is condensed on the bottom of the flask.

Prop. The commercial article usually occurs in broken pieces of the cakes, into which it had been sublimed; it is transparent and glass-like at first, but becomes after a time opaque white or yellowish.

The medicinal acid, or that which has been resublimed by the above process, is in the form of a crystalline, heavy, white powder; soluble in about 100 parts of cold water (the amorphous being more soluble than the crystalline variety)—much more in boiling water, which, on cooling, deposits octahedral crystals of the acid; when sublimed slowly in a tube, the same octahedral crystals are seen. When mixed with charcoal and heated, metallic arsenic sublimes with an alliaceous odour. The solution of arsenious acid is precipitated yellow by sulphuretted hydrogen, and lemon or canary-yellow colour by ammonio-nitrate of silver, insoluble in water, but soluble in ammonia and nitric acid, and green with sulphate of copper, after the addition of potash.

Tests for purity. It is entirely volatilized by a heat of 400°. Four grains dissolved in boiling water with eight grains of bicarbonate of soda, discharge the colour of 808 grain-measures of the volumetric solution of iodine. This decolorization is effected by the conversion of the iodine into hydriodic acid. The change may be represented by the formula, $As_2O_3+2H_2O+4I=As_2O_5+4HI$, four equivalents of iodine corresponding to one equivalent of arsenious acid.

Off. Prep. Liquor Arsenicalis. Arsenical Solution. A mixed solution of arsenite and carbonate of potash.

Synonym. Liquor Potassæ Arsenitis. *Lond.* Fowler's Solution. (Arsenious acid in powder, carbonate of potash, of each eighty grains; compound tincture of lavender, five fluid drachms; distilled water, one pint. Boil the acid and carbonate with half a pint of water, until they are dissolved. To the cold liquor add the tincture; and lastly, as much of the water as may be requisite, that it may accurately measure a pint.) A reddish liquid, alkaline to test paper, and having the odour of lavender. When acidulated with hydrochloric acid, it gives, with sulphuretted hydrogen, a yellow precipitate, brightest when the arsenical solution has been previously diluted. One fluid ounce boiled for five minutes with ten grains of bicarbonate of soda, and then diluted with six fluid ounces of water to which a little mucilage of starch has been added, does not give with the volumetric solution of iodine a permanent blue colour, until 808 grain-measures, (representing four grains of arsenious acid) have been added. The

explanation of this test is the same as that given under the head of arsenious acid itself. The addition of the starch ensures the detection of free iodine more readily.

Therapeutics. Acute arsenical poisoning may present at least two forms ; in the one, the symptoms are those of intense gastro-intestinal irritation ; in the other, the action of the poison seems to be concentrated upon the nervous centres, while the alimentary canal escapes. Besides the post-mortem changes in the stomach and intestines, fatty degeneration of the liver, kidneys, voluntary muscles, and other organs, may be found. Chronic poisoning by arsenic presents a long and varied series of phenomena ; it is not met with as a consequence of the medicinal use of the drug, but only among workmen who are habitually exposed to its influence, or in persons who are accidentally subjected to it (arsenical wall-papers, &c.) It is undoubtedly possible for certain constitutions to become used to the poison ; the arsenic-eaters of Styria, beginning with minute doses, are ultimately able to swallow five grains of arsenious acid at a time. The effects produced upon them are said to be favourable ; increased muscular energy, improved nutrition and colour, and augmented respiratory power, being among the principal ones. In minute doses the effects of arsenic appear to be directed to the skin and nervous system, being alterative and tonic in their nature : in larger doses, irritation of the alimentary canal and of the mucous membrane of the eyes is produced ; in still larger ones, poisonous effects ensue : externally, it acts as an escharotic, and may be absorbed to a dangerous extent. In medicinal doses it is said to check oxidation and tissue-change ; it is chiefly eliminated in the urine, though some of it accumulates in the liver, spleen, and elsewhere. It has been found in nearly all the secretions except the milk. Arsenic is employed :

1°. In certain forms of skin-disease, not of syphilitic origin. In chronic eczema and psoriasis, in relapsing pemphigus and lichen ruber, the drug acts as a specific.

2°. As an antiperiodic. Excepting, perhaps, the preparations of cinchona bark, there is no agent so potent in the cure of intermittent fever, and periodic forms of neuralgia. Arsenic sometimes succeeds when quinine has failed.

3°. Arsenic cures some forms of neuralgia which cannot be attributed to malaria.

4°. It is a most valuable remedy in chorea, and has been employed in the treatment of epilepsy.

5°. It has been advantageously given in some forms of chronic

pulmonary disease; its good effects being perhaps due to its improving the general state of the patient's nutrition.

Dose. Of arsenious acid $\frac{1}{60}$ gr. to $\frac{1}{24}$ gr., or $\frac{1}{12}$ gr. Of arsenical solution, 2 min. to 5 min., or occasionally to 10 min. Preparations of arsenic should be given soon after a meal, and pain in the epigastrium, nausea, and irritation of the eyelids, should be looked upon as indications for diminishing the dose.

Adulteration. Gypsum and chalk, which have been sometimes mixed with arsenious acid, can be readily detected by not subliming with heat.

Liquor Arsenici Hydrochloricus. Hydrochloric Solution of Arsenic.

(Arsenious acid in powder, eighty grains; hydrochloric acid, two fluid drachms; water, a sufficiency. Boil the hydrochloric acid and arsenic with four ounces of the water, and add water till the bulk is a pint.)

Prop. A colourless liquid, with an acid reaction. Sp. gr. 1·009. Gives a yellow precipitate with sulphuretted hydrogen. A fluid ounce boiled for five minutes with twenty grains of bicarbonate of soda, and then diluted with six fluid ounces of distilled water, to which a little mucilage of starch has been added, does not give with the volumetric solution of iodine a permanent blue colour, until 808 grain-measures have been added, corresponding to four grains of arsenious acid in each fluid ounce.

Therapeutics. Some practitioners regard this solution as a milder preparation than that of the arsenite of potash; from many observations made by the author, he has come to the conclusion that there is no ground for such opinion; in cases in which the ordinary arsenical solution caused disturbance, the same amount of arsenic given in the form of the hydrochloric solution always produced the same symptoms.

Dose. 2 min. to 8 min.

Sodæ Arsenias. Arseniate of Soda. $2NaO,HO,AsO_5+14HO$, or $Na_2HAsO_4.7H_2O$.

Prep. Made by finely powdering and intimately mixing together ten ounces of arsenious acid, eight and a half ounces of nitrate of soda, and five and a half ounces of dried carbonate of soda, afterwards putting the mixture into a large clay crucible

covered with a lid, and exposing it to a full red heat, till effervescence has ceased and complete fusion has taken place. In this process the arsenious acid gets oxidised at the expense of the nitric acid, and combines with the sodium; carbonic acid and nitric oxide escape.

Prop. In colourless transparent prisms, soluble in water, the solution giving a brick-red precipitate with nitrate of silver (Ag_3AsO_4), and a white precipitate with chloride of barium, chloride of calcium, and sulphate of zinc, all of which precipitates are soluble in nitric acid. The precipitate with silver is also soluble in excess of ammonia. Arseniate of soda heated to 300° loses 40·38 per cent. of its weight. A watery solution of ten grains of the residue, treated with 53 grain-measures of the volumetric solution of soda, continues to give a precipitate with the volumetric solution of nitrate of silver, until 1613 grain-measures of the latter have been added, equivalent to 6·18 grains of arsenic acid (As_2O_5.)

Off. Prep. Liquor Sodæ Arseniatis. Solution of Arseniate of Soda. (Arseniate of Soda, rendered anhydrous by a heat not exceeding 300°, four grains; distilled water, one fluid ounce.)

Therapeutics. Arseniate of soda may be employed in the same cases as arsenious acid or the arsenical solution. The author has made many observations upon this salt, and considers it one of considerable value; from his trials he came to the conclusion that, measured by the amount of metal, its action is milder than arsenious acid, less liable to produce irritation of the mucous membranes, and equally effectual in its constitutional effects. See Therapeutics of Arsenious Acid.

Dose. Of the crystallized salt, $\frac{1}{12}$ gr. to $\frac{1}{2}$ gr.; of the salt dried at 300°, $\frac{1}{20}$ gr. to $\frac{1}{4}$ gr.; of solution of arseniate of soda, 5 min. to 10 min. or more. Some patients are very intolerant of arsenic, and much smaller doses must then be administered.

Ferri Arsenias. Arseniate of Iron. See Iron Salts.

Arsenici et Hydrargyri Hydriodatis Liquor. Solution of Hydriodate of Arsenic and Mercury; Donovan's Solution. (Not officinal.)

Prep. (Pure arsenic, in fine powder, six grains; pure mercury, sixteen grains; pure iodine, fifty and a half grains; alcohol, half a fluid drachm; distilled water, nine ounces or a sufficient quantity. Rub together the arsenic, mercury, iodine, and spirit, until a dry mass is obtained, and having triturated eight ounces of the

water with this in successive portions, let the whole be transferred to a flask, and heated until it begins to boil. When cooled and filtered, let as much distilled water be added to it as will make the bulk of the solution exactly eight fluid ounces and six drachms.)

Prop. & Comp. A very pale greenish-coloured liquid, having no odour, but a styptic taste ; it probably contains the red iodide of mercury and ter-iodide of arsenic.

Therapeutics. It has been used chiefly in obstinate skin affections, and seems occasionally to be useful when other preparations of arsenic fail ; it is peculiarly applicable to those depending on venereal taint. Externally, freely diluted, it has been used as a lotion in similar cases.

Dose. 10 min. to ½ fl. drm. diluted, and given with the precautions enjoined for the other preparations of arsenic. Each fl. drm. contains about 0·086 gr. of metallic arsenic.

AURUM. GOLD.

(Au, or **Au.** Eq.=197.)

Aurum. Gold. Appendix. Fine gold ; in mass or leaf.

Gold, when pure, is a soft, malleable, yellow metal ; sp. gr. 19·5 ; introduced into the Pharmacopœia for forming a solution. Gold is not acted on by nitric or any other simple acid, only by nitro-hydrochloric acid or chlorine. The test solution of the ter-chloride of gold is formed by dissolving gold in nitro-hydrochloric acid ; evaporating to dryness, and re-dissolving the resulting ter-chloride in distilled water. It is used as a test for Atropine, &c.

Therapeutics. Metallic gold in a state of very minute division (Pulvis Auri), the ter-oxide and ter-chloride, have been employed in medicine. Gold appears to act in a very similar manner to mercury ; its use has been chiefly confined to the treatment of venereal and scrofulous affections ; as yet its action has not been well made out. The preparation most employed is a double chloride of gold and sodium ($NaCl,AuCl_3,2H_2O$), which occurs as an orange-coloured salt in quadrangular prisms. Leaf gold is much used by dentists for stopping teeth.

Dose. Of powdered gold, ¼ gr. to 1 gr. ; of ter-oxide $\frac{1}{10}$ gr. upwards ; of ter-chloride or of the double salt, gr. $\frac{1}{20}$ upwards. The chloride is very poisonous, acting in a manner similar to corrosive sublimate.

BARIUM.

(Ba. Eq. = 68·5 or **Ba.** Eq. = 137.)

Barium, the metallic base of the Baryta salts, when separated, forms a brilliant white metal.

Barii Chloridum. Appendix. Chloride of Barium, in crystals. BaCl,2HO, or $\mathbf{BaCl_2.2H_2O}$.

Prep. By acting on the native carbonate of barium (Witherite) by means of hydrochloric acid assisted by heat.

Prop. Flat rectangular, white, transparent crystals, with bevelled edges; taste acrid and disagreeable; pretty soluble in water.

Use. Chloride of barium is introduced into the Pharmacopœia as a test for detecting the presence of sulphuric acid or sulphates in solution; the precipitated sulphate of barium forms a heavy white powder, insoluble even in boiling nitric acid.

Therapeutics. Chloride of barium has been employed in medicine, and in small doses appears to act as an alterative, especially affecting the glandular system; it is also supposed to act on the nervous centres. It is, however, a very poisonous salt, and is seldom used therapeutically.

Dose. $\frac{1}{2}$ gr. to 2 gr. and upwards.

BISMUTHUM. BISMUTH.

(Bi, or **Bi.** Eq. = 210.)

Bismuthum. Bismuth.

Description. A pinkish-white metal, occurring native, fusing readily, and crystallizing in cubes or octahedra; sp. gr. 9·8; soluble in nitric acid, precipitated by water: introduced for the formation of the nitrate.

Bismuthum Purificatum. Purified Bismuth.

Prep. Bismuth, ten ounces; nitrate of potash in powder, two ounces. Heat the bismuth and half the nitre to fusion, and continue the heat until the salt has solidified into a slag over the metal. Remove the salt, add the remainder of the nitre to the

bismuth, and repeat the process. Pour the melted bismuth into moulds. The nitre forms a slag with the impurities, which are thus removed.

Bismuthi Oxidum. Oxide of Bismuth. Bi_2O_3, or $\mathbf{Bi_2O_3}$.

Prep. By boiling one pound of the subnitrate of bismuth with four pints of solution of soda. The liquid is decanted from the precipitated oxide; the latter is then washed with distilled water, and dried on a water-bath.

Prop. A dull lemon-yellow powder. Does not lose weight by being heated to redness. Insoluble in water; soluble in nitric acid mixed with half its volume of water; if it be thus dissolved to saturation, the solution mixed with ten or twenty times its volume of water yields a white precipitate of the subnitrate. The nitric acid solution gives no precipitate with dilute sulphuric acid or nitrate of silver. Solution of chloride of ammonium added to the nitric acid solution gives a white precipitate, and if this be treated with excess of solution of ammonia, then filtered, and the clear filtrate neutralized with hydrochloric acid, it will not become turbid.

Therapeutics. Similar to the carbonate of bismuth (*quod vide*).

Dose. 5 gr. to 15 gr.

Bismuthi Subnitras. Subnitrate of Bismuth. White Bismuth. $BiO_3,NO_5,2HO$, or $\mathbf{BiNO_4.H_2O}$.

Prep. By dissolving two ounces of purified bismuth (in coarse powder) in four fluid ounces of nitric acid, diluted with three ounces of water, aiding the solution by heat; when the effervescence has ceased, decanting from impurities, evaporating the liquor to two fluid ounces, and pouring it into half a gallon of water, decanting the supernatant fluid from the precipitate which subsides, washing the sediment by agitation with water, and drying on a filter at a temperature of 150°.

The acid solution of nitrate of bismuth ($\mathbf{Bi(NO_3)_3}$) when poured into water, lets fall a white precipitate, chiefly composed of subnitrate of bismuth; its composition is somewhat altered by washing.

Prop. A heavy white powder, in minute crystalline scales, blackened by sulphuretted hydrogen. It is insoluble in water, dissolves in nitric acid mixed with half its volume of distilled water, and the solution poured into water gives a white crystalline precipitate; dissolved in sulphuric acid, diluted with an equal

bulk of water, it forms a solution which is blackened by sulphate of iron, showing the presence of nitric acid. The solution in nitric acid gives no precipitate with dilute sulphuric acid, nor with nitrate of silver.

Off. Prep. TROCHISCI BISMUTHI. Bismuth Lozenges. (Subnitrate of bismuth, fourteen hundred and forty grains; carbonate of magnesia, four ounces; precipitated carbonate of lime, six ounces; refined sugar, twenty-nine ounces; gum acacia in powder, one ounce; mucilage of gum acacia, two fluid ounces; rose-water a sufficiency; to make 720 square lozenges.) Each lozenge contains two grains of the salt of bismuth.

Therapeutics. Subnitrate of bismuth, when taken internally, acts upon the mucous membrane of the stomach and intestines as a direct sedative; a portion of it is dissolved and promptly absorbed, deeply impregnating the tissues; it has been discovered in some of the secretions, by which it is very slowly eliminated; much of it, however, passes through the alimentary canal, and becoming blackened in its passage by the action of sulphuretted hydrogen, imparts its colour to the fæces. The remote physiological action of bismuth is at present unknown. Subnitrate of bismuth is employed largely in the treatment of irritative forms of dyspepsia, more especially when pyrosis is a prominent symptom, and pain occurs an hour or more after food; it is also useful in some other forms of gastralgia, and in chronic vomiting; whether functional, or depending upon ulcer of the stomach. Subnitrate of bismuth has likewise been proposed to check diarrhœa, and was stated by Dr. Theophilus Thompson to be of much value in the diarrhœa of phthisis.

Bismuth has been also given in some nervous diseases, as epilepsy; and it is stated to have been occasionally of service: the author has tried it in a few cases of epilepsy, but without obtaining any benefit from it.

Externally, the subnitrate of bismuth has been used as a local sedative application in some skin affections, also in leucorrhœa and gleet. This salt has likewise been largely used as a cosmetic; the vapours of sulphuretted hydrogen, such as arise from the sulphurous mineral waters, are apt to blacken the face if so used.

Dose. 5 gr. to 20 gr. in powder; or suspended by means of mucilage of gum arabic or tragacanth. Of the lozenges, from 2 upwards.

Adulteration. Carbonate of lead, a dangerous addition, known by the tests given above; this salt effervesces with nitric acid, and

the solution is precipitated by sulphuric acid. Arsenic has been occasionally detected by the sublimation of arsenious acid when the preparation is heated, and by the other tests given under that metal.

Liquor Bismuthi et Ammoniæ Citratis. Solution of Citrate of Bismuth and Ammonia.

Prep. Purified bismuth, four hundred and thirty grains; nitric acid, two fluid ounces; citric acid, two ounces; solution of ammonia and distilled water, of each a sufficiency. Mix the nitric acid with an ounce of distilled water, and add the bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces, then add the citric acid previously dissolved in four ounces of distilled water, and afterwards the solution of ammonia in small quantities at a time until the precipitate formed is redissolved, and the solution is neutral or slightly alkaline to test-paper. Dilute with distilled water to the volume of one pint.

Prop. A colourless solution, with a saline and slightly metallic taste. Sp. gr. 1·122. Neutral or slightly alkaline. Miscible with water without undergoing decomposition; heated with hydrate of potash, ammonia is evolved and a white precipitate formed of oxide of bismuth. Hydrochloric acid gives a white precipitate soluble in excess. One fluid drachm contains three grains of oxide of bismuth.

Therapeutics. This solution has been proposed as a soluble bismuth preparation, and it appears to possess the same properties as the subnitrate, and may be employed in the same cases. Some practitioners regard it as more powerful than the subnitrate, and attribute this superiority to the soluble condition of the metal; comparative trials are at present wanting.

Dose. ½ fl. drach. to 1½ fl. drach. in water, or some other menstruum.

Bismuthi Carbonas. Carbonate of Bismuth. $2(BiO_3,CO_2),HO$ or $2(Bi_2CO_5).H_2O$.

Prep. Add the solution of nitrate of bismuth, as produced above in the preparation of the subnitrate, to a solution of six ounces of carbonate of ammonia in two pints of distilled water, constantly stirring, when the carbonate is precipitated; this must be washed and dried at a temperature not above 150°.

Prop. A fine, white powder, blackened by sulphuretted hydrogen ; insoluble in water, but soluble with effervescence in nitric acid. If to nitric acid, mixed with half its volume of distilled water, carbonate of bismuth is added to saturation, one volume of this solution, poured into twenty volumes of water, will yield a white precipitate. The nitric acid solution gives no precipitate with dilute sulphuric acid, or with solution of nitrate of silver. When added to sulphuric acid, coloured with sulphate of indigo, the colour of the latter is not discharged.

Therapeutics. Carbonate of bismuth probably acts in the same manner as the subnitrate ; it is more soluble in the secretion of the stomach, and perhaps on this account may cause a more powerful action upon the mucous membrane, but no trustworthy comparative clinical observations have been yet recorded.

Dose. 5 gr. to 20 gr.

CADMIUM.

(Cd. Eq. = 56 or Cd. Eq. = 112.)

Cadmium is a metal of a white colour, resembling tin, and a bar of it creaks when it is bent in the same manner as tin. It is found as a sulphide, in combination with some ores of zinc. Sp. gr., 8·6.

Cadmii Iodidum. Iodide of Cadmium. CdI, or CdI_2. Is formed by the direct union of iodine and cadmium in the presence of water.

Prop. It occurs in white flat micaceous crystals, having a pearly lustre ; is freely soluble in water and rectified spirit ; the solution being acid to litmus paper. The crystals melt at about 600° into an amber-coloured fluid, and give off violet-coloured vapours at a dull red heat. The watery solution is precipitated yellow (cadmium yellow, a pigment) with sulphuretted hydrogen or sulphide of ammonium; the precipitate is insoluble in excess of the latter ; precipitated in a white jelly with excess of potash, and the filtered fluid not affected by sulphide of ammonium. A solution of ten grains in water gives with an excess of nitrate of silver, a precipitate, which after being washed with water, and then with half an ounce of solution of ammonia, and dried, weighs 12·5 grains.

Off. Prep. Unguentum Cadmii Iodidi. Ointment of Iodide

of Cadmium. (Iodide of cadmium in fine powder, sixty-two grains ; simple ointment, an ounce ; mix.)

Therapeutics. Iodide of cadmium is not given as an internal remedy, but when in the form of an ointment it forms an efficient preparation, which may be used in the same cases, and has the same action as the iodide of lead ; while the staining which the latter salt produces is not produced by the cadmium salt ; this fact renders the iodide of cadmium a desirable remedy when we wish to avoid the production of any yellow disfiguration. Cadmium, when absorbed into the system, is not known to produce injurious effects, as is the case with lead. The ointment of the Pharmacopœia often causes irritation of the skin, and requires to be diluted with lard or some other bland substance.

Sulphate of Cadmium resembles in appearance sulphate of zinc ; it is crystalline and soluble in water ; in large doses it produces vomiting ; it is said to possess anti-syphilitic properties, and applied in solution topically acts as an astringent and irritant, and may be used for the same purposes as the sulphate of zinc. Its action is said to be ten times more powerful ; it is not officinal.

CALCIUM.

(Ca. Eq. = 20, or **Ca.** Eq. = 40.)

Calcium is the metallic base of lime ; it occurs, when pure, as a white metal, which, when heated, oxidizes rapidly and is converted into lime.

Calx. Lime, recently prepared from Chalk. CaO, or **CaO.**

Prep. Lime, or quick-lime, is made from chalk or carbonate of lime by strongly heating it, so as to drive off the carbonic acid.

Prop. In whitish masses, quite white when pure ; of a caustic taste ; it rapidly absorbs water, and when two-thirds of its weight of water are poured upon it, it slakes rapidly with development of much heat, and is converted into a snow-white and very bulky powder. About 11 grains are dissolved by a pint of water at 60° Fah. ; it is less soluble in boiling water ; sugar greatly increases its solubility. The solution of lime has an alkaline reaction, and yields a white precipitate with oxalate of ammonia ; it soon absorbs carbonic acid if exposed to the air. Lime, if previously slaked, dissolves in dilute hydrochloric acid without effervescence, and if this solution be evaporated to dryness, and the residue redissolved in water, only a very scanty precipitate forms on the

addition of saccharated solution of lime, showing the absence of all but traces of alumina and magnesia.

Off. Prep. Calcis Hydras. Slaked Lime, CaO, HO, or **Ca H_2O_2**, with some impurities. Recently prepared lime slaked with water.

Liquor Calcis. Solution of Lime ; Lime Water. (Slaked lime, two ounces ; distilled water, one hundred and sixty ounces. Keep the solution in stoppered glass vessels ; and when it is to be used, draw off the clear solution with a syphon.) Ten fluid ounces require for neutralization at least 200 grain-measures of the volumetric solution of oxalic acid, which correspond to five grains and a half of lime (**CaO**) ; or about half a grain to the ounce.

Liquor Calcis Saccharatus. Saccharated Solution of Lime. (Slaked lime, one ounce ; refined sugar in powder, two ounces ; distilled water, twenty fluid ounces.) Sp. gr., 1·052. One fluid ounce requires for neutralization 254 grain-measures of the standard solution of oxalic acid, which correspond to 7·11 grains of lime.

Linimentum Calcis. Liniment of Lime. (Lime-water, olive oil, each, two fluid ounces ; shake them together, until they are mixed.) Identical with Carron oil, olive being substituted for linseed oil.

Lime also forms a part of Potassa cum Calce, not now officinal.

Therapeutics. Lime is only given as liquor calcis, which acts as an antacid both on the intestinal canal, and, after absorption, on the blood and secretions. It differs, however, from potash and soda, in being astringent or desiccative, diminishing secretion, and hence is very useful in diarrhœa connected with acidity, and in some cases of dyspepsia ; it has also been used in certain calculous affections, as the urate of lime is a moderately soluble salt.

Externally applied, lime acts as a caustic, or much diluted, as a desiccant, and is applied to burns in the form of linimentum calcis.

Dose. Of solution of lime, or lime-water, ½ fl. oz. to 2 fl. oz. or more, with milk, &c. ; of saccharated solution of lime, 15 min. to 1 fl. drm.

Adulteration. Lime and liquor calcis are apt to contain carbonic acid and metallic impurities, which can be detected by the tests given above.

Calcis Carbonas Præcipitata. Precipitated Carbonate of Lime. CaO,CO_2, or $CaCO_3$.

Prep. Dissolve five ounces of chloride of calcium and thirteen ounces of carbonate of soda, each in two pints of boiling water, and mix, when carbonate of lime and chloride of sodium are formed; the latter subsides, is washed, and dried at 212°.

Prop. A white crystalline powder, in other respects corresponding with creta præparata. (Contained in Trochisci Bismuthi.)

Creta. Chalk; Native friable Carbonate of Lime. Used in producing carbonic acid gas.

Creta Præparata. Prepared Chalk. Chalk reduced to a very fine powder and elutriated.

Prop. In white powder, or small friable masses, tasteless, insoluble in water; entirely soluble, with effervescence, in dilute hydrochloric acid. This solution, when supersaturated with ammonia, gives a copious white precipitate with oxalate of ammonia; saccharated solution of lime added to a neutral solution gives no or scarcely a trace of precipitate, indicating the absence of silica, common metallic impurities, alumina, or magnesia.

Off. Prep. Mistura Cretæ. Chalk Mixture. (Prepared chalk, a quarter of an ounce; gum acacia, in powder, a quarter of an ounce; syrup, half a fluid ounce; cinnamon water, seven fluid ounces and a half.)

Pulvis Cretæ Aromaticus. Aromatic Powder of Chalk.
Synonym. Confectio Aromatica. *Lond.*
(Cinnamon bark, four ounces; nutmeg and saffron, each three ounces; cloves, one and a half ounces; cardamom seeds, one ounce; refined sugar, twenty-five ounces; all in powder; prepared chalk, eleven ounces.)

Pulvis Cretæ Aromaticus cum Opio. (*See* Opium.)
Prepared chalk is also contained in hydrargyrum cum cretâ.

Therapeutics. Chalk acts as an antacid and astringent on the intestinal canal; a little becomes absorbed and produces the remote effects of lime. It is used chiefly in diarrhœa, alone or combined with other astringents and aromatics. Chalk should not be given for too long a time, as when it ceases to meet with acidity in the intestinal canal it is apt to cause concretions which may lead to much discomfort. The action of precipitated carbonate of lime is the same as that of chalk.

Dose. Of precipitated carbonate of lime, and of prepared chalk, 10 gr. to 60 gr. ; of chalk mixture, 1 fl. oz. to 2 fl. oz. ; of aromatic powder of chalk, 10 gr. to 60 gr.

Adulteration. The same for chalk as for lime, detected by the above tests.

Calcii Chloridum. Chloride of Calcium. CaCl, or $CaCl_2$.

Prep. By dissolving white marble or chalk in hydrochloric acid, adding a little chlorinated lime and slaked lime to the solution, filtering, evaporating to dryness at 400°, and preserving it in well-closed bottles.

Prop. In whitish crystalline semitransparent masses or fragments, with a bitter, acrid, saline taste, deliquescent, and soluble in twice its weight of water, from which it can be crystallised ; soluble in alcohol. It evolves no chlorine or hypochlorous acid on the addition of hydrochloric acid. The aqueous solution is not precipitated by the addition of lime water. (Freedom from iron and alumina.)

Therapeutics & Use. It is introduced into the Pharmacopœia on account of the power it possesses of absorbing water, and is employed in the preparation of chloroform, ether, &c. ; it is used also in the rectification of spirit and as a test. (*See* Appendix.) As a medicine, chloride of calcium seems to act upon the glandular system, and was formerly used in scrofula ; it also appears to possess the power of allaying certain forms of vomiting.

Dose. 10 gr. and upwards.

Calx Chlorata. Chlorinated Lime. Probably a mixture of calcium hypochlorite ($CaCl_2O_2$) with calcium chloride ($CaCl_2$). It always contains some uncombined lime.

Prep. By passing chlorine gas over hydrate of lime loosely spread out in a proper chamber or vessel until it is completely saturated. ($2CaH_2O_2+2Cl_2=CaCl_2+CaCl_2O_2+2H_2O$.)

Prop. A whitish powder having the odour of chlorine and an acrid taste ; absorbs carbonic acid and water when exposed to the air, and at the same time gives off chlorine ; it is only partly soluble in water, the solution being alkaline and possessing bleaching properties ; the addition of oxalic acid causes the rapid and copious evolution of chlorine and the deposition of oxalate of lime. Ten grains mixed with 30 grains of iodide of potassium, and dissolved in 4 fluid ounces of water, produce, when acidulated

with 2 fluid drachms of hydrochloric acid, a reddish solution requiring for the discharge of its colour at least 850 grain-measures of the volumetric solution of hyposulphite of soda, which corresponds to 30 per cent. of chlorine, liberated by hydrochloric acid. (For explanation *see* Appendix, under Volum. Solution of hyposulphite of soda.)

Off. Prep. Liquor Calcis Chloratæ. Solution of Chlorinated Lime. (Chlorinated lime, one pound ; distilled water, one hundred and sixty fluid ounces.) Sp. gr. 1·035. Sixty grains by weight mixed with twenty grains of iodide of potassium dissolved in four fluid ounces of water, when acidulated with two fluid drachms of hydrochloric acid, give a red solution requiring for the discharge of its colour 500 grain-measures of the volumetric solution of hyposulphite of soda, equivalent to 13 grains of available chlorine in a fluid ounce.)

Vapor Chlori. Inhalation of Chlorine.

(Chlorinated lime, two ounces ; water (cold) a sufficiency.) Moisten the powder, and inhale the rising vapour.

Use. In the preparation of chloroform, also as a disinfectant agent to evolve chlorine : it is not often given internally, or used externally, chlorinated or chlorated soda being usually substituted for it.

Calcis Phosphas. Phosphate of lime. $3CaO,PO_5$, or $Ca_3P_2O_8$.

Prep. By dissolving bone ash in hydrochloric acid, precipitating the solution with ammonia, and drying at a temperature not exceeding 212°.

Prop. A white powder insoluble in water, but soluble without effervescence in dilute nitric acid. The solution continues clear when an excess of acetate of soda is added to it, but lets fall a white precipitate on the addition of oxalate of ammonia, or perchloride of iron (oxalate of lime and phosphate of iron being respectively formed. The acetate of soda is previously added to neutralise the nitric acid, in which oxalate of lime and phosphate of iron are soluble). Ten grains dissolve without effervescence in dilute hydrochloric acid, and the solution yields with ammonia a white precipitate (phosphate of lime), insoluble in boiling potash, and when washed and dried weighing 10 grains : the absence of effervescence proves that no carbonate is present, and the weight of the precipitate shows that the salt is pure.

Off. Prep. (Contained in Pulvis Antimonialis.)

Therapeutics. Scarcely given as a medicinal agent. Some practitioners have given it in scrofula and in rickets with an idea that it promotes the formation of bone.

Calcis Hypophosphis. Hypophosphite of Lime. CaO,PO,2HO, or $Ca2PH_2O_2$.

Prep. By heating phosphorus with hydrate of lime and water, until phosphuretted hydrogen ceases to be evolved. $3(CaO,H_2O)+2P_4+6H_2O=3(Ca2PH_2O_2)+2PH_3$. The liquid is then filtered, and the uncombined lime separated with carbonic acid gas; the remaining solution being evaporated until the salt separates in a crystalline form.

Prop. A white crystalline salt, with a pearly lustre, and a bitter nauseous taste. Soluble in six parts of cold water, and only slightly more soluble in hot water; insoluble in rectified spirit. The crystals do not lose water when heated to 300° F. Heated to redness they ignite, evolving spontaneously inflammable phosphuretted hydrogen, and leaving a reddish-coloured residue amounting to about 80 per cent. of the salt.

Therapeutics. The hypophosphites of lime and soda are said to possess all the stimulant, tonic, and alterative virtues of phosphorus, without being open to the objections which may be urged against the use of the uncombined drug (*See* Phosphorus). They were originally introduced as remedies for pulmonary phthisis; careful observations, however, both in this country and in France, appear to have proved their worthlessness in this respect.

Dose. 5 gr. to 10 gr.

CERIUM.

(Ce. Eq.=46, or Ce. Eq.=92.)

Some of the salts of cerium, a metal which exists in a few rare minerals, as cerite, have been employed in medicine during the last few years, and the oxalate is now made officinal.

Cerii Oxalas. Oxalate of Cerium. $2CeO,C_4O_6+6HO$, or $CeC_2O_4.3H_2O$.

A salt which may be obtained as a precipitate by adding a solution of oxalate of ammonia to a soluble salt of cerium.

Prop. A white granular powder, insoluble in water, decomposed at a dull red heat into a reddish-brown powder, which dissolves completely and without effervescence in boiling hydro-

chloric acid. The resulting solution gives with solution of sulphate of potash a white crystalline precipitate of double sulphate of cerium and potassium, which is quite insoluble in the sulphate of potash solution. If the salt be boiled with solution of potash and filtered, the filtrate is not affected by solution of chloride of ammonium, but when supersaturated with acetic acid it gives with chloride of calcium a white precipitate which is soluble in hydrochloric acid. Ten grains lose 5·2 grains in weight by incineration.

Therapeutics. Oxalate of cerium appears to act as a local sedative, and afterwards upon the system as a nervine tonic. It has been employed in irritable states of the stomach, as gastrodynia, vomiting and pyrosis, in the same way as nitrate of silver and subnitrate of bismuth; it is said to be very useful in the vomiting of pregnancy. It is also administered on account of its remote action in chronic forms of nervous disease, as epilepsy and chorea; likewise in convulsive cough and nervous palpitation of the heart. Cerium salts were first used by Sir James Simpson, of Edinburgh, who considers that they possess at least one great advantage over salts of silver in not causing blackening of the skin when long persevered in.

Dose. 1 gr. to 2 gr.

Other cerium preparations, as the *oxide* and *nitrate*, have been used, but as yet the therapeutic action of these salts is but imperfectly made out.

CUPRUM. COPPER.

(Cu. Eq. = 31·75, or Cu. Eq. = 63·5.)

Cuprum. Copper. Fine copper wire, about No. 25. Copper, in the form of foil, thin and bright, is contained in the Appendix.

Prop. & Use. Metallic copper has a well-known peculiar red colour; sp. gr. 8·86; malleable and ductile; oxidizable in the air, especially when in contact with acids, alkalies, or fatty bodies; it is employed to test the purity of hydrochloric acid; it can also be used for the detection of silver and mercury. Copper is also employed in Reinsch's test for arsenic.

Cupri Sulphas. Sulphate of Copper. CuO,SO_3+5HO, or $CuSO_4.5H_2O$.

Prep. May be obtained by heating sulphuric acid and copper

together, dissolving the soluble product in hot water and evaporating till crystals form on cooling.

Prop. In oblique rhombic azure-blue crystals, with a styptic metallic taste; efflorescing slightly in dry air; soluble in water; and reddening litmus. The aqueous solution gives a white precipitate with chloride of barium insoluble in hydrochloric acid, and a maroon-red precipitate with ferrocyanide of potassium; it is also precipitated by ammonia, but re-dissolved in excess of the re-agent. A watery solution of the salt, to which twice its volume of the solution of chlorine has been added, when treated with an excess of ammonia, gives a clear sapphire-blue solution (from the formation of the ammonio-chloride), leaving nothing undissolved; this shows the absence of iron.

Therapeutics. Internally, in small doses, sulphate of copper is astringent to the alimentary canal; and after absorption, a tonic to the nervous system. In large doses, it is a quick and powerful emetic. Externally, in powder or in strong solution, it acts as an escharotic; in a more diluted form as a stimulant and astringent. It is given as an astringent in cases of obstinate diarrhœa and dysentery, also as a tonic in chorea and epilepsy; in some cases of narcotic poisoning, as an emetic.

Externally, in the solid form or strong solution, it may be used to excessive granulations or ulcers, or as a weaker solution to diminish excessive secretions from mucous membranes, as in ophthalmia, gleet, &c.

Dose. As an astringent or tonic, $\frac{1}{4}$ gr. to 2 gr.; as an emetic, 5 gr. to 8 gr. Externally, in substance or in solution, from 1 gr. to 10 gr., or more, to the 1 fl. oz.

Adulteration. Sulphate of iron in the commercial salt; sometimes sulphate of zinc is fraudulently added: the iron is detected by ammonia not redissolving the oxide; zinc, by first precipitating the copper with sulphuretted hydrogen, then, on the addition of ammonia, some of the above gas being in solution, a whitish sulphuret of zinc is thrown down.

Subacetate of Copper of Commerce. Appendix. Verdigris; Ærugo. $(C_2H_3O_2)_2Cu.CuO$.

Prep. By exposing copper-plates to the action of the fermenting marc of grapes, or pyroligneous acid, when this salt forms on the surface.

Prop. In powder or masses consisting of very minute crystals,

of a bluish-green colour, with a peculiar sour metallic odour, and styptic metallic taste; resolved by water into a soluble acetate and insoluble tris-acetate; when treated with sulphuric acid, it gives off acetic acid fumes; it dissolves in this acid when dilute, and from the solution ammonia precipitates the oxide, but re-dissolves it when in excess.

A solution of acetate of copper is used for detecting the presence of butyric acid in valerianate of zinc. (*See* Zinci Valerianas.)

Therapeutics. Verdigris is occasionally used externally as an escharotic, in powder, or mixed with honey and vinegar, under the name of Linimentum Æruginis; it should be applied with a camel's-hair brush.

Adulteration. It sometimes contains chalk and sulphate of copper, detected by its effervescing with an acid, and by the solution precipitating with ammonia and chloride of barium. Other impurities can be detected by the tests given above.

FERRUM. IRON.

(Fe. Eq. = 28, or Fe. Eq. = 56.)

Iron Wire.

Iron wire is used in the Pharmacopœia for the formation of the iodide, the sulphate, and the granulated sulphate: and when thus employed, should be soft or wrought iron, which is flexible and non-resilient.

Off. Prep. Mistura Ferri Aromatica. Aromatic Mixture of Iron. (Pale cinchona bark, an ounce, and calumba root, half an ounce, in powder; cloves, a quarter ounce; fine iron wire, half an ounce; compound tincture of cardamoms, three fluid ounces; tincture of orange-peel, half a fluid ounce; and peppermint water, to twelve and a half ounces.)

Vinum Ferri. Wine of Iron. (Fine iron wire, one ounce; sherry, one pint; macerate for thirty days.)

Therapeutics. Action of Iron Salts in general. Iron forms an essential part of the red corpuscles of the blood, as much as six and a half per cent. of the metal being contained in the pure colouring matter or hæmatin. The iron appears to be neither in the state of protoxide nor peroxide, but intimately united with the organic elements of the compound. This portion of the blood is apt, from various causes, to become deficient, and a state of system is then induced designated by the term anæmia; to restore the blood when in such a condition to the healthy standard,

the preparations of iron are most valuable, and hence they are among the most important medicines in the list of the Materia Medica. All the preparations of iron appear to act as blood restorers or hæmatinics, and there is no good clinical evidence to show that, provided the amount of metal is the same, and the solubility ensured, one class of iron salts is superior to another in respect to their effect in improving the state of the blood.

Iron preparations also produce a distinct and direct influence upon the nervous system, independent of their hæmatinic power, and hence their administration is indicated in debility of this system, as in many cases of chorea, neuralgia, hysteria, epilepsy, &c.

Most of the preparations of iron are astringent, and apt to cause constipation, but some are much more astringent than others, and may be advantageously used in passive forms of hæmorrhage, especially when connected with anæmia; likewise in passive mucous and other discharges: they may also be given as bracing tonics. It is often useful to combine some mild aperient with iron preparations. The persalts are most astringent; the salts which contain iron in combination with a vegetable acid possess little or no such effect, although they may cause the bowels to be confined: the preparations of little astringency are especially adapted for cases in which the hæmatinic property only is required, and when it is desirable not to produce any powerful action upon the stomach.

Iron salts are often given in amenorrhœa as emmenagogues, but it is questionable if they act directly upon the uterus; they certainly do so indirectly by restoring the blood to its normal state, and hence causing the necessity for a catamenial discharge.

It is probable that only a small proportion of the iron introduced into the alimentary canal is absorbed into the blood. The greater part is excreted in the fæces, to which it gives a black colour, owing to the formation of iron sulphide, and a little tannate of the metal. Iron is probably absorbed in the form of a soluble albuminate; it is chiefly excreted by those surfaces which yield an albuminous secretion, such as the mucous membranes. Very little passes into the urine; none into the saliva; it has been found in the milk. It is stated to raise the temperature of the body and to increase the amount of urea excreted by the kidneys. There is reason to believe that the beneficial effect of iron in anæmia is not due solely to its furnishing a necessary chemical constituent of the red corpuscles.

The tongue of patients taking ferruginous preparations is

usually somewhat stained, and the teeth are apt to become discoloured.

Dose. Of aromatic mixture of iron, 1 fl. oz. to 2 fl. ozs.; of iron wine, from 1 fl. dr. to 2 fl. dr. and upwards. The mixture is said to contain less than a grain of iron in sixteen fluid ounces.

The peculiarities of action of the different preparations of iron will be noticed under each.

Ferrum Redactum. Reduced Iron. Metallic iron, with a variable amount of magnetic oxide. Fer réduit.

Prep. Made by reducing the hydrated peroxide of iron to the metallic state, by heating it in a gun-barrel in a furnace, and passing through it hydrogen gas, previously rendered dry by having passed over sulphuric acid and chloride of calcium.

Prop. & Comp. An impalpable powder, of a greyish-black colour, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar; it is soluble in dilute hydrochloric acid, with effervescence from the evolution of hydrogen, and the solution gives a light blue precipitate with the ferrocyanide of potassium; it oxidizes when exposed to damp air. Ten grains added to an aqueous solution of 50 grains of iodine and 50 grains of iodide of potassium, and digested with them in a small flask at a gentle heat, leave not more than 5 grains undissolved, and this should be entirely soluble in hydrochloric acid: this test indicates that at least one-half of the powder is metallic iron, as the magnetic oxide is not dissolved by the iodine solution.

Off. Prep. Trochisci Ferri Redacti. Reduced Iron Lozenges. (Reduced iron, seven hundred and twenty grains; refined sugar, twenty-five; gum acacia, an ounce; mucilage of gum acacia, two fluid ounces; distilled water, an ounce. Mix and divide into 720 lozenges.) Each lozenge contains a grain of reduced iron.

Therapeutics. Reduced iron may be given when we desire the blood-restoring properties of the metal without any astringent action. It is a powerful hæmatinic, even in small doses. It usually sits easily on the stomach; but occasionally annoys by the evolution of sulphuretted hydrogen, causing disagreeable eructations. The author has used it extensively for the last fifteen years.

Dose. Of reduced iron, 2 gr. to 6 gr. It may be taken with advantage during a meal, the powder being mixed up with the

food; or it can be made into a pill with Balsam of Peru, which prevents the oxidation of the metal.

Adulteration. Reduced iron is very apt to contain some sulphuret, from a subsulphate being thrown down with the oxide. Occasionally magnetic oxide has been mixed with or substituted for the reduced metal. The former impurity can be detected by the evolution of sulphuretted hydrogen when an acid is added; the latter by the want of effervescence or non-evolution of hydrogen, and the quantitative test above given.

Ferri Carbonas Saccharata. Saccharated Carbonate of Iron. Carbonate of Iron, FeO,CO_2, or $FeCO_3$, mixed with peroxide of iron and sugar, the carbonate forming at least 57 per cent. of the mixture.

Prep. Made by decomposing a solution of the sulphate of iron, by means of carbonate of ammonia, collecting the precipitated carbonate on a filter, and having first subjected it to expression, rubbing it with sugar in a porcelain mortar, and drying at a temperature not exceeding 212°.

Prop. In small lumps of a grey-brown colour, and a sweet chalybeate taste, dissolves with effervescence in warm hydrochloric acid diluted with half its volume of water, and this solution is but slightly affected by chloride of barium, showing absence of sulphate.

Twenty grains dissolved in excess of hydrochloric acid and diluted with water continue to give a blue precipitate with the ferridcyanide of potassium, until at least 208 grain-measures of the volumetric solution of bichromate of potash have been added, indicating that 3·5 grains of protoxide are present. (*See* Appendix, Volumetric Solution of Bichromate of Potash.)

Off. Prep. Mistura Ferri Composita. Compound Mixture of Iron. (Powdered myrrh, sixty grains; carbonate of potash, thirty grains; rose-water, nine and a half fluid ounces; sulphate of iron, twenty-five grains; spirit of nutmeg, four fluid drachms; sugar, sixty grains. Rub the myrrh with the spirit of nutmeg and the carbonate of potash: to these, while rubbing, add first the rose-water, with the sugar, then the sulphate. Put the mixture immediately into a glass vessel, and stop it.)

Pilula Ferri Carbonatis. Pill of Carbonate of Iron. (Saccharated carbonate of iron, one ounce; confection of roses, a quarter of an ounce.)

Therapeutics. The carbonate of iron in any of the above preparations has the hæmatinic properties of iron before noticed. The carbonate is not astringent, and produces little or no action upon the mucous membranes of the alimentary canal. It has enjoyed great repute in the form of mist. ferri. comp., or Griffiths's Mixture, as it is called, in the treatment of anæmic amenorrhœa.

Dose. Of saccharated carbonate of iron, 5 gr. to 20 gr. or more; of compound mixture of iron, 1 fl. oz. to 2 fl. oz.; of pill of carbonate of iron, 5 gr. to 20 gr. or more. When the mixture has been kept many days, it becomes reddish-brown in colour, from the green carbonate being converted into the sesquioxide of iron. The sugar in the other two preparations preserves the salt from oxidation.

Ferri Iodidum. Iodide of Iron. Iodide of iron, FeI, or FeI_2, with about 18 per cent. of water of crystallization and a little oxide of iron.

Prep. Made by dissolving iron wire and iodine in water with the aid of heat, evaporating, and allowing the product to solidify.

Prop. Crystalline, green, with a tinge of brown; inodorous, deliquescent; almost entirely soluble in water, forming a slightly-green solution, which rapidly decomposes into free iodine and peroxide of iron: if an iron wire is kept in the solution, the strength remains the same, for as the iodine becomes free, it dissolves the metallic iron and again forms the iodide. It gives a copious blue precipitate with the ferridcyanide of potassium, and one of similar colour with mucilage of starch, on the addition of a minute quantity of chlorine.

Off. Prep. Syrupus Ferri Iodidi. Syrup of Iodide of Iron. (Iodine, two ounces; iron, one ounce; distilled water, thirteen fluid ounces, or as much as may be necessary; sugar, twenty-eight ounces. Mix the iodine and iron with three ounces of water, and heat until the froth becomes white, then filter the liquid while still hot into the syrup which has been previously prepared by dissolving the sugar in ten ounces of water, and mix.) The product should weigh two pounds eleven ounces, and should have the sp. gr. 1·385.

Each fluid drachm of the syrup contains nearly four grains and a half of iodide of iron.

PILULA FERRI IODIDI. Pill of Iodide of Iron. (Fine iron wire, forty grains; iodine, eighty grains; refined sugar, in powder, seventy grains; liquorice root, in powder, one hundred and forty grains; distilled water, fifty minims. Agitate the iron with the iodine and water in a strong stoppered ounce phial, until the froth becomes white. Pour the fluid upon the sugar in a mortar, triturate briskly, and gradually add the liquorice.) One grain of iodide of iron is contained in about three grains and a half of the pill.

Therapeutics. Iodide of iron possesses the valuable properties of the ferruginous salts, in addition to those of iodine; it is peculiarly applicable to the treatment of the following conditions of the habit:—

In scrofulous diseases; in habits in which there is also much anæmia, the depressing influence of the iodine being counterbalanced by the hæmatinic powers of the iron.

In phthisis it has been much lauded, and although it does not act as a specific, yet in many cases it has appeared to produce a beneficial effect. It is often combined in these cases with cod-liver oil.

In some cases of rheumatoid arthritis it has proved useful, especially if the pains in the joints are increased by the heat of bed.

In secondary and tertiary forms of syphilis occurring in cachectic subjects.

It may, in fact, be administered whenever we wish to give iodine, and at the same time desire the tonic and blood-making power of the iron.

It should be remembered that the proportion of iron to iodine is small, only as 1 to $4\frac{1}{2}$.

Dose. Of iodide of iron, 1 gr. to 5 gr. or more. Of the syrup (containing about $4\frac{1}{2}$ gr. of iodide of iron to 1 fl. drm.), 20 min. to 1 fl. drm. Of the pill, $3\frac{1}{2}$ gr. to 8 gr. or more.

Ferri Sulphas. Sulphate of Iron. FeO,SO_3+7HO, or $\mathbf{FeSO_4.7H_2O}$.

Ferri Sulphas Exsiccata. Dried Sulphate of Iron. $FeO,SO_3,+HO$, or $\mathbf{FeSO_4.H_2O}$.

Ferri Sulphas Granulata. Granulated Sulphate of Iron. FeO,SO_3+7HO, or $\mathbf{FeSO_4.7H_2O}$.

Prep. Sulphate of Iron is made by dissolving iron wire in sul-

phuric acid, and crystallizing the solution; the *Dried Sulphate of Iron* by exposing these crystals to a moderate heat for some time, and finally raising it to 400°, when the water is driven off; and the *Granulated Sulphate* by pouring the hot solution of sulphate of iron into rectified spirit, and stirring the mixture, so that the salt shall separate in minute granular crystals.

Prop. In light bluish-green oblique rhombic prisms having an astringent styptic taste; it dissolves in about 1½ times its weight of cold water; is insoluble in alcohol; it generally contains a little persalt; the solution, when exposed, gradually becomes turbid, depositing a reddish-brown sediment of the peroxide; it gives a white precipitate with chloride of barium, a nearly white one with ferrocyanide of potassium, and a blue one with the ferridcyanide. The crystals should be free from opaque rust-coloured spots, and dissolve in water without leaving any ochry residue. The aqueous solution gives no precipitate with sulphuretted hydrogen. Dried sulphate of iron forms a whitish powder. The granulated sulphate occurs in small granular crystals, and has the composition and properties of the ordinary sulphate.

Off. Prep. Sulphate of iron is used in the preparation of mist. ferri. comp.; but in this preparation the carbonate of iron is formed.

Therapeutics. The same as iron salts in general, but in addition it has a powerful astringent action. It may be employed when an astringent is required with iron, as in passive hæmorrhages and mucous discharges, and is altogether a most valuable remedy in anæmic and relaxed conditions of the habit. The author has largely employed this salt, sometimes in doses as large as 15 grains, and has every reason to be satisfied with its action. It may also be used externally for its constricting powers.

Dose. Of the sulphate or granulated sulphate, 1 gr. to 5 gr., or even 10 gr., in pill or solution recently prepared. Of the dried sulphate from ½ gr. to 3 gr. or more may be administered. As a medicinal agent, the granulated sulphate has no peculiar advantages, except that it is much less liable to become oxidized than the common sulphate.

Incompatibles. None of the soluble iron preparations should be given with vegetable infusions or tinctures containing tannin or gallic acids, as inky compounds are then formed, which, though efficient as medicines, are not agreeable to the eye.

Ferri Arsenias. Arseniate of Iron. Arseniate of iron, $3FeO$, AsO_5, or $Fe_3As_2O_8$, partially oxidized.

Prep. Made by precipitating a mixed solution of arseniate of soda (four parts) and acetate of soda (three parts) by a solution (of nine parts) of sulphate of iron ; collecting and washing the precipitate. It should be dried by squeezing it in folds of linen in a screw-press, and afterwards exposing it on porous bricks in a warm-air chamber, whose temperature should not exceed 100°. In this way arseniate of iron, sulphate of soda, and free acetic acid are formed, and the presence of the free acetic acid causes the precipitation of the arseniate of iron, which is insoluble in it. The decomposition may be represented thus :

$$3FeSO_4+2Na_2HAsO_4+2NaC_2H_3O_2=Fe_3As_2O_8+3Na_2SO_4+2C_2H_4O_2.$$

Prop. A tasteless amorphous powder, of a green colour, insoluble in water, but readily soluble in hydrochloric acid. Its solution gives a blue precipitate both with ferro- and ferrid-cyanide of potassium, more abundant with the latter. A small quantity boiled with an excess of caustic soda and filtered, gives, when exactly neutralized by nitric acid, a brick-red precipitate on the addition of solution of nitrate of silver (arseniate of silver). The solution in hydrochloric acid when diluted gives no precipitate with chloride of barium (absence of sulphate).

Twenty grains dissolved in excess of hydrochloric acid diluted with water, continue to give a blue precipitate with the ferrid-cyanide of potassium, until at least 170 grain-measures of the volumetric solution of bichromate of potash have been added, corresponding to 2·8 grains of protoxide of iron. (For the explanation of this test, *see* Appendix, Volumetric Solution of Bichromate of Potash.)

Therapeutics. From a therapeutic point of view, this preparation is identical with arsenious acid. It can exert none of the specific effects of iron in those doses which are borne by the system.

Dose. $\frac{1}{10}$ to $\frac{1}{8}$ gr.

Ferri Phosphas. Phosphate of Iron. Phosphate of iron, $3FeO$, PO_5, or $Fe_3P_2O_8$, partially oxidized.

Prep. In the same manner as the arseniate of iron, phosphate of soda being made use of in the place of arseniate of soda.

(Sulphate of iron, three parts; phosphate of soda, two parts and a-half; acetate of soda, one part.) The decomposition being

$$3FeSO_4+2Na_2HPO_4+2NaC_2H_3O_2=Fe_3P_2O_8+3Na_2SO_4+2C_2H_4O_2.$$

The acetate of soda is added because phosphate of iron is less soluble in free acetic than in sulphuric acid.

Prop. A slate-blue amorphous powder, insoluble in water, soluble in hydrochloric acid; the solution precipitates both with ferrocyanide and ferridcyanide of potassium, more abundantly with the latter (showing that both proto- and per-salt are present); when treated with tartaric acid and an excess of ammonia, and subsequently with the solution of ammonio-sulphate of magnesia, it lets fall a crystalline precipitate—indicating phosphoric acid. (For explanation of this test, *see* Appendix, under solution of Ammonio-sulphate of Magnesia.) If digested in hydrochloric acid with a lamina of pure copper, a dark deposit does not form on the metal (absence of arsenic). Twenty grains, dissolved in hydrochloric acid, continue to give a blue precipitate with ferridcyanide of potassium until 250 grain-measures of the volumetric solution of bichromate of potash have been added. (*See* Appendix, Vol. Sol. of Bichromate of Potash.)

Off. Prep. Syrupus Ferri Phosphatis. Syrup of Phosphate of Iron. (Prepared by precipitating a solution of two hundred and twenty-four grains of granulated sulphate of iron with a mixture of two hundred grains of phosphate, and seventy-four grains of acetate of soda; the precipitate is pressed strongly between folds of bibulous paper, and five fluid ounces and a-half of dilute phosphoric acid added; as soon as the precipitate is dissolved, the solution is filtered; eight ounces of sugar are then added and dissolved without heat. The product should measure twelve fluid ounces).

One grain of the iron salt is contained in each fluid drachm of the syrup.

Therapeutics. The blue phosphate of iron was much used by the late Dr. Prout in the treatment of diabetes. It acts as a blood-restorer like the other preparations of iron, and has been recommended also in the treatment of rickets.

The syrup is an agreeable form for its administration, but it must be remembered that there is an excess of phosphoric acid present.

Dose. 5 gr. to 10 gr. Of the syrup, 1 fl. drm. and upwards.

Ferri Oxidum Magneticum. Magnetic Oxide of Iron. Magnetic oxide of iron, Fe_3O_4, or $\mathbf{Fe_3O_4}$, combined with about 20 per cent. of water of hydration, and containing some peroxide of iron.

Prep. Dissolve two ounces of sulphate of iron in two pints of water, and add five and a-half fluid ounces of solution of persulphate of iron; mix with four pints of solution of soda, and boil, whereby a mixture of proto- and per-oxide of iron is precipitated, and sulphate of soda left in solution. The precipitate is washed, and dried at a temperature not exceeding 120°.

Prop. A brownish-black powder, without taste, strongly magnetic, dissolves without effervescence in hydrochloric acid diluted with half its bulk of water, and this solution gives blue precipitates with the ferrocyanide, and the ferridcyanide of potassium. Twenty grains, dissolved in hydrochloric acid, continue to give a blue precipitate with the ferridcyanide of potassium, until 230 grain-measures of the volumetric solution of bichromate of potash have been added, indicating about 3·9 grains of protoxide.

Therapeutics. It may be used for the same purposes as reduced iron; it is a cheaper preparation, but probably less effectual.

Dose. 3 gr. to 5 gr. or more.

Ferri Peroxidum Hydratum. Hydrated Peroxide of Iron. Fe_2O_3,HO, or $\mathbf{Fe_2O_3,H_2O}$.

Prep. By drying the moist peroxide of iron at a temperature not exceeding 212°, and reducing it to a powder.

Prop. A dark-brown powder, insoluble in water, destitute of taste, and not magnetic. It dissolves slowly, with the aid of heat, in hydrochloric acid diluted with half its volume of water, and forms a solution which gives a copious blue precipitate with ferrocyanide of potassium; none with the ferridcyanide of potassium. It is often calcined to improve its colour, but this process injures it by diminishing its solubility. Heated to dull redness in a test tube it gives off moisture.

Off. Prep. Emplastrum Ferri. Chalybeate Plaster. (Hydrated peroxide of iron, in fine powder, one ounce; Burgundy pitch, two ounces; lead plaster, eight ounces.)

Therapeutics. It is a non-irritating preparation of iron, and is useful when it is desirable to continue the use of iron for a long

time, or to give it in large doses; it has been much administered in tic douloureux and other neuralgic affections.

As an external application its value as an iron preparation is very questionable.

Dose. 10 gr. to 60 gr., or more, in treacle or honey.

Ferri Peroxidum Humidum. Moist Peroxide of Iron. Hydrated peroxide of iron with about 86 per cent. of uncombined water.

Prep. Made by precipitating a solution of persulphate of iron with soda, collecting the precipitate on a calico filter, and preserving it, without drying, in a well-covered vessel.

Prop. A pasty mass of reddish-brown colour, dissolving readily in dilute hydrochloric acid, without the aid of heat, giving a copious blue precipitate with ferrocyanide of potassium, none with the ferridcyanide. A little dried at 212° until it ceases to lose weight, gives off moisture when heated to dull redness.

Therapeutics. The hydrated peroxide is not given internally to produce the general effects of iron on the system, but has been used as an antidote in cases of arsenical poisoning. It is capable of converting arsenious acid, the form in which the poison is usually taken, into an insoluble arseniate of iron.

Ferri Perchloridi Liquor Fortior. Strong Solution of Perchloride of Iron.

Prep. By dissolving iron wire in hydrochloric acid, and subsequently peroxidizing the iron by evaporating the solution with nitric acid, and afterwards diluting with water to the proper strength.

Prop. An orange-brown solution, with a strong styptic taste; miscible with water and alcohol in all proportions. Diluted with water, it is precipitated white by nitrate of silver, and blue by the ferrocyanide of potassium, but not at all by the ferridcyanide. Sp. gr. 1·44. A fluid drachm diluted with water, and precipitated with ammonia, yields a precipitate (peroxide of iron), which when washed and incinerated weighs 15·62 grs., indicating the presence of 31·728 grains of perchloride of iron in the fluid drachm.

Off. Prep. Liquor Ferri Perchloridi. Solution of Perchloride of Iron. The same strength as Tinctura Ferri Perchloridi. (Strong solution of perchloride of iron, five fluid ounces; distilled water, fifteen fluid ounces.)

TINCTURA FERRI PERCHLORIDI. Tincture of Perchloride of Iron. (Strong solution of perchloride of iron, five fluid ounces; rectified spirit, fifteen fluid ounces.) Sp. gr. 0·992.

Therapeutics. A most powerful astringent ferruginous preparation, useful in passive hæmorrhages and other discharges; also in erysipelas. Given as a blood-restorer, as well as an astringent.

Dose. Of the strong solution, 3 min. to 10 min.; of the tincture 10 min. to 40 min. or more, and the same for the solution.

Ferri Pernitratis Liquor. Solution of Pernitrate of Iron.

Prep. By dissolving iron wire in nitric acid and diluting to the proper strength. One ounce of iron wire with four and a-half fluid ounces of nitric acid are used in preparing thirty ounces of the solution.

Prop. A clear solution of reddish-brown colour, slightly acid and astringent to the taste. It gives a blue precipitate with the ferrocyanide, but not with the ferridcyanide of potassium. When to a little of it in a test tube half its volume of pure sulphuric acid is added, and then a solution of sulphate of iron is poured in, the whole assumes a dark-brown colour, showing the presence of nitric acid in the solution. Sp. gr. 1·107. One fluid drachm precipitated with ammonia yields 2·6 grains of peroxide, corresponding to 7·865 grains of pernitrate of iron.

Therapeutics. A powerful astringent tonic, and useful in the same cases as the perchloride. It has been much used in Dublin, and is recommended in some forms of diarrhœa in debilitated subjects, and in passive mucous discharges.

Dose. 30 min. to 1 fl. drm.

Ferri Persulphatis Liquor. Solution of Persulphate of Iron.

Prep. By boiling a solution of protosulphate of iron and sulphuric acid with nitric acid, until all the proto- is converted into a per-sulphate.

Prop. A dense solution of a dark-red colour, inodorous and astringent, miscible with water and alcohol with all proportions. Diluted with ten volumes of water, it gives a white precipitate with chloride of barium and a blue one with ferrocyanide of potassium, but not with the ferridcyanide. Sp. gr. 1·441. One fluid drachm yields with ammonia 11·44 grains of peroxide of iron.

Use. It is used in preparing other ferruginous salts, and is not given as a remedy. It is highly astringent.

Ferri et Ammoniæ Citras. Citrate of Iron and Ammonia. Formula uncertain.

Prep. The hydrated peroxide of iron, recently precipitated from the solution of the persulphate by means of ammonia, is dissolved in a solution of citric acid by the aid of heat, the liquid neutralized by the addition of ammonia, evaporated to the consistence of syrup, and dried in thin layers on flat porcelain or glass plates.

Prop. It is not crystalline, but dries in garnet or hyacinth-red transparent scales. It feebly reddens litmus paper, is soluble in water, but almost insoluble in rectified spirit. Its aqueous solution is of a sweet and very slight styptic taste. When incinerated with exposure to air it leaves not less than 27 per cent. of peroxide of iron, which is not alkaline. Heated with solution of potash, it evolves ammonia and deposits peroxide of iron; the alkaline solution from which the iron has separated does not, when slightly supersaturated with acetic acid, give any crystalline deposit, showing the absence of tartaric acid. When acidulated with hydrochloric acid it gives a copious precipitate with ferrocyanide of potassium, but none with the ferridcyanide.

Off. Prep. Vinum Ferri Citratis. Wine of Citrate of Iron. (Citrate of iron and ammonia, 160 grains; orange wine one pint. Dissolve, shake; after three days, filter.)

Therapeutics. As a blood-restorer it is a very effectual salt, and it possesses scarcely any astringency; it may often be given, especially in an effervescent mixture, when the stomach will not bear the more styptic preparations of iron. It is well adapted for administration to children, as the taste is not unpleasant.

Dose. 5 gr. to 10 gr. and upwards. Of the wine, 1 fl. drm. to 4 fl. drm.

Incompatibles. Tannin solutions strike black; caustic alkalies precipitate the oxide.

Ferrum Tartaratum. Tartarated Iron; Tartrate of Iron and Potash.

Synonym. Ferri Potassio-Tartras. (*Lond.*)

Prep. The hydrated peroxide of iron recently precipitated from the solution of the persulphate by ammonia, is mixed with a solution of acid tartrate of potash, and the mixture digested with repeated stirring for twenty-four hours, the temperature being always kept below 140°. The solution is afterwards allowed to

cool, any undissolved precipitate removed, and the fluid (reduced to the consistence of syrup) poured in a thin layer on flat glass or porcelain plates, and evaporated to dryness at a temperature of 120°.

Prop. Garnet scales, having the physical characters of the ammonio-citrate, but darker in colour; sparingly soluble in spirit; soluble in water, the solution is neutral; when acidulated with hydrochloric acid, it gives a copious blue precipitate with ferrocyanide of potassium, none with ferridcyanide. Boiled with a solution of soda, peroxide of iron separates, but no ammonia is evolved, and the filtered solution, when slightly acidulated by acetic acid, gives as it cools a crystalline deposit (acid tartrate of potash). Fifty grains incinerated at a red heat, and what is left washed with distilled water and again incinerated, leave a residue of peroxide of iron weighing 15 grains.

Therapeutics. The action of the tartarated iron is exactly similar to that of the ammonio-citrate; it can be prescribed with the alkaline cærbonates. It is probable that this salt, besides possessing hæmatinic powers, acts on the blood and urine in the same way as the simple alkaline tartrates; but in the doses in which it is usually given, these latter effects would be scarcely appreciable.

Dose. Of the salt, 5 gr. to 20 gr.

Ferri et Quiniæ Citras. Citrate of Iron and Quinia.

Prep. Freshly precipitated peroxide of iron (prepared by precipitating a solution of the persulphate of iron by means of ammonia) is dissolved in a solution of citric acid, and to this is added quinia (prepared by dissolving sulphate of quinia by the aid of a little sulphuric acid in water, and precipitating the quinia by ammonia), and the liquid digested on a water bath till the alkaloid is dissolved. It is then evaporated in thin layers on porcelain or glass plates, in the manner directed for the ammonio-citrate.

Prop. In thin lustrous scales of a greenish-yellow colour, deliquescent, entirely soluble in cold water. The solution is slightly acid, and is precipitated reddish-brown by solution of soda, white by solution of ammonia, blue by the ferrocyanide and by the ferridcyanide of potassium, and greyish black by tannic acid.

Taste bitter and chalybeate. When completely burned with

exposure to air, it leaves a residue (peroxide of iron) which yields nothing to water. Fifty grains dissolved in a fluid ounce of water, and treated with a slight excess of ammonia, yield a precipitate of quinia, weighing when dried 8 grains. The precipitate is entirely soluble in ether, and when burned leaves but a minute residue ; when dissolved in a dilute acid, and purified with a little animal charcoal, it yields a solution which turns the plane of polarization strongly to the left. This test determines the amount, nature, and purity of the alkaloid.

Therapeutics. This salt possesses the combined properties of both iron and quinine, and is an elegant preparation : it must be remembered that the quinine is precipitated by alkalies, and therefore it cannot be prescribed with these latter remedies.

Dose. 5 gr. to 20 gr.

Adulterations. Deficiency of quinia, and substitution of cinchonia, &c., indicated by above tests.

Tinctura Ferri Acetatis. Tincture of Acetate of Iron.

Prep. A solution of acetate of potash in rectified spirit is added to one of persulphate of iron ; they are shaken together during an hour, and the mixture is then filtered. A precipitate of sulphate of potash is retained by the filter, while the tincture of the acetate of iron runs through.

Therapeutics. A very palatable hæmatinic.

Dose. 5 min. to 30 min.

HYDRARGYRUM. MERCURY.

(Hg. Eq. = 100, or **Hg.** Eq. = 200.)

Hydrargyrum. Mercury. Quicksilver.

Prep. Mercury is obtained chiefly from its sulphide, native cinnabar, by distillation with iron ; sometimes it is met with in its metallic state, sometimes combined with chlorine, &c. Mercury of Commerce is purified by redistillation and washing with dilute hydrochloric acid.

Prop. When pure, mercury occurs as a brilliant white metallic liquid, becoming solid at $-39°$ Fahr. ; sp. gr. 13·5 ; entirely vaporized by a heat below that of visible redness ; and when small globules of it are rolled slowly upon a sheet of paper, not the least particle adheres ; above 40° Fahr. a slight vapour arises from it. It forms two classes of salts, proto- and persalts. It dissolves

many metals, as tin, bismuth, zinc, silver, and gold, and forms amalgams with them.

Off. Prep. Liquid mercury is seldom used in medicine, but there are many preparations which owe their value to the presence of mercury in a very highly divided state, caused by long trituration with saccharine and greasy matters, or fine powders.

HYDRARGYRUM CUM CRETÂ. Mercury with Chalk. Grey Powder. (Mercury, one ounce; prepared chalk, two ounces. Rub together until globules are no longer visible.)

Prop. A light-grey powder, free from grittiness; insoluble in water; partly dissolved by dilute hydrochloric acid, the mercury being left in a finely-divided state: the solution in hydrochloric acid is not precipitated by the addition of chloride of tin, showing the absence of perchloride of mercury, which would be then precipitated as calomel.

PILULA HYDRARGYRI. Mercurial Pill. Blue Pill. (Mercury, two ounces; confection of roses, three ounces; powdered liquorice root, one ounce. Rub the mercury with the confection until globules can no longer be seen; then, the liquorice being added, beat the whole together to form a mass.)

EMPLASTRUM HYDRARGYRI. Mercurial Plaster. (Mercury, three ounces; olive oil, one fluid drachm; sulphur, eight grains; lead plaster, six ounces. Heat the oil and add the sulphur, with this mixture rub the mercury till globules disappear, then add the lead plaster, previously liquefied.)

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Ammoniacum and Mercury Plaster. (Gum ammoniac, twelve ounces; mercury, three ounces; olive oil, one fluid drachm; sulphur, eight grains.)

UNGUENTUM HYDRARGYRI. Mercurial ointment. Blue ointment. (Mercury, one pound; prepared lard, one pound; prepared suet, one ounce. Rubbed together thoroughly.)

UNGUENTUM HYDRARGYRI COMPOSITUM. Compound Mercury Ointment. (Ointment of mercury, six ounces; yellow wax and olive oil, of each three ounces; camphor, one and a half ounce.)

LINIMENTUM HYDRARGYRI. Liniment of Mercury. (Ointment of mercury, one ounce; solution of ammonia, and liniment of camphor, each one fluid ounce.)

SUPPOSITORIA HYDRARGYRI. Mercurial Suppositories. (Ointment of mercury, sixty grains; benzoated lard and white wax,

each twenty grains; oil of theobroma, eighty grains. Form twelve suppositories.)

Therapeutics of Mercurials. Liquid mercury, when taken into the stomach, appears to possess no action on the economy, and very large quantities, even pounds, have at times been swallowed without any particular symptoms being produced; now and then, however, the full effects of the metal have ensued, probably owing to partial oxidation and absorption. The vapour of mercury acts with great energy, as seen in the effects on artificers exposed to its influence; the same results may be produced by rubbing mercury in a very highly divided state upon the surface of the body, or taking it internally in a state of minute subdivision. Given in small doses, the first effects of mercurials are observed in the increase of various secretions; and hence sialagogue, cholagogue, diuretic, emmenagogue, and other properties have been ascribed to this mineral. Its sialagogue power is shown in the increase of the salivary fluid and mucous secretions of the mouth, together with a peculiar condition of the gums and neighbouring parts; and as these are among the first, most constant, and most peculiar of the effects of mercurials, they are generally taken as guides during the administration of the drug, as to the propriety of increasing or diminishing the dose. The sialagogue effects are seldom desired for themselves.

The cholagogue effect, at least the power of emptying the gall-bladder of contained bile, is exhibited in the increase of the colouring matter and other principles of the bile in the evacuations from the bowels; the fæces are at the same time more liquid in character from an excessive secretion from other secreting glands, as the pancreas, and also the mucous membrane of the intestinal canal. It has been shown by experiments on animals that mercurials, so far from increasing the amount of the biliary secretion, actually diminish it. The secretion of the kidneys is not unfrequently augmented, also the action of the skin, and occasionally the catamenial discharge; it seems probable, however, that many of these effects are not so much due to the direct action of the remedy on the secreting organs, as to the relief of certain morbid conditions of the system, which had given rise to the imperfect performance of their functions. Mercurials also cause the absorption of morbid fluids, either from increasing the activity of the absorbent system, or preventing deposition. In whatever way mercury is administered it becomes absorbed into the blood, where it has been detected; and its presence has also been demonstrated in the milk, urine, saliva, sweat, bile,

pus from ulcers, and in the various tissues of the body, as the bones, brain, serous and synovial membranes, cellular tissue, and lungs. Its action on the blood is not well made out; it diminishes the number of red corpuscles, and has some influence on the quantity and quality of the fibrine. Mercurials are employed in the treatment of various diseases, among which the following are the most important.

In *internal congestions*, as of the liver, kidneys, &c.; to increase secretion, and hence relieve the vessels of the parts.

Acute inflammation of any part is often found to give way when the system is brought under the influence of mercury, probably from its power of increasing the secretions of the part, influencing the capillary circulation, and altering the condition of the blood; sthenic inflammations, with effusions of plastic lymph, are more controlled by the drug than those of an asthenic kind; serous membranes are more influenced than mucous membranes, and the parenchyma of the liver more than that of the lungs. In *chronic inflammations* mercurials often prove useful in removing the morbid products, such as induration, and fibrinous and other effusions.

Mercury is injurious in erythematous and scrofulous inflammation, and also in inflammatory action of a low type.

Of late, some doubt has been thrown upon the power of mercurials to check inflammation; it may be affirmed that when the inflammation abates, the mercurial produces its physiological effects, and that the subsidence of the morbid action is not caused by the influence of the metal.

In acute *rheumatism* mercurials are much employed by some practitioners; it is questionable whether they influence the duration of the disease, but they are generally considered to be useful in the peri- or endo-carditis, which is so frequently present.

In *dropsies* dependent on inflammation of serous membranes and hepatic disease mercurials are useful, but injurious when arising from granular disease of the kidneys.

In idiopathic *fevers* mercurials are often useful in keeping up the action of secreting organs and relieving congestions, but they appear to have no influence on the duration of the fever itself.

In *syphilis* mercurials at one time formed the sole remedy; at the present time they are not considered essential to the cure of the affection, although employed in moderate quantities, both in the primary and secondary forms of the disease: it is probable that the terrible sequelae of syphilis, formerly so common

were often as much dependent on the drug as on the disease itself.

Mercury is very commonly used as an alterative in chronic affections of almost every part of the system, and as a cholagogue purgative in cases of dyspepsia, &c., where the secretion of the liver is defective.

Externally employed, in the form of ointments, plasters, &c., mercurials produce a topical stimulant action, causing exalted action of the capillaries; they also become absorbed, and affect the system generally. They are used over indurated and chronically inflamed parts, and sometimes to introduce the mineral into the system by a process of exhibition termed inunction.

Effects of over-doses, or the too great action of Mercurials.

Very profuse ptyalism, swelling of the tongue and salivary glands, and of the whole face, tumefaction and redness of the gums, ulceration of different parts of the mucous membrane of the mouth, loosening of the teeth, and even necrosis of the jaw. Occasionally the flow of saliva and buccal mucus amounts to some pints in the day.

Excessive purging, with very bilious stools.

Profound anæmia and marasmus.

Certain skin affections, as Eczema Mercuriale.

Inflammation of the periosteum and bone, of parts not connected with the mouth.

A low, febrile condition (mercurial erethism), accompanied with intense prostration of the vital powers.

Affections of the nervous system, such as neuralgic pains, partial paralysis, tremor mercurialis, and sometimes complete paralysis and death; occasionally epileptiform convulsions and mental failure; these symptoms are usually observed in those who are subject to the action of mercurial vapours.

Circumstances influencing the operation of Mercurials

The age of the patient has great influence, children are much less affected than adults; still, care should be used in administering mercurials to young subjects, as very injurious results sometimes ensue.

Certain individuals appear to be able to resist completely the action of mercurials, others to be very susceptible of their influence; often such idiosyncrasy cannot be explained, but at times it depends on a diseased condition of the system.

The presence of acute sthenic inflammation gives a resisting power to the action of mercurial preparations, whereas granular disease of the kidney, scrofula, and scorbutus, render the system very sensitive to mercury, and the drug should generally be avoided in such cases.

Therapeutics of Mercury in its unoxidized forms.

The mercurial and chalk powder is one of the mildest forms in which the metal can be given; its influence upon the mucous membrane is slight, and hence it may be used in irritable conditions of the intestinal canal, as in diarrhœa, &c. Blue pill is likewise a comparatively unirritating preparation.

As external applications the blue and compound ointments produce little local action; hence their use when it is desirable to cause the constitutional effects of mercury through the medium of the skin: the mercurial plaster is used to produce the local effects of the remedy, as also the suppository. The liniment, from its containing ammonia, is more irritating than the ointment.

Dose. Of mercury with chalk, or grey powder, 3 gr. to 8 gr.; of mercurial or blue pill, 3 gr. to 8 gr.

The mercurial ointment, or blue ointment, may be rubbed into a part where the skin is thin, as in the arm-pit or inner side of the thigh, in quantities varying from 30 gr. to 120 gr. The inunction should be continued till absorption has taken place.

Adulteration. Other metals, as lead, tin, zinc, and bismuth, are often found in a state of amalgamation with mercury, or dissolved in it: when such are present, the small globules leave a trail when rolled along a sheet of paper: zinc and tin are soluble in hydrochloric acid, and lead and bismuth would not volatilize, and so could be detected: the process of purification by means of distillation and hydrochloric acid removes these impurities.

Hydrargyri Subchloridum. Subchloride of Mercury. Calomel. Hg_2Cl, or **HgCl.**

Prep. Sulphate of mercury, ten ounces; mercury, seven ounces; chloride of sodium, dried, five ounces; boiling distilled water, a sufficiency. The sulphate of mercury and the mercury are rubbed together with a little water until globules are no longer visible; then the chloride of sodium is well triturated with them, and the whole heated, and the vapour sublimed as a powder. In this process the mercuric sulphate is, by being rubbed with a second equivalent of the metal, reduced to a

mercurous sulphate; and this last, by the action of the common salt, is converted into calomel, sulphate of soda being produced at the same time. The decompositions may be thus represented:

1st part of process, $HgSO_4+Hg=Hg_2SO_4$.

2nd part of process, $Hg_2SO_4+2NaCl=Na_2SO_4+2HgCl$.

Prop. A dull-white, heavy powder, without odour or taste; rendered yellowish by trituration in a mortar; insoluble in water, spirit, or ether; sublimes with heat; it is blackened when treated with potash, from precipitation of mercurous oxide, and the clear supernatant fluid, acidulated with nitric acid, gives a copious white precipitate with nitrate of silver, showing the presence of a chloride. When calomel is boiled or washed in water, this liquid should afterwards give no precipitate with nitrate of silver, lime-water, or sulphuretted hydrogen. Contact with hydrocyanic acid darkens its colour as it liberates some metallic mercury. It is entirely volatilized by a sufficient heat. Warm ether shaken with it in a bottle leaves, on evaporation, no residue.

Off. Prep. Lotio Hydrargyri Nigra. Black Mercurial Lotion. (Subchloride of mercury, thirty grains; solution of lime, ten fluid ounces. Mix.)

Pilula Hydrargyri Subchloridi Composita. Compound Pill of Subchloride of Mercury. Plummer's pill. (Calomel and sulphurated antimony, each one ounce; guaiac resin, in powder, two ounces; castor oil, one fluid ounce.) One grain of calomel is contained in five grains of the pill mass.

Unguentum Hydrargyri Subchloridi. Ointment of Subchloride of Mercury. (Calomel, eighty grains; prepared lard, one ounce.) About one grain of calomel is contained in six grains of this ointment.

Therapeutics. Calomel when absorbed acts on the system in the manner noticed under Hydrargyrum. Its peculiarities are, that it produces little local irritant action; as a purgative, it increases the secretion of fluid into the intestines; and hence forms a useful adjunct in affections of the liver, and obstructions to the portal circulation; calomel has been largely used in the treatment of cholera. It often produces in children the so-named calomel stools, or green-coloured fæces. The compound pill is employed chiefly as an alterative in chronic skin diseases, in which the antimony and guaiacum aid its operation. There is clinical evidence to show that purgative doses of calomel, repeated three

or four times during the first week of enteric fever, may diminish the intensity of the attack. (Wunderlich, Niemeyer.)

The ointment is a clean and valuable local alterative application in some forms of skin disease ; it can also be employed as an inunction. In the black mercurial lotion, the suboxide of mercury is the active ingredient.

Dose. Of calomel as a purgative, 2 gr. to 5 gr. ; to affect the system, $\frac{1}{2}$ gr. to 1 gr. or more, frequently repeated. Of the compound pill of subchloride of mercury as an alterative, 5 gr. to 10 gr. Calomel should not be given with alkaline chlorides, as corrosive sublimate is liable to be formed.

Adulteration. Calomel is apt to contain a trace of corrosive sublimate (perchloride of mercury) formed in the process of preparation : this can be detected by the water in which it is boiled, exhibiting reactions with the tests above given. Intentional impurities, as carbonate of lead, sulphate or carbonate of barium, &c., are not volatilized by heat, and the carbonates effervesce with acids.

Hydrargyri Perchloridum. Perchloride of Mercury. Corrosive Sublimate. HgCl or $\mathbf{HgCl_2}$.

Prep. Sulphate of mercury, twenty ounces ; chloride of sodium, dried, sixteen ounces ; black oxide of manganese, in fine powder, one ounce. The sulphate and the chloride are reduced to fine powder, and then thoroughly mixed by trituration in a mortar with the oxide of manganese ; the corrosive sublimate is then sublimed by heat. When the sulphate of mercury is heated with the common salt, a double decomposition takes place ; mercuric chloride and sulphate of soda are produced, as represented in the formula, $\mathbf{HgSO_4 + 2NaCl = Na_2SO_4 + HgCl_2}$. The mercuric sulphate frequently contains some mercurous sulphate which the common salt changes into calomel ; to prevent this, a little black oxide of manganese is added, which, with the excess of common salt, generates some free chlorine.

Prop. In heavy white crystalline masses of prismatic crystals, of a styptic and metallic taste ; soluble in about 20 parts of cold water ; more so in alcohol ; and more still in ether : its watery solution is precipitated by alkalies and lime-water of a red or yellowish colour (the oxide) ; it gives a white precipitate with ammonia, and a curdy white precipitate with nitrate of silver ; it precipitates albumen, and forms with it a definite and very

sparingly soluble compound. When heated, it sublimes without decomposition, leaving no residue.

Off. Prep. Liquor Hydrargyri Perchloridi. Solution of Perchloride of Mercury. (Perchloride of mercury and chloride of ammonium, of each ten grains; distilled water, a pint.) The presence of the chloride of ammonium increases the solubility of the mercurial salt in water. Contains half a grain in each fluid ounce.

Lotio Hydrargyri Flava. Yellow Mercurial Lotion. (Perchloride of mercury, eighteen grains; solution of lime, ten fluid ounces. Mix.)

Therapeutics. Corrosive sublimate is a very powerful irritant; when taken in large doses it causes burning at the epigastrium, vomiting and purging; applied to the skin, it acts as a corrosive. In very small doses it is useful as an alterative in chronic affections, syphilitic or not, as in scaly skin diseases, periosteal affections, &c.; externally, as a lotion, injection, gargle, or ointment, in chronic skin diseases, ulcerated sore throats, and chronic discharge from mucous membranes. In the yellow mercurial lotion the peroxide of mercury is the active ingredient.

All the ordinary effects of mercury may be produced by the exhibition of this salt.

Dose. $\frac{1}{20}$ gr. to $\frac{1}{4}$ gr. in solution or pill, with crumb of bread; of solution of perchloride of mercury, $\frac{1}{2}$ fl. drm. to 2 fl. drm.

Incompatibles. In solution it precipitates most of the vegetable preparations which contain albumen, tannin, &c. It is also thrown down by alkalies, alkaline sulphurets, iodides, and tartar emetic. An iodide in excess redissolves the precipitate.

Hydrargyrum Ammoniatum. Ammoniated Mercury; Ammonio-Chloride of Mercury; White Precipitate of Mercury. NH_2Hg_2Cl, or $\mathbf{NH_2HgCl}$.

Prep. Corrosive sublimate, three ounces; solution of ammonia, four ounces; distilled water, three pints. Dissolve the perchloride in the water, aided by heat; to the solution, when it has cooled, add the ammonia, frequently shaking it. Collect the precipitated powder on a filter, and wash with distilled water until the liquid which passes through ceases to give a precipitate when dropped into a solution of nitrate of silver acidulated by nitric acid; lastly, dry it. When ammonia is added to a solution of corrosive sublimate, this compound (in which two atoms of the hydrogen

in the ammonium are replaced by their equivalent of mercury), and not the oxide of mercury, is precipitated.

Prop. A white, amorphous, heavy powder, usually in the form of small spiral cones from the wringing of the linen filters; when heated, it sublimes; it is insoluble in water, alcohol, and ether; when digested with caustic potash, it gives off vapours of ammonia, and becomes yellow from the formation of the oxide of mercury; and the resulting fluid, filtered and acidulated with nitric acid, gives a white precipitate with nitrate of silver, showing the presence of a chloride. Boiled with a solution of chloride of tin, it becomes grey, and affords globules of metallic mercury.

Off. Prep. Unguentum Hydrargyri Ammoniati. Ointment of Ammoniated Mercury.

Synonym. Unguentum Præcipitati Albi. *Edin.*

(Ammoniated mercury, sixty-two grains; simple ointment, one ounce). Contains one part in eight.

Therapeutics. Never used internally; externally, it destroys pediculi, and acts as a stimulant application when used to chronic skin affections in the form of the ointment.

Adulteration. Chalk, carbonate of lead, plaster of Paris, &c.; these do not sublime when heated: the carbonates effervesce with acids.

Hydrargyri Iodidum Viride. Green Iodide of Mercury. Hg_2I, or **HgI**.

Prep. Mercury, by weight, one ounce; iodine, two hundred and seventy-eight grains; rectified spirit, as much as may be necessary. Rub the mercury and iodine together, gradually adding the spirit, until the globules are no longer visible, and the whole assumes a green colour. Dry the powder in a dark room, on filtering paper, without artificial heat, and keep it in a black glass vessel well stoppered. Direct union takes place when mercury and iodine are brought into contact with each other in a highly-divided state; the spirit aids the union by its solvent action upon the iodine.

Prop. A dingy, greenish-yellow powder, which darkens on exposure to light. If carefully heated in a test tube, it yields a yellow sublimate, which upon friction becomes red, while a globule of metallic mercury is left in the bottom of the tube. It is entirely volatilized by a heat under redness; it is insoluble in

ether, in water, and also in a solution of chloride of sodium ; it is apt to decompose with the formation of some red iodide of mercury, from which it may be freed by washing with hot strong solution of chloride of sodium.

Therapeutics. Acts in a very similar manner to calomel ; perhaps is less purgative, more readily affecting the system ; it has been proposed in venereal diseases occurring in scrofulous habits.

Externally it is alterative, and useful in chronic skin diseases, rubbed up with lard in the form of an ointment.

It is probable that the iodides of mercury are eliminated from the system more readily than the other preparations, as the salts of iodine, as stated under iodide of potassium, possess the power of causing the removal of the mercury when it has become deposited in the tissues.

Dose. 1 gr. to 3 gr.

Adulteration. It may contain a little red iodide of mercury, which is a powerful irritant ; this is detected by being soluble in a solution of common salt, also in ether.

Hydrargyri Iodidum Rubrum. Red Iodide of Mercury. HgI, or HgI_2.

Prep. Four ounces of corrosive sublimate, and five ounces of iodide of potassium, are dissolved separately in boiling water, and the two solutions mixed ; the red iodide is precipitated, and is separated by decantation and filtration, and afterwards washed and dried. This is a simple case of double decomposition, per chloride of mercury and iodide of potassium becoming chloride of potassium and iodide of mercury ($HgCl_2+2KI=HgI_2+2KCl$).

Prop. A crystalline powder of fine bright vermilion colour, becoming yellow when heated over a lamp on a sheet of paper ; almost insoluble in water, dissolves sparingly in alcohol, but freely in ether or in an aqueous solution of iodide of potassium. When digested with a solution of soda, it assumes a reddish-brown colour, and the fluid cleared by filtration and mixed with solution of starch, gives a blue precipitate on being acidulated with nitric acid. Entirely volatilized by a heat under redness.

Off. Prep. Unguentum Hydrargyri Iodidi Rubri. Ointment of Red Iodide of Mercury. (Red iodide of mercury, in fine powder, sixteen grains ; simple ointment, one ounce.) Contains one part in thirty.

Therapeutics. The red iodide closely resembles corrosive sublimate in its action upon the system, and is far more irritant than the green iodide. It is chiefly used as an external application in the form of ointment to enlarged glands, and periosteal nodes of a syphilitic nature, also in goïtre.

Internally it may be administered in the same cases as corrosive sublimate.

Dose. $\frac{1}{16}$ gr. to $\frac{1}{4}$ gr.

Hydrargyri Oxidum Flavum. Yellow Oxide of Mercury. HgO, or **HgO**.

Prep. Four ounces of perchloride of mercury are dissolved in four pints of distilled water with the aid of heat. Two pints of solution of soda are added, and a yellow precipitate of the oxide is thrown down. The supernatant liquid is removed by decantation, and the precipitate washed on a calico filter with distilled water. Dried on a water bath.

Prop. A yellow powder, insoluble in water, but readily soluble in hydrochloric acid. From this solution a white precipitate of the ammonio-chloride is thrown down by ammonia. The oxide is entirely volatilised when heated to incipient redness, being resolved into oxygen gas and the vapour of mercury. This compound is merely an allotropic modification of the red oxide, from which it differs in entering more readily into combination; thus a cold solution of oxalic acid is without action on the red oxide, while it converts the yellow oxide into an oxalate.

Therapeutics. The yellow oxide is employed in the preparation of the oleate of mercury, which has been recommended by Mr. Marshall as an elegant and cleanly substitute for the various mercurial ointments and liniments. The 5 per cent. solution of the oleate resembles olive oil in appearance; the 20 per cent. preparation forms an opaque, yellowish mass, not unlike resin ointment, which melts at the temperature of the body, and forms a transparent varnish when applied to the skin. It is simply spread over the surface with a brush. Mr. Marshall employs these preparations as local remedies in chronic inflammation of the joints, skin diseases, &c. Also when it is desired to affect the system in syphilis, in place of the ordinary grey ointment. The yellow oxide is the active ingredient in Lotio Hydrargyri Flava.

Hydrargyri Oxidum Rubrum. Red Oxide of Mercury. HgO, or **HgO**.

Synonym. Hydrargyri Nitrico-Oxidum. *Lond.*

Prep. Mercury, by weight, eight ounces; nitric acid, four and a half fluid ounces; distilled water, two fluid ounces. Dissolve half the mercury in the nitric acid diluted with the water, evaporate the solution to dryness, and triturate the dry salt thus obtained with the remainder of the mercury. Heat the mixture in a porcelain capsule until acid vapour ceases to arise.

Prop. An orange-red powder, consisting of small crystalline scales, insoluble in water, but entirely soluble in hydrochloric acid. Entirely volatilized by a heat under redness, being at the same time decomposed into mercury and oxygen. If this be done in a test tube no orange vapours should be given off, indicating the absence of nitric acid. The solution in hydrochloric acid gives a yellow precipitate with caustic potash in excess, and a white precipitate with solution of ammonia, as do all solutions of corrosive sublimate.

Off. Prep. Unguentum Hydrargyri Oxidi Rubri. Ointment of Red Oxide of Mercury. (Red oxide of mercury, in very fine powder, sixty-two grains; yellow wax, a quarter of an ounce; oil of almonds, three quarters of an ounce.) About one grain of oxide in eight grains of the ointment.

Therapeutics. Used externally only, as a powerful irritant and escharotic; applied, much diluted, as an ointment to the eye in ophthalmia, to indolent ulcers, &c.; as an escharotic, in powder, alone or mixed with sugar, to specks in the cornea, over excrescences, chancres, and fungous ulcers.

Adulteration. Brick-dust, red-lead, and other red powders, detected by not being volatile; some undecomposed nitrate of mercury may be present, and then red fumes are given off when heated; the nitrate is also soluble in water.

Hydrargyri Nitratis Liquor Acidus. Acid Solution of Nitrate of Mercury.

Prep. Mercury, four ounces; nitric acid, five fluid ounces; distilled water, one and a half fluid ounces. Mix the nitric acid and the water, and dissolve the mercury in the mixture without heat; afterwards boil gently for fifteen minutes, cool and preserve in a stoppered bottle.

Prop. A colourless, strongly acid solution, which gives a yellow precipitate with potash added in excess (oxide of mercury). If a crystal of sulphate of iron be dropped into it, in a little time the salt of iron and the liquid in its vicinity acquire a dark

colour, showing the presence of nitric acid. Sp. gr. 2·246. A little of it dropped into hydrochloric acid, when diluted with twice its volume of water, gives no precipitate.

Off. Prep. Unguentum Hydrargyri Nitratis. Ointment of Nitrate of Mercury.

Synonym. Unguentum Citrinum. *Edin.*

(Mercury, by weight, four ounces; nitric acid, twelve fluid ounces; prepared lard, fifteen ounces; olive oil, thirty-two fluid ounces. Dissolve the mercury in the nitric acid with the aid of a gentle heat, then add the solution to the lard and oil, previously melted together by a steam or water bath, and mix thoroughly. If the mixture do not froth up, increase the heat till this occurs.)

Therapeutics. The acid solution of nitrate of mercury is a powerful caustic, and has been applied topically in some cancerous affections and in lupus. The ointment acts as a stimulant, and is used in skin affections, and especially in chronic inflammatory diseases of the eyes, as in ophthalmia tarsi, &c. The ointment can be diluted to any degree.

The acid solution is not intended for internal administration.

Hydrargyri Sulphuretum. (Not officinal.) Sulphide of Mercury; Artificial Cinnabar, called in *London Pharmacopœia of* 1851, Hydrargyri Bisulphuretum. **HgS.**

Prep. Lond. Mix mercury and sulphur in equivalent proportions, melt them over a fire, and as soon as the mass swells remove the vessel and strongly cover it lest the mixture take fire; then rub the mass to powder and sublime it. When melted sulphur is brought in contact with mercury, direct union ensues, the compound is afterwards sublimed, and forms artificial cinnabar.

Prop. Dark scarlet shining crystalline masses, forming, when powdered, a beautiful scarlet colour, known by the name of vermilion; insoluble in water or alcohol. Volatilizes entirely when heated alone, but with potash it is reduced to metallic globules.

Therapeutics. When the fumes are brought into contact with the surface of the body, the drug acts as a topical alterative and becomes absorbed, affecting the system the same as other mercurials; probably, when heated in the air, it is decomposed, at least in part. It is used as a fumigation in some syphilitic skin

diseases, as ecthyma; also as an inhalation in venereal sore throat. Rarely or never used internally.

Dose. As a fumigating agent, 30 gr., heated on an iron plate and placed under the patient wrapped in a blanket; or the vapours may be applied to the mouth and throat through a funnel.

Adulteration. Red-lead, red oxide of iron, and brick-dust, detected by not subliming; occasionally red sulphide of arsenic has been found, but this can be detected by heating with charcoal, when it gives off the garlic odour; also by the other tests for arsenic.

Hydrargyri Sulphas. SULPHATE OF MERCURY. HgO,SO_3, or $HgSO_4$.

Prep. By dissolving twenty ounces, by weight, of mercury, in twelve fluid ounces of sulphuric acid with the aid of heat; and subsequently evaporating until a dry white salt remains.

Prop. A white crystalline powder, which is decomposed by the action of water, and rendered yellow from the formation of an insoluble basic salt of mercury ($HgSO_4,2HgO$). Entirely volatilized by heat.

Use. It is used in the preparation of corrosive sublimate and calomel, and not given as a remedy. The yellow subsulphate above mentioned, under the name of Turbith Mineral, has been employed as an errhine.

LITHIUM.

(L, or **L.** Eq. = 7.)

Lithium, the metallic base of lithia, does not exist native, but can be obtained from various minerals, as lepidolite, triphylline, &c., and derives its name from λίθος, a stone, as it was supposed to exist only in the mineral kingdom. It is the lightest solid body known, floats on water and on naphtha, and has a density of 0·5936, and a very small atomic or equivalent weight, only seven on the hydrogen scale. Its oxide (L_2O), which is a powerful base, forms crystallizable salts with the acids. The urate of lithia is much more soluble than that of potash or soda.

Lithiæ Carbonas. Carbonate of Lithia. LO,CO_2, or L_2CO_3.

Prop. In white powder or in minute crystalline grains. It has an alkaline reaction, and is soluble in 100 parts of cold water; its

solubility is increased by the presence of carbonic acid in the liquid; not soluble in alcohol. When treated with hydrochloric acid it dissolves with effervescence; the solution when evaporated to dryness leaves a residue of chloride of lithium which communicates a red colour to the flame of a spirit lamp, and redissolved in water yields a precipitate with phosphate of soda, on the addition of ammonia (the double phosphate of lithia and soda).

Ten grains neutralized with sulphuric acid, and afterwards heated to redness, should leave 14·86 grains of dry sulphate of lithia; this when redissolved in distilled water yields no precipitate with oxalate of ammonia or solution of lime, showing the absence of lime or magnesia.

Off. Prep. Liquor Lithiæ Effervescens. Effervescing Solution of Lithia. Lithia water. (Carbonate of Lithia, ten grains; water, a pint.) Dissolve and add as much carbonic acid as it will contain under a pressure of seven atmospheres.

Therapeutics. From the small amount of lithia sufficient to form a salt with uric acid, and the much greater solubility of the salt, it follows that unless other circumstances interfere with their administration, the lithia salts must be valuable remedies when it is desirable to keep uric acid in solution during its transit through the urinary organs, or prevent its deposition in the structures of the body. The carbonate of lithia acts as a powerful diuretic, and in the same dose has more influence in rendering the urine alkaline than the corresponding salt of soda or potash. Accordingly, it may be given with great advantage:

1. In acute and chronic gout, to promote the elimination of urate of soda from the blood and tissues.

2. In uric acid gravel and renal calculus, owing partly to its solvent, partly to its diuretic, properties. A patient of the author's, a gentleman 60 years of age, was in the habit of passing small uric acid calculi almost daily. He had been operated on for stone. From the time that he began to take carbonate of lithia (5 gr. twice a day), he enjoyed perfect immunity from this symptom,—an immunity which lasted for seven years:

Externally, the carbonate of lithia may be employed in the form of a lotion (4 gr. to the ounce). It may be applied on a thin slice of sponge, covered with gutta-percha tissue to prevent evaporation. This lotion may be advantageously used:

1. To parts affected with gouty inflammation, whether acute or chronic.

2. To joints stiffened by chronic gout.

3. To gouty ulcers from which urate of soda is being discharged. These ulcers are commonly very obstinate; their healing is facilitated and promoted by the lithia lotion.

4. To chalk-stones covered with unbroken skin. Its efficacy in causing their gradual disappearance is unquestionable, though it is not easily explained. The lithia salt is probably absorbed through the skin and thus brought into contact with the deposit; the latter is rendered soluble and passes into the circulation.

The author has known a few instances in which the long continued use of the drug has appeared to cause symptoms referable to the nervous system, as shaking or trembling of one hand, which has disappeared on the omission of the remedy. These cases have been very few. As a diuretic, lithia is much more powerful than either potash or soda.

Dose. Of the carbonate, 3 gr. to 6 gr. The carbonate may be given in the form of Liq. Lithiæ effervesc.; dose, 5 oz. to 10 oz; free dilution aids its diuretic action.

Lithiæ Citras. Citrate of Lithia. $3LO,C_{12}H_5O_{11}$, or $L_3C_6H_5O_7$.

Prep. Made by dissolving fifty grains of carbonate of lithia in one fluid ounce of water containing ninety grains of citric acid, by the aid of heat, evaporating the solution till water ceases to escape, and the residue is converted into a viscid liquid. This is dried at a temperature of about 240°, pulverized and kept in a stoppered bottle.

Prop. A white amorphous powder, deliquescent, and soluble in water without any residue; the citric acid is carbonized by heating the salt to redness, and the residue, neutralised with hydrochloric acid, and dissolved in alcohol, burns with a crimson flame. Twenty grains burned at a low red heat with free access of air leave 10·6 grains of white residue (carbonate of lithia).

Therapeutics. The citrate of lithia resembles the carbonate, as far as its remote antacid powers are concerned, but it has no direct antacid property; that is, it has no influence upon any acid it meets with in the alimentary canal. In its action, therefore, it has the same relation to the carbonate as the citrate of potash has to the carbonate of that base.

Dose. 5 gr. to 10 gr.

MAGNESIUM.

(Mg. Eq. = 12, or Mg. Eq. = 24.)

Magnesium, the metallic base of the magnesian salts, does not exist native; when obtained artificially, it is a brilliant grey-coloured metal; sp. gr. 1·7; not readily oxidated except when heated in air, when it forms the earth magnesia.

Magnesia. Magnesia. Oxide of Magnesium. MgO, or **MgO.**

Magnesia Levis. Light Magnesia. MgO, or **MgO.**

Prep. Carbonate of magnesia, four ounces, burnt in a Cornish or Hessian crucible closed loosely by a lid, and exposed to a low red heat, as long as a little of the powder taken from the centre, when cooled and dropped into dilute sulphuric acid, gives rise to effervescence. In preparing the light magnesia, the light carbonate is used. In this process the carbonate is converted into the oxide by the heat driving off the carbonic acid.

The light magnesia differs from magnesia only in its greater levity, the volumes corresponding to the same weight being in the ratio of three and a half to one.

Prop. A white powder with scarcely any taste; almost insoluble in water, but when moistened giving a slight alkaline reaction to turmeric paper, turning it brown. It dissolves in hydrochloric acid without effervescence; and the solution when neutralized by a mixed solution of ammonia and chloride of ammonium, gives a copious crystalline deposit when phosphate of soda is added (the ammonio-magnesian phosphate). Dissolved in nitric acid and neutralized with a mixture of ammonia and chloride of ammonium, it does not give any precipitate with oxalate of ammonia or chloride of barium, showing the absence of any sulphate of lime, or carbonate of magnesia or lime.

Off. Prep. Light oxide of magnesia is contained in Pulvis Rhei Compositus (6 parts in 9).

Therapeutics. Magnesia, when introduced into the stomach, acts first as a direct antacid, neutralizing any acid it meets with; and, as its equivalent is small, its antacid properties are considerable; if the acid in the stomach is insufficient to neutralize and dissolve the whole of the magnesia, it passes undissolved into the intestines, and if given incautiously, or taken for a long time, it is rather apt to cause concretions in these organs, as the insoluble

salts of this metal have a tendency to form a species of cement. The salts of magnesia have all of them a cathartic tendency, and in large doses they produce considerable purgative effects. Magnesia, after its absorption into the blood, renders the urine alkaline, and holds in solution uric acid and urates, and thus often causes the urine to remain clear.

Magnesia is given as an antacid in acidity of the stomach and heartburn, and when there is an acid condition of the intestines; it is useful on this account in the treatment of the early stages of diarrhœa, especially when combined with rhubarb. Magnesia is especially indicated in acidity with a tendency to constipation, as also in the treatment of the disorders of the alimentary canal in children. Magnesia is at times employed as a lithontriptic from its power of dissolving uric acid; it is also much used in the treatment of gouty affections, in which it acts both as a direct and remote antacid, and likewise as a purgative.

Dose. Of magnesia or light magnesia: as an antacid, 10 gr. to 20 gr.; as a purgative or adjunct, 20 gr. to 60 gr.

Adulteration. It is apt to contain a little sulphate, as the carbonate is prepared from the sulphate; also lime, the sulphate being usually obtained from dolomite, a magnesian limestone; lastly, some carbonate, from imperfect calcination: these can be all detected by the above tests.

Magnesiæ Carbonas. Carbonate of Magnesia. $(MgO,CO_2)_3 + MgO + 5HO$, or $(\mathbf{MgCO_3})_3.\mathbf{MgO}.5\mathbf{H_2O}$.

Magnesiæ Carbonas Levis. Light Carbonate of Magnesia. $(MgO,CO_2)_3 + MgO + 5HO$, or $(\mathbf{MgCO_3})_3.\mathbf{MgO}.5\mathbf{H_2O}$.

Prep. of Carbonate of Magnesia. Sulphate of magnesia, ten ounces; carbonate of soda, twelve ounces; boiling distilled water a sufficiency. Dissolve the carbonate and sulphate separately, each in a pint of water; then mix the solutions, and evaporate the whole to perfect dryness, by means of a sand bath; digest the residue for half an hour with two pints of water, collect the insoluble matter on a calico filter, and wash till the washings cease to give a precipitate with chloride of barium; then dry at a temperature not exceeding 212°.

The *light carbonate of magnesia* is prepared by dissolving the same quantities of the sulphate and carbonate in half a gallon of water each, mixing the two solutions cold, and boiling the mixture in a porcelain dish for fifteen minutes, then transferring

to a calico filter, and washing and drying at a heat not exceeding 212°.

In these processes double decomposition takes place, sulphate of magnesia and carbonate of soda being converted into sulphate of soda and carbonate of magnesia, which latter, during the ebullition, gets partly decomposed, some carbonic acid being driven off and some oxide left. The difference in the aggregation of the particles in the two carbonates depends on the heat employed in their preparation, and on the amount of dilution of the solutions.

Prop. A white powder with scarcely any taste; insoluble in water; neutral, or very slightly alkaline in reaction; soluble with effervescence in dilute mineral acids, yielding solutions which, when first treated with chloride of ammonium, are not disturbed by the addition of an excess of solution of ammonia, but yield a copious crystalline precipitate upon the addition of phosphate of soda. With excess of hydrochloric acid it forms a clear solution in which chloride of barium causes no precipitate. Another portion of the solution supersaturated with ammonia gives no precipitate with oxalic acid, or sulphuretted hydrogen, indicating the absence of sulphates, and of lime, &c. Fifty grains calcined at a red heat are reduced to twenty-two.

Off. Prep. Liquor Magnesiæ Carbonatis. Solution of Carbonate of Magnesia. Fluid Magnesia. (Sulphate of magnesia, two ounces; carbonate of soda, two and a half ounces; water, a sufficiency. Prepare as above, suspend in water and pass pure carbonic acid gas through it, and keep it under pressure for twenty-four hours, with an excess of the gas, filter and again pass carbonic acid through the filtrate.) This solution contains about thirteen grains of carbonate of magnesia in a fluid ounce in the form of a bicarbonate; if exposed to the air, crystals of the salt are deposited.

Prop. It may effervesce slightly when the containing vessel is first opened. The liquid is clear and not bitter in taste. One fluid ounce, evaporated to dryness, yields a white residue, which after being calcined, weighs not less than five grains (magnesia).

Therapeutics. Carbonate of magnesia acts in the same manner as magnesia, both as an antacid and purgative; the only difference being that when it meets with acidity in the alimentary canal, it gives rise to the evolution of carbonic acid gas, which sometimes is grateful to the stomach, but at other times is troublesome from the uncomfortable distension it causes.

Carbonate of magnesia may be administered with the sulphate;

if magnesia is so mixed, after a time a solid mass is produced, rendering the combination pharmaceutically incompatible. The solution of the carbonate is an elegant mode of exhibiting the salt, and is not distasteful.

Dose. 10 gr. to 20 gr. as an antacid; 20 gr. to 60 gr. as a purgative. Of solution of carbonate of magnesia, 1 to 2 fluid ounces.

Adulteration. Lime and some sulphate may be present, as in the last preparation, detected by the above tests.

Liquor Magnesiæ Citratis. Solution of Citrate of Magnesia. *Limonade Purgative.*

Prep. Two hundred grains of citric acid and one hundred grains of carbonate of magnesia are dissolved in two ounces of water. The solution is filtered into a half-pint bottle, and half a fluid ounce of syrup of lemons added, with enough water to nearly fill the bottle. Forty grains of bicarbonate of potash in crystals are then introduced, and the bottle immediately corked and wired. The bicarbonate is then dissolved by shaking.

Therapeutics. A mild and agreeable aperient drink.

Dose. Five to ten fluid ounces.

Magnesiæ Sulphas. Sulphate of Magnesia; Epsom Salts. MgO,SO_3+7HO, or $MgSO_4.7H_2O$.

Prep. Generally made, at the present time, from dolomite, a magnesian limestone (consisting of the carbonates of lime and magnesia), by treating it with sulphuric acid, which dissolves out the magnesia, and leaves the lime in the form of an insoluble sulphate of lime. Formerly it was prepared from bittern, the residual liquor left after the crystallization of common salt from sea water.

Prop. In 4 or 6-sided colourless prisms, with from 2 to 6 terminal planes; as generally sold it is in small acicular crystals; they should not deliquesce in the air, but have a tendency to effloresce. Sulphate of magnesia is soluble in water, and the solution gives copious white precipitates with chloride of barium (sulphate of barium), and with a mixed solution of ammonia, chloride of ammonium, and phosphate of soda (ammonio-magnesian phosphate). Its aqueous solution at ordinary temperatures is not precipitated by oxalate of ammonia, showing that no lime is present. Nor should it give a brown precipitate with chlorinated

lime or soda, showing the absence of iron, an occasional impurity. The presence of the proper amount of magnesia is shown by the following test:—the precipitate given by carbonate of soda, when obtained from a boiling solution of 100 grains of the salt, should, when washed, dried, and heated to redness, weigh 16·26 grains.

Off. Prep. Enema Magnesiæ Sulphatis. Enema of Sulphate of Magnesia.

Synonym. Enema Catharticum. *Edin. Dub.*

(Sulphate of magnesia, one ounce; olive oil, one fluid ounce; mucilage of starch, fifteen fluid ounces.)

Sulphate of magnesia is contained in Mistura Sennæ Composita.

Therapeutics. In ordinary doses sulphate of magnesia acts as a saline purgative, causing a free secretion of watery fluid from the canal. In small doses, and freely diluted, if the purgative effect is not produced, it causes diuresis. Epsom salts are employed very frequently, either alone or in combination with other purgatives, and are especially adapted to the treatment of febrile affections, and also where the portal system is congested: with the infusion of senna, sulphate of magnesia forms the ordinary black draught. The enema is used as a purgative. Sulphate of magnesia is seldom administered to produce diuresis. When given alone, in many patients it causes uncomfortable distension of the abdomen, and much rumbling from irregular intestinal contraction.

Dose. In the form of enema an ounce or more may be employed. As a purgative, 120 gr. to ½ oz. or more; in combination, from 60 gr. upwards; as a diuretic, 20 gr. to 60 gr.

Adulteration. When made from bittern it contains chloride of magnesium and sodium; it then deliquesces, and gives off hydrochloric acid fumes with sulphuric acid; it also precipitates nitrate of silver.

MANGANESIUM. MANGANESE.

(Mn. Eq. = 27·5, or **Mn.** Eq. = 55.)

Manganesii Oxidum Nigrum. Black Oxide of Manganese. MnO_2, or $\mathbf{MnO_2}$.

Prop. Oxide of manganese, called also black oxide of manganese, is found native, sometimes crystallized, sometimes amorphous; as met with in commerce, it is a black heavy powder, devoid of odour and taste, which dissolves in hydrochloric acid

with the evolution of chlorine; and when heated to redness evolves oxygen. Used for producing chlorine.

Therapeutics. Manganese preparations have been occasionally employed in medicine: the sulphate of the protoxide, in large doses, as from sixty grains to one hundred and twenty grains, produces purgative effects, and by some is considered to increase the excretion of bile: in small doses this salt, as well as the carbonate, have been given with the idea of improving the condition of the blood, in cases of anæmia; its value, however, has not yet been satisfactorily established, and in every case of anæmia in which the author has employed manganese salts alone, the metal has failed to prove curative; whereas the subsequent administration of iron salts has always been followed by rapid improvement and cure. The black oxide is not used in medicine.

PLUMBUM. LEAD.

(Pb. Eq. = 103·5, or Pb. Eq. = 207.)

Metallic lead is not employed in medicine; but when individuals are exposed for a long time to its influence, as by handling it, they exhibit symptoms of slow poisoning.

Plumbi Oxidum. Oxide of Lead. Litharge. PbO, or **PbO.**

Prep. It is usually made during the cupellation of lead ores containing silver, when the oxide becomes fused or semi-vitrified.

Prop. Heavy red or orange-red scales; entirely soluble in dilute nitric or acetic acid without effervescence; either solution when neutral gives a copious yellow precipitate of iodide of lead with iodide of potassium. Its solution in diluted nitric acid when supersaturated with ammonia and then cleared by filtration does not exhibit a blue colour, indicating the absence of copper. The solution is precipitated black by sulphuretted hydrogen, white by caustic potash, and re-dissolved by it in excess.

Off. Prep. Emplastrum Plumbi. Lead Plaster.

(Oxide of lead, in fine powder, four pounds; olive oil, a gallon; water, seventy fluid ounces. Boil them together over a steam bath for four or five hours, constantly stirring, until the oil and oxide of lead unite into the consistence of a plaster; a little boiling water may be added, if that which was used at the first has evaporated before the end of boiling.)

Therapeutics. Oxide of lead, or litharge, is never given internally. The plaster, in which the lead exists in combination

with margaric and oleic acids, is used as a mechanical support; it is less irritating than many other plasters, and perhaps slightly astringent.

Plumbi Iodidum. Iodide of Lead. PbI, or PbI_2.

Prep. Made by precipitating a clear solution of nitrate of lead by means of iodide of potassium, and subsequent washing and drying. In this process iodide of lead and nitrate of potash are formed by double decomposition.

Prop. A yellow powder, or crystalline scales, soluble in boiling water, forming a colourless solution, depositing crystals on cooling. Fuses and sublimes yellow, but soon gives off violet vapours from decomposition. It is altered a little by light.

Off. Prep. EMPLASTRUM PLUMBI IODIDI. Iodide of Lead Plaster. (Iodide of lead, one ounce; soap and resin plaster, each four ounces; mix the salt with the melted plasters.)

UNGUENTUM PLUMBI IODIDI. Ointment of Iodide of Lead. (Iodide of lead, in fine powder, sixty-two grains; simple ointment, one ounce; mix thoroughly.)

Therapeutics. Externally applied, iodide of lead acts as a mild stimulant, and has been used in the form of ointment or plaster to enlarged scrofulous joints, &c. The objection to its long-continued use over a large surface is the fear of absorption of the metal; also the yellow stain which it produces if applied to exposed parts of the body, as the neck, &c. (See Iodide of Cadmium.) Iodide of lead is seldom used internally, but has been given in scrofulous tumours; it has no advantage in such cases over other iodides.

Dose. ¼ gr. to 1 gr. or more.

Plumbi Acetas. Acetate of Lead; Sugar of Lead. $PbO,C_4H_3O_3 + 3HO$, or $Pb(C_2H_3O_2)_2.3H_2O$.

Prep. By dissolving oxide of lead in dilute acetic acid, and subsequent evaporation and crystallization.

Prop. Generally in white spongy-looking masses, composed of interlaced acicular crystals; it may be obtained in large, flat four-sided prisms; acetate of lead has a sweetish, acetous odour, and sweet, metallic taste; effloresces slightly in the air; is soluble in water; the solution slightly reddens litmus; and is precipitated white by carbonate of soda, yellow by iodide of

potassium, and black by sulphuretted hydrogen; treated with sulphuric acid, acetic vapours are given off, and white sulphate of lead is precipitated. The solution in distilled water is clear, or has only a slight muddiness, which disappears on the addition of acetic acid: 38 grains dissolved in water require for complete precipitation 200 measures of the volumetric solution of oxalic acid, corresponding to 22·3 grains of oxide of lead.

Off. Prep. Pilula Plumbi cum Opio. Pill of Lead and Opium. (Acetate of lead, in fine powder, thirty-six grains; opium, in powder, six grains; confection of roses, six grains.) One grain of opium is contained in eight grains of the pill mass.

Suppositoria Plumbi Composita. Compound Lead Suppositories. (Acetate of lead, thirty-six grains; opium, in powder, twelve grains; benzoated lard, forty-two grains; white wax, ten grains; oil of Theobroma, eighty grains. Divide into twelve suppositories.)

Unguentum Plumbi Acetatis. Ointment of Acetate of Lead. (Acetate of lead, in fine powder, twelve grains; benzoated lard, one ounce; mix thoroughly.)

Therapeutics. Acetate of lead in small doses acts as a sedative and astringent, lessening morbid mucous discharges and hæmorrhages, and even diminishing the natural secretions; hence it produces constipation, thirst, and a species of colic named Painters' or lead colic, accompanied with a peculiar blue line on the gums (a valuable diagnostic sign), and occasionally with dark blotches on the mucous lining of the lower lip; when continued for some time, it renders the pulse smaller, and induces wasting of the body; it also produces an influence on the nervous system, shown by the production of neuralgic pains in the limbs and subsequently the loss of power of the extensors of the hand, sometimes complete paralysis, muscular tremor and atrophy, epilepsy, or mental failure. Acetate of lead and otherSaturnine preparations cause a diminution of the red corpuscles of the blood, and hence induce an anæmic condition of the body. The production of lead colic is probably due to a loss of power in some portion of the muscular coat of the small intestines.

Lead when taken for a long time also causes the blood to be impregnated with uric acid, and hence leads to the production of a gouty diathesis; this is seen in the prevalence of gout among painters and plumbers.

The serious symptoms above described are, for the most part,

brought on by contact with lead in various occupations, and by drinking water impregnated with the metal, and not often by its employment as a medicine. Acetate of lead is used in hæmorrhages from various organs, also in chronic diarrhœa and dysentery; in phthisis to check expectoration and excessive sweating. Externally it is sedative and astringent, and is sometimes used in skin affections and over inflamed parts. It is also employed as a local astringent in the form of the compound lead suppository and the ointment.

Dose. ½ gr. to 3 gr., or more; of pill of lead and opium, 4 gr. to 8 gr.

Liquor Plumbi Subacetatis. Solution of Subacetate of Lead, $2PbO,C_4H_3O_3$, or $Pb(C_2H_3O_2)_2.PbO$, in water.

Prep. (Acetate of lead, five ounces; oxide of lead, in powder, three ounces and a half; distilled water, one pint, or a sufficiency. Boil them together for half an hour, frequently stirring, then filter; and when the liquor is cold, add of distilled water as much as may be necessary, that it may accurately measure twenty fluid ounces. Let it be kept in well-closed vessels.) By the action of the litharge on acetate of lead, a sub-salt is formed, an additional amount of the oxide of lead entering into the composition of the salt.

Prop. A clear colourless liquid, sp. gr. 1·26, with an alkaline reaction, and sweet, astringent taste, becoming turbid when exposed to the air, from the formation of carbonate of lead; it agrees with the acetate in most of its properties, except that it precipitates gum as well as mucilage from solution, forming an opaque white jelly. Sulphuric acid in excess gives a white precipitate of sulphate of lead, acetic acid being set free. 413·3 gr. by weight (6 fluid drachms) require for perfect precipitation 810 grain-measures of the volumetric solution of oxalic acid, corresponding to about 30 grains of oxide of lead. Solution of subacetate of lead is sometimes termed Goulard Extract.

Off. Prep. Liquor Plumbi Subacetatis Dilutus. Diluted Solution of Subacetate of Lead. (Solution of subacetate of lead, and rectified spirit, each two fluid drachms; distilled water, nineteen fluid ounces and a half.) This preparation is commonly known as Goulard Water.

Unguentum Plumbi Subacetatis Compositum. Compound Ointment of Subacetate of Lead. (Solution of subacetate of lead, six fluid ounces; camphor, sixty grains; white wax, eight ounces; oil of almonds, one pint.)

Therapeutics. Subacetate of lead acts as an astringent and sedative; it is only used externally; and in the form of the dilute solution, is most commonly employed when the topical action of lead is desired. The ointment is used for a similar purpose.

Plumbi Carbonas. Carbonate of Lead. Probably $Pb_2CO_3.PbHO$.

Prep. Often made by exposing sheets of metallic lead to the fumes of acetic and carbonic acids, from vinegar and spent tan.

Prop. & Comp. A heavy white powder insoluble in water, blackened by sulphuretted hydrogen. It is soluble with effervescence in dilute acetic acid, forming a solution which is precipitated yellow by iodide of potassium, and white by sulphuric acid; the solution treated with sulphuretted hydrogen in excess, boiled and filtered, gives no precipitate with oxalate of ammonia, showing the absence of lime salts.

Off. Prep. Unguentum Plumbi Carbonatis. Ointment of Carbonate of Lead. (Carbonate of lead, in powder, sixty-two grains; simple ointment, one ounce.)

Therapeutics. This salt is not used as an internal remedy; when applied externally, it acts as a local astringent and sedative, and may be used in the same cases as the subacetate. It may be employed either alone or mixed with starch, and powdered upon diseased surfaces; or it may be applied in the form of the ointment.

Plumbi Nitras. Nitrate of Lead. PbO,NO_5, or $Pb(NO_3)_2$.

Prep. By dissolving lead in boiling nitric acid, slightly diluted, and crystallizing out.

Prop. Colourless octahedra, nearly opaque, of a sweetish astringent taste; soluble in water and alcohol, not efflorescent. The aqueous solution is precipitated black by sulphuretted hydrogen, white by dilute sulphuric acid, and yellow by iodide of potassium. Added to a solution of sulphate of indigo it discharges the colour of that compound.

Use. It is employed in the preparation of the iodide of lead.

Therapeutics. Applied in the form of powder, it is said to be of great value in the treatment of onychia maligna.

POTASSIUM.

(K, or K. Eq. = 39.)

This metal, called also Kalium, does not exist native, but can be obtained from potash salts; when pure, it has a metallic lead

colour ; sp. gr. 0·86 ; rapidly oxidizes, and is converted into the oxide or potash, which is contained in the following preparations.

Preliminary remarks. Potash salts are necessary constituents of the body in health, especially of the muscular tissue and the red blood-corpuscles. Their continued excretion in the urine necessitates a corresponding supply in the food to make good the loss.

Experiments on animals have shown that the potash salts, when introduced immediately into the blood, are extremely poisonous. The effect seems to be due to the base, and to be independent of the acid with which it is combined (always excepting such compounds as *e.g.* the cyanides, whose specific action is that of the corresponding acid). In cold-blooded animals, the salts of potash, even in small doses, cause gradual but complete paralysis of the voluntary muscles, and finally of the heart, which ceases to beat in diastole, and no longer responds to irritation. In warm-blooded animals, the arrest of the heart is preceded by dyspnœa and convulsions. It is still uncertain whether the paralysis be due to some action of the salt on the nervous system, or on the idio-muscular contractility. Small doses raise the blood-pressure in the systemic arteries and slow the heart ; lethal ones cause immediate paralysis of the heart and a sudden fall of blood-pressure.

The therapeutic action of the salts of potash as alkalies, diuretics, purgatives, &c., will be described under the head of the individual compounds.

Liquor Potassæ. Solution of Potash. KO,HO, or **KHO**, in water.

Prep. Carbonate of potash, one pound ; slaked lime, twelve ounces ; distilled water, a gallon. Dissolve the carbonate in the water, and having heated the solution to the boiling point in a clean iron vessel, gradually mix it with the slaked lime, and continue the ebullition for ten minutes with constant stirring. Then set by, that the carbonate of lime may subside. Lastly, when the supernatant liquor has become perfectly clear, transfer it by means of a syphon to a well-stoppered green-glass vessel. In this process the lime, on account of its affinity for carbonic acid, abstracts it from the carbonate of potash, and thus carbonate of lime, which is insoluble, is precipitated, and potash remains in solution. $CaO + H_2O + K_2CO_3 = CaCO_3 + 2KHO$.

Prop. A colourless liquid, with intensely acrid and caustic taste; sp. gr. 1·058. One fluid ounce requires for neutralization 482

grain-measures of the volumetric solution of oxalic acid, equivalent to 5·84 per cent. by weight of hydrate of potash (KHO). It does not effervesce when added to an excess of hydrochloric acid, nor give a precipitate with lime or oxalate of ammonia, showing the absence of carbonic acid and lime; and after being heated with nitric acid in excess, and evaporated to dryness, the residue forms with water a nearly clear solution, which is only slightly precipitated by chloride of barium and nitrate of silver, and is rendered very slightly turbid by ammonia, showing that mere traces of sulphates, chlorides, metallic impurities, or alumina are present; it forms with perchloride of platinum, the yellow double salt ($2KCl,PtCl_4$). It injures glass containing lead by partially dissolving it; hence it is ordered to be kept in green-glass bottles. One fluid ounce contains twenty-seven grains of hydrate of potash.

Therapeutics. Liquor potassæ, in large doses and undiluted, is a violent caustic poison; taken into the stomach in a very diluted form it acts at first as a direct antacid, neutralizing any free acid in the stomach; but it must be remembered that the amount of alkali contained in a medicinal dose of the solution of potash is small, and hence its antacid powers are necessarily limited. Solution of potash also acts as a powerful sedative upon the mucous membrane of the stomach. After absorption into the blood, free potash possesses the power of increasing the change of tissues in the body, and hence is an alterative, especially to the glandular system, and gives activity to the secreting and excreting organs: it, doubtless, renders the blood more alkaline, and the fibrin less plastic; but from the small amount which can be taken on account of its causticity, never produces alkalinity in urine which was previously strongly acid. Solution of potash is used as an antacid in dyspepsia, but in the inflammatory forms of this affection its value depends more upon its sedative than its antacid powers; it is also employed in skin affections, and is especially useful when these depend upon a morbid condition of the stomach, as erythema and certain other cutaneous diseases. As a blood alterant, liquor potassæ has been employed in inflammation of serous membranes, attended with fibrinous depositions, as pleuritis and pericarditis; also in periostitis and cystitis; also to diminish the viscidity of secretions, as in chronic bronchitis, and sometimes in scrofula, syphilis, and chronic rheumatism. As a diuretic, solution of potash is at times employed, and apparently with good effect in some cases. Recently, iodide of potassium has replaced this medicine in a great measure as an alterative.

Externally, when freely diluted, liquor potassæ may be employed as a wash in some chronic skin disorders to remove thickened secretions, and act as a sedative.

Dose. 10 min. to 1 fl. drm., freely diluted.

Adulteration. Carbonate and sulphate of potash, chloride of potassium, and lime, all of which can be detected by the tests given above.

Potassa Caustica. Caustic Potash. KO,HO, or **KHO**, not quite pure.

Synonym. Potassæ Hydras. *Lond.* Potassa. *Edin.*

Prep. Two pints of the solution of potash are evaporated in a silver or clean iron vessel over a fire, until the ebullition being finished, the hydrate of potash liquefies: this is poured into proper moulds, and when it has solidified, and while it is still warm, put into stoppered bottles.

Prop. Caustic potash is usually moulded for medical purposes into small sticks about the size of a pencil, which should be white, but are often greenish, bluish, or reddish-brown from impurities; it quickly deliquesces when exposed to air, and, if pure, dissolves in rectified spirit; it dissolves animal tissues, forming a kind of soap with them; a watery solution acidulated by nitric acid, gives a yellow precipitate with perchloride of platinum, and scanty white precipitates with nitrate of silver and chloride of barium. Fifty-six grains dissolved in water leave only a trace of sediment, and require for neutralization at least 900 grain-measures of the volumetric solution of oxalic acid, corresponding to 42·3 grains of potash.

Therapeutics. The hydrate of potash, and also its mixture with equal parts of lime (potassa cum calce), which is not now officinal, are used only externally, as caustics, for the formation of sloughs, for touching ulcers, &c.; the advantage of the latter depends on its being much less deliquescent: it is applied as a paste made with spirit; it is often cast in cylinders for external use.

Adulteration. The same as of liquor potassæ; besides which, oxides of iron and alumina are often present; these are not soluble in spirit.

Potassæ Carbonas. Carbonate of Potash. KO,CO_2, or K_2CO_3, with about 16 per cent. of water of crystallization.

Prep. From pearl-ashes (made from the ashes of wood) by solution in a small amount of water and crystallization ; in which process most of the other salts contained in the wood are left undissolved. By heating the crystallized bicarbonate to redness, a very pure dry carbonate of potash is obtained.

Prop. In small white and rather opaque crystalline grains, having a strong alkaline taste ; it deliquesces in the air ; soluble in water, insoluble in spirit ; effervesces with dilute hydrochloric acid, and forms a solution with which perchloride of platinum gives a yellow precipitate ; when supersaturated with nitric acid and evaporated to dryness, the residue is almost entirely soluble in water, only a little silica remaining undissolved, and the solution is precipitated only faintly by chloride of barium or nitrate of silver. 83 grains require for neutralization at least 980 grain-measures of the volumetric solution of oxalic acid, equivalent to about 46 grains of potash. It should be kept in a well-stoppered bottle. 20 grains of this salt neutralize 17 grains of citric or 18 grains of tartaric acid.

Therapeutics. Almost the same as of potash, but is much less caustic, and hence more of the alkali can be introduced into the system ; after absorption its effects are the same. Sometimes it is employed externally as a wash.

Carbonate of potash is contained in the compound decoction of aloes and compound iron mixture ; also used as a solvent in the arsenical solution. It has been a popular remedy for whooping-cough.

Dose. 10 gr. to 20 gr.

Adulteration. Sulphates and chlorides are very apt to be present ; detected by the tests above given.

Potassæ Bicarbonas. Bicarbonate of Potash. $KO,HO,2CO_2$, or $KHCO_3$.

Prep. Made by passing a stream of carbonic acid through a solution of carbonate of potash in water unto saturation, and subsequent crystallization.

Prop. In large transparent colourless rhombic prisms, not deliquescent, with a mild alkaline taste ; soluble in about four times its weight of water. The solution, when cold, does not precipitate sulphate of magnesia ; effervesces with nitric acid ; and the supersaturated solution is not precipitated by chloride of barium, and scarcely by nitrate of silver. With dilute hydro-

chloric acid it forms a solution with which perchloride of platinum gives a yellow precipitate ($2KCl,PtCl_4$). Fifty grains exposed to a low red heat leave 34½ grains of a white residue, which require for exact saturation 500 grain-measures of the volumetric solution of oxalic acid, equivalent to 23·5 grains of potash. 20 grains neutralize 14 grains of citric or 15 grains of tartaric acid.

Therapeutics. Bicarbonate of potash acts as a direct antacid, but does not produce the sedative effect of liquor potassæ upon the mucous membrane of the stomach; it may be taken in very large doses, and is readily absorbed. It renders the urine, and probably many other secretions, strongly alkaline, and doubtless influences the composition of the blood; hence it is a powerful alterative; the action of the kidneys is likewise often increased by its administration. It is used in dyspepsia as an antacid; also in urinary affections where there is excessive deposit of uric acid. Bicarbonate of potash may be also employed with great advantage in the treatment of inflammatory affections, as acute rheumatism, &c.

Off. Prep. Liquor Potassæ Effervescens. Effervescing Solution of Potash. Potash Water.

(Bicarbonate of potash, thirty grains; water, a pint; pass into this as much carbonic acid as can be introduced under a pressure of seven atmospheres.)

Dose. 10 gr. to 30 gr. as an antacid, &c.; in acute rheumatism, 30 gr. to 60 gr. every 4 hours, freely diluted with water.

Adulteration. It is apt to contain carbonate of potash, which can be detected by its precipitating sulphate of magnesia.

Potassæ Acetas. Acetate of Potash. $KO,C_4H_3O_3$, or $KC_2H_3O_2$.

Prep. Acetic acid, forty ounces, or a sufficiency; carbonate of potash, twenty ounces. To the acetic acid, placed in a thin porcelain basin, add gradually the carbonate of potash; then strain; if necessary add a few additional drops of acetic acid; evaporate the liquor until the salt is dried; then raise the heat cautiously so as to liquefy the product. Allow the basin to cool; and when the salt has solidified, and while it is still warm, break it in fragments and put into stoppered bottles. Simply a substitution of acetic for carbonic acid, which comes off with effervescence.

Prop. White foliated satiny masses, this appearance being

caused by the crystallization after fusion ; neutral in reaction, and deliquescent ; very soluble in water, also in alcohol. The solution of acetate of potash in water should not be precipitated by chloride of barium or nitrate of silver ; or if the silver salt does precipitate it, this is again dissolved by water or dilute nitric acid. With a watery solution of the salt, tartaric acid causes a crystalline precipitate (acid tartrate of potash), and a dilute solution of perchloride of iron strikes a blood-red colour. The solution is unaffected by sulphide of ammonium.

Therapeutics. When taken internally in moderate doses and freely diluted it becomes absorbed, and the acetic acid being destroyed or burnt off in the blood, appears in the urine as a carbonate, rendering that fluid alkaline ; it has been shown, contrary to expectation, that the acetate of potash, administered to a healthy man, causes only a slight increase of the urinary water, and actually diminishes the amount of urea and solids excreted in the twenty-four hours, possibly by interfering with digestion ; in large doses and concentrated, it sometimes produces a slight purgative action.

It is used chiefly as a diuretic in various forms of dropsy, and it is perhaps the most powerful saline diuretic that we possess ; it is also now and then employed on account of its alkaline alterant effects upon the blood and secretions, as in acute rheumatism, skin diseases, and chronic enlargement of the glands and other organs. Sometimes it is used as an anti-lithic, on account of its power of rendering the urine capable of holding uric acid in solution.

Dose. 10 gr. to 60 gr. as a diuretic ; as a purgative, 120 gr., upwards.

Adulteration. It may contain traces of sulphates and chlorides, detected by the above tests. Acetate of silver is rather insoluble, and hence may be precipitated if the solution is very concentrated.

Potassæ Citras. Citrate of Potash. $3KO,C_{12}H_5O_{11}$, or $K_3C_6H_5O_7$.

Prep. By neutralizing carbonate of potash with citric acid, when carbonic acid gas is liberated and citrate of potash formed.

Prop. A white deliquescent crystalline powder, very soluble in water, feebly acid in taste. Heated with sulphuric acid, it forms a brown fluid, gives off an inflammable gas, and evolves the odour

of acetic acid. Its solution, mixed with a solution of chloride of calcium, remains clear till it is boiled, when a white precipitate separates (citrate of lime), readily soluble in acetic acid. Its solution acidulated with hydrochloric acid gives a yellow precipitate with perchloride of platinum. 102 grains heated to redness till gases cease to be evolved, leave an alkaline residue (carbonate of potash) which requires for exact saturation 1000 grain-measures of the volumetric solution of oxalic acid, corresponding to 47 grains of potash.

Therapeutics. Citrate of potash sits easily upon the stomach, and is more pleasant to the taste, more readily absorbed into the system, and less liable to purge than the other vegetable salts of potash. Its diuretic action in health resembles that of the acetate; it slightly increases the urinary water, and diminishes the total amount of solids. It is a valuable saline febrifuge, increasing the secretion from the kidneys in disease. The citrate is readily decomposed after absorption into the blood, reduced to a state of carbonate of the base, and in this state is eliminated in the urine, rendering this fluid less acid or even alkaline in reaction. It is thus an indirect alkaline remedy, although in the stomach it possesses no antacid properties. It may be used with advantage in cases of uric acid gravel and allied diseases, and probably might be also usefully given as an alterative in some of the chronic diseases for which the acetate has been prescribed. Citrate of potash possesses powerful anti-scorbutic properties.

Dose. 20 gr. to 60 gr.

Potassæ Tartras. Tartrate of Potash. $2KO,C_8H_4O_{10}$, or $K_2C_4H_4O_6$.

Prep. Boil the acid tartrate with carbonate of potash, when an equivalent of hydrogen in the acid salt is replaced by one of potassium, and carbonic acid is given off; concentrate and crystallize.

Prop. Small granular crystals, usually without distinguishable shape; its real form is a right rhombic prism; neutral, deliquescent, and very soluble in water. Acetic acid added sparingly to its solution causes the separation of a white crystalline precipitate, the acid tartrate and acetate of potash being thus formed. Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas, and the odour of burned sugar. It is entirely dissolved by its own weight of water. 113 grains heated to redness, till gases cease to be evolved, leave an alkaline residue, which requires for exact saturation 1000 grain-measures of the

volumetric solution of oxalic acid, equivalent to 47 grains of potash.

Therapeutics. In small doses it acts as a diuretic, and is changed into the carbonate in the same way as the acetate : in larger doses it is purgative, producing watery evacuations. This salt is seldom employed except as a saline cathartic, and is added to vegetable purgatives, as senna and rhubarb, to increase their action. Its tendency to cause intestinal action militates against its use as a diuretic.

Doses. As a diuretic and alterative, 20 gr. to 60 gr.; as a purgative, 120 gr. to 200 gr.

Adulteration. Some sulphates may be present, which may be detected by the tests already given for them.

Potassæ Tartras Acida. Acid Tartrate of Potash. KO,HO, $C_8H_4O_{10}$, or $\mathbf{KHC_4H_4O_6}$.

Synonym. Potassæ Bitartras. Cream of Tartar, crystallized.

Prep. From argol, the deposit which occurs on the inside of wine casks, by purification with charcoal and clay. It is called cream of tartar from the purest crystals being skimmed off the saturated solution while evaporating.

Prop. A gritty, white powder ; or in fragments of cakes crystallized on one surface ; or in small oblique rhombic prisms ; acid, slightly soluble in water ; insoluble in spirit. Heated in a crucible, it evolves inflammable gas and the odour of burned sugar, and leaves a black residue (carbonate of potash and carbon), which effervesces with dilute hydrochloric acid, and forms a solution which, when filtered, gives a yellow precipitate with perchloride of platinum, and when neutralized by ammonia is rendered slightly turbid by oxalic acid : 188 grains heated to redness till gas ceases to be evolved, leave an alkaline residue, which requires for exact saturation 1000 grain-measures of the volumetric solution of oxalic acid, equivalent to 47 grains of potash.

Off. Prep. Contained in Pulv. Jalapæ Comp., and Confectio Sulphuris.

Therapeutics. In small doses acid tartrate of potash is refrigerant and diuretic ; in larger doses it acts as a powerful hydragogue purgative, without producing much depression. It is employed to form an acid drink in febrile and dropsical affections,

and as a purgative in dropsies, depending upon renal or cardiac disease. It is desirable when a full purgative effect is wished for, to combine the salt with some vegetable purgative, as jalap, gamboge, or scammony, for the purpose of increasing peristaltic action, and causing the evacuation of the fluid. The author has known the salt, when given alone in large doses, cause a large flow of fluid into the intestine, followed by subsequent absorption, from the bowel not being sufficiently stimulated to evacuate it.

Dose. As a refrigerant or diuretic, 20 gr. to 60 gr.; as a hydragogue purgative, 120 gr. to 300 gr.

Adulteration. Often contains a little tartrate of lime.

Potassæ Sulphas. Sulphate of Potash. KO,SO_3, or $\mathbf{K_2SO_4}$.

Prep. From the residuum of the distillation of nitric acid when made by treating nitre with sulphuric acid, which consists of acid sulphate of potash ($\mathbf{KHSO_4}$), not quite pure. This is dissolved in water, and the excess of acid in the acid sulphate is removed in the form of sulphate of lime, by rendering the solution slightly alkaline with slaked lime. The excess of lime is afterwards got rid of by the addition of carbonate of potash, and to the filtered fluid dilute sulphuric acid is added, so as to produce a neutral or slightly acid solution (this ensures all the carbonate of potash present being converted into sulphate), and the sulphate of potash is allowed after evaporation to crystallize out.

Prop. In hard semi-transparent colourless, six-sided prisms, terminated by corresponding pyramids; decrepitates when heated; of a bitter saline taste, slightly soluble in water, and insoluble in alcohol. The aqueous solution is neutral, gives no precipitate with oxalate of ammonia, but acidulated with hydrochloric acid, is precipitated yellow by perchloride of platinum, and white by chloride of barium.

Off. Prep. It is contained in Pulv. Ipecacuanhæ Compositus; Pilula Colocynthidis Composita; Pilula Colocynthidis et Hyoscyami.

Therapeutics. Mildly purgative. It is almost always given in combination with rhubarb or some other vegetable aperient; by some it is supposed to be alterative, acting on the secreting and excreting organs; latterly, evidence has been given of its acting as a poison in large doses. It was at one time supposed to have the power of repressing the secretion of milk. It is often used

on account of its mechanical properties for the purpose of more intimately dividing vegetable substances, as in the compound ipecacuanha powder.

Dose. 20 gr. to 120 gr. as a purgative ; in smaller doses as an alterative.

Potassæ Nitras. Nitrate of Potash. Nitre. $KONO_5$, or KNO_3.

Prep. Certain soils in India contain nitrates of lime and potash ; these, by being treated with wood ashes (carbonate of potash), yield nitrate of potash and carbonate of lime ; the former is dissolved out and crystallized, and purified by re-solution and crystallization.

Prop. In white crystalline masses or fragments of six-sided prisms, transparent, striated, with a peculiar cooling taste, soluble in water, not precipitated by chloride of barium or nitrate of silver ; deflagrates with heated charcoal, and forms carbonate of potash ; warmed in a test tube with sulphuric acid and copper filings, it evolves ruddy fumes (peroxide of nitrogen). The solution acidulated with hydrochloric acid, gives a yellow precipitate with perchloride of platinum.

Therapeutics. Nitre is refrigerant and diuretic, and in large doses exerts a powerful sedative action upon the heart and vascular system. It was once thought to cause some peculiar change in the blood by imparting oxygen to that fluid, but this idea has been shown to be fallacious. It is used in small doses as a refrigerant and diuretic in febrile affections, and to allay irritation of the mucous membrane of the stomach in inflammatory forms of dyspepsia ; in large doses as a vascular sedative in febrile affections, and especially in acute rheumatism. In dropsical affections, its action on the kidneys has sometimes proved useful.

Dose. 5 gr. to 20 gr. as a refrigerant and diuretic ; 20 gr. to 30 gr. as a vascular sedative.

Adulteration. It may contain traces of sulphate or chloride : detected by chloride of barium and nitrate of silver : lime, if present, would yield a precipitate with oxalate of ammonia.

Potassæ Chloras. Chlorate of Potash. KO,ClO_5, or $KClO_3$.

Prep. By passing a stream of chlorine gas through a mixture of carbonate of potash and slaked lime ; when saturation has taken place, chlorate of potash, chloride of calcium, and carbonate

of lime are formed; after the carbonate has been removed by filtration, the less sparingly soluble chlorate crystallizes on evaporating the solution.

($K_2CO_3 + 6CaH_2O_2 + 6Cl_2 = 2KClO_3 + 5CaCl_2 + CaCO_3 + 6H_2O$.)

Prop. In colourless transparent tabular crystals with four or six sides; have a cooling taste; soluble in sixteen parts of cold water: when a few drops of sulphuric acid are dropped upon the crystals, they become orange-red, and give off yellow vapours of peroxide of chlorine; when the salt is rubbed with sulphur in a mortar, it detonates. When heated, it first liquefies and then gives off nearly 39 per cent. of oxygen, and leaves a white residue, chloride of potassium (**KCl**), readily forming with water a neutral solution, which is precipitated white by nitrate of silver, and yellow by perchloride of platinum. The solution of the chlorate is not affected by nitrate of silver or oxalate of ammonia.

Off. Prep. Trochisci Potassæ Chloratis. Chlorate of Potash Lozenges. (Chlorate of potash, 3600 grains; refined sugar, twenty-five ounces; gum acacia, an ounce; all in powder; mucilage of gum acacia, two fluid ounces; distilled water, a fluid ounce. Mix, and divide into 720 lozenges. 5 grs. contained in each lozenge.)

Therapeutics. Chlorate of potash acts as a refrigerant and diuretic, in a manner similar to nitre; it has been supposed to give oxygen to the system, but this is evidently an error, for it is found to pass through the kidneys in the oxidized state and not as chloride of potassium. It appears to exert a powerful action upon the mucous membranes with which it comes in contact, and has been found extremely useful as a gargle in cases of severe tonsillitis, stomatitis, cancrum oris, and mercurial ptyalism; it has also been employed in low fevers, as scarlatina maligna, typhus and typhoid fevers, but its efficacy is less marked as a general than as a local remedy.

Dose. 10 gr. to 20 gr. or more.

Adulteration. Chloride of potassium may be present.

Potassæ Permanganas. Permanganate of Potash. KO,Mn_2O_7, or $KMnO_4$.

Prep. Mix three and a half ounces of chlorate of potash with four ounces of peroxide of manganese, add a solution of five ounces of caustic potash in a small quantity of water. Evaporate the whole to dryness, pulverise the residue and expose it to a dull red heat till all the chlorate is decomposed, by which means

manganate of potash and chloride of potassium are formed (probably $3MnO_2+6KHO+KClO_3=3K_2MnO_4+KCl+3H_2O$). Pulverize the cooled residue and boil with water, when the manganate is decomposed into the permanganate, peroxide of manganese, and potash (probably $3K_2MnO_4+2H_2O=2KMnO_4+MnO_2+4KHO$). The peroxide thus formed is allowed to subside, and the solution containing the permanganate of potash decanted, again boiled and redecanted. The free potash is neutralized with sulphuric acid and the solution evaporated till a pellicle forms, when on cooling the permanganate crystallizes.

Prop. Dark purple acicular crystals, sometimes reflecting a metallic green colour, and having a sweet astringent taste. A single small crystal is sufficient to colour an ounce of water deep purple, which, when mixed with a little rectified spirit and heated, is changed to a yellowish brown; this is due to the deoxidation of the acid by the organic matter and its reduction to the state of peroxide of manganese. The crystals evolve oxygen gas when heated, and leave a black residue in which the presence of potash may be detected by the usual tests. Five grains dissolved in water, require for complete decoloration a solution of 44 grains of granulated sulphate of iron, acidulated with 2 fluid drachms of dilute sulphuric acid. In this decomposition, the ferrous sulphate absorbs oxygen from the permanganate, and becomes converted into a persalt with the aid of the additional sulphuric acid present.

Off. Prep. Liquor Potassæ Permanganatis. Solution of Permanganate of Potash. (Permanganate of potash, four grains; distilled water, one fluid ounce.) Condy's fluid contains 4 grains of the salt to the fluid ounce.

Therapeutics. Permanganate of potash is a powerful oxidizing agent, and possesses the power of destroying many organic substances; hence it acts as an antiseptic and deodorizer. If taken internally, it is probable that it is changed in the stomach into peroxide of manganese, giving off oxygen to the organic substances contained in that organ.

Permanganate of potash is valuable as an application to foul ulcers, gangrenous parts, &c.; it is also useful in some cases as an injection or gargle in some affections of the mucous membranes, as of the mouth, throat, and vagina; in mercurial salivation, &c.

Of its value as an internal remedy we know little: it was once stated to be useful in diabetes, but observations by the author,

given in the Gulstonian Lectures, 1857, before the Royal College of Physicians, showed that it had no effect in decreasing the saccharine elimination, sometimes even increasing it, when irritation of the stomach was produced. Other physicians have subsequently arrived at the same results. It is probable that its remote effects are the same as those of black oxide of manganese, which are very unimportant.

Dose. 1 gr. to 4 gr. if given internally. Externally, 1 fl. drm. of the solution to 5 or 10 oz. of water. Internally, 2 to 4 fl. drms. of the solution.

Potassii Bromidum. Bromide of Potassium. KBr, or **KBr.**

Prep. The same as iodide of potassium, substituting an equivalent quantity of bromine for iodine. $6\mathbf{KHO}+Br_6=5\mathbf{KBr}+\mathbf{KBrO_3}+3H_2O$.

Prop. In colourless cubic crystals, closely resembling the iodide, with no odour, but a pungent saline taste, readily soluble in water, less soluble in spirit. Its watery solution gives a white crystalline precipitate with tartaric acid. When its solution is mixed with a little chlorine, chloroform agitated with it, on falling to the bottom, exhibits a red colour. A solution of the salt mixed with mucilage of starch and a drop of an aqueous solution of bromine, does not exhibit any blue colour, indicating the absence of iodine. Ten grains require for complete decomposition 840 grain-measures of the volumetric solution of nitrate of silver, equivalent to 6·72 grains of bromine.

Therapeutics. Bromide of potassium is the salt most commonly employed when we wish to produce the constitutional effects of bromine; it is devoid of the local irritant properties of free bromine, but after absorption into the blood induces all the peculiar physiological and therapeutic effects of the drug. As yet it has not been employed as an external remedy. (See Bromine, p. 26).

Dose. 5 gr. to 15 gr. and upwards.

Adulteration. A few years since, bromide of potassium was found by the author to contain iodide of potassium, sometimes in such large amounts as to induce iodism when the salt was given in large doses. This adulteration can be detected by the starch test above given. It may likewise contain bromate of potash.

Potassii Iodidum. Iodide of Potassium. KI, or **KI.**

Prep. The mode of preparing this salt consists in adding

iodine to a solution of potash, when the following changes ensue ($6KHO+I_6=5KI+KIO_3+3H_2O$). The mixture of the two salts, namely, the iodide of potassium and iodate of potash, with a little charcoal in fine powder, is heated to redness, by which means the iodate of potash is converted into iodide of potassium, the charcoal facilitating the deoxidation.

Prop. In white semi-transparent cubic crystals; without odour if pure, and of a saline taste; as met with in commerce, it occasionally has some odour of free iodine; very soluble in water, and in about six or eight parts of rectified spirit; the solutions should be neutral; and the watery solution, mixed with mucilage of starch, gives a blue colour on the addition of a minute quantity of chlorine. It gives a crystalline precipitate with tartaric acid; but tartaric acid and starch should not develope a blue colour; should they do so, it indicates the presence of iodate of potash; for iodic acid, being then liberated by the tartaric acid, acts as an oxidizing agent upon the hydriodic acid which is formed at the same time, and sets free the iodine. With nitrate of silver a pale yellow iodide falls, insoluble in solution of ammonia, and the ammoniacal liquid gives with excess of nitric acid no turbidity, showing a freedom from chlorides.

Off. Prep. Unguentum Potassii Iodidi. Iodide of Potassium Ointment. (Iodide of potassium, sixty-four grains; carbonate of potash, four grains; distilled water, one fluid drachm; prepared lard, one ounce. Dissolve the iodide and carbonate in the water, then mix with the lard.)

Linimentum Potassii Iodidi cum Sapone. Liniment of Iodide of Potassium and Soap. Hard soap (or curd soap) and iodide of potassium, each one and a half ounce; glycerine, one fluid ounce; oil of lemons, one fluid drachm; distilled water, ten fluid ounces.

Iodide of potassium is contained also in linimentum iodi, tinctura iodi, and unguentum iodi; but in all these preparations it is introduced more on account of its solvent than its therapeutic powers.

Therapeutics. The action of this salt as an iodine preparation is seen under the head of iodine (p. 23). Iodide of potassium does not produce the local irritant effects of free iodine, and hence it is better adapted for internal administration. After absorption into the blood it is probable that the effect of an alkaline iodide is the same as that of free iodine, and it can

hardly be conceived that there is any marked difference of action between the different iodides, as of potassium and sodium. Iodide of potassium has the power of causing the elimination of mercury from the system, and is administered with advantage after a mercurial course; it also removes lead. It has been administered in large doses (20 to 30 grs. three times a day) to patients suffering from aortic aneurism. Its depressant influence upon the circulation, aided by rest and low diet, probably explains the good results that have sometimes been obtained.

As an external remedy, the ointment and liniments with soap may be conveniently used when the slow action of the iodides upon a diseased part is desired.

Dose. 2 gr. to 10 gr., or more.

Adulteration. The salt may be damp, from the presence of water; it may also contain many impurities, as carbonate of potash, chlorides of sodium and potassium, iodate of potash, free iodine, &c., all detectable by the tests above given. When iodate of potash exists in the salt, from the imperfect ignition of the mixed iodide and iodate, the ointment is apt to become yellow, owing to the decomposition of the iodic acid by the animal matter.

Potassa Sulphurata. Sulphurated Potash. Hepar Sulphuris. Tersulphide of potassium with some sulphate of potash.

Prep. By mixing together sulphur and carbonate of potash, and afterwards heating in a crucible till they have combined. The changes are probably 10 $S+4K_2CO_3=3K_2S_3+K_2SO_4+4CO_2$.

Prop. A brown liver-coloured mass, which is brittle, slightly deliquescent, having a strong odour of sulphuretted hydrogen, especially when moist, and an acrid disagreeable taste; soluble in water, forming a yellow solution; the solution is precipitated by acids, with the deposition of sulphur, and strikes black with the salts of lead. The acrid fluid when boiled and filtered is precipitated yellow by perchloride of platinum, and white by chloride of barium. About three-fourths of its weight (the tersulphide of potassium) should be dissolved by rectified spirit.

Off. Prep. Unguentum Potassæ Sulphuratæ. Ointment of Sulphurated Potash. (Sulphurated Potash, thirty grains; prepared lard, one ounce). Should be used recently prepared.

Therapeutics. In small doses it acts as a stimulant diaphoretic and expectorant, and is sometimes employed in the treatment of chronic skin diseases, as scabies and psoriasis; also in chronic

rheumatism, and certain cases of bronchitis; in fact it possesses all the physiological and therapeutic properties which sulphur has when it becomes absorbed into the blood; but on account of its solubility it is much more potent than either sublimed or precipitated sulphur. Externally, this salt may be used in the form of ointment, or as a bath, or lotion, in the treatment of chronic rheumatic and skin affections. It is poisonous in large doses.

Dose. 3 gr. to 6 gr., in pill.

Adulteration. When exposed, this compound becomes pale from oxidation and the formation of sulphate of potash.

Sapo Mollis. Soft Soap. A compound containing potash. It is described under Olive Oil.

SODIUM.

(Na, or **Na**. Eq. = 23.)

This metal, called also Natrium, is contained in the soda salts, but does not exist native; when pure it resembles silver in colour, but is soft; sp. gr. 0·97; rapidly oxidizes, and forms an oxide, the alkali soda.

Preliminary remarks. Sodic chloride is abundantly present in the healthy organism. It seems to be in some way necessary for tissue-proliferation, whether normal or morbid.

Salts of soda, when injected into the blood of animals, do not exert any such toxic influence as do those of potash. Even large doses do no more than cause transient muscular weakness, and do not appear to affect the heart. It is a curious circumstance that the subcutaneous injection of sodic chloride in the frog causes cataract, and a transudation of red blood-corpuscles through the walls of the capillaries in various regions of the body.

Liquor Sodæ. Solution of Soda.

Prep. Carbonate of soda, twenty-eight ounces; slaked lime, twelve ounces; distilled water, a gallon. Prepared in the same manner as directed for the solution of potash. The changes which take place in this process are exactly the same as those which occur in forming liquor potassæ.

Prop. A colourless liquid, with intensely caustic taste; sp. gr. 1·047. 458 grains, by weight (one fluid ounce) require for neutralization 470 grain-measures of the volumetric solution of oxalic

acid, equivalent to 4·1 per cent., by weight, of hydrate of soda (NaO,HO, or **NaHO**). In most of its characters it resembles liquor potassæ, except that it is not precipitated by perchloride of platinum, or tartaric acid, and is precipitated by a solution of antimoniate of potash, the antimoniate of soda being a rather insoluble salt. When heated with an excess of dilute nitric acid and evaporated to dryness, the residue forms with water a clear solution, which is rendered turbid by chloride of barium and by nitrate of silver, but not by ammonia, indicating traces of sulphates and chlorides, and the absence of metallic impurities (iron, &c.). One fluid ounce contains 18·8 grains of hydrate of soda.

Therapeutics and Use. The action upon the system is probably almost the same as that of liquor potassæ, but it is seldom administered. It is employed in the preparation of sulphurated antimony, and in other processes.

Dose. 10 min. to 1 fl. drm., freely diluted.

Soda Caustica. Caustic Soda; Hydrate of Soda. NaO,HO, or **NaHO**, not quite pure.

Prep. Made by evaporating solution of soda to an oily consistence, and pouring it on a clean silver or iron plate to solidify.

Prop. In whitish fragments or cakes, alkaline and corrosive. It imparts a yellow colour to flame; its solution in water acidulated by nitric acid gives scanty white precipitates with nitrate of silver and chloride of barium. Forty grains dissolved in water leave scarcely any sediment, and require for neutralization about 900 grain-measures of the volumetric solution of oxalic acid, corresponding to 27·9 grains of soda.

Therapeutics. Soda may be employed externally as a caustic, in the same manner as potash. It is less deliquescent, and therefore more convenient, but likewise probably somewhat less powerful. It may be cast into sticks for medicinal use.

Sodæ Carbonas. Carbonate of Soda. NaO,CO_2+10HO, or $Na_2CO_3.10H_2O$.

Prep. Formerly derived from kelp or barilla, the ashes obtained from burning sea-weeds, and species of salsola: it is now almost always made from common salt, by converting the chloride of sodium into a sulphate by means of sulphuric acid, and afterwards, by combustion with small coal and chalk, resolving this

salt into a sulphide, and then into a carbonate; it is manufactured on a very large scale.

Prop. In large rhombic octahedra, colourless, transparent, except on the surface, with an alkaline and caustic taste; it effloresces and crumbles when exposed to air; it imparts a yellow colour to flame; very soluble in water; dissolves with effervescence in hydrochloric acid, forming a solution which does not precipitate with perchloride of platinum. By heat it undergoes aqueous fusion, and loses 63 per cent. of its weight. When supersaturated with nitric acid it precipitates slightly, or not at all, with chloride of barium or nitrate of silver. One hundred and forty-three grains require for neutralization at least 960 grain-measures of the volumetric solution of oxalic acid.

20 grs. of carbonate of soda neutralise 9·7 grs. of citric and 10·5 grs. of tartaric acid.

Sodæ Carbonas Exsiccata. Dried Carbonate of Soda. NaO,CO_2, or Na_2CO_3. Apply heat to the carbonate, until the crystals fall to powder, and afterwards heat it to redness; lastly, rub it to powder. It is simply the last described salt deprived of its water of crystallization, which amounts to 63 per cent., by heat; it is soluble in water, and contains 41·51 per cent. of carbonic acid, and 58·49 of soda.

Therapeutics. The action of carbonate of soda resembles that of the corresponding salt of potash, but is less caustic. The general effects of soda salts will be described under Sodæ Bicarbonas.

Dose. 10 gr. to 30 gr. Of dried carbonate of soda, 5 gr. to 15 gr.; this last is convenient when it is desired to administer the drug in powder or pill.

Adulteration. It usually contains a little sulphate of soda, detected by the chloride of barium test above given.

Sodæ Bicarbonas. Bicarbonate of Soda $NaO,HO,2CO_2$, or $NaHCO_3$.

Prep. From the carbonate, in the same way as the bicarbonate of potash is prepared, dried carbonate being used to prevent the formation of large crystals.

Prop. It forms an opaque white powder, or minute crystals, slightly alkaline, and not caustic; imparts a yellow colour to flame; soluble in water; it dissolves with much effervescence in dilute hydrochloric acid, forming a solution which does not pre-

cipitate with perchloride of platinum. A solution of the salt in cold water gives a white, not a coloured, precipitate with solution of perchloride of mercury, which is oxychloride of mercury, but subsequently the red carbonate forms. Supersaturated with nitric acid, its solution scarcely precipitates with chloride of barium or nitrate of silver. Eighty-four grains exposed to a red heat leave 53 of an alkaline residue (carbonate of soda), which requires for neutralization 1000 grain-measures of the volumetric solution of oxalic acid. Twenty grains of bicarbonate of soda neutralize 16·7 grains of citric and 17·8 grains of tartaric acid.

Off. Prep. Liquor Sodæ Effervescens. Effervescing Solution of Soda. Soda Water. (Bicarbonate of soda, thirty grains; water, a pint. Dissolve, filter, and pass into the solution as much carbonic acid gas as can be introduced under a pressure of seven atmospheres. Bottle tightly.)

Trochisci Sodæ Bicarbonatis. Bicarbonate of Soda Lozenges. (Bicarbonate of soda, three thousand six hundred grains; refined sugar, twenty-five ounces; gum acacia, an ounce; mucilage of gum acacia, two fluid ounces; distilled water, a fluid ounce. Mix and make 720 lozenges.)

Each lozenge contains five grains of the bicarbonate.

The bicarbonate is also contained in Sodæ Citro-tartras effervescens.

Therapeutics. Very similar to bicarbonate of potash, and almost all that has been stated of the action of that salt applies to this, except that the urate of soda is very much less soluble than the potash salt, and hence soda is less adapted for the treatment of the uric acid diathesis. Some practitioners are of opinion that the bicarbonate of soda agrees better with the stomach than the potash salt, and it probably influences the secretions of the liver more than the bicarbonate of potash, and has less power in causing diuresis. The author once knew a patient suffering from chronic eczema, in whom, when bicarbonate of potash was given, nausea was always induced, attended with increase of the skin affection, but no such symptoms were caused by the exhibition of the corresponding salt of soda. Other differences probably exist, but are not well made out.

Dose. 10 gr. to 60 gr.; of the lozenges, 1 to 6.

Adulteration. Carbonate and sulphate of soda in an efflorescent state, detected by the magnesia and chloride of barium tests.

Sodæ Arsenias. See Arsenical Preparations.

Sodæ Sulphas. Sulphate of Soda; Glauber's Salts. NaO,SO_3+10HO, or $Na_2SO_4.10H_2O$.

Prep. By treating common salt with sulphuric acid in the process for making hydrochloric acid, and neutralizing with carbonate of soda; it is found native, and exists in sea-water.

Prop. In six-sided oblique rhombic prisms, which are deeply channelled; colourless, transparent, neutral, with a bitter saline taste; effloresces in air, soluble in water; insoluble in spirit. Heated, it loses 55·9 per cent. of water. Heated with solution of potash no odour of ammonia is evolved and no precipitate is formed. It imparts a yellow colour to flame. One hundred grains of it dissolved in water and acidulated with hydrochloric acid, give, by the addition of chloride of barium, a white precipitate (sulphate of barium) which when washed and dried weighs 72·2 grains.

Therapeutics. It acts as a saline purgative, probably influencing the biliary secretions; in small doses as a diuretic; it was formerly much employed, but at present sulphate of magnesia is generally substituted for it, on account of its more agreeable taste. The so-called Cheltenham salts consist chiefly of sulphate of soda; and this salt is also a constituent of the Carlsbad waters.

Dose. ¼ oz. to 1 oz. When effloresced, the dose is smaller.

Sodæ Acetas. Acetate of Soda. $NaO,C_4H_3O_3+6HO$, or $NaC_2H_3O_2.3H_2O$.

Prop. In transparent colourless crystals, soluble in water. The watery solution, when dilute, should not be precipitated by chloride of barium or nitrate of silver, showing the absence of sulphates and chlorides.

Uses. In the preparation of phosphate and arseniate of iron.

Therapeutics. Acetate of soda is rarely used as medicine; it acts as a mild diuretic, less powerful than acetate of potash.

Dose. 20 gr. to 60 gr.

Sodæ Sulphis. Sulphite of Soda. (Not officinal.) $NaSO_3.7H_2O$.

Prep. Formed by saturating a solution of carbonate of soda with sulphurous acid gas, and crystallizing.

Prop. White prisms, having a slight odour of sulphurous acid; soluble in water.

Therapeutics. It is a decided antiseptic, arresting the development of bacteroid organisms in neutral solutions, and so preventing putrefaction. It has been used with good effect in enteric fever and septic conditions of the blood. In large doses it is said to check ammoniacal decomposition of the urine in the bladder. It has also been recommended as a substitute for quinia in the treatment of ague; but its efficacy in this respect is questionable. It has been given, with seemingly good effect, in many cases of chronic vomiting, accompanied by the presence of sarcinæ in the vomited matter.

Dose. 20 gr. to 60 gr.

Hyposulphite of Soda. Appendix. NaO,S_2O_2+5HO, or $\mathbf{Na_2H_2S_2O_4.4H_2O}$.

It occurs in large rhombic prisms with oblique faces, which are very soluble in water. The hyposulphite of soda, in common with other soluble hyposulphites, has the peculiar property of dissolving chloride of silver, and also of rendering colourless a solution of iodine; the explanation of this latter phenomenon will be found among the volumetric tests.

Use. It is introduced into the Appendix of the Pharmacopœia for the formation of one of the volumetric solutions. See Appendix.

Therapeutics. The antiseptic power of the hyposulphite in neutral or alkaline solutions is very inferior to that of the sulphite. As a constitutional remedy it is valueless. Its therapeutic properties are due to the fact that it is decomposed by acids, free sulphur and sulphurous acid being produced. Hence, in cases of sarcinous vomiting, it may be administered to check the fermentation of food in the stomach. Again, it is extremely valuable as an external application in all forms of parasitic skin disease; for it exhibits all the efficacy of sulphurous acid without the irritant property of the latter. It is probable that in both cases the acid of the gastric juice, and that of the perspiration, may be respectively essential to bring out the therapeutic effect of the salt.

Dose. 20 gr. to 60 gr.

Sodæ Nitras. Nitrate of Soda. NaO,NO_5, or $\mathbf{NaNO_3}$.

Prop. A deliquescent salt crystallizing in obtuse rhombohedra. It is soluble in about two parts of cold water; the solution should give no precipitate with nitrate of silver or

chloride of barium, showing the absence of chlorides and sulphates. Thrown on a fire it deflagrates; warmed with sulphuric acid and copper wire, it evolves red fumes.

Use. It is not employed in medicine, but is introduced for making the arseniate of soda.

Sodæ Phosphas. Phosphate of Soda. $2NaO,HO,PO_5+24HO$, or $Na_2HPO_4.12H_2O$.

Prep. Formed by digesting bone ash (phosphate of lime) in sulphuric acid, when sulphate of lime and free phosphoric acid are formed; adding carbonate of soda till carbonate of lime is no longer formed and the solution is slightly alkaline, whereby phosphate of soda is formed, filtering and crystallizing.

Prop. In transparent, oblique, rhombic prisms, with a mild saline taste, effloresecing in the air. It imparts a yellow colour to flame, is faintly alkaline in reaction, very soluble in water; with nitrate of silver it throws down the yellow phosphate, the resulting fluid acquiring an acid reaction, owing to the liberation of nitric acid ($Na_2HPO_4+3AgNO_3=Ag_3PO_4+2NaNO_3+HNO_3$); it loses 63 per cent. of water at a dull red heat, and the remaining salt dissolved in water gives with chloride of barium a precipitate entirely soluble in dilute nitric acid, and with nitrate of silver a precipitate of a white colour, owing to the change of the tribasic phosphate (Na_2HPO_4) into the pyrophosphate ($Na_4P_2O_7$) by the action of heat.

Therapeutics. In large doses it acts as a mild saline purgative; in smaller ones as a diuretic, altering also the condition of the urine, rendering it alkaline, and increasing its solvent power for uric acid; sometimes employed as a pleasant purgative for children and delicate persons, and frequently in the uric acid diathesis; in many patients the exhibition of small doses of this salt causes disturbance of the stomach and bowels, and prevents its employment as a lithontriptic.

Dose. As a purgative, ½ oz. to 1 oz.; as a diuretic, 30 gr. to 120 gr.,—given in mutton broth it is almost tasteless.

Adulteration. It frequently contains a little phosphate of lime, which renders the solution milky.

Sodæ Hypophosphis. Hypophosphite of Soda. $NaO,PO,2HO$, or $NaPH_2O_2$.

Prep. By adding carbonate of soda to a solution of hypophosphite of lime as long as a precipitate of carbonate of lime is

formed. The solution is then filtered and evaporated to dryness by the heat of a steam-bath, keeping it constantly stirred when the salt begins to solidify. It sometimes explodes spontaneously while evaporation is going on.

Prop. A white, granular salt, with a bitter nauseous taste. It is deliquescent, very soluble in water and spirit (differing in this respect from the hypophosphite of lime), but insoluble in ether. At a red heat it ignites and gives off inflammable phosphuretted hydrogen.

Therapeutics. Similar to Calcis Hypophosphis, *quod vide.*

Dose. 5 gr. to 10 gr.

Borax. Borax. Biborate of Soda. $NaO,2BO_3+10HO$, or $Na_2B_4O_7.10H_2O$.

Prep. Found native in Thibet, and imported from India as tincal or crude borax; made also in Tuscany by neutralizing the boracic acid, obtained from the lagoons, with carbonate of soda.

Prop. Flattened six-sided prisms, semi-transparent, with a slight alkaline reaction and saline taste, efflorescent; insoluble in rectified spirit; pretty soluble in water, especially when hot; and from this solution, on the addition of any of the mineral acids, crystalline scales of boracic acid are thrown down; the solution of boracic acid in spirit burns with a green flame; it loses its water and fuses when heated. 191 grains dissolved in 10 fluid ounces of distilled water require for saturation 1000 grain-measures of the volumetric solution of oxalic acid, equivalent to 31 grains of soda.

Off. Prep. Mel Boracis. Honey of Borax. (Powdered borax, sixty-four grains; honey, one ounce. Mix.)

Glycerinum Boracis. Glycerine of Borax. (Borax powdered, one ounce; glycerine, four fluid ounces. Mix.)

Therapeutics. Borax acts as a mild alkali upon the alimentary canal, and after absorption tends to render the fluids alkaline, and to produce diuresis: other powers have been attributed to it, viz., a specific action upon the uterus, causing contraction; this power is very questionable. It is also stated to have the power of checking the zymotic action of yeast, diastase, emulsine, and myrosin. It is used sometimes as a diuretic and antacid, sometimes combined with ergot to produce expulsion of the placenta, and as an emmenagogue. Borax produces a peculiar topical

sedative or soothing influence when applied to mucous membranes; and it is used mixed with honey, glycerine, or as a gargle, in aphthous conditions of the tongue and throat, and in mercurial salivation. It is also advantageously employed in the form of an injection in irritable conditions of the vagina and uterus, and as a lotion in pruritus of the pudendum or anus.

Dose. 10 gr. to 60 gr.

Liquor Sodæ Chloratæ. Solution of Chlorinated Soda.

Prep. By passing chlorine gas through a solution of carbonate of soda (twelve ounces in thirty-six fluid ounces of water) till it has attained a sp. gr. of 1·06, for if the process be continued further, chlorate of soda is formed. Thus prepared, a mixture of hypochlorite of soda (**NaClO**), chloride of sodium, and bicarbonate of soda is the result.

Prop. A colourless alkaline liquid, having the odour of chlorine, a pungent taste, with the power of bleaching vegetable colours, turmeric paper being first made brown, and the colour afterwards speedily destroyed; indigo is also decolorized by it; it effervesces with hydrochloric acid, evolving chlorine and carbonic acid, and forming a solution which does not precipitate with perchloride of platinum. When exposed to the air, from the absorption of carbonic acid, and more especially when an acid is added to it, free chlorine is evolved. It is not precipitated by oxalate of ammonia. Sp. gr. 1·103. Seventy grains by weight, added to a solution of 20 grains of iodide of potassium in 4 fluid ounces of water, and acidulated with 2 fluid drachms of hydrochloric acid, require for the discharge of the brown colour which the mixture assumes (from the liberation of iodine) 500 grain-measures of the volumetric solution of hyposulphite of soda, equivalent to 1·52 grains of chlorine.

Off. Prep. Cataplasma Sodæ Chloratæ. Poultice of Chlorinated Soda. (Boiling water, eight fluid ounces; linseed meal, four ounces; solution of chlorinated soda, two fluid ounces. Stir constantly, add the linseed to the water by degrees, then mix in the chlorinated soda.)

Therapeutics. Internally it acts as an antiseptic and stimulant, and has been given with success in low malignant fevers, as scarlatina, &c. Externally, in the form of cataplasm or solution, it is applied to correct the fœtor of unhealthy or gangrenous parts, and also to stimulate to more healthy action. As a gargle it is useful

in ulcerated sore throats, and in ulcerated mouths from the use of mercury. (*See* Liquor Chlori.)

Dose. 10 min. to 20 min., or more, diluted with 1 fl. oz. of water; or as a gargle, ½ fl. oz. to 1 fl. oz. in the ½ pint of water.

The test of its goodness is the free evolution of chlorine when an acid is added to it.

Sodii Chloridum. Chloride of Sodium. Common Salt. NaCl, or **NaCl.**

Found in Cheshire as rock-salt, and in brine springs; also in sea-water, &c.

Prop. Transparent cubes, or small white grains, free from moisture, soluble in water and spirit, but not in absolute alcohol, imparting a yellow colour to flame. The solution is not precipitated by perchloride of platinum, but gives a white precipitate with nitrate of silver, soluble in ammonia, but insoluble in nitric acid.

Therapeutics. A necessary article of food, contained in blood and other animal fluids. A deficiency of it causes disease. In large doses it is emetic and purgative; in milder ones, it acts as a slight stimulant and alterative. Externally applied, it is also stimulant and rubefacient. Sometimes used in the form of sea-water as an emetic, purgative, and anthelmintic; also as an adjunct to clysters: its internal employment, however, is chiefly as a condiment. Sponging and bathing in salt water, with or without friction, are valuable aids in many affections, as chronic rheumatism, joint affections, &c.

Dose. A tablespoonful or more as an emetic.

Soda Tartarata. Tartarated Soda. Tartrate of Soda and Potash. Rochelle Salt. $NaO,KO,C_8H_4O_{10}+8HO$, or **$NaKC_4H_4O_6.4H_2O$.**

Prep. Add sixteen ounces of acid tartrate of potash to twelve ounces of carbonate of soda dissolved in four pints of boiling water, when the basic equivalent of hydrogen is replaced by one of sodium and carbonic acid is given off. If after being boiled for a short time the liquid is acid or alkaline, it must be neutralized by carbonate of soda or acid tartrate of potash as required. Boil and filter, concentrate and crystallize.

Prop. In colourless, transparent prisms, or halves of prisms, of the rhombic order, generally eight-sided, neutral in reaction, entirely soluble in cold water, tasting like common salt. Nitrate of silver and chloride of barium throw down no precipitate, or

only such as is dissolved by water. Heated with sulphuric acid it blackens and evolves inflammable gas and the odour of burned sugar. It imparts a yellow colour to flame. A strong solution gives a crystalline precipitate of acid tartrate of potash, on the addition of a small quantity of acetic acid. A hundred and forty-one grains heated to redness till gases cease to be evolved, leave an alkaline residue, which requires for neutralization 1000 grain-measures of the volumetric solution of oxalic acid.

Therapeutics. A mild saline purgative, in large doses; in smaller ones, diuretic; and producing an alkaline condition of the fluids in the same way as tartrate of potash: it is employed under exactly similar circumstances.

Dose. As a purgative, 120 gr. to ½ oz.; as a diuretic, 30 gr. to 60 gr.

Sodæ Citro-Tartras Effervescens. Effervescent Citro-tartrate of Soda.

Prep. Mix seventeen ounces of bicarbonate of soda, eight ounces of tartaric acid, and six ounces of citric acid, in powder. Heat to between 200° and 220°, stir till granular, pass through suitable sieves, and keep dry.

Therapeutics. The same as the tartarated soda, but it is more pleasant to the taste, and the carbonic acid evolved makes it sit more easily on the stomach.

Dose. 60 gr. to ¼ oz.

Soap and Valerianate of Soda will be treated of under the heads of Olive Oil and Valerian.

STANNUM. TIN.

(Sn. Eq. = 59, or Sn. Eq. = 118.)

Granulated Tin. *See* Appendix.

Solution of Chloride of Tin. *See* Appendix.

Neither the chloride of tin, nor, in fact, any of the salts of this metal, are commonly employed as remedies. They have, however, been administered in the treatment of some nervous affections, as epilepsy and chorea, in the same way as the salts of zinc and silver: also in some chronic forms of skin disease. No good clinical investigation of the action of tin salts has yet been made.

ZINCUM. ZINC.

(Zn. Eq. = 32·5, or Zn. Eq. = 65.)

Zinc, and Granulated Zinc. *See* Appendix.

Prep. Obtained from the sulphide, Blende, or the native carbonate, Calamine, by distillation with carbonaceous matters. Granulated zinc is prepared by fusing zinc and pouring it into cold water.

Prop. A bluish-white crystalline metal; sp. gr. 6·86; soluble in dilute hydrochloric and sulphuric acids, with evolution of hydrogen, also in nitric acid. The gas evolved on the addition of pure sulphuric acid does not blacken a piece of paper moistened with acetate of lead, and when ignited gives no dark stain to the lid of a porcelain crucible held low down in the flame, showing that the metal is free from sulphur and arsenic. The precipitate thrown down by ammonia is re-dissolved by excess of that reagent. Used in pharmacy for the preparation of the chloride.

Zinci Oxidum. Oxide of Zinc. ZnO, or **ZnO.**

Prep. Made by heating the carbonate of zinc in a loosely covered crucible exposed to a dull red heat, till a portion taken from the centre, when cool, does not effervesce when dropped into dilute sulphuric acid; the carbonic acid is driven off, and the oxide of zinc remains.

Prop. A white powder, without odour or taste, becoming pale yellow by heat, insoluble in water, but soluble in hydrochloric and other acids. Dissolves, without effervescence, in diluted nitric acid, showing the absence of carbonate; the solution is not affected by chloride of barium or nitrate of silver, and gives a white precipitate with carbonate of ammonia, which dissolves entirely without colour in excess of the reagent, forming a solution which is precipitated white by sulphide of ammonium; the three latter reactions indicating the absence of sulphates, chlorides, alumina, iron, or other metallic impurities.

Off. Prep. Unguentum Zinci. Ointment of Zinc. (Oxide of zinc, eighty grains; benzoated lard, one ounce. Mix them together.)

Therapeutics. Oxide of zinc, if given in large doses, causes vomiting, but it is seldom or never used as an emetic. In small doses it becomes absorbed and acts as a tonic and astringent; its tonic effects are exerted chiefly upon the nervous system; as is

seen in cases of chorea, epilepsy, hysteria, neuralgia, and whooping cough; as a general astringent it is useful in cases of colliquative sweating. When long continued and in large doses, it has been said to cause a species of tabes sicca, or dry wasting. Externally it is employed as a desiccant and astringent upon excoriated surfaces and slight ulcerations, either alone or mixed with starch and dusted upon the parts.

Dose. 1 gr. to 10 gr. or more, in pill or powder.

Adulteration. Chalk, carbonate of magnesia; detected by effervescing, and the special tests of these bodies. Starch has sometimes been used to adulterate this oxide.

Zinci Chloridum. Chloride of Zinc. ZnCl, or $\mathbf{ZnCl_2}$.

Prep. Made by dissolving granulated zinc in hydrochloric acid, digesting for some hours with heat, filtering and adding solution of chlorine, until the fluid acquires a permanent odour of that gas; afterwards adding carbonate of zinc in small quantities at a time, until a brown sediment of peroxide of iron appears; this is separated, and the fluid evaporated to a proper consistence and poured into moulds to solidify.

The use of the chlorine and carbonate of zinc in making this salt and its solution is to peroxidize and precipitate any iron.

Prop. A white, crystalline, semi-transparent mass, in rods or tablets, rapidly absorbing water if exposed to the air, caustic, and very deliquescent; soluble in rectified spirit, in water, and in ether. The watery solution is precipitated white by sulphide of ammonium and nitrate of silver; but, if first acidulated with hydrochloric acid, it is not affected by sulphuretted hydrogen. The aqueous solution is likewise precipitated by ammonia and potash, but the precipitate is re-dissolved by excess of these reagents; also precipitated by carbonate of soda or potash, but not re-dissolved by excess of these reagents; it is not affected by chloride of barium or oxalate of ammonia, and is not tinged blue by ferro- or ferridcyanide of potassium; showing the absence of sulphates, lime, or iron.

Off. Prep. Liquor Zinci Chloridi. Solution of Chloride of Zinc. (Granulated zinc, one pound; hydrochloric acid, forty-four fluid ounces; solution of chlorine, a sufficiency; carbonate of zinc, half an ounce; water, a pint. Dissolve and reduce to two pints.) Contains 366 grs. in one fluid ounce.

Therapeutics. When applied externally in substance, or made

into a paste with flour or gypsum, it acts as a powerful escharotic from its power of combining with some of the proximate elements of the tissues; when in solution, as an irritant and astringent. Chloride of zinc is seldom given as an internal remedy, although it has occasionally been employed in chorea and epilepsy. Externally it is used in the treatment of cancerous affections, intractable and malignant ulcers, and the removal of nævi. The use of gypsum or flour is to prevent the action from being extended too far, owing to the deliquescent nature of the salt.

A solution of chloride of zinc, sp. gr. 2·0, is used as a deodorizer and disinfectant, under the name of Sir W. Burnett's Solution.

Dose. Internally, ½ gr. to 1 gr. or 2 gr.

Zinci Sulphas. Sulphate of Zinc; White Vitriol. ZnO,SO_3+7HO, or $\mathbf{ZnSO_4.7H_2O}$.

Prep. By dissolving zinc in dilute sulphuric acid, filtering and mixing with a solution of chlorine, and subsequently adding carbonate of zinc, as directed in the preparation of the chloride; evaporating and crystallizing.

Prop. In large or small crystals, of the same form as sulphate of magnesia; slightly efflorescent; soluble in water; precipitated and again re-dissolved by ammonia; precipitated by chloride of barium and sulphide of ammonium. Its watery solution is not tinged purple by tincture of galls, showing absence of iron, and when acidulated with hydrochloric or sulphuric acid is not precipitated by sulphuretted hydrogen, showing absence of arsenic, copper, and lead. Boiled a few minutes with a little nitric acid, it yields with ammonia a white precipitate, entirely soluble without colour in excess of the reagent, showing the absence of iron, &c.

Therapeutics. In small doses, sulphate of zinc acts as an astringent and nervine tonic; in large doses as a quick, direct emetic; externally, as a powerful astringent. It is used as a tonic chiefly in diseases of the nervous system, as in chorea, epilepsy, hysteria, and allied spasmodic affections; when the dose is gradually increased, a tolerance soon becomes established. The author has an epileptic patient under his care who has taken from 10 to 15 grains of the salt twice a day for about four years, without having experienced any unpleasant symptom from the remedy. Sulphate of zinc is sometimes given as an astringent in chronic passive discharges, as in leucorrhœa, gleet, and bronchorrhœa. In large doses, as an emetic, it is used when the rapid

emptying of the stomach is desired without the production of much depression, as in narcotic poisoning, phthisis, and dyspepsia. Externally, in solutions of different strengths, it is employed as a lotion or injection, as in ophthalmia, gleet, leucorrhœa, &c.

Dose. As a tonic, or astringent, 1 gr. to 5 gr. or 10 gr., in pills, or solution; as an emetic, 10 gr. to 30 gr. Externally, from 1 gr. to 10 gr. may be dissolved in an ounce of water.

Zinci Carbonas. Carbonate of Zinc. $ZnO,CO_2+2ZnO+3HO$, or $ZnCO_3(ZnO)_2.3H_2O$.

Prep. By precipitating a solution of sulphate of zinc with carbonate of soda, washing and drying the precipitate.

Prop. A white powder, without odour or taste, insoluble in water, soluble with effervescence, and without residue, in dilute nitric acid; this solution gives no precipitate with chloride of barium or nitrate of silver; and with carbonate of ammonia, a white precipitate (carbonate of zinc) entirely soluble without colour in excess of the reagent, forming a solution which is precipitated white by sulphide of ammonium.

Therapeutics. Not much employed as a medicinal agent; it may be used in the same cases as the oxide, both internally and externally; its action is probably identical with that of the oxide of zinc. Dr. Marcet has proposed its administration in solution in carbonic acid in cases of chronic alcoholic poisoning.

Dose. 1 gr. to 10 gr. in pill or powder.

Zinci Acetas. Acetate of Zinc. $ZnO,C_4H_3O_3+2HO$, or $Zn(C_2H_3O_2)_2.2H_2O$.

Prep. By dissolving carbonate of zinc in acetic acid, evaporating and crystallizing.

Prop. In thin colourless plates, of a pearly lustre, and a sharp unpleasant taste; evolving acetic acid when decomposed by sulphuric acid. Soluble in water, giving a white precipitate with sulphuretted hydrogen. A dilute watery solution is not affected by chloride of barium or nitrate of silver, and when slightly acidulated with hydrochloric acid, is not precipitated by sulphuretted hydrogen. Boiled for a few minutes with a little nitric acid, it yields with ammonia a white precipitate, entirely soluble, without colour, in excess of the alkali.

Therapeutics. Acetate of zinc, as far as has been clinically determined, acts in a manner very similar to the sulphate of the

metal; producing either vomiting, or a tonic and astringent effect, according to the dose. It is chiefly employed as an external agent for the same purposes as sulphate of zinc, to which latter it is preferred by many, especially in gonorrhœa. It has long been prescribed as an extemporaneous preparation made by mixing acetate of lead with sulphate of zinc.

Dose. 1 gr. to 2 gr. as a tonic; 10 to 20 gr. as an emetic. As a lotion or injection, 1 gr. to 10 gr., to 1 fl. ounce of water.

Valerianate of Zinc is described under the head of Valerian.

ALCOHOLIC AND ETHEREAL PREPARATIONS, CHLOROFORM, ETC.

Alcohol. *See* Appendix. Absolute Alcohol. $C_4H_6O_2$, or C_2H_6O.

Prep. Rectified spirit, a pint; carbonate of potash, one and a half ounces; slaked lime, ten ounces. Mix the carbonate of potash with the rectified spirit; burn the lime and immediately add to it the spirit from which the denser aqueous solution of carbonate of potash has been completely separated. Distil (after it has stood in the apparatus for twenty-four hours) at a gentle heat, till one and a half fluid ounces have passed over; reject this, and continue the distillation until nothing more comes over at a temperature of 200°.

Prop. A limpid, colourless liquid, of a pungent, spirituous odour; very volatile; sp. gr. 0·795, rapidly absorbing water; it is a very powerful solvent of certain substances, as alkaloids, pure alkalies, volatile oils, iodine, &c.; it does not dissolve common salt, which is soluble in ordinary rectified spirit. It is not rendered turbid when mixed with water, and does not give rise to a blue colour when in contact with anhydrous sulphate of copper; it is entirely volatilized by heat: these tests indicating freedom from oily matters, or other impurities.

Use. It is never administered as a medicine, but is employed as a solvent, and to test the purity of some chemical substances.

Spiritus Rectificatus. Rectified Spirit.

Alcohol, with sixteen per cent. of water.

Prep. Alcohol is a product of the vinous fermentation of

sugar, occurring in wine, malt liquors, &c. : these, when distilled, afford spirits, such as brandy and rum ; and re-distilled, give rectified spirit. It is usually procured from malt.

Prop. It resembles alcohol in most of its properties : sp. gr. 0·838. It burns with a blue flame without smoke ; odour and taste, alcoholic ; it should not be made cloudy by the addition of water, nor tinged red with sulphuric acid. It contains about 84 per cent. of absolute alcohol. Four fluid ounces, with 30 grain-measures of the volumetric solution of nitrate of silver, exposed for 24 hours to a bright light, and then decanted from the black powder which has formed, undergo no further change when again exposed to light with more of the test ; indicating the presence of but a small amount of fousel oil and aldehyd, both of which are capable of reducing nitrate of silver. Alcohol when pure undergoes no change under the influence of this salt and a bright light. The thirty grain-measures of the silver solution contain nearly half a grain of nitrate of silver.

Off. Prep. Spiritus Tenuior. Proof Spirit, or weak Alcohol.

Prep. (By adding to every five pints of rectified spirit, three pints of distilled water, at a temperature of 60° Fah.) It contains 49 per cent. of alcohol. Sp. gr. 0·920.

Use. Rectified spirit is employed in pharmacy in making many tinctures and spirits, when the substances contain a large amount of resin or volatile oil. *Proof spirit* is used when the drugs are not very rich in such principles. See Introduction under the head *Tinctures.*

Therapeutics. Externally, spirit is employed mixed with water in the form of a lotion, as a stimulant application, as to sore nipples, &c. Eau de Cologne is often employed instead of simple spirit on account of its agreeable odour. (*See* Arnica.)

Spiritus Vini Gallici. Brandy, Spirit distilled from French wine.

Prop. & Comp. Brandy contains about 53 per cent. of alcohol, together with some volatile oil and œnanthic ether ; it is almost white when first distilled, but in the cask acquires some colour ; burnt sugar is often added to it to produce the same effect.

Prep. Mistura Spiritus Vini Gallici. Mixture of Spirit of French Wine. Brandy Mixture. (Spirit of French wine, cin-

namon water, each, four fluid ounces; the yolks of two eggs; refined sugar, half an ounce. Rub the yolks and sugar together, then add the cinnamon water and spirit.)

Therapeutics. The effect produced by alcohol on a healthy individual may be divided into three stages :

1. The face is flushed, the pulse and respiration are quickened, there is a sensation of warmth all over the body, with increased muscular and mental energy.

2. The exhilaration passes over into excitement, sometimes amounting to furious delirium. Co-ordinating power over muscular movements is impaired, especially over those of the tongue (thick utterance), of the eyeballs (double vision), of the limbs (staggering gait). The cutaneous sensibility is blunted. Vomiting sometimes occurs.

3. The excitement is followed by drowsiness, passing into coma with stertorous breathing. There is almost complete sensory and motor paralysis. Pulse usually slow and compressible. Death occurs by asphyxia from paralysis of the respiratory centre in the medulla oblongata.

As regards the effect of alcohol on the different functions taken separately, the following facts have been experimentally determined. It causes dilatation of the systemic arterioles, followed by quickening of the heart's action and fall of blood-pressure. The temperature of the body is lowered ; this occurs so soon after the introduction of the alcohol that it must be ascribed to increased loss of heat from the skin in consequence of relaxation of the cutaneous vessels. The fall of temperature is much greater in pyrexial states than in health ; especially when the fever has been artificially induced by the injection of septic matter into the animal's veins. The cooling is here attributed to diminished oxidation (Binz). Alcohol resembles quinia in its effect on protoplasm, retarding or abolishing its amœboid movements, and hindering its proliferation. The amount of tissue-metamorphosis, measured by the urea and carbonic acid excreted, is said to be diminished ; but this is denied by Dr. Parkes.

The question whether alcohol is destroyed in the organism, or eliminated in the urine, is still under discussion. There seems to be no doubt that the theory of its being eliminated unchanged rests on an error of observation. It is highly probable that small doses are entirely decomposed in the system, while larger ones are partially removed by the lungs and kidneys. The peculiar

odour noticed in the breath after alcohol has been taken should rather be ascribed to the œnanthic and other ethers contained in wine and brandy, than to the alcohol itself. (Anstie, Binz, Dupré, &c.)

Brandy is medicinally employed with the following ends in view :—

1. To rouse the circulation in states akin to collapse, whatever may be their immediate cause.

2. To deaden pain and cause sleep.

3. To lower the temperature of the body in fevers and acute inflammations.

4. To check or retard suppuration in erysipelas, pyæmia, &c.

5. To assist digestion. In small doses, alcohol stimulates the secretion of the gastric juice. Larger doses, mixed with food, hinder the solvent action of the pepsin.

6. Externally, to promote the healing of bruises, cracked nipples, bed-sores, &c. (*See* Arnica.)

Dose. Of Brandy, from one to two tablespoonfuls diluted with water, and given according to circumstances ; of the brandy mixture, the dose is from one to two fluid ounces.

Vinum Xericum. Sherry. A Spanish Wine.

Prop. & Comp. The physical properties of sherry are well known ; it contains from 15 to 20 (usually from 17 to 18) per cent. of alcohol, together with colouring matter, œnanthic ether, and other ethereal compounds, which impart to it the peculiar bouquet ; also certain salts, as acid tartrate of potash, malates, and sugar.

Off. Prep. It is used in making most of the wines of the Pharmacopœia, as Vinum Aloes, Vinum Antimoniale, Vinum Colchici, Vinum Ferri, Vinum Ipecacuanhæ, Vinum Opii, and Vinum Rhei. Cape and other white wines are often substituted for sherry.

Therapeutics. Sherry wine may be given as a medicine in the same cases as brandy, where it is desirable to keep up the action of the circulating system ; as a stimulant in dyspepsia, however, it is often inferior to brandy, from its tendency to become acid. The *wines* of the Pharmacopœia are sometimes objectionable when large doses are required, on account of the alcohol they contain ; the same remark applies to the administration of tinctures.

Vinum Aurantii. Orange Wine.

Wine made in Britain by the fermentation of a saccharine solution to which the fresh peel of the bitter orange has been added.

Prop. & Comp. A vinous liquid, having a golden sherry colour, and a taste and aroma derived from the bitter orange peel. It contains about 12 per cent. of alcohol, and is but slightly acid to test paper.

Off. Prep. VINUM FERRI CITRATIS. VINUM QUINIÆ (Q. V.)

Cerevisiæ Fermentum. Beer Yeast. The ferment obtained in brewing beer.

Prep. During the fermentation of an infusion of malt, by the action of yeast, a fresh formation of the ferment (yeast) is produced from the albuminous principles contained in the malt.

Prop. & Comp. Yeast is a yellowish or greyish-white, viscid, frothy liquid, having a characteristic odour and a peculiar bitter taste; under the microscope it is found to consist, for the most part, of separate oval confervoid cells or vesicles. The plant is called the *Torula cerevisiæ*. In composition yeast resembles gluten or albumen, but it is in an active condition, and possesses the property of exciting the vinous fermentation in saccharine solutions.

Off. Prep. CATAPLASMA FERMENTI. Yeast Poultice. (Beer yeast, six fluid ounces; flour, fourteen ounces; water heated to 100°, six fluid ounces. Mix the yeast with the water; add the flour, and stir until a cataplasm is made. Place it near the fire until it rises.)

Therapeutics. Yeast, when externally applied, acts as a stimulant and antiseptic, and in the form of cataplasm or poultice is employed to correct the discharges of indolent ulcers. Internally it has been used in low states of the system, in which it is stated to clean the tongue and correct the fœtor of the alvine discharges, to prevent the formation of boils and carbuncles, and as a remedy in diabetes: in the latter disease there has been no proof afforded of its efficacy, and the author has repeatedly given it in cases of boils without benefit; still there are many cases recorded in which its administration appears to have proved of service. Enemata of yeast have been found useful in cases of flatulent distension.

Dose. From a dessert to a tablespoonful. Fresh yeast should be employed.

Æther. Ether. A volatile liquid, prepared from alcohol, and containing not less than 92 per cent., by volume, of pure ether. C_4H_5O, or $C_4H_{10}O$.

Synonym. Æther Sulphuricus. *Edin. Dub.*

Prep. Ether is prepared by the action of sulphuric acid upon alcohol, the proportion of acid employed being much less than that used in the formation of oleum æthereum, which was formerly officinal. In the British Pharmacopœia ten fluid ounces of sulphuric acid are made to act upon fifty fluid ounces of rectified spirit added in successive portions.

The exact nature of the changes which occur during etherification is a subject which will be found discussed at some length in books on chemistry; the following remarks will perhaps suffice to give some idea of the process.

When alcohol and strong sulphuric acid are heated together, at about a temperature of 300°, sulphovinic acid is first formed, thus: $H_2SO_4+C_2H_6O=C_2H_6SO_4+H_2O$, and this is again decomposed with the formation of sulphuric acid and ether, thus: $C_2H_6SO_4+C_2H_6O=H_2SO_4+C_4H_{10}O$: the latter distils over and is condensed; by the addition of more alcohol, sulphovinic acid is again formed, and again decomposed; and by a continuous and slow supply of alcohol, the formation of the ether is rendered continuous.

Ether is purified by allowing it to stand upon chloride of calcium and slaked lime, and re-distilling until it becomes of sp. gr. 0·735.

Prop. Ether is a very volatile, colourless liquid, with a peculiar fragrant odour and hot taste; sp. gr. 0·735; is entirely dissipated in vapour when exposed to the air, and has scarcely any acid reaction; very inflammable, burning with a white flame; it boils below 105°. A little poured upon the hand evaporates rapidly, producing a sensation of cold. Fifty measures agitated with an equal volume of water are reduced to 45 by an absorption of 10 per cent. It evaporates without residue.

Off. Prep. Spiritus Ætheris. Spirit of Ether. (Ether, ten fluid ounces; rectified spirit, twenty fluid ounces. Mix.) Sp. gr. 0·809.

Use. Ether is also made use of in the Pharmacopœia for preparing Æther Purus, and for making collodion and the epispastic solution. Spirit of ether is employed in making the ethereal tincture of lobelia.

Therapeutics. Taken internally, ether is a powerful diffusible stimulant, more rapid and evanescent in its action than alcohol; it is used to expel flatus from the stomach, and allay pain and cramp in that organ, to diminish spasm in various other affections, as in spasmodic asthma, angina pectoris, and hysteria. It stimulates the salivary and pancreatic secretions, and thereby assists the digestion of fatty matters; it is sometimes given in combination with cod-liver oil, when the patient finds it difficult to assimilate the latter medicine. When applied externally, it produces cold by its rapid evaporation, and is occasionally made use of as a refrigerant, in the reduction of hernia; if the vapour is confined, then rubefacient effects are produced. Inhaled in the form of vapour it acts as an anæsthetic. It is almost universally preferred to chloroform in America; and its use in this country has become very general during the last two years. The chief advantage of ether over chloroform is its greater safety. Ether stimulates instead of depressing the heart; hence there is less danger of cardiac syncope from its use. Statistics tell strongly in favour of the view that ether is less dangerous to life than chloroform. Moreover, vomiting is said to be less frequent and troublesome after the former than after the latter drug. Against these advantages, the following drawbacks have to be placed:—

1. Ether causes laryngeal spasm, violent struggling, and great lividity at the outset of its administration.

2. Its nauseous odour and taste render it very disagreeable to the patient.

3. The recovery of consciousness is often followed by great excitement, which may last for hours. Hence it has been found unsuitable for administration in operations for cataract. Fatal accidents have occurred during this period of excitement from patients tearing off their bandages, &c. Accordingly, they should be kept under observation for some time after anæsthesia has passed off.

4. The large quantity of ether required makes its use far more expensive than that of chloroform.

5. The inflammable character of its vapour forbids its employment by artificial light, or in cases requiring the actual cautery.

We may conclude, therefore, that chloroform, setting aside its dangerous effect upon the heart, is preferable to ether as an anæsthetic. It has been found in practice that chloroform is least

likely to cause dangerous symptoms in infants, in old people, and in women during child-birth. For long operations upon adults, especially when the heart's action is feeble, ether is the more suitable anæsthetic of the two.

Ether is most conveniently administered on a hollow, conical sponge, coated with waterproof material. The cone should be closely applied to the face so as to admit as little air as possible. An ounce of ether should be poured on the sponge to begin with; if great lividity and stertor occur, the sponge should be removed; a few inspirations will restore the normal colour to the face. The average quantity required to produce anæsthesia in an adult is 2½ oz. In protracted operations, the ether employed has been measured by pounds.

Dose. Of ether, 20 min. to 1 fl. drm.; of spirit of ether, ½ fl. drm. to 1½ fl. drm.

Æther Purus. Pure Ether. Ether free from Alcohol and Water.

Prep. Ether is purified by well washing it with water, decanting the washed ether, digesting it for twenty-four hours with recently burned lime and chloride of calcium, and then distilling it from this mixture with a gentle heat.

Prop. Pure ether should have a specific gravity not exceeding 0·720. It does not coagulate the albumen of blood, and is a powerful solvent of a limited number of substances, such as fixed and volatile oils, resins, a few alkaloids, gun cotton, iodine, bromine, perchloride of mercury, &c.

Use. Pure ether is used in the preparation of some alkaloids, as aconitia, in the estimation of quinine in cinchona bark, and to test the purity of some medicinal substances.

Adulterations. Ether may contain alcohol, which increases its specific gravity, and causes it to coagulate the serum of the blood; water and sulphurous acid may also be present, adding to its weight, and giving it an acid reaction.

Æther Aceticus. Acetic Ether. (Ethyl Acetate.) $C_4H_8O_2$, $C_4H_3O_3$, or $C_2H_5C_2H_3O_2$.

Prep. By distilling a mixture of eight parts of dry acetate of soda, five parts of rectified spirit, and ten parts of sulphuric acid. The distilled product is added to half its weight of chloride of calcium in a stoppered bottle; they are allowed to remain together

for twenty-four hours, and the ethereal liquid is then decanted and rectified. The process may be represented as follows:

$$\left.\begin{matrix}C_2H_3O\\Na\end{matrix}\right\}O+\left.\begin{matrix}C_2H_5\\H\end{matrix}\right\}O+H_2SO_4=\left.\begin{matrix}C_2H_3O\\C_2H_5\end{matrix}\right\}O+NaHSO_4+H_2O.$$

Prop. A clear liquid with a burning taste and an agreeable odour, faintly resembling that of apples. Sp. gr. 0·91. Boiling-point, 166° F. Soluble in all proportions in rectified spirit and ether. One part dissolves in eleven or twelve parts of water at 60°. It is a good solvent for the essential oils, resins, and for pyroxylin. When mixed with a solution of caustic potash in alcohol, it is immediately decomposed into potassic acetate and alcohol.

Therapeutics. Possesses the stimulant and anti-spasmodic properties of sulphuric ether, only in a feebler degree. On the other hand, its taste and smell are more agreeable. It is not used as an anæsthetic.

Dose. 20 min. to 60 min.

Spiritus Ætheris Nitrosi. Spirit of Nitrous Ether. A spirituous solution, containing nitrous ether, or ethyl nitrite. C_4H_5O,NO_3, or $C_2H_5NO_2$.

Synonym. Spiritus Etheris Nitrici. *Lond. Edin.*

Prep. Nitric acid, three fluid ounces; sulphuric acid, two fluid ounces; fine copper wire, two ounces; rectified spirit, a sufficiency. Add the sulphuric acid gradually to a pint of the spirit, then, in the same way, add two and a half fluid ounces of the nitric acid; and distil in a vessel containing the copper, between 170° and 180°, until twelve fluid ounces have passed over; withdraw the heat and let the contents of the retort cool: add the remaining half ounce of nitric acid and re-distil until the distillate has increased to fifteen fluid ounces. Mix this with two pints of rectified spirit, or as much as will make the product answer to the specific gravity and chloride of calcium tests.

In this process the sulphuric acid decomposes the alcohol with formation of ether, which is converted into nitrous ether by the nitrous acid generated by the action of the copper on the nitric acid.

Prop. A colourless or slightly yellow liquid, with an agreeable fruity odour, and slightly acidulous cooling taste; volatile and inflammable; sp. gr. 0·845; it has usually a slight acid reaction, but should effervesce feebly or not at all when carbonate of soda

is added; when agitated with the solution of sulphate of iron, and a few drops of sulphuric acid, it becomes deep olive brown or black (from the liberation of the peroxide of nitrogen). If it is agitated with twice its volume of a saturated solution of chloride of calcium, 2 per cent. by volume of nitrous ether separates and rises to the surface.

Therapeutics. Spirit of nitrous ether is a stimulant diaphoretic, and diuretic, used for the latter property in dropsies; also as a diaphoretic in slight febrile affections: it also appears to act as a grateful refrigerant. Experiments on a healthy individual showed that it slightly increases the urinary water, while diminishing the total amount of urea and solids. It is popularly known by the name of Sweet Spirits of Nitre. This preparation, even when properly made, contains but a small amount of nitrite of ethyl, and has usually been sold almost devoid of this compound: so that the true value of real nitrous ether can scarcely be said to have been clinically determined.

Dose. ½ fl. drm. to 2 fl. drm.

Adulteration. Excess of acid, from being too long kept or improperly prepared; it then effervesces with carbonate of soda. It is incompatible with iodide of potassium, liberating iodine unless carbonate of potash be present.

Chloroformum. Chloroform. C_2HCl_3, or $CHCl_3$.

Prep. Chlorinated lime, ten pounds; rectified spirit, thirty fluid ounces; water, three gallons; chloride of calcium, broken into fragments, two ounces; slaked lime, a sufficiency; sulphuric acid, a sufficiency; distilled water, nine fluid ounces. The rectified spirit and water are distilled with a mixture of slaked and chlorinated lime; the distillate well agitated with water, and the lower stratum, which is crude chloroform, separated, repeatedly washed with successive portions of water, and well shaken with its own volume of sulphuric acid; the layer of chloroform is again separated, mixed with chloride of calcium and slaked lime, and purified by re-distillation. Chloroform may be produced by several processes, but the above probably yields it purer and more advantageously than any other. When chlorine, from chlorinated lime, acts upon alcohol, many complicated and ill-understood decompositions ensue; the principal product, however, seems to be chloroform.

Prop. Chloroform is a colourless heavy liquid, with a pecu-

liarly agreeable, fruity, ethereal odour, and sweet taste ; sp. gr. from 1·48 to 1·496 ; boiling-point, 140° F. ; but slightly soluble in water, sinking readily in that fluid ; it mixes with alcohol and ether in all proportions ; neutral in reaction ; when rubbed on the skin it quickly evaporates, and, if pure, leaves no odour. Chloroform is a powerful solvent of caoutchouc, gutta percha, many resins, fats and alkaloids, also of iodine and bromine. When exposed to air and light, it is apt to decompose, hydrochloric acid and free chlorine being formed : it is stated that when chloroform is purified with oil of vitriol, it is more liable to undergo this change, and that redistillation with carbonate of barium gives it stability. Chloroform is not coloured by agitation with sulphuric acid, and evolves no gas when potassium is dropped into it, indicating the absence of oily matters or any oxygen compounds. Chloroform is decomposed by fixed alkalies ; by an alcoholic solution of potash it is resolved into formiate of potash and chloride of potassium.

Off. Prep. Aqua Chloroformi. Chloroform Water. (One fluid drachm of chloroform dissolved by agitation with twenty-five fluid ounces of distilled water.)

Linimentum Chloroformi. Liniment of Chloroform. (Chloroform, two fluid ounces ; liniment of camphor, two fluid ounces.)

Spiritus Chloroformi. Spirit of Chloroform. (Chloroform, one fluid ounce ; rectified spirit, nineteen fluid ounces.) Sp. gr. 0·871.

Tinctura Chloroformi Composita. Compound Tincture of Chloroform. (Chloroform, two fluid ounces ; rectified spirit, eight fluid ounces ; compound tincture of cardamoms, ten fluid ounces. Mix.)

Therapeutics. When taken *internally*, chloroform appears to act as a narcotic and antispasmodic, not unlike ether ; its sedative effects, however, are more distinctly marked, and it produces in large doses a general diminution of sensorial power, with drowsiness, and without exhilaration or acceleration of the pulse. It has been employed in spasmodic affections, as spasmodic coughs, asthma, cholera, lead colic, and hysteria ; it is also stated to act as a valuable sedative in cancer, neuralgia, and other painful affections, and it is even asserted to be antiperiodic, relieving sometimes when bark and quinine have failed.

Externally, it has been used in medicine to allay pain and irri-

tation in neuralgia, and certain skin affections attended with troublesome itching; also as a stimulant and rubefacient. For all these purposes, however, its application is very limited; its chief employment being in the form of vapour, for the production of its anæsthetic effects.

When *inhaled* in small doses, it produces a slight species of inebriation, with some impairment of vision and common sensibility, consciousness remaining. The sensations produced by these small doses are usually of a pleasurable character; carried to this extent, it may be employed in the treatment of spasmodic and neuralgic affections.

If the inhalation be continued longer, the patient passes into a dreamy state, sometimes with considerable mental excitement, but with loss of common sensibility; it may be given to this extent when employed in natural labour: from these effects the patient soon recovers on the cessation of the administration of the vapour.

If the inhalation be carried still further, the patient loses the power of voluntary motion; there is an inclination of the eyes upwards, complete suspension of the mental faculties, with slight contraction of the muscles and rigidity of the limbs. This is often so slight as to escape observation; but in strong young men it sometimes amounts to tetanic spasm, especially if the chloroform is inhaled after alcoholic stimulus has been taken; it also occurs very frequently in cases when patients from the dread of the chloroform resist breathing. Although at this stage common sensibility appears quite destroyed, yet on the performance of surgical operations there may be indications expressive of pain in the features, and even moaning and inarticulate cries. When this condition has been kept up for some time, and the winking of the eyelids very much diminished, then is the proper period for the performance of surgical operations.

If the effects be carried further, complete relaxation of the voluntary muscles takes place, but the sphincters remain contracted, the respiration goes on, though accompanied with slight stertorous breathing, the glottis continues sensible, the sensibility of the pharynx is somewhat impaired, but it is sufficient to effect the swallowing of the blood collected there in operations about the mouth unless the bleeding is very profuse. In dental operations the patient often vomits blood before consciousness is restored. The iris at this stage is less sensitive to light, and moderately contracted. When the relaxation of the muscles has fully taken place, then is the time for reduction of hernia and dislocations

Chloroform has been administered in the form of vapour in the treatment of tetanus, epileptiform convulsions, hydrophobia, colic, and painful spasmodic affections, as during the passage of renal calculi, or of gall-stones, &c. ; in some of these cases its use has been followed by great relief. The first and second set of symptoms above mentioned may be generally produced by administering from half a fluid drachm to a fluid drachm, and repeating it in a few minutes if this condition is required to be kept up. When the inhalation is suspended, the patient, in the course of five or six minutes, recovers his consciousness, but without remembering anything which has taken place. For the production of complete insensibility and relaxation more chloroform must be employed, and the effects carefully watched. At this stage the jaw may drop and the tongue fall back so as to allow the epiglottis to cover the larynx. In this case it is a common practice to open the mouth and take hold of the tongue and draw it forward with a pair of artery forceps. An equally effective and less objectionable plan is to raise the chin and draw it forcibly away from the spine.

If the inhalation has proceeded too far, the dangerous symptoms may be those of syncope, or of apnœa—the breathing becoming more stertorous and intermitting ; or both sets of symptoms may appear at the same time. Artificial respiration is the best remedy in any case, and may be relied on to recover the patient if commenced while the pulse is perceptible. It is often successful even when the heart's action is too feeble to make a pulse at the wrist.

There is reason to believe that cardiac syncope of a fatal character has been produced by inhaling air very strongly charged with chloroform. Indeed, it is owing to the risk of cardiac paralysis, that ether has come to take the place of chloroform to so great an extent during the last two or three years. It is therefore important to administer it gradually ; and if a handkerchief is used, to hold it at least an inch from the mouth, and not to put more than 15 or 20 minims upon it at one time. The pulse, as well as the respiration, should be constantly watched.

In order to regulate with precision the proportion of air and chloroform, Mr. Clover has invented an instrument by which the patient is made to inhale under four per cent. of the vapour of chloroform, or any weaker mixture that may be desired. It consists of a bag, charged with this mixture, which hangs at the back of the administrator, a face piece, with valves to prevent the expired air being breathed a second time, and a tube connecting them. The bag is charged by means of a bellows which holds a thousand cubic inches of air. This quantity, in passing to the

bag, is forced through a vessel constructed for evaporating the chloroform, and to each bellowsful of air thirty-three minims of chloroform are supplied. The patient cannot be given a stronger mixture than that which is contained in the bag, but by regulating the size of an opening in the face-piece additional air is admitted, and so the dose reduced to 3, 2, or 1 per cent.

In the administration of chloroform, several precautions should be taken. In the first place, the chloroform should be pure, that is, free from oily matter, hydrochloric acid, and uncombined chlorine; it should not be used at all, or if so, employed with the greatest care, for persons suffering from any cerebral disease, or tendency to such, or any organic cardiac affection. It may be administered in vapour either by means of a folded handkerchief applied over the face and nose, or by means of inhalers which are sold for this purpose; and care should be taken that the patient breathes atmospheric air at the same time with the chloroform vapour. Disagreeable symptoms sometimes occur after the inhalation of chloroform, as nausea, vomiting, headache: probably these may occasionally arise from impurities in the preparation. The patient should fast for four or five hours before chloroform is exhibited, and some diffusible stimulant such as wine or brandy should always be given just before the anæsthetic. It has been found advisable to inject a preliminary dose of morphia under the skin of such persons as are liable to suffer from violent excitement during the first stage of anæsthesia; the full effect of the chloroform is thus more speedily and tranquilly induced, the state of unconsciousness is more profound and lasting, and a much smaller quantity of the anæsthetic is found to suffice.

Ether, and the vapour of some other hydrocarbons, as Amylene, Benzol, Dutch liquid, Tetrachloride of Carbon, &c., when inhaled, produce effects not unlike those of chloroform, and before the discovery of this latter agent, pure ether was always made use of.

When chloroform is taken into the stomach, or exhibited in the form of vapour, it is absorbed into the blood, and Dr. Snow discovered its presence in the blood of animals killed by this agent. Its detection can be effected by causing the vapour from the suspected fluid to pass through a red-hot tube, when the chloroform, if present, is decomposed and free chlorine evolved, which may be made to act upon nitrate of silver, or upon starch-paper impregnated with iodide of potassium.

Dose. Chloroform, when given in a liquid state, may be rubbed up with yolk of egg and mucilage, or syrup: the dose may be

from 1 min. to 10 min. Of Aqua Chloroformi ½ fluid oz. to 2 fl. oz. It is more frequently administered in the form of Spiritus Chloroformi (chloric ether), of which the dose may be from 10 min. to 30 min. or more; or of compound tincture of Chloroform from 20 min. to 60 min. Externally it may be employed in the form of the Chloroform liniment, or added to other liniments, or as an ointment, made by rubbing together 1 part of chloroform with about 7 of lard. The doses for inhalation have been already indicated.

Adulteration. Hydrochloric acid and free chlorine, detected by their acid reaction and bleaching power, and by the water with which the chloroform has been agitated, precipitating nitrate of silver. Sometimes an oily matter, formed during the preparation, may be present, detected by its leaving an odour on evaporation, and being coloured by sulphuric acid.

Tetrachloride of Carbon. CCl_4. Discovered by Regnault in 1839. Sp. gr. 1·56. Boiling point, 170° F. Density of vapour, 5·3. (Not officinal.)

Prepared by the action of chlorine on carbon disulphide; a transparent colourless oil, with pungent odour, not unpleasant when quite free from the disulphide.

Therapeutics. When inhaled it produces symptoms similar to chloroform. It was at one time supposed to excite less vomiting, but experience has not confirmed this.

It was also thought to be safer on account of its higher boiling-point causing it to be more slowly vaporized. Whatever advantage there may be in this respect, it is more than counterbalanced by the greater difficulty of expelling it from the system in case an overdose should accidentally be taken.

Mr. Clover found it was fatal to dogs in the same doses as chloroform.

Bichloride of Methylene has been recommended by Dr. Richardson as a safer anæsthetic than chloroform. As yet pure specimens have not been met with in commerce. (Not officinal.)

A mixture sold in London under this name produces similar effects to chloroform slightly diluted with ether—and on examination was certainly not a simple substance—for it commenced to boil at about 90°; and after a portion had evaporated, the remainder boiled at about the same temperature as chloroform.

Therapeutics. Bichloride of Methylene is stated to produce less

sickness and discomfort than chloroform, and to act as advantageously as an anæsthetic.

Alcohol Amylicum. Amylic Alcohol. Fousel Oil.

Amylic Alcohol, $C_{10}H_{12}O_2$, or $C_5H_{12}O$, with a small proportion of other spirituous substances. An oily liquid, contained in the crude spirit produced by the fermentation of saccharine solutions with yeast, and separated in the rectification or distillation of such crude spirit.

Prop. A colourless liquid, much less volatile than ordinary alcohol, which accumulates in the last portion of the liquids submitted to distillation. It boils at 270°, and has a specific gravity of 0·818, and a peculiar unpleasant odour and burning taste. It is sparingly soluble in water, but soluble in alcohol, ether, and essential oils. By the action of oxidizing agents it is converted into *Valerianic Acid*, which corresponds to acetic acid in the ethyl series.

It is introduced into the Pharmacopœia for the preparation of Valerianate of Soda.

Amyl Nitris. Nitrite of Amyl. $C_{10}H_{11}O,NO_3$, or $C_5H_{11}NO_2$.

Prep. By passing nitrous vapours into amylic alcohol contained in a heated retort, rectifying the distillate, and collecting apart the portion that goes over at 205° F. The reaction may be thus represented:

$$\left.\begin{matrix}C_5H_{11}\\H\end{matrix}\right\}O + N_2O_4 = \left.\begin{matrix}C_5H_{11}\\NO\end{matrix}\right\}O + HNO_3.$$

Prop. An ethereal liquid of a yellowish colour and peculiar odour. Sp. gr. ·877. Boiling-point, 205° F. Insoluble in water, but freely soluble in rectified spirit, in all proportions. If it be added drop by drop to caustic potash, while fused by the application of heat, valerianate of potash will be formed.

Therapeutics. Nitrite of amyl vapour, when inhaled, causes a great and rapid fall of blood-pressure, with accelerated action of the heart. This diminution of blood-pressure is due to dilatation, first of the systemic, next of the pulmonary arterioles. If inhalation be stopped, the blood-pressure speedily returns to the normal. If it be continued, suffocative convulsions and death ensue. The dilatation of the arterioles is probably due to a direct action of the nitrite upon them, and not to any influence

exerted on the vaso-motor centres. Several hours after the administration of the vapour, the urine is found to contain sugar; this transient diabetes being probably due to dilatation of the hepatic vessels. The nitrite does not affect the motor or sensory nerves till just before death. Its suffocative action may perhaps be explained by the fact that it prevents the hæmoglobin of the red corpuscles from imparting its oxygen to the tissues. It has been found to lower the heat of the body and to diminish the amount of carbonic acid excreted. (Brunton and others.)

From two to eight minims of the nitrite inhaled by a healthy man quickens the pulse-rate in from three to ten seconds; this is followed by flushing of the face, with throbbing of the carotids and a sense of oppression in the chest. Slight headache and general lassitude remain after the primary effects have subsided.

Nitrite of amyl has been inhaled in cases of angina pectoris; it gives instantaneous relief in the purely neurotic form, unattended by disease of the heart or great vessels (Anstie); in a case due to aortic disease with hypertrophy, the vapour relieved the paroxysms at once and permanently (Brunton). It has been employed in spasmodic asthma and several forms of neuralgia with good effect. Its value in epilepsy is questionable. It has been tried in the collapse of cholera, but without any satisfactory result. It should be given with caution, especially to old subjects with rigid vessels.

Dose. By inhalation, 2 to 5 min. on a piece of lint. Internally, ½ min. to 5 min. may be given, dissolved in rectified spirit.

Chloral Hydras. Hydrate of Chloral. $C_4Cl_3HO_2.2HO$, or $C_2Cl_3HO.H_2O$.

Prep. Chloral may be obtained by passing dry chlorine gas through absolute alcohol to saturation; hydrochloric acid is abundantly liberated, and chloral formed in solution. The decomposition may be thus represented:

$$C_2H_6O+4Cl_2=5HCl+C_2Cl_3HO.$$

It can be obtained in the pure state by distillation from sulphuric acid, and then from quick lime.

Prop. Chloral is a volatile, colourless, pungent liquid, of sp. gr. 1·502, which boils at 202° Fahr. On exposure to the air it absorbs moisture, and becomes converted into the hydrate. When treated with a little water this hydrate is also formed, with considerable evolution of heat.

Hydrate of chloral presents itself as a mass of white crystals, much like those of Epsom Salts, which do not deliquesce on exposure to the air. It has a pungent, but not acrid odour, and a pungent, rather bitter taste. On the application of a gentle heat it fuses to a colourless, transparent liquid, which as it cools, begins to solidify at about 120° F. It boils in a test-tube, with pieces of broken glass immersed in it, at about 205° F., and at a slightly higher temperature it volatilises on platinum foil without residue. Soluble in less than its own weight of distilled water, rectified spirit, or ether, and in four times its own weight of chloroform. The aqueous solution should be neutral or but slightly acid to test-paper (showing freedom from hydrochloric acid). A solution in chloroform when shaken up with sulphuric acid, does not impart colour to the acid. (Absence of oily impurities). 100 grains of hydrate of chloral dissolved in an ounce of distilled water and mixed with 30 grains of slaked lime, should yield when carefully distilled not less than 70 grains of chloroform. [Hydrate of chloral is decomposed by alkalies into chloroform and a formiate of the base: $2(C_2Cl_3HO.H_2O)+CaH_2O_2=CaC_2H_2O_4+2CHCl_3+2H_2O$.]

Off. Prep. Syrupus Chloral. Syrup of Chloral. (Hydrate of Chloral, eighty grains; distilled water, four fluid drachms; simple syrup, enough to make one fluid ounce.) Ten grains of hydrate of chloral are contained in each fluid drachm of the syrup.

Therapeutics. It was observed by Oscar Liebreich that chloral hydrate is decomposed by alkaline solutions into chloroform and a formiate of the base; the likelihood of a similar decomposition being wrought in the blood and causing the physiological effects of chloroform, led him to administer it as a medicine. It was thus introduced as an anæsthetic; but experience showed that it was not nearly so certain or so safe as chloroform in vapour, the dose having to be large, and different for different individuals.

Injected into the veins of a rabbit, chloral causes deep sleep, and complete muscular relaxation. It lowers the blood-pressure, causes dilatation of the cutaneous arterioles, and markedly lessens the heat of the body. The respiratory movements are rendered slower, owing probably to the action of the drug on the respiratory centre in the medulla oblongata. Finally, the heart's action is depressed, probably through paralysis of its intrinsic motor ganglia. The reflex excitability of the cord is diminished, and at last abolished; the peripheral motor nerves are not paralyzed.

The cerebral functions also are impaired. Death may result from cardiac syncope ; Liebreich asserts that—as in the case of chloroform—this fatal issue is not hindered by artificial respiration.

The following are the chief medicinal uses of the drug :—

1. It has the power of inducing natural sleep. In the healthy subject, a dose of 30 grains is followed in from half to three-quarters of an hour by a light and normal sleep, without previous cerebral disturbance, and without causing the headache, nausea, and constipation, which commonly result from the administration of opium. In this dose it does not seem to affect either the respiration or the pulse.

2. As an anodyne, chloral stands far below opium or morphia. It relieves pain in certain cases, but its operation is very capricious. As a rule, it seems merely to allay the pain so long as sleep continues, the pain returning as soon as the patient wakes. It hardly ever relieves pain unless by causing sleep.

3. It is employed to quiet the agitation of delirium tremens, acute mania, and severe chorea. In such cases it is of great value.

4. It is used to relax muscular spasm in tetanus and strychnia-poisoning. It effects this purpose with great uniformity ; numerous cases have recovered under its use, and when it fails to cure, it certainly palliates.

5. It is of great value as a hypnotic in cases where opium is inadmissible ; *e.g.*, in uræmic patients, young children, and certain stages of continued fever.

6. It checks the nocturnal restlessness and sweating of phthisis without disturbing the nutritive processes.

7. It gives relief in some cases of asthma and pertussis.

A full dose of chloral occasionally gives rise to dangerous symptoms of cardiac depression. Giddiness and sickness, delirium, a weak and irregular pulse, pallor, coldness of the extremities, lividity, are the symptoms which may be followed by syncope and death. When the drug fails to cause sleep, it may produce considerable excitement. It is sometimes followed by an eruption of urticaria. It should be given with caution to patients with disease of the heart and arteries, or to such as have their bronchi loaded with secretion. Although the habitual use of chloral is less hurtful to the nutritive functions than that of opium, yet it is sometimes attended with evil consequences ; profound melancholy and enfeeblement of the will, muscular lassitude, inability to sleep without the drug, being among them.

Chloral hydrate should not be given hypodermically; it irritates the skin too much. Its nauseous taste may be disguised by syrup of orange-peel or syrup of tolu.

Dose. As a hypnotic, 10 gr. to 30 gr. or more. Of the syrup, 1 fl. drm. to 3 fl. drm. or more.

Croton-Chloral Hydrate. Trichlorocrotonic aldehyd. $C_4H_3Cl_3O$. (Not officinal.)

Prep. & Prop. A large quantity of aldehyd is formed during the purification of absolute alcohol by charcoal. When this mixture of alcohol and aldehyd is treated with chlorine for the manufacture of chloral, hydrochloric acid is produced, and acts as a dehydrating agent on the acetic aldehyd, converting it into crotonic aldehyd :—

$$2\left(\begin{matrix}C_2H_3O\\H\end{matrix}\right\}\Big) - H_2O = \begin{matrix}C_4H_5O\\H\end{matrix}\Big\}$$

Lastly, the crotonic aldehyd, as fast as it is formed, is converted by the free chlorine into trichlorocrotonic aldehyd, $C_4H_3Cl_3O$. Croton-chloral hydrate is a white powder, made up of minute, glittering tablets ; it is very sparingly soluble in water.

Therapeutics. Contact with an alkali is said to convert croton chloral, first into allyl-chloroform, and then into bichlorallylene. A similar decomposition is supposed to take place in the blood. The inhalation of bichlorallylene produces the same effect on animals as the administration of croton-chloral.

A drachm of the substance, given by the mouth, produces in from 15 to 20 minutes a deep sleep, accompanied by anæsthesia of the head. While the 5th nerve is completely paralysed, the pulse and respiration continue unaffected, and the voluntary muscles retain their tone. The patient may remain asleep in a sitting posture.

In animals poisoned by a full dose of the drug, life may always be restored by artificial respiration ; this is not the case with substances which, like chloral and chloroform, act directly on the heart.

Croton-chloral hydrate is indicated in cases where chloral hydrate is inadmissible, owing to disease of the heart. It has also been given with effect in various forms of trigeminal neuralgia. Moreover, Liebreich recommends the addition of croton-chloral to chloral hydrate when very large doses of the latter drug are needed to produce sleep.

Dose. In this country, small doses have hitherto been em-

ployed : 1 gr. to 3 gr. frequently repeated, till pain is relieved. In Germany, the doses employed are very much larger.

Nitrous Oxide Gas. NO, or N_2O.

Prep. By heating nitrate of ammonium at a temperature of 400° Fahr., when the salt breaks up into nitrous oxide and water,

$$H_4N.NO_3 = N_2O + 2H_2O.$$

The gas thus prepared is washed by being passed in succession through water, caustic potash and solution of protosulphate of iron, to rid it of mechanical impurities, carbonic acid and the higher oxides of nitrogen respectively. It is generally stored in iron bottles, in the liquid form, which is obtained by great mechanical compression.

Prop. A tasteless, inodorous gas, of sp. gr. 1·527. It is liquefied by a pressure of 50 atmospheres at 45° Fahr., when its sp. gr. is 0·908. It is composed of two volumes of nitrogen and one volume of oxygen condensed to two volumes. Cold water dissolves about its own volume of the gas, which is expelled by boiling the solution. It supports combustion nearly as well as oxygen. It differs from oxygen in not producing red fumes when mixed with nitric oxide.

Therapeutics. The name laughing gas given to this substance originated in Sir H. Davy's observation that when inhaled it caused exhilaration of spirits, but this phenomenon is not exhibited when the gas employed is free from any admixture. When inhaled in the pure state, unmixed with air, it is the most satisfactory anæsthetic that is known. Before administering the gas, the only precaution to be observed is that a meal should not have been recently taken. Vomiting rarely or never occurs, and nausea is not at all common as a direct result. When first introduced, it was administered by making the patient inhale from a bladder, full of the gas, by means of a tube in the mouth, but this method involves the continual reintroduction into the lungs of the oxygen and carbonic acid which they previously contained, and was frequently followed by headache and nausea.

It is now given by means of an inhaler, made with valves, so arranged that any amount of fresh gas may be introduced at the will of the operator. The apparatus covers the mouth and nose. The patient is told to take deep, but not hurried inspirations, when in from 20 to 30 seconds slight lividity of the face appears,

which by the end of a minute is very marked ; at which time the hands and eyeballs, from being previously quiet, commence twitching, and the pupils are slightly dilated. Without any further administration of the gas, small operations of short duration can be performed, but two or three inspirations will bring back the normal colour to the face. When a longer operation is contemplated, the gas must be administered until slight stertorous breathing is caused, and the anæsthesia may be maintained by removing the apparatus from the face every now and then so as to allow one respiration of air to about 5 or 6 respirations of the gas. If the stertor becomes great, the pulse irregular, and the pupils widely dilated, the administration of the gas should be instantly stopped. If the symptoms become alarming, artificial respiration should be immediately commenced, which generally leads to a rapid recovery if the action of the heart has been regular, it being a known fact, from experiments on animals, that respiration ceases before the heart stops, when an overdose of the gas has been exhibited.

The recovery from the anæsthesia induced by this gas is very rapid, a patient, after having had sufficient for the extraction of a tooth, being able to walk away in five minutes or so, with no unpleasant reminiscences. On the first few inhalations, a ringing noise is heard in the head, with a sensation of general pulsation, followed by a dreamy condition of very short duration, leading to the anæsthesia. Screams and violent movements are not uncommon during the anæsthesia, if it be not carried to its full extent.

It is not advisable to administer this gas in cases of advanced pulmonary disease, or where there is any tendency to hæmoptysis. Care must be taken, in operations on the mouth, that blood is not allowed to flow into the trachea and cause suffocation.

Nitrous oxide appears to produce its effect by diminishing the amount of oxygen contained in the blood. During anæsthesia, the amount of carbonic acid exhaled is said to be diminished by about a half. It has been experimentally determined that the sensibility of the sciatic nerve in the dog disappears only at the moment when the proportion of oxygen in the blood falls below a certain standard.

The gas itself is not in any way changed by being respired.

Mr. Coleman has taken advantage of this last fact to contrive an apparatus by which the gas is allowed to pass over quicklime after expiration, by which means it is deprived of the carbonic acid, and again made fit for inhalation.

HYDROCARBONS FROM THE DESTRUCTION OF WOOD BY FIRE.

Creasotum. Creasote, or Kreasote. A product of the distillation of Wood Tar.

Prep. During the destructive distillation of wood in the preparation of pyroligneous acid, amongst other hydrocarbons creasote is formed; it is also obtained from oil of tar, or pyroxylic oil, and is contained in the smoke from wood.

Prop. & Comp. A colourless transparent liquid, of peculiarly strong odour and burning taste; sp. gr. 1·071; very slightly soluble in water, but soluble in glacial acetic acid, alcohol, and ether; coagulates albuminous fluids, and has considerable preservative powers over both animal and vegetable matter; it should volatilize entirely at 212° Fahr., and not leave a transparent stain on bibulous paper. A slip of deal dipped into it, and afterwards into hydrochloric acid, and allowed to dry in the air, acquires a greenish-blue colour. Much doubt exists as to the composition of creasote; much of that found in commerce is carbolic acid. Pure creasote may be distinguished from carbolic acid by its being insoluble in its own volume of glycerine. Probably it is a homologue of phenic (carbolic) acid.

Off. Prep. Mistura Creasoti. Creasote Mixture. (Creasote, sixteen minims; glacial acetic acid, sixteen minims; spirit of juniper, half a fluid drachm; syrup one fluid ounce; distilled water, fifteen fluid ounces.) Contains one minim of creasote in one fluid ounce.

Unguentum Creasoti. Ointment of Creasote. (Creasote, one fluid drachm; simple ointment, one ounce. Mix thoroughly.)

Vapor Creasoti. Inhalation of Creasote. (Creasote, twelve minims; boiling water, eight fluid ounces. Mix the creasote and water in an apparatus so arranged that air may be made to pass through the solution, and may afterwards be inhaled.)

Therapeutics. Internally, in small doses, creasote acts as a sedative to the stomach, and has often been used with success to arrest certain forms of vomiting, not connected with febrile disturbance of the system; it has also been given with temporary advantage in diabetes; sometimes it is useful in diarrhœa. Externally it allays toothache depending on caries, and forms a stimulant application to ulcers and chronic skin disorders;

it is used also as a topical styptic in hæmorrhages; and as a gargle in mercurial salivation. The vapour mixed with that from hot water in the form of the officinal inhalation is useful in checking excessive expectoration in chronic bronchitis, and correcting the fœtor of the sputa in dilatation of the bronchi, and in pulmonary abscess and gangrene.

Dose. 1 min. to 3 min., in pill. Of the creasote mixture, ½ fl. oz. to 1½ fl. oz.; as a gargle, ½ drm. of creasote may be used to the pint of water.

Incompatibles. Creasote, when mixed with oxide of silver, gives rise to much heat, and even flame, from the oxidizing power of the silver compound; hence these two medicinal agents should not be prescribed together.

Acidum Carbolicum. Carbolic Acid. $HO,C_{12}H_5O$, or HC_6H_5O.

Synonym. Phenic Acid.

Prep. An acid obtained from coal-tar oil by fractional distillation and subsequent purification.

Prop. Carbolic acid is generally met with in colourless acicular crystals, which melt at 95° to an oily liquid, having a strong odour and taste, resembling those of creasote, but more offensive; it also resembles creasote in many of its characters and properties. Its specific gravity is 1·065; boiling-point, 370°. The crystals readily absorb moisture on exposure to the air, and they are thus liquefied; the acid, however, is but slightly soluble in water, but it is freely soluble in alcohol, ether, and glycerine. It does not redden blue litmus paper. A slip of deal dipped into it, and afterwards into nitric or hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. It coagulates albumen.

Off. Prep. Glycerinum Acidi Carbolici. Glycerine of Carbolic Acid. (Carbolic acid, one ounce; glycerine, four fluid ounces; rub them together in a mortar, until the acid is dissolved.)

Suppositoria Acidi Carbolici cum Sapone. Carbolic Acid Suppositories. (Carbolic acid, twelve grains; curd soap, one hundred and eighty grains; add enough starch to form a paste, and divide the mass into twelve suppositories, each of which will contain one grain of the acid.)

Therapeutics. Externally applied, the pure acid acts as a powerful caustic and escharotic. It may be used to check bleeding. In

a more dilute form, it may be applied to the skin as a stimulant, in various chronic dermatoses. The acid is fatal to the lowest forms of life; hence it arrests fermentation and putrefaction. Accordingly, it is much used as an antiseptic dressing for fœtid sores, abscesses, sinuses connected with diseased bone, &c.; also for wounds. (Lister's method.)

Internally, carbolic acid may be given for the same objects as creasote; the latter, however, is more agreeable, both for inhalation and administration by the mouth. When the antiseptic action of the drug is desired in the blood and tissues, the sulphocarbolates may be employed.

The external or internal use of carbolic acid, creasote, or any tarry preparation, may be followed by a change in the colour of the urine, that fluid becoming dark or even black, and letting fall a deposit which presents a superficial resemblance to altered blood. The black matter is, however, entirely derived from the drug; it is a form of indigo blue.

When applied to a large extent of surface, or incautiously inhaled, carbolic acid may give rise to symptoms of poisoning: giddiness, nausea, and vomiting, a feeble pulse, and even convulsions and coma. When accidentally swallowed, the best antidote is olive oil.

Dose. As an external application to ulcers, &c., 1 part of the acid to 7 or 8 of water; or used as the glycerine of carbolic acid; internally, 1 to 3 grains may be administered.

Sodæ Sulphocarbolas. Sulphocarbolate of Soda. $NaC_5H_6SO_4$. (Not officinal.)

Prep. Sulphocarbolic or phenylsulphuric acid is formed by the direct union of pure carbolic acid with sulphuric acid. The sulphocarbolate of soda is prepared by neutralising pure sulphocarbolic acid, dissolved in six times its bulk of water, with carbonate of soda. The resulting solution is evaporated over a water-bath and crystallized.

Prop. Usually met with in whitish lumps, made up of minute, colourless, rhombic prisms. Freely soluble in water; slightly soluble in alcohol, not in ether. A strong heat drives off a portion of the carbolic acid, and an aqueous solution of the residue gives the reactions of a sulphate. The salt is a very stable compound, without any smell of carbolic acid, and with a saline taste. Its watery solution is quite clear, and gives no precipitate with chloride of barium. The addition of a few drops of perchloride

of iron turns it of a beautiful violet colour. A few crystals boiled in nitric acid, are dissolved; on adding twice its volume of water, yellow scales of picric acid are thrown down, while the supernatant liquid gives a white precipitate with chloride of barium, showing the presence of sulphuric acid.

Therapeutics. The sulphocarbolate of soda has a decided antiseptic power, though far inferior to that of carbolic acid. It was introduced by Dr. Sansom as a means of indirectly administering the acid, and obtaining its constitutional effects without the nausea and gastric irritation incidental to its direct employment. He asserts that the sulphocarbolate is decomposed in the blood, sodic sulphate being eliminated in the urine, while the carbolic acid is chiefly got rid of in the breath. It has been used in septic conditions of the blood, in the exanthemata and continued fevers, &c.

Dose. 30 gr. to 60 grs. of the salt, dissolved in water.

ORGANIC SUBSTANCES.

VEGETABLE KINGDOM.

VEGETABLES should be gathered in dry weather, and not when wet with rain or dew. They should be collected annually, and not be kept beyond a year.

Most roots and rhizomes should be dug up after the old leaves and stalks have fallen, and before the new ones appear.

Barks ought to be collected at the season in which they can be most easily separated from the wood; herbs and leaves should be gathered after the flowers have blown and before the seeds ripen.

Flowers should be gathered recently blown.

Fruits and seeds should be collected when ripe.

The different parts of vegetables should be kept dried for use, except when otherwise directed. Expose those which are to be dried, a short time after they have been gathered, in shallow wicker baskets to a gentle heat in a current of air, in the dark; when the moisture is driven off, gradually increase the heat to 150° Fah., that they may dry. Finally, preserve the more delicate parts, viz., flowers and leaves, in black glass bottles, well closed, and the rest in vessels, preventing the access of light and moisture.

CLASS I. EXOGENÆ.

SUB-CLASS I. THALAMIFLORÆ.

RANUNCULACEÆ.

Aconiti Folia. Aconite Leaves. The fresh leaves and flowering tops of Aconitum Napellus, Monkshood; gathered when about one-third of the flowers are expanded, from plants cultivated in Britain.

Aconiti Radix. Aconite Root. The root, dried, of Aconitum Napellus, imported from Germany or cultivated in Britain; and collected in winter or early spring, before the leaves have appeared.

Aconitia. Aconitia. Aconitina. An alkaloid obtained from Aconite.

Description. The *leaves* are deep green on the upper surface, lighter beneath, smooth, palmate, five-partite, the segments wedge-shaped and pinnately cut. The *root* is fusiform, like a carrot, from one to three inches long, not thicker than the finger at the crown, with fleshy fibres, dark brown on the surface, whitish within. The *flowers* are purple, helmet-shaped, numerous, and in dense racemes.

Prop. & Comp. All parts of the plant are bitter and acrid, causing tingling of the lips and skin, followed by numbness; they contain the alkaloid, *Aconitia* ($C_{30}H_{47}NO_7$) united with *Aconitic acid* ($C_6H_6O_6$); another base is also present, which has been named *Aconella*, resembling narcotine in its composition and properties, capable of crystallization, but not possessing the active properties of Aconitia. The alkaloid Aconitia is prepared by thoroughly exhausting the root by maceration and percolation with rectified spirit; distilling off the spirit, and making a watery solution (with boiling water) of the alcoholic extract; the solution is filtered, and ammonia added in slight excess to the filtered liquid, which is gently heated, the precipitate separated on a filter and dried. The ammonia throws down aconitia mixed with colouring matter. The precipitate is powdered and treated with successive portions of ether, to dissolve the aconitia, leaving the colouring matter behind; the ether is distilled off, and the dry ethereal extract dissolved in warm water acidulated with sulphuric acid (sulphate of aconitia formed), and again precipitated by ammonia. Lastly, the precipitate is washed on a filter with a little cold distilled water, and dried between folds of blotting paper.

Aconitia is a white uncrystallizable solid, soluble in 150 parts of cold, and 50 parts of hot water, and much more soluble in alcohol and ether; alkaline, neutralizing acids, and precipitated from them by the caustic alkalies, but not by carbonate of ammonia, or the bicarbonates of potash or soda. It melts with heat, and burns with a smoky flame; causes tingling, followed by numbness, when rubbed on the skin. It is a very active poison; entirely

soluble in pure ether, and leaving no residue when burned with free access of air.

Off. Prep.—Of Aconite Leaves. EXTRACTUM ACONITI. Extract of Aconite. (Aconite leaves, fresh, are bruised, and the juice treated as directed for the green extracts.) See Introduction.

Of the Root :—

TINCTURA ACONITI. Tincture of Aconite. (Aconite root, in coarse powder, two ounces and a half ; rectified spirit, twenty fluid ounces. Prepared by maceration and percolation.)

This tincture has one-fourth of the strength of Tinctura Aconiti, *Dub.*, one-third of the strength of Tinctura Aconiti, *Lond.*, and about one-sixth of the so-called Fleming's Tincture.

LINIMENTUM ACONITI. Liniment of Aconite. (Aconite root, in powder, twenty ounces ; camphor, one ounce ; rectified spirit, a sufficiency. The product should measure twenty fluid ounces. Prepared by maceration and percolation, and then adding the camphor.)

Of Aconitia :—

UNGUENTUM ACONITIÆ. Ointment of Aconitia. (Aconitia, eight grains ; rectified spirit, half a fluid drachm ; prepared lard, one ounce.)

Therapeutics. Given internally in small doses, aconite produces tingling of the lips and tongue, a peculiar sensation at the palate and pharynx, and warmth at the epigastrium ; in large doses tingling often occurs in the extremities, followed by numbness, and a feeling of faintness, with weak and often intermitting action of the heart ; occasionally there is a considerable increase in the urinary secretion, and diuresis is produced. Should the patient be suffering from pain, this is diminished or removed ; if the dose is still larger, alarming symptoms of vascular depression ensue. When an individual is fully under the influence of aconite, the pulsations of the heart are diminished in number, as likewise the frequency of the respirations. In dangerous and fatal doses there is loss of sight, hearing, and feeling, followed by convulsions, syncope, and death. Externally applied, aconite causes at first a tingling of the part, succeeded by numbness, and the cessation of local pain, if present. Aconite appears to cause contraction of the pupil, both when topically applied and when taken internally.

Aconite has been used internally in the treatment of acute and chronic rheumatism, gout, neuralgia, and carcinomatous affec-

tions, for the purpose of relieving pain; in hypertrophy and other diseases of the heart, to allay palpitation; in dropsies, on account of its diuretic properties. It is stated to have marked antiphlogistic powers; to be capable of controlling or even cutting short inflammation, and reducing the attendant fever; these effects being probably due to its action on the circulatory organs. (Ringer.) In different forms of neuralgia its internal administration is often attended with marked relief, as in sciatica, and tic douloureux; the same happens in acute and chronic rheumatism, and in muscular rheumatism, as lumbago; inordinate action of the heart can be undoubtedly diminished by its use; and the pain of carcinomatous disease may be lessened; notwithstanding these facts, it is questionable if its internal administration is often desirable, as its effects are only very temporary, and it is at best a dangerous remedy to make use of; at the present time it is not very often employed, or only by a very limited number of practitioners.

Externally applied in the form of the liniment, it is very valuable in different forms of neuralgia, and in chronic rheumatic pains.

Aconitia has the same properties as the Aconite leaf and root, and in fact gives to the different parts of the plant their virtues. Its physiological action is still in much need of elucidation. The contradictory results arrived at by different enquirers may probably be due to the difficulty of obtaining the alkaloid in a state of purity. Its depressant influence on the heart is ascribed to over-stimulation of the inhibitory apparatus in the heart itself. It lowers the pulse-rate and blood-pressure, and finally arrests the heart in diastole. Its paralyzing effect on the voluntary muscles is probably due to its action on the spinal cord, the sensory being affected before the motor centres. It is doubtful whether it affects the motor nerve-ends; there can be no doubt that it paralyses the cutaneous terminations of the sensory nerves when applied to the skin. It does not act directly on the muscular tissue. Its effect on the pupil is disputed. Aconitia is not given internally, as the one-fiftieth part of a grain may cause very alarming symptoms, but it is much used as an external remedy in the form of the ointment, and is perhaps the most valuable external remedy in cases of facial neuralgia, sciatica, and other forms of neuralgia and muscular pain. When the application is effectual, it almost invariably induces pricking sensation and subsequent numbness of the parts to which it is applied. Sometimes much irritation of the skin is produced by its use; and when applied near the eye, great care

should be taken not to allow any to enter that organ, or intense discomfort may be produced.

Dose. Of tincture of aconite, 5 min. to 15 min.; of extract of aconite, 1 gr. to 2 grs. An *alcoholic extract* is sometimes used, of which the dose should be from $\frac{1}{8}$ gr., gradually increased.

Adulteration. Aconitia is very often impure; sometimes it is mixed with Delphinia, and sometimes it contains Aconella, the other principle contained in the root and precipitated with the Aconitia. Pure Aconitia in $\frac{1}{50}$ gr. dose will destroy a dog; but 1 gr. of the spurious alkaloid can often be given without much effect.

Podophylli Radix. Podophyllum Root. The dried rhizome of Podophyllum peltatum, or the American May-apple, called sometimes *Mandrake* in the United States, over which it is extensively diffused, and whence it is imported.

Podophylli Resina. Resin of Podophyllum; Podophylline. A resin obtained from Podophyllum by means of rectified spirit.

Description. *Podophyllum* occurs in thin rhizomes a few inches long and 2 lines in thickness, brown, jointed, with numerous radicles, wrinkled longitudinally; it breaks short, and is whitish internally; powder, greyish-yellow, with a sweet odour and sweetish acrid taste.

The *resin* or *Podophylline* is a pale greenish-brown amorphous powder, and is prepared by the following process:—Podophyllum root in coarse powder is exhausted by percolation with rectified spirit. The spirit is then distilled off, and the remaining liquid slowly poured into three times its volume of water acidulated with one twenty-fourth of its bulk of hydrochloric acid. The deposited resin is afterwards washed on a filter with distilled water, and dried.

Prop. & Comp. Podophyllum contains resinous matters, together with gum and other substances soluble in water; the resin constitutes about $3\frac{1}{2}$ per cent. of the root, and is soluble in rectified spirit and ammonia; it is precipitated from the former by water, from the latter by acids. It is almost entirely soluble in pure ether. Berberine is stated to exist in the root, and to be contained in much of the commercial podophylline. Berberine is contained in larger quantities in the Hydrastis canadensis, and

in other plants belonging to the order Ranunculaceæ ; also in the Jateorrhiza Calumba and the Common Barberry. It is represented by the formula ($C_{20}H_{17}NO_4$).

Therapeutics. Podophyllum root is at present seldom employed, as its virtues depend on the resin which is now extensively used. This resin, commonly termed Podophyllin, acts as a drastic purgative, not unlike jalap or scammony resins ; it is supposed, however, to differ from them in its power of causing an increased secretion or flow of bile ; that it frequently causes an emptying of the gall-bladder is certain, but its operation in increasing the secretion of bile is doubtful ; for if many evacuations are caused by its action, the latter ones are of a mucous or serous character rather than bilious. Its operation is often accompanied by much griping, and is very uncertain, the same dose at one time producing little effect, at another time, and in the same patient, very troublesome hypercatharsis. It is better to give Podophyllin with other purgatives than by itself ; and aloes, or colocynth, are the drugs mostly given with it ; a little extract of henbane, belladonna, or Cannabis indica are useful adjuncts to lessen its griping properties. Podophyllin is much used in congestion of the liver or portal system ; and it may be combined with calomel, and acid tartrate of potash, in dropsies. Externally applied, the resin of Podophyllum acts as an irritant ; and it has been used in America for the purpose of causing counter-irritation.

Dose. Of the powder, about 10 gr. to 20 gr. ; of the resin (podophyllin), $\frac{1}{4}$ gr. to 2 gr. In combination with other purgatives still smaller doses may be given.

Staphisagria. (Not officinal.) The seed of Delphinium Staphisagria or Stavesacre ; inhabiting chiefly the southern parts of Europe.

Description. The seed is irregularly triangular, of a brownish black colour, deeply pitted on the surface.

Prop. & Comp. No odour, acrid taste, contains an alkaloid, *Delphinia*, together with resin, fatty matter, wax, lignin, &c.

Therapeutics. Stavesacre appears to act as an emetic and purgative when given internally, and has been used as an anthelmintic ; it seems also to possess narcotic properties. Externally it has the power of destroying pediculi, and may be used in powder or ointment.

Dose. 3 gr. to 10 gr., in powder and decoction; very seldom used.

Actæa racemosa. (Not officinal.) The root of Actæa or Cimicifuga racemosa, the Black Snake Root.

This remedy, which has been much used in America, has lately been introduced into this country. Its use is said to have been attended with much success in rheumatic fever, in chorea, and in lumbago, and in some forms of puerperal hypochondriasis. As yet no good clinical evidence of its value in medicine has been brought forward.

The tincture, made by macerating four ounces of the root in a pint of spirit, is the most convenient form of administering it; it may be given in doses of from thirty to sixty minims three times a day.

MAGNOLIACEÆ.

Illicium anisatum. Star Anise.

The fruit of this plant yields an oil distilled in China which resembles true anise oil very closely, and which is made officinal under the name of Oleum Anisi, in conjunction with the oil from the umbelliferous fruit. (See Anisi Oleum.)

MENISPERMACEÆ.

Calumbæ Radix. Calumba Root. The root cut transversely and dried of Jateorrhiza Calumba. (Cocculus palmatus, D.C.) From the forests of Eastern Africa between Ibo and the Zambesi. Sometimes called Columbo root; the name was supposed to be derived from Colombo, the modern capital of the island of Ceylon.

Description. It occurs in small ovoid cylindrical pieces, which are cut into thin disks. These vary in diameter from $\frac{1}{2}$ inch to 2 or 3 inches, and in thickness from 2 to 4 lines; the central portion is spongy, yellow, and in concentric layers; the outer portion dark green or olive; the slices usually become concavo-convex in the drying, and thinner in the centre.

Prop. & Comp. Calumba root has little odour, but a very bitter taste. It contains a neutral non-nitrogenized crystallizable principle, called *Calumbine* ($C_{21}H_{22}O_7$), but slightly soluble in water or proof spirit; an acid called *Calumbic* ($C_{21}H_{21}O_7$), and an alka-

loid, *Berberine* ($C_{20}H_{17}NO_4$), the salts of which are soluble, and yellow; and give the colour to the root. The calumbate of berberine is contained in the infusion and tincture. Berberine was first found in the Berberis vulgaris, and hence its name. It must not be confounded with Beberia, which is officinal, and which is obtained from Bebeeru Bark. There is also much starch in the root, and hence a decoction of the root when cold is turned dark violet-black by a solution of iodine.

Off. Prep. Extractum Calumbæ. Extract of Calumba. (Calumba, in powder, one pound; distilled water, a sufficiency. Prepared by maceration and evaporation of the infusion to a proper consistence.) A pound of the root yields about two and a half ounces of extract.

Infusum Calumbæ. Infusion of Calumba. (Calumba, in coarse powder, half an ounce; cold distilled water, ten fluid ounces.) An infusion made with cold water should not be coloured by iodine.

Tinctura Calumbæ. Tincture of Calumba. (Calumba, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Calumba root is also contained in Mist. Ferri Aromatica.

Therapeutics. Calumba is a bitter stomachic and tonic, and is useful in debility of the digestive organs, and hence valuable in the non-inflammatory forms of gastrodynia, pyrosis, and vomiting; it is also a stomachic tonic, which is more readily borne by the stomach than any other tonic during recovery from subacute inflammatory affections of this organ; as a general tonic to the system, especially in the early stages of convalescence from acute diseases; it is often usefully combined, in stomachic affections, with an alkali or alkaline bicarbonate, or with the nitrate of bismuth or hydrocyanic acid; it may likewise be administered with the mineral acids.

Dose. Of the powder, 10 gr. to 20 gr., or more; of the extract, 2 gr. to 10 gr.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture ½ fl. drm. to 2 fl. drm.

Incompatibles. The cold infusion of calumba contains no starch in solution, and hence does not strike blue with iodine. Calumba may be given with salts of iron, as it contains neither tannin nor gallic acid.

Adulteration. Tinged bryony root, also the root of the Frasera

Walteri, and of a Menisperm from Ceylon, have been substituted for true calumba. The two former may be distinguished by their containing hardly any starch.

Pareiræ Radix. Pareira Root. The dried root of Cissampelos Pareira, or Velvet leaf; a plant growing in Brazil. (Hanbury concludes that the commercial root is not derived from Cissampelos Pareira; its botanical source is unknown. Further, that the original reputation of Pareira brava was founded on the root of the Chondodendron tomentosum.)

Description. It occurs in more or less cylindrical-shaped pieces, entire or split longitudinally, ½ an inch to 4 inches in diameter, and 4 inches to 4 feet in length; externally brownish, wrinkled both longitudinally and transversely; internally yellowish-grey, with concentric circles and radiating rays, and very porous or cancellated in structure.

Prop. & Comp. Odour very slight, taste sweetish and aromatic, then bitter. It contains a crystalline nitrogenized principle, named *Pelosine* or *Cissampeline* ($C_{18}H_{21}NO_3$), a strong base, recently said to be identical with Beberia; besides which there exists some resin, a bitter yellow matter, starch, salts, &c.

Off. Prep. Decoctum Pareiræ. Decoction of Pareira. (Pareira, sliced, one ounce and a half; distilled water, one pint. Boil for fifteen minutes, strain, and make up to a pint.)

Extractum Pareiræ. Extract of Pareira. (Pareira root, a pound; boiling distilled water, a gallon, or a sufficiency. Prepared by digestion, percolation, and evaporation of the liquid to a proper consistence for forming pills.)

Extractum Pareiræ Liquidum. Liquid Extract of Pareira. (Pareira, in coarse powder, one pound; boiling distilled water, a gallon, or a sufficiency. Prepared by maceration and percolation with water, evaporation to thirteen fluid ounces, and subsequent addition of three fluid ounces of rectified spirit.)

Each fluid part of the extract contains a solid part of the root.

Therapeutics. Pareira is a bitter tonic, like calumba, but scarcely ever used as such; it is thought to act as a diuretic, and to have an action on the mucous membrane of the bladder. Its use is chiefly confined to chronic catarrhal affections of that viscus, to allay irritation and diminish the mucous discharge; it may be combined with nitric acid or an alkali, according to the state of the urine; likewise with henbane if required; it is used also in

chronic pyelitis. The opinions of practitioners as to the value of Pareira in bladder affections differ considerably, some regarding it almost as a specific, while others think but little of its medicinal virtues. A real clinical investigation of its merits is still a desideratum.

Dose. Of powder, 30 gr. to 60 gr. ; of the decoction, 1½ fl. oz. to 2 fl. oz. ; of the extract, 10 gr. to 20 gr. ; of the liquid extract, ½ fl. drm. to 2 fl. drm. It is a common plan to strengthen the decoction by the addition of the extract, but this produces a muddy unpleasant mixture ; the liquid extract is perfectly clear, contains all the virtues of the root, and forms an elegant mode of administering the drug.

Cocculus. Cocculus Indicus. (Not officinal.) The fruit of Anamirta Cocculus, the Cocculus Indicus plant ; a climbing shrub, growing in the East India Islands and Malabar coast, &c.

Description. A berry, between a pea and a bayberry in size, consisting of a dark brown exterior, enclosing a wrinkled, bivalved shell, and a reniform yellowish and oily seed, which should fill at least two-thirds of the shell.

Prop. & Comp. Cocculus fruit contains a non-nitrogenized crystalline neutral principle, *Picrotoxine* ($C_{12}H_{14}O_5$), which resides in the kernel and forms colourless stellate needles ; also an alkaloid, *Menispermine* ($C_9H_{12}NO$) ?, united with an acid, *Cocculinic acid*, contained chiefly in the shell.

Prep. Unguentum Cocculi. Ointment of Cocculus. (The seeds of Cocculus Indicus, eighty grains ; prepared lard, an ounce.)

Therapeutics. Cocculus Indicus, as well as picrotoxine, act upon the nervous system as intoxicating agents, apparently upon the cerebellum ; they are not, however, used internally in medicine. Externally, in the form of the ointment, Cocculus Indicus is employed to destroy pediculi, and it is likewise occasionally used in chronic skin diseases.

PAPAVERACEÆ.

Papaveris Capsulæ. Poppy Capsules. The nearly ripe capsules of Papaver somniferum, the Garden, or Opium Poppy; a native of Syria and Egypt, cultivated in Britain.

Description. The ripe fruit, poppy-heads, or capsules, are globular, from 2 to 3 inches in diameter ; of a pale brownish-yellow colour, smooth, with a radiating stigma on the top ; within are parietal placentæ, and very numerous small pale brownish, reniform seeds ; the texture of the heads is light and papery, with little or no odour, and some bitterish opiate taste.

Prop. & Comp. Besides woody fibre, &c., the capsules contain a small amount of the principles found in opium ; and the seeds, called maw seeds, have much bland oil (poppy oil), but possess no narcotic properties. When gathered unripe, more opium is present in the capsules.

Off. Prep. Decoctum Papaveris. Decoction of poppy-heads. (Poppy-heads bruised and free from seeds, two ounces ; distilled water, 1½ pint. Boil for 10 minutes and strain. The product should be made up to the measure of a pint, by the addition of distilled water.)

Extractum Papaveris. Extract of Poppies. (Prepared by maceration with water and percolation : then after partial evaporation of the liquid, by the addition of rectified spirit, subsequent filtration and evaporation to a pilular consistence.)

Syrupus Papaveris. Syrup of Poppy. (Poppies bruised, the seeds being removed, thirty-six ounces ; refined sugar, four pounds ; boiling distilled water, twenty pints ; rectified spirit, sixteen fluid ounces. Macerate the poppy capsules in the water for twelve hours ; evaporate and strain ; reduce the strained liquor to three pints, and when quite cold add the spirit, mix and filter ; distil off the spirit, evaporate the remaining liquor to two pints, and then add the sugar.) The product should weigh six pounds and a half, and should have the sp. gr. 1·320. Syrup of Poppy is often badly prepared ; at times manufactured from treacle and laudanum.

Therapeutics. The preparations of poppy capsules act in the same manner as opium, but are much weaker, and less certain in their action than most of the officinal preparations of that drug. The decoction is not given internally, but is employed as an external application to allay pain and soothe. The syrup of poppies is often employed to allay cough, and likewise as an opiate for children ; in the latter case, it should be used with great caution. The extract is merely a mild preparation of opium.

Dose. Of the syrup, 1 fl. drm. to ½ fl. oz. ; for children, ½ fl.

drm., cautiously increased, such patients being very susceptible of the influence of opium. Of the extract, 2 grs. to 5 grs.

Opium. Opium; Turkey Opium. The juice from the incised unripe fruit of Papaver somniferum, hardened in the air.

Morphiæ Hydrochloras. Hydrochlorate of Morphia. $C_{34}H_{19}NO_6,HCl.+6HO$, or $C_{17}H_{19}NO_3.HCl.3H_2O$. The Hydrochlorate of an alkaloid, prepared from opium.

Synonym. Morphiæ Murias. *Ed. Dub.*

Morphiæ Acetas. Acetate of Morphia. $C_{34}H_{19}NO_6,C_4H_3O_3+HO$, or $C_{17}H_{19}NO_3.C_2H_4O_2$. The acetate of an alkaloid prepared from opium.

Description. Opium is prepared by making horizontal incisions with a sharp instrument into poppy capsules, a few days after the petals have fallen, taking care not to penetrate the interior; a milky juice exudes, which soon becomes brown, and forms tears; these, when scraped off, and wrought together into masses or cakes, form opium: it is usually enveloped in some leaf.

Of *Turkey opium* there are two varieties, viz., Smyrna and Constantinople. *Smyrna* opium occurs in masses more or less flattened, from $\frac{1}{4}$ to 2 pounds in weight, covered externally with the capsules of a species of rumex; internally, when fresh, it is soft, of a rich brown colour, heavy narcotic odour and bitter taste; it is made up of agglutinated tears. *Constantinople* opium is met with in small lenticular masses, from $\frac{1}{4}$ to $\frac{1}{2}$ a pound in weight, often inclosed in a poppy leaf, and marked with the midrib; it was at one time inferior to the Smyrna variety.

Besides Turkey opium, there are several other kinds, which are however not officinal, and should not be employed in making the Pharmaceutic preparations of the drug; among these are—

Egyptian opium, in flat cakes, more or less circular, and about two or three inches in diameter, covered with some leaf (perhaps the poppy); internally hard, of a dark reddish-brown colour, and a musty narcotic odour; it is met with in English commerce, but is very inferior to Turkey opium.

East Indian opium is found in round balls, like twenty-four pound shot, about 4 pounds in weight; covered with a thick case of poppy leaves, agglutinated; internally rather soft and black; called *Chinese investment* opium. East Indian opium also occurs in cakes, called *Malwa*, and *Garden Patna* opium. Nearly all the

Indian opiums are inferior to Turkey opium, and are not found in English commerce.

Other varieties of opium, such as *Persian*, or Trebizond, in sticks, or occasionally in masses, and *European* opiums, as English, French, and German, are now and then met with.

Prop. & Comp. Opium is rich in crystalline principles; it contains a peculiar acid, and several alkaloids and neutral bodies.

The following list comprises all which have hitherto been isolated. The physiological properties of those printed in italics have been more or less fully investigated.

Acids.	*Meconic.* Thebolactic.	
Alkaloids.	PRIMARY.	DERIVED.
	Morphia . . .	*Apomorphia.*
	Codeia . . .	*Apocodeia.*
	Codamine.	
	Laudanine.	
	Pseudomorphine.	
	Papaverine.	
	Rhæadine . .	Rhæagenine.
	Lanthopine.	
	Cryptopia.	
	Meconidine.	
	Thebaia or *Paramorphia.*	
	Narcotine . .	Cotarnine.
	Opianine.	
	Porphyroxine.	
Neutral Bodies.	*Narceia.*	
	Meconine or *Opianyl.*	

ACIDS. *Meconic acid* ($C_7H_4O_7$), a tribasic acid, crystallizing in pearly scales containing three molecules of water; it is soluble in water, and forms insoluble salts with calcium, barium, and lead. Meconic acid strikes blood-red with persalts of iron. It is easily decomposed.

Thebolactic acid ($C_3H_6O_3$), isomeric, or perhaps identical with lactic acid. Turkey opium contains 2 per cent. of it.

ALKALOIDS.—*Morphia* ($C_{17}H_{19}NO_3$), an alkaloid in the form of six-sided prisms; soluble in alcohol and caustic fixed alkaline solutions; *very slightly so indeed in ether or water;* its solutions are reddened by nitric acid; it is very sensitive to the action of oxidizing agents; it has the power of liberating iodine, and hence

bluing starch, when added to iodic acid; morphia, and its salts, strike blue with persalts of iron; and when the solutions are treated with free chlorine, and excess of ammonia afterwards added, a brown colour is produced, disappearing with excess of chlorine.

Acetate of Morphia occurs in very fine needles; generally in powder; apt to lose a part of its acid; *soluble in water* and alcohol. When sulphuric acid is added to the salt, acetous vapour is evolved. It is prepared by precipitating morphia from a solution of the hydrochlorate by means of ammonia; and redissolving it in a solution of acetic acid, evaporating to dryness and pulverising.

Hydrochlorate of Morphia when pure is found in plumose acicular crystals; *requires about twenty parts of water to dissolve it;* soluble in spirit; when pure, both this salt and the acetate are entirely dissipated at a red heat. The aqueous solution gives a white curdy precipitate with nitrate of silver, and a white one with potash, redissolved by excess. Moistened with strong nitric acid, it becomes orange red, with perchloride of iron greenish blue. Twenty grains of the salt dissolved in half an ounce of warm water, with ammonia added in the slightest possible excess, give on cooling a crystalline precipitate, which when washed with a little cold water, and dried by exposure to air, weighs 15·18 grains.

Hydrochlorate of Morphia is prepared by thoroughly exhausting opium with water, and evaporating to a small bulk, so that one pint of fluid shall contain the soluble matter of one pound of opium. This watery solution contains the meconate and lactate of morphia and codeia, with some other unimportant substances. To this is added a strong solution of chloride of calcium, whereby meconate and lactate of lime, with some resins, are precipitated, and the chlorine combines with the morphia and codeia. The whole is evaporated till it forms a solid mass when cool, and then enveloped in two folds of calico, and subjected to powerful pressure, which removes the mother liquor, containing much colouring matter. The cake is then triturated with about half a pint of boiling water, which dissolves the hydrochlorate of morphia and codeia mainly; thrown on a filter and washed. The filtered liquor is again evaporated, and allowed to cool and solidify; pressed, dissolved as before, evaporated, and again allowed to solidify; if the mass is still much coloured, this process may again be repeated. The pressed cake is finally dissolved in six

ounces of boiling water, with animal charcoal, for twenty minutes, to remove the last trace of colouring matter, and then, after filtration, ammonia is added in slight excess, which precipitates the morphia, leaving the codeia in solution. The pure crystalline morphia which separates is collected and dried. This is dissolved in hydrochloric acid, and the hydrochlorate of morphia allowed to crystallize. An additional quantity of morphia may be obtained from the dark liquids expressed, by diluting them with water, precipitating with potash in excess, filtering, saturating with hydrochloric acid, and purifying with animal charcoal.

Apomorphia ($C_{17}H_{19}NO_3$). Obtained by heating morphia in a closed tube for several hours at a temperature of 280°—300° F., with excess of hydrochloric acid. This removes one molecule of water from the morphia. $C_{17}H_{19}NO_3.H_2O-H_2O=C_{17}H_{19}NO_3$.

Codeia ($C_{18}H_{21}NO_3+H_2O$), an alkaloid, in rhombic prisms, or octahedral crystals; soluble in alcohol, ether, and chloroform; also in boiling water, but not in alkaline solutions. Does not answer to the tests given above for morphia. Forms crystallized salts with acids. One part dissolves in fifty parts of water at 60° F. Opium contains from ½ to 1 per cent. of this alkaloid.

Apocodeia (Matthiessen and Burnside) ($C_{18}H_{19}NO_2$). By depriving codeia of one molecule of water.

Codamine ($C_{19}H_{23}NO_3$). Soluble in alcohol, ether, and boiling water. Solutions alkaline. Salts bitter. Forms a dark-green solution with strong nitric acid.

Laudanine ($C_{20}H_{25}NO_3$). In stellate groups of small, colourless, six-sided prisms. Tasteless. Salts bitter. Dissolves in chloroform and benzol; sparingly in alcohol. Turned orange-red by nitric acid.

The quantity of codamine and laudanine contained in opium is small. A sample of Turkey opium which yielded 8·3 per cent. of morphia, had only ·0033 per cent. of codamine and ·0052 of laudanine.

Morphia, codeia, codamine and laudanine form a homologous series:

$C_{17}H_{19}NO_3$.
$C_{18}H_{21}NO_3$.
$C_{19}H_{23}NO_3$.
$C_{20}H_{25}NO_3$.

Apomorphia and apocodeia are derivative members of this series pseudomorphine is also related to it.

Pseudomorphine ($C_{17}H_{19}NO_4$). A white, finely-crystalline precipitate, insoluble in water, alcohol, and ether. With nitric acid, forms a deep orange-red solution, turning to yellow.

Papaverine ($C_{21}H_{21}NO_4$). In delicate, colourless prisms, without action on litmus.

Rhœadine ($C_{21}H_{21}NO_6$). In small, white prisms, nearly insoluble in ether, alcohol, chloroform, and water. This base is tasteless and not poisonous. By the action of dilute mineral acids it is converted into its isomer, *Rhœagenine*. May be viewed as dioxypapaverine.

Lanthopine ($C_{23}H_{25}NO_4$). Homologous with papaverine. Minute white prisms. Tasteless. Does not affect litmus. Insoluble in water and alcohol; soluble in chloroform. Good Turkey opium contains ·0058 per cent.

Cryptopia ($C_{23}H_{25}NO_5$). May be viewed as oxylanthopine. Colourless, six-sided prisms, readily soluble in chloroform, hardly at all in ether and water. Forms salts—neutral and acid—with a bitter taste. With strong sulphuric acid gives a blue colour, turning to orange-yellow on the addition of nitre. Difficult to obtain quite free from thebaia. A ton of opium yields only one ounce of the base.

Meconidine ($C_{21}H_{23}NO_4$). Contains 2 at. more H than papaverine. A brownish, resinoid mass, splitting up into laminæ when touched. Tasteless. Insoluble in water; soluble in alcohol, ether, and chloroform. The alcoholic solution blues litmus. Its salts are very unstable. Homologous with *Sanguinarin*, an alkaloid contained in Chelidonium majus, a papaveraceous plant.

Thebaia or *Paramorphia* ($C_{19}H_{21}NO_3$). Insoluble in water; very soluble in alcohol and ether. Does not give the tests of morphia. Crystallises in square plates of a silvery lustre. Taste acrid and styptic.

Narcotine ($C_{22}H_{23}NO_7$). Neutral, in brilliant prisms, insoluble in water and alkalies; soluble in alcohol, ether, and acids, with the latter of which it forms acid crystalline salts. Heated with water, it splits up into *meconine* and *cotarnine*.

$$\underset{\text{Narcotine.}}{C_{19}H_{14}(CH_3)^3NO_7} = \underset{\text{Meconine.}}{C_8H_4(CH_3)^2O_4} + \underset{\text{Cotarnine.}}{C_{11}H_{10}(CH_3)NO_3}.$$

Opianine, a principle found as yet only in Egyptian opium, resembling narcotine, and perhaps identical with it.

Porphyroxine, a crystalline principle, distinguished by becoming

purple when heated with dilute hydrochloric acid; its nature is but little understood.

NEUTRAL BODIES. *Narceia* ($C_{23}H_{29}O_9$). Very insoluble in water, chloroform, and ether. More soluble in alcohol and glycerine. Sulphurous acid dissolves it; the solution has a rich amber colour, rapidly passing through greenish-orange to a port-wine hue.

Meconine or *Opianyl* ($C_{10}H_{10}O_4$). May be obtained from narcotine (*quod vide*). In colourless hexagonal prisms with dihedral summits. Tasteless at first, but developes an acrid flavour as it dissolves in the mouth. Very sparingly soluble in cold water; more so in alcohol and ether; freely soluble in chloroform. Opium contains from ·1 to ·2 per cent.

Besides these crystallizable bodies, opium contains several different *Resins*, hitherto but little examined, also gummy, extractive, and fatty matters, caoutchouc, a trace of *volatile oil*, and inorganic salts. Analyses of opium have given the following per-centage of constituents: Morphia, 6 to 12; Codeia, less than 1; Narcotine, 6 to 8; Narceia, less than 1; Meconine, less than 1; Meconic acid, 6 to 8; Resin, 10·93; Bassorine, caoutchouc, fat, and lignin, 26·25; salts and volatile oil, 3·60; earthy salts, &c., 0·71; brown acid, gum, &c., 41·17.

The following analyses of opium were made by Schindler:—

	Smyrna Opium.	Constantinople Opium.	Egyptian Opium.
Morphia	10·30	4·50	7·00
Codeia	0·25	0·52	
Narcotine	1·30	3·47	2·68
Narceia	0·71	0·42	
Meconine	0·08	0·30	
Meconic Acid	4·70	4·38	
Peculiar Resin	10·93	8·10	
Vegetable mucus, caoutchouc, acid, fat, and vegetable fibre	26·25	17·18	
Brown acid soluble in water and alcohol	1·04	0·40	
Brown acid soluble only in water, also gum	40.13	56·46	
Lime	0·40	0·02	
Magnesia	0·07	0·40	
Alumina, Ferric Oxide, Silica, Calcic Phosphate	0·24	0·22	
Salts and vegetable oil (about)	0·36	0·36	
	96·76	96·73	

The British Pharmacopœia gives the following test for ascertaining the quantity of morphia present in opium :—

Take of opium 100 grains, slaked lime 100 grains, distilled water 4 ounces. Break down the opium, and steep it in an ounce of the water for 24 hours, stirring the mixture frequently. Transfer it to a displacement apparatus, and pour on the remainder of the water in successive portions, so as to exhaust the opium by percolation. To the infusion thus obtained, placed in a flask, add the lime, boil for ten minutes, place the undissolved matter on a filter, and wash it with an ounce of boiling water. Acidulate the filtered fluid slightly with dilute hydrochloric acid, evaporate it to the bulk of half an ounce, and let it cool. Neutralize cautiously with solution of ammonia, carefully avoiding an excess; remove by filtration the brown matter which separates, wash it with an ounce of hot water, mix the washings with the filtrate, concentrate the whole to the bulk of half an ounce, and add now solution of ammonia in slight excess. After 24 hours collect the precipitated morphia on a weighed filter, wash it with cold water, and dry it at 212°. It ought to weigh at least from 6 to 8 grains.

Off. Prep.—Of Opium :—

Confectio Opii. Confection of Opium. (Compound powder of opium, 192 grains ; syrup, a fluid ounce.)

Emplastrum Opii. Opium Plaster. (Opium, in very fine powder, one ounce ; resin plaster, nine ounces.)

Enema Opii. Enema of Opium. (Decoction of starch, two fluid ounces ; tincture of opium, thirty minims. Mix.)

Extractum Opii. Extract of Opium. (Opium, in thin slices, one pound ; distilled water, six pints. Prepared by macerating the opium, three times, for twenty-four hours each time, in two pints of water, mixing the liquors, straining and reducing by evaporation to a proper consistence.)

Extractum Opii Liquidum. Liquid Extract of Opium. (Extract of opium, one ounce ; distilled water, sixteen fluid ounces ; rectified spirit, four fluid ounces.)

Linimentum Opii. Liniment of Opium. (Tincture of opium, two fluid ounces ; liniment of soap, two fluid ounces.)

Pilula Saponis Composita. Compound Pill of Soap. (Opium, in fine powder, half an ounce ; hard soap, two ounces ; distilled water, a sufficiency.)

One grain of opium is contained in five grains of the pill mass.

PILULA PLUMBI CUM OPIO. Pill of Lead and Opium. (Acetate of lead, in fine powder, thirty-six grains; opium, in powder, six grains; confection of roses, six grains.)

One grain of opium is contained in eight grains of the pill mass

PILULA IPECACUANHÆ CUM SCILLÂ. Pill of Ipecacuanha with Squill. (Compound powder of Ipecacuanha, three ounces; squill and ammoniacum in powder, of each one ounce; treacle, a sufficiency.)

One part of opium in twenty-three and a half parts of the pill mass.

PULVIS CRETÆ AROMATICUS CUM OPIO. Aromatic Powder of Chalk and Opium. (Aromatic powder of chalk, nine ounces and three quarters; opium, in powder, a quarter of an ounce.)

One part of opium in forty parts of the powder.

PULVIS IPECACUANHÆ COMPOSITUS. Compound Powder of Ipecacuanha. (Ipecacuanha, in powder, half an ounce; opium, in powder, half an ounce; sulphate of potash, four ounces.)

One part of opium in ten parts of the powder. This preparation is also known as Dover's powder.

PULVIS KINO COMPOSITUS. Compound Powder of Kino. (Kino, in powder, three ounces and three quarters; opium, in powder, a quarter of an ounce; cinnamon, in powder, one ounce.)

One part of opium in twenty parts of the powder.

PULVIS OPII COMPOSITUS. Compound Powder of Opium. (Opium, an ounce and a half; black pepper, two ounces; ginger, five ounces; caraway fruit, six ounces; tragacanth, half an ounce.)

One part of opium in ten parts of the powder.

TINCTURA OPII. Tincture of Opium. (Powdered opium, one ounce and a half; proof spirit, one pint. Prepared by maceration.)

One grain of dry opium is contained in fourteen minims and a half of the tincture.

TINCTURA CAMPHORÆ COMPOSITA. Compound Tincture of Camphor. (Opium, in coarse powder, forty grains; benzoic acid, forty grains; camphor, thirty grains; oil of anise, half a fluid drachm; proof spirit, one pint. Prepared by maceration.)

One grain of opium is contained in half a fluid ounce of this tincture. This preparation is often termed *Paregoric Elixir.*

TINCTURA OPII AMMONIATA. Ammoniated Tincture of Opium. (Opium in coarse powder, 100 grains; saffron and benzoic acid

each, 180 grains; oil of anise, a fluid drachm; strong solution of ammonia, four fluid ounces; rectified spirit, sixteen fluid ounces.)

One grain of opium is contained in ninety-six minims.

Trochisci Opii. Opium Lozenges. (Extract of opium, seventy-two grains; tincture of tolu, half a fluid ounce; refined sugar, sixteen ounces; gum acacia, in powder, two ounces; extract of liquorice, six ounces; boiling distilled water, a sufficiency. To make 720 lozenges.)

Each lozenge contains one-tenth of a grain of extract of opium.

Unguentum Gallæ cum Opio. Ointment of Galls and Opium. (Ointment of galls, one ounce; opium, in powder, thirty-two grains.)

One part of opium is contained in fourteen parts and a half of the ointment.

Vinum Opii. Wine of Opium. (Extract of opium, an ounce; cinnamon bark and cloves, in powder, of each seventy-five grains; sherry, a pint. Macerate.) It contains nearly twenty-two grains of extract of opium in a fluid ounce.

Opium is also contained in Suppositoria Plumbi Comp..

Of Hydrochlorate of Morphia:—

Liquor Morphiæ Hydrochloratis. Solution of Hydrochlorate of Morphia. (Hydrochlorate of morphia, four grains; dilute hydrochloric acid, eight minims; rectified spirit, two fluid drachms; distilled water, six fluid drachms.)

Half a grain of hydrochlorate of morphia is contained in each fluid drachm of this solution. It is half the strength of Liquor Morphiæ Hydrochloratis, London, 1851.

Suppositoria Morphiæ. Morphia Suppositories. (Hydrochlorate of morphia, six grains; benzoated lard, sixty-four grains; white wax, twenty grains; oil of theobroma, ninety grains; to make twelve suppositories.) Each suppository contains half a grain of the morphia salt.

Suppositoria Morphiæ cum Sapone. Morphia Suppositories with Soap. (Hydrochlorate of morphia, six grains; glycerine of starch, fifty grains; curd soap, one hundred grains; add enough starch to form a paste, and divide the mass into twelve equal parts.) Each suppository contains half a grain of the morphia salt.

Trochisci Morphiæ. Morphia Lozenges. (Hydrochlorate of morphia, twenty grains; tincture of tolu, half a fluid ounce;

refined sugar, in powder, twenty-four ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, a sufficiency; distilled water, half a fluid ounce. Divide into 720 lozenges.) Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia.

Trochisci Morphiæ et Ipecacuanhæ. Morphia and Ipecacuanha Lozenges. (Hydrochlorate of morphia, twenty grains; ipecacuanha, in fine powder, sixty grains; and the same ingredients, in the same quantities, as for the morphia lozenges.)

Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia, and one-twelfth of a grain of ipecacuanha.

Of Acetate of Morphia:—

Liquor Morphiæ Acetatis. Solution of Acetate of Morphia. (Acetate of morphia, four grains; dilute acetic acid, eight minims; rectified spirit, two fluid drachms; water, six fluid drachms.) Half a grain of acetate of morphia is contained in each fluid drachm of this solution.

Injectio Morphiæ Hypodermica. Hypodermic Injection of Morphia. A solution of acetate of morphia, containing *one grain of the salt in twelve minims.* (Prepared by dissolving eighty-eight grains of hydrochlorate of morphia in two ounces of distilled water with the aid of heat. Ammonia is added to precipitate the alkaloid, which is dissolved in an ounce of distilled water to which acetic acid is added in quantity sufficient to render the solution slightly acid. Enough distilled water is then added to make the solution up to two fluid ounces. Filtered and preserved in a stoppered bottle, excluded from the light.) The product should be perfectly clear and very slightly acid to test-paper. A fluid drachm of it rendered slightly alkaline by the addition of solution of ammonia, yields a precipitate of morphia which, after being washed and dried, should weigh 4·3 grains, corresponding to 5 grains of acetate of morphia.

Therapeutics. Inasmuch as the physiological action of opium is but the aggregate of the separate actions of its constituent principles, those which are present in largest proportion producing the major part of the effect, it may be well to give a brief summary of what is known concerning the action of the individual principles before going on to speak of that of the crude drug. Numerous discrepancies still exist upon the subject; discrepancies due on the one hand to the difficulty of isolating the principles in a state of chemical, and still more, in a state of "physiological"

purity, on the other to differences of idiosyncrasy among the various animals chosen for experiment.

Speaking broadly, the active constituents of opium may be arranged in a series, the two extreme members of which are meconine and thebaia, the former exhibiting purely hypnotic, the latter purely convulsant properties. Between these two extremes the various active principles occupy different positions; morphia, the most abundant of them, and hence the most important one from a practical point of view, possessing both convulsant and hypnotic powers; the latter being predominant in the case of the human subject.

1. *Thebaia* exhibits purely convulsant properties, exciting tetanic spasms, like strychnia and brucia, which it resembles in its physiological action. Bernard regards it as the most poisonous of the opium alkaloids. Administered to the dog, it causes tetanus, and speedy death from asphyxia; in doses less than fatal, its action is transient, probably because it is rapidly eliminated. It has no hypnotic or anodyne power. Fraser and Crum Brown have shown that the salts of methyl-thebaia resemble curare in causing paralysis by destroying the activity of the end-organs of the motor nerves. (*See* Strychnia). Rabuteau, from experiments on man, concludes that, dose for dose, thebaia is less poisonous than morphia. As a tetanising agent, it is inferior to strychnia and brucia.

2. *Morphia* has both a soporific and a convulsant action. In some animals it appears to produce almost exclusively hypnotic, in others almost exclusively tetanic symptoms. In man, the hypnotic effect usually predominates over the convulsant one to such a degree, that the latter is wholly masked. Individuals are met with, however, whose idiosyncrasy is such as to render them peculiarly susceptible to the latter effect of the alkaloid.

Clinical experience has shown that morphia possesses the anodyne and soporific powers of opium, and gives to the drug most of its valuable properties. At the same time its action is, as a rule, more agreeable, having less tendency to cause headache, nausea, and constipation; it is also much less stimulant in its operation, and does not produce the full diaphoretic effects of opium. Although only about 10 per cent. of morphia is contained in good opium, the alkaloid is not more than four times as strong as the crude drug, showing that other principles must contribute appreciably to the effects of the latter substance. Since the subcutaneous method of administration has become general the

use of morphia to alleviate pain and spasm has been much extended. It is stated to cause less constitutional disturbance when given hypodermically than by the mouth. Moreover, in some rare cases it seems to give more effectual and permanent relief when injected at the seat of pain, than when introduced elsewhere. The smallness of the dose required, and the rapidity of its operation, are two practical advantages of the hypodermic method.

In other respects, morphia resembles opium in its therapeutic effects, and must be given with the same precautions.

The salts of methyl-morphia have been shown to retain the hypnotic power of morphia, while losing all trace of its convulsant action. Moreover, they cause paralysis by acting on the end-organs of the motor nerves.

3. *Cryptopia*, like morphia, exerts both a convulsant and a hypnotic action on the dog. In man, no excitant effect has been noticed. It is a good hypnotic, twice as active as meconine, and a quarter as powerful as morphia. In large doses, it is said to dilate the pupil. (John Harley.) It causes death by apnœa.

4. *Codeia* gives rise to tetanic spasms and sleep when administered to rabbits. Bernard places it next to thebaia as a poison; his alkaloid was probably impure. In man, it has a feeble soporific action; one to two grains, given subcutaneously, being required to produce this effect in persons susceptible to it. It quickens the pulse and contracts the pupils. As an anodyne it is useless; the author having repeatedly found five grains of codeia fail to relieve pain (in the case of a patient suffering from a tumour pressing on a nerve) which was always readily subdued by the fourth of a grain of morphia. The hypnotic effect of codeia is wholly destroyed by its conversion into methyl-codeia, which resembles curare in its action on the terminations of the motor nerves.

5. *Narceia.* From experiments on dogs, Bernard concludes that its narcotic action is superior to that of morphia. Harley finds that it is a pure hypnotic, much feebler than morphia. Given hypodermically, 1 gr. is equivalent to $\frac{1}{8}$ gr. of morphia. Five grains by the mouth induced only slight drowsiness. Narceia is very insoluble, and irritates the skin at the point of injection; it is eliminated by the kidneys, causing dysuria and even anuria, by blocking up the uriniferous tubes. It causes profound sleep in dogs, during which, however, they are aware of painful sensations. It is useless as a medicine

6. *Papaverine* has been clinically studied by Leidesdorf. The hydrochlorate is soporific and narcotic. It reduces the pulse; relaxes the voluntary muscles; and causes slight looseness of the bowels. Its effects are manifested in about three hours after its administration by the mouth, and continue for 24-48 hours. Dose, ½ gr. to 1 gr. by the mouth; ¼ gr. to ½ gr. subcutaneously.

7. *Meconine* or *Opianyl* acts on man as a mild hypnotic. Its effects are identical with those of narceia, but slightly more powerful. It does not irritate the skin at the point of injection, or cause dysuria. Given by the mouth it exerts no appreciable effect. From ½ gr. to 2 gr. may be given subcutaneously. (J. Harley.)

8. *Narcotine* was at one time supposed to be the narcotic principle of opium, but it is now known not to be so. It probably acts as a tonic and antiperiodic; the author has given it with this end in view in half-drachm doses without the production of any narcotic symptoms.

9. *Apomorphia* has none of the characteristic properties of morphia. It is a powerful emetic. A dog was injected with it daily for five weeks, without any tolerance of the drug being established. In small doses it simply caused vomiting, while larger ones (3 grs. and upwards) did not give rise to this effect, but caused symptoms of poisoning, *sc.*, weakness of hind limbs, staggering gait, salivation. It produced no effect on the sensory or motor nerves, on the muscles, or on the blood-pressure. Chloroform narcosis prevented its emetic action. In man, ·15 to ·3 grs. given by the mouth, are stated to cause vomiting, without previous nausea, in ten minutes. Subcutaneously administered ·05 gr. to ·1 gr. produce the same effect. It depresses the pulse slightly, like ipecacuanha. No irritation of the skin is caused at the point of injection.

10. *Apocodeia* resembles apomorphia in its action, but is much weaker. Moreover, it causes local irritation when given by the skin.

The actions of the other crystalline principles of opium are as yet almost unknown; the resinous matter (containing minute quantities of lanthopine, laudanine, &c.) possesses considerable power, and in one case in which it was administered in rather large doses, giddiness and great contraction of the pupils ensued.

Therapeutics of Opium. Opium, when taken internally, in small doses, produces, at first, some excitement of the vascular and nervous systems, shown by increased fulness and rapidity of

the pulse, exaltation of the mental functions, and very pleasant sensations; these after a time are followed by a feeling of drowsiness, and at last by sound sleep, often accompanied with perspiration; on awakening, the individual usually feels some nausea and headache, the tongue is furred, there is loss of appetite, thirst, and a torpid state of the bowels. If pain or spasm be present, these are relieved, while at the same time the influence of the drug in producing sleep is much diminished. The stimulant effect of opium does not last long, usually not more than half an hour, and when the dose is large and the patient unaccustomed to the drug, it is often scarcely noticed, the soporific influence being very speedily produced; certain conditions of the system and the previous long-continued use of the medicine hinder or prevent the soporific effect, but favour the development of the symptoms of excitement; when large doses are taken the sleepiness becomes intense, and there is great difficulty in awakening the patient; in still larger doses poisonous symptoms ensue, the sleep passing into a condition of stupor or coma, with gradually increasing slowness of respiration, feebleness of pulse, cold perspiration, and contracted pupils, followed by death.

The influence of opium upon the different organs and functions of the body may be thus enumerated:—

On the *Digestive Organs;* it impairs appetite and the digestive process, causes thirst, diminishes the secretions from the whole mucous membrane, and induces constipation.

On the *Brain* and *Nervous System* the action of opium is most powerfully exerted, as is shown in the primary exaltation of the mental faculties and the subsequent sleep and coma; the pupils of the eyes become contracted, even to a point, when the patient is powerfully under the influence of the drug; the spinal cord is sometimes affected, and tetanic symptoms may occur.

On the *Vascular System;* opium acts at first as a stimulant and then as a sedative; both effects are probably induced through the medium of the nervous system; when given in small doses, frequently repeated, the force of the circulation can be kept up for a long time.

On the *Cutaneous System;* opium causes free perspiration, an effect for which the drug is often prescribed, and which is much increased by combination with ipecacuanha, camphor, &c.

On the *Secreting* and *Excreting Organs*, with the exception of the skin, the effect of opium is to lessen their activity; the bile is

diminished, as seen in the pale-coloured fæces ; the urine often becomes scanty, and also the saliva and buccal mucus.

On the *Respiratory System*, opium produces a sedative effect, diminishing the frequency of the respirations, and hence impairing the oxidation of the blood.

On the *Sexual System*, opium acts as a stimulant, especially in males, and has been employed in Eastern countries as an aphrodisiac.

Applied to the skin opium appears to possess some power of allaying pain, and is often added to fomentations. When the cutis is denuded, the opium and morphia salts become absorbed and produce constitutional effects. Applied also to the mucous membrane of the rectum in the form of suppository or enema, not only the local but the general symptoms of the drug are produced. Within the last few years, opium, and more especially the salts of morphia, have been extensively employed in the form of subcutaneous injection. When opium or morphia is applied to the conjunctiva it does not cause contraction of the pupil, although this phenomenon results from its internal administration.

The effects of opium compared with those produced by belladonna will be found discussed under the latter medicine.

Opium is perhaps more extensively used than any other drug, and of such value is it, that it has been called the "gift of God" to man.

It may be employed to allay *pain* and *spasm*, occurring in almost any condition of the system, as in the varieties of neuralgia and colic, during the passage of renal or biliary calculi, in tetanus and inflammations of various kinds : in short, pain, from whatever cause arising, is usually advantageously treated by opium.

In *Inflammation* it is given not only to assuage pain and spasm, but to control diseased action ; opium seems to have some power over the capillary circulation, which is advantageously made use of after depletion; perhaps this may be exercised through the medium of the nervous system ; it is very commonly given, combined with calomel, in cases of inflammation, where it is valuable not only for the influence it exerts over the disease, but also from its preventing the mercurial salt from running off by the bowels. Opium is given with tartar emetic, in several forms of inflammation. In inflammation of mucous membranes, opium may or may not be useful ; when the air passages are affected, opium should be cautiously administered ; but when the intestinal tube is involved,

as in dysentery, its property of checking secretion and allaying irritability is of much value.

In *Fevers* opium may be sometimes used when nervous symptoms, as tremor, and watchfulness, occur, attended with deficient power of the heart; it should always be given in small doses, and the effects watched. In intermittent fevers, or agues, opium sometimes suffices for the cure, when given before the time of accession of the cold stage; but there are other remedies which possess greater antiperiodic powers, without the narcotic properties; opium, however, may be occasionally used in intermittent cases with advantage.

In diseases of the *Nervous System*, when attended with increased vascular action, opium is generally injurious; but when there is defective power of the circulation, as in delirium tremens, and allied affections, then the value of the drug becomes very evident.

In *Hæmorrhages*, opium is often useful, especially when there has been much loss of blood, and consequent excitement of the pulse; whether the drug acts as a direct astringent is doubtful; it is usually combined in such cases with acetate of lead, and gallic acid.

In *Mucous Discharges*, opium is often of service, especially in diarrhœa; sometimes also in leucorrhœa, &c.; but the condition of the system must be the guide to the administration of the drug in these cases; certain forms of ulcers, of a phagedænic character, or those occurring in very weak subjects, are greatly improved by the influence of this remedy.

In *Urinary Diseases*, to lessen the amount of urine, if excessive, as in diabetes; and to allay the irritability of the bladder, occurring in many affections of the urinary organs, opium is employed with advantage.

In *Chest Affections*, this drug should be used with caution; it often allays the cough; but when the respiratory function is seriously impaired, increased dyspnœa is sometimes produced by it; opium tends to diminish the expectoration, an effect at times desirable, but often injurious.

Opium is used in the form of suppository in painful diseases of the rectum and bladder, and chordee; also as an enema in similar cases. It may be applied to the skin in the form of fomentation, over painfully inflamed joints and other parts; and as a liniment or plaster in neuralgic, rheumatic, or other diseases.

Circumstances influencing the operation of Opium.

Age has great influence ; children are much more affected than adults ; much more than in proportion to the age ; and opium must be given with the greatest care to infants and young subjects.

Certain *individuals* are peculiarly susceptible of the action of opium ; and in some, great excitement and restlessness are produced, instead of calmness and sleep.

The presence of *Disease* often gives a resisting power to the influence of this drug, especially when great pain is present. On the other hand, opium should be given with very great caution in chronic renal disease, certain forms of cerebral mischief, and in bronchial and acute pulmonary affections.

Custom or habit has perhaps the most marked influence on its action ; by gradually increasing the dose, enormous quantities may be taken without any very evident effect being produced ; the want of the drug in such cases is, however, most severely felt. The author knew a young man who took 60 grains of Smyrna opium night and morning, and, frequently, in addition to this, 1 fluid ounce to 1½ fluid ounce of laudanum during the day. And in 1866 he had a patient, a man about 35 years of age, under his care, who positively asserted that he had taken 72 grains of acetate of morphia in one day, and also that he had swallowed as much as a pint of laudanum : the patient had once been a student of medicine, and no ordinary dose of opium appeared to produce the slightest effect on him.

If the drug be discontinued, and after a time the large dose at once resumed, poisoning may occur.

Dose. Of opium, ¼ to 3 gr. or more ; of confection of opium, 5 gr. to 20 gr. ; of extract of opium, ¼ gr. to 3 gr. or more ; of liquid extract of opium, 4 min. to 40 min. or more ; of tincture of opium (laudanum), 4 min. to 40 min. or more ; of ammoniated tincture of opium, ½ fl. dr. to 1 fl. dr. ; of wine of opium, 4 min. to 40 min. or more ; of aromatic powder of chalk and opium, 10 gr. to 60 gr. ; of compound soap pill, 3 to 5 gr. ; of compound ipecacuanha powder, 5 gr. to 15 gr. ; of compound powder of kino, 5 gr. to 20 gr. ; of compound powder of opium, 2 gr. to 5 gr. ; of compound tincture of camphor, 15 min. to 1 fl. drm. ; of pill of lead and opium, 4 gr. to 8 gr. ; of opium lozenges, one to four ; of hydrochlorate or acetate of morphia, ⅛ gr. to 1 gr. ; of solution of acetate of morphia, 10 to 60 min. ; of solution of hydrochlorate of morphia, 10 min. to 60 min. ; of morphia lozenges, one to

four, of morphia and ipecacuan lozenges, one to four. Of injectio morphiæ hypodermica (administered subcutaneously), 1 minim to 6 minims.

Adulteration. Opium often contains many mechanical impurities, as stones, sand, clay, bullets, &c.; it may also be mixed with vegetable extracts of various kinds, sugar and treacle; it may contain much water, and it may have had much of its active matter extracted by water, and subsequently dried; physical examination will throw much light on the value of the drug, but on account of its very varying quality, processes are employed for ascertaining the amount of morphia contained in it, and this is taken as the index to the commercial value of the drug. The process given above may be resorted to with advantage. Good Smyrna opium should yield 10 per cent. of morphia; Egyptian opium about 6 or 7 per cent.; East Indian, from 3 to 8 per cent. or more.

Rhœados Petala. RED POPPY PETALS. The dried petals of Papaver Rhœas, the Red or Corn Poppy; indigenous; growing in fields and waste places.

Description. The petals are of a rich scarlet colour when fresh, becoming dull red or dingy on drying. They have the peculiar heavy odour of opium when fresh, but become scentless on drying.

Prop. & Comp. The petals yield to water *red colouring matter*, for which they are chiefly prized; this colour is much darkened by alkalies. They contain no trace of morphia, but an alkaloid, *Rhœadine* ($C_{21}H_{21}NO_6$). (*See* under Opium alkaloids.)

Off. Prep. SYRUPUS RHŒADOS. Syrup of Red Poppy. (Red poppy petals, thirteen ounces; boiling distilled water, one pint, or a sufficiency; sugar, two pounds and a quarter; rectified spirit, two fluid ounces and a half. Add the red poppy petals gradually to the water, heated in a water-bath, frequently stirring; then set the vessel aside, macerate for twelve hours; afterwards press out the liquid. Strain, add the sugar, and dissolve by means of heat. When nearly cold add the spirit, and as much distilled water as may be necessary to make up for the loss in the process, so that the product shall weigh three pounds ten ounces, and have the specific gravity 1·330.

Therapeutics. The action of red poppy is very slight, but similar to that of opium; the amount of active ingredients is

very small, and rather uncertain in quantity. It is chiefly used as a colouring agent.

Dose. Of syrupus rhœados, from 1 fl. drm. upwards.

CRUCIFERÆ, OR BRASSICACEÆ.

Sinapis. Mustard. The seeds of Sinapis nigra and Sinapis alba, or Black and White Mustard; also the seeds reduced to powder, mixed; plants common in Europe.

Oleum Sinapis. Oil of Mustard. The oil distilled with water from the seeds of Black Mustard, after the expression of the fixed oil.

Description. Black mustard seeds are very small, round, wrinkled, and brownish-black on the surface, yellow within; white mustard seeds are larger, and yellow on the surface. The seeds reduced to powder are the officinal part.

Prop. & Comp. When crushed, both seeds yield the flour of mustard; the best is made from the mixed seeds; when dry, it has little or no odour, but an acrid bitterish oily pungent taste, and gives off, when moist, a peculiar pungent smell, very irritating to the eyes and nostrils. Both seeds contain a *fixed oil*, from 25 to 35 per cent. Black mustard contains no *volatile oil* ready formed, but a principle named *myronic acid*, united with potash, constituting about $\frac{1}{3}$ per cent.; the myronate of potash has the composition ($C_{10}H_{18}KNS_2O_{10}$); and by the action of an albuminous matter, also contained in the seed, and termed *myrosine*, breaks up, in the presence of water, at 120° F., into the volatile oil of mustard, glucose, and hydropotassic sulphate, with some free sulphur and an insoluble organic substance, derived probably from the myrosine. ($C_{10}H_{18}KNS_2O_{10}=KHSO_4+C_3H_5.CN.S+C_6H_{12}O_6$.) The *volatile oil of mustard* is of a light yellow colour; sp. gr. about 1·015; very pungent and acrid; has the properties and composition of sulphocyanate of Allyl ($C_3H_5.CN.S$). It dissolves in alcohol and ether, slightly in water. Applied to the skin it produces almost instant vesication. White mustard does not yield the volatile oil, but contains a crystallizable compound, *sulpho-sinapisin*, which gives rise to an acrid but not volatile principle, containing sulphur. This compound has been supposed to be the sulphocyanate of a peculiar alkaloid sinapine ($C_{16}H_{23}NO_5$). The fixed oil of mustard contains *erucic* acid ($C_{22}H_{42}O_2$). A de-

coction of flour of mustard when cooled should not be made blue by tincture of iodine, indicating the absence of starch.

Off. Prep. of the Seeds. CATAPLASMA SINAPIS. Mustard Cataplasm. (Boiling water, ten fluid ounces ; linseed meal, powdered mustard, of each two ounces and a half. Add the powders, first well mixed, to the water by degrees; keep stirring that a cataplasm may be formed.) Too hot water, or alcohol, or vinegar are apt to injure the production of the volatile oil.

CHARTA SINAPIS. Mustard Paper. (Black mustard seeds, in powder, one ounce ; solution of gutta percha, two fluid ounces, or a sufficiency. Mix the mustard with the gutta-percha solution so as to form a semi-fluid mixture ; then pass strips of cartridge-paper over its surface, so that one side of the paper shall be thinly coated with it. Dry the sheets by exposure to the air.) Before applying this paper to the skin, it should be dipped for a few seconds into tepid water.

Of the volatile Oil. LINIMENTUM SINAPIS COMPOSITUM. Compound Liniment of Mustard. (Oil of mustard, a fluid drachm ; ethereal extract of mezereon, forty grains ; camphor, a hundred and twenty grains ; castor oil, five fluid drachms ; rectified spirit, four fluid ounces.)

Therapeutics. Mustard, both seeds and flour, act as powerful stimulants. Internally, in large doses, mustard causes speedy vomiting (useful in narcotic poisoning) ; in smaller doses, as a condiment, it assists digestion. The entire seed was formerly used, and now and then caused ill effects, from accumulating in the intestines. Externally, in the form of the mustard cataplasm, it acts as a powerful rubefacient and vesicant, and its application is useful to relieve slight inflammations of serous and mucous surfaces when applied to a neighbouring part ; as for example, upon the chest in bronchitis and pleurisy ; also to relieve congestion of various organs by drawing blood to the surface, as in head affections ; and likewise for the alleviation of neuralgic and other pains and spasms. Mustard is frequently added to local baths, as for the feet.

The volatile oil (Oleum Sinapis of the Pharmacopœia) is a very useful local application ; the author has long used it combined with Spirits of Camphor, in the proportion of ten minims to the fluid ounce, lightly sprinkled on impermeable piline, as an elegant substitute for a mustard plaster, or sometimes combined with the Belladonna liniment. The oil may also be employed in the

form of the Compound Liniment of Mustard of the British Pharmacopœia.

Dose. As an emetic, from one teaspoonful to a tablespoonful of mustard flour mixed with a little water.

Adulteration. Flour of mustard is extensively mixed with common flour, pepper, chilies, turmeric, &c.

Armoraciæ Radix. Horseradish Root. The fresh root of Cochlearia Armoracia. Cultivated in Britain. Common throughout Europe.

Description. A long, tap-shaped cylindrical root, half an inch to an inch in diameter, expanding at the crown into several very small stems; internally white. When cut it has an odour, but probably when uncut it contains no volatile oil.

Prop. & Comp. When scraped, it emits a very pungent odour, and has an acrid taste, depending on a *volatile oil* ($C_3H_5.CN.S$) identical with oil of mustard; probably the oil is formed as in the black mustard seed.

Off. Prep. SPIRITUS ARMORACIÆ COMPOSITUS. Compound Spirit of Horseradish. (Horseradish sliced, dried orange peel, each twenty ounces; bruised nutmeg, half an ounce; proof spirit, a gallon; water, two pints. Mix them; let a gallon distil with a moderate heat.)

Therapeutics. The same as mustard; seldom employed in the fresh state except as a condiment. The officinal preparation is used in atonic dyspepsia; also as a sudorific in chronic rheumatism; and as a diuretic in dropsies. As a syrup it has been slowly swallowed in hoarseness; an infusion is also occasionally prescribed for the same purpose, or the root may be masticated, and the saliva slowly swallowed.

Dose. Of the spirit, 1 fl. drm. to 2 fl. drm.

POLYGALACEÆ.

Senegæ Radix. Senega Root; the root of Polygala Senegæ: a small plant growing in the United States of America.

Description. A knobby root-stock, or knotty head with roots proceeding from it about the thickness of a quill, twisted and keeled. Cortical portion is greyish-yellow, the interior or central portion is woody, tasteless, and inert.

Prop. & Comp. Taste sweetish, and acrid to the fauces, increas-

ing the flow of saliva; it contains a glucoside called *senegin* or *polygalic* acid, probably identical with *Saponin*, $C_{32}H_{54}O_{18}$, derived from Saponaria officinalis, which breaks up, on being boiled with dilute acids, into sapogenin and glucose. ($C_{32}H_{54}O_{18}+2H_2O=C_{14}H_{22}O_2+3C_6H_{12}O_6$). It is an acrid white powder, causing sneezing when applied to the nostrils; moreover, it is said to cause local anæsthesia, by paralyzing the sensory nerve-ends, when topically applied to the skin. Senega root also contains tannin, pectin, gum, &c. The active part of the root is the cortex.

Off. Prep. INFUSUM SENEGÆ. Infusion of Senega. (Senega, bruised, half an ounce: boiling distilled water, ten fluid ounces.)

TINCTURA SENEGÆ. Tincture of Senega. (Senega, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Senega root is a stimulant to the mucous membranes, acting especially on the bronchial tubes; it also acts upon the skin as a stimulating diaphoretic; and at times its diuretic powers are well marked. The uterus appears to be influenced by its administration, and it is therefore termed an emmenagogue. It is used in the treatment of chest affections, as chronic pneumonia and asthenic and chronic forms of bronchitis; sometimes in croup and whooping-cough. Senega has also been found useful in dysmenorrhœa, apparently from its action upon the mucous lining of the uterus. As a diuretic, it is employed chiefly in dropsy depending on kidney disease and accompanied with albuminuria. It is stated that under the influence of Senega the pulsations of the heart are rendered less frequent, and that it is useful in heart disease attended with weak and dilated cavities: probably acting in the same way as Digitalis. Senega is often advantageously combined with carbonate of ammonia, and with other expectorants and diuretics.

Dose. Of the powder, 20 gr. to 60 gr.; of the infusion, 1 oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.

Adulteration. Ginseng, or root of Panax quinquefolium; also Gillenia, detected by absence of the line running along the true senega root.

Krameriæ Radix. Rhatany Root; the dried root of Krameria triandra; growing in Peru and Chili.

Description. Generally a large root-stock about an inch in

diameter, with long roots from one-sixth to half an inch thick proceeding from it. Externally, dark red or reddish brown; internally, paler red. The powder is red.

Prop. & Comp. Rhatany has no odour, but a sweetish astringent taste, tinging the saliva very red. It contains *krameric acid*, of which little is known, about 40 per cent. of *tannin*, and a red astringent matter, both of which are soluble in water and alcohol.

Off. Prep. Extractum Krameriæ. Extract of Rhatany. (Rhatany, in coarse powder, one pound; distilled water, a sufficiency. Prepared by maceration, percolation, and subsequent evaporation.)

Infusum Krameriæ. Infusion of Rhatany. (Rhatany, half an ounce; boiling distilled water, ten fluid ounces.)

Tinctura Krameriæ. Tincture of Rhatany. (Rhatany, bruised, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.) Krameria is also contained in Pulvis Catechu Compositus.

Therapeutics. A powerful astringent; it may be employed whenever tannin is indicated; it is useful in chronic forms of diarrhœa and dysentery, and may be given in the various forms of hæmorrhage. The powder has had much repute as a dentifrice when the gums are bleeding or spongy. It may also be used as a gargle or injection in relaxed sore throat, leucorrhœa, and prolapsus ani, in the form of the infusion or diluted tincture.

Dose. Of the powder, 20 gr. to 60 gr.; of the extract, 5 gr. to 20 gr.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.

SAPINDACEÆ.

Guarana. The powdered seeds of Paullinia sorbilis, from Brazil. (Not officinal.) Known also as Brazilian cocoa.

Description. The dried seeds, after being slightly roasted, are powdered, and made into a stiff paste with water. With this paste a certain proportion of the whole and broken seeds is mingled; the mass is then moulded into cylindrical rolls, not unlike sausages, for the market. An infusion of this product is drunk like coffee or chocolate in S. America.

Prop. & Comp. Guarana owes its therapeutic value to the *caffein*, of which it contains a larger proportion (5 per cent.) than either tea or coffee. (*See* Thea.) *Tannic acid*, *starch*, and *gum*, are also present.

Therapeutics. It has been recommended by Dr. Wilks and others as a remedy for migraine or sick headache. It probably acts in much the same way as strong tea. One or two doses will frequently ward off a threatened attack in persons liable to recurrent paroxysms of the disorder; but its action is somewhat uncertain. It has also been employed against diarrhœa and dysentery, on account of its astringent properties.

Dose. Of powdered guarana, 15 to 30 grs. taken when the attack is expected, and repeated, if necessary, in two hours. An extract may be made by exhausting the powder with alcohol and evaporating; the dose of the extract is the same as that of the powder.

ERYTHROXYLACEÆ.

Coca. The leaves of Erythroxylon Coca, native of S. America. (Not officinal).

Description. The shrub is about six feet high. The leaves are shortly petiolate, oval, entire, pointed, 1—3 inches in length. The dried leaves are mixed with lime and chewed by the natives of Peru.

Prop. & Comp. The leaves contain an alkaloid, *cocaine* ($C_{17}H_{21}NO_4$) in combination with a variety of tannic acid. Cocaine forms salts with the mineral acids; it is precipitated by the chlorides of gold and platinum. Heated with strong hydrochloric acid, it is resolved into a new alkaloid, ecgonine, together with benzoic acid and methyl alcohol.

Therapeutics. The leaves, when chewed, are said to exert a powerfully restorative, stimulant, and perhaps narcotic effect. The South American Indians can endure fatigue for days together without food, if furnished with coca. Its action probably resembles that of guarana, but is in much need of clinical investigation.

Dose. 120 grs. to 240 grs. of the leaves infused in hot water.

LINACEÆ.

Lini Semina. The seeds of Linum usitatissimum; common Linseed or flax; an indigenous plant.

Lini Farina. Linseed Meal.

Lini Oleum. Linseed Oil.

Description. The *seed* is small, oval, oblong, and flattened, pointed at one end; dark brown and shining on the surface, and

white within. The *flour* or linseed meal, consists of the seeds ground and deprived of their oil by expression, and the cake reduced to powder. The *oil* is of a light yellow colour, similar in appearance to most other vegetable oils.

Prop. & Comp. The seeds contain a *fixed oil*, about 20 per cent., and *mucilage*, together with the ordinary constituents of seeds : the oil is found in the kernel, the mucilage in the envelope or testa of the seed. After the expression of the oil, the marc which remains is called linseed or oil-cake : and when powdered, linseed meal. The fixed oil, sp. gr. 0·93, rapidly absorbs oxygen from air and forms a varnish, hence called a drying oil ; it contains palmitin (and perhaps stearin) with a glyceride of linoleic acid ($C_{16}H_{28}O_2$), the latter in much greater quantity.

Off. Prep. of the Meal. Cataplasmi Lini. Linseed Poultice. (Boiling water, ten fluid ounces ; linseed meal, four ounces ; olive oil, half a fluid ounce. Mix the linseed meal with the oil, then add the water gradually, constantly stirring.) Crushed seeds, unless the oil is first removed, become rancid ; the addition of the olive oil in the cataplasm is for the purpose of supplying anew this oleaginous ingredient.

Of the Seed. Infusum Lini. Infusion of Linseed. (Linseed one hundred and sixty grains ; fresh liquorice, sliced, sixty grains ; boiling distilled water, ten fluid ounces.) The seeds are used without being crushed, as the mucilage is contained in the covering.

Therapeutics. Internally, when given in the form of the infusion, linseed is demulcent, from the mucilage and the little oil contained in it, and has been employed in catarrhal and urinary affections ; also in diarrhœa and dysentery. Externally, in the form of the poultice, linseed is used to inflamed and suppurating parts. The oil is a useful emollient to burns or scalds, either alone or mixed with lime-water, and the old Linimentum Calcis, Edin., is made with it in place of olive oil.

Dose. The infusion may be taken *ad libitum*.

MALVACEÆ.

Gossypium. Cotton Wool. A filamentous substance attached to the seeds of Gossypium herbaceum and other species of this genus. Carded.

Description. Cotton consists of fine filaments or tubular hairs,

becoming flattened by drying, which were attached to the seed-coat ; these tubes have but few joints when examined by the microscope : cotton can be distinguished from linen by the fibres of the latter having tapering ends, and being aggregated in bundles. In composition it resembles cellulin ($C_{18}H_{30}O_{15}$). It is used for the preparation of pyroxylin, gun cotton.

Use. CARDED COTTON is used as an application to burns and scalds, diminishing the inflammation, and aiding recovery probably by protecting the surface : occasionally employed in erysipelas. Cotton is also usefully employed to surround joints inflamed with gout ; it should then be completely covered with oil-silk or gutta-percha tissue, so as to keep the affected parts in a kind of vapour bath.

Pyroxylin. Gun Cotton.

Prep. By immersing an ounce of cotton in five fluid ounces of sulphuric, and the same amount of nitric acid, for three minutes, and afterwards well washing, and drying in a water bath.

Prop. & Comp. It is readily soluble in a mixture of ether and rectified spirit, and leaves no residue when exploded by heat. It resembles cellulin in composition, with a certain number of equivalents of hydrogen replaced by peroxide of nitrogen ($C_{18}H_{23}(NO_2)_7O_{15}$). It is used in the Pharmacopœia for the preparation of Collodion.

Collodium. Collodion.

Prep. Pyroxylin, one ounce ; ether, thirty-six fluid ounces ; rectified spirit, twelve fluid ounces. Dissolve the pyroxylin in the ether, mixed previously with the rectified spirit.

Prop. A colourless highly inflammable liquid with ethereal odour, which dries rapidly upon exposure to the air, and leaves a thin transparent film, insoluble in water and rectified spirit.

Collodium Flexile. Flexible Collodion.

Prep. Collodion, six fluid ounces ; Canada balsam, a hundred and twenty grains ; castor oil, a fluid drachm. Mix and keep in well-corked bottle.

Use. COLLODION, when applied to the skin, leaves on the evaporation of the ether, a thin transparent layer, and may be used to cut and inflamed surfaces, in skin diseases, as small-pox, and chapped nipples ; to arrest hæmorrhage from leech bites, &c. : in some of these cases it acts by forming a protecting surface ; in

others, through the contraction of the film constricting the vessels of the injured part. For surgical purposes the flexible collodion is the more useful, as it does not crack.

AURANTIACEÆ.

Aurantii Fructus. The ripe fruit of Citrus Bigaradia, the Seville or bitter orange tree ; growing in southern Europe, Spain, &c.

Aurantii Cortex. Bitter Orange Peel. The exterior rind of the bitter orange, dried.

Aurantii Floris Aqua. Orange Flower Water. Water distilled from the flower of Citrus Bigaradia, and Citrus Aurantium, the sweet orange tree, prepared mostly in France.

Description. The cortex, or rind, is well known ; it has an aromatic bitter taste and fragrant odour ; the interior white portion should be removed. Aqua Floris Aurantii has the grateful odour of the orange blossoms.

Prop. & Comp. The cortex, or rind, contains a *volatile oil*, isomeric with oil of turpentine ($C_{10}H_{16}$), a *bitter extractive* (hesperidin), and a little *gallic acid.* Aqua Floris Aurantii contains a little *volatile oil* (oil of Neroli), differing from that contained in the cortex. The water should be colourless, with a fragrant odour. It should not be coloured by sulphuretted hydrogen.

Off. Prep. of the Peel:—

Infusum Aurantii. Infusion of Orange Peel. (Bitter orange peel, half an ounce ; boiling distilled water, ten fluid ounces.)

Infusum Aurantii Compositum. Compound Infusion of Orange Peel. (Bitter Orange Peel, a quarter of an ounce ; fresh lemon peel, sixty grains ; cloves, thirty grains ; boiling water, ten fluid ounces.)

Syrupus Aurantii. Syrup of Orange Peel. (Tincture of orange peel, one fluid ounce ; syrup, seven fluid ounces.)

Tinctura Aurantii. Tincture of Orange Peel. (Bitter orange peel, cut small and bruised, two ounces ; proof spirit, one pint. Prepared by maceration and percolation.)

Tinctura Aurantii Recentis. Tincture of Fresh Orange Peel. (Fresh peel of the bitter orange, six ounces ; rectified spirit, one pint. Prepared by maceration and expression.) The

flavour of this tincture is stronger and more agreeable than that of the tincture prepared with the dried rind.

VINUM AURANTII. See p. 157.

Of the Orange Flower Water:—

SYRUPUS AURANTII FLORIS. Syrup of Orange Flower Water. (Orange flower water, eight fluid ounces; refined sugar, three pounds; distilled water, sixteen fluid ounces, or a sufficiency to make the product four pounds and a half. The sp. gr. should be 1·33.)

Orange peel is contained in some preparations of gentian.

Therapeutics. The rind is an aromatic bitter stomachic, a pleasant adjunct to other bitters in the treatment of dyspepsia; it covers, to some extent, the taste of quinine. Aqua Floris Aurantii, and Syrupus Floris Aurantii, are only used as vehicles, and to give flavour to other medicines. Orange wine is used in making the wine of the citrate of iron and the quinine wine.

Dose. Of infusion of orange peel, 1 oz. to 2 oz.; of compound infusion of orange peel, 1 oz. to 2 oz.; of the tinctures of orange peel, 1 fl. drm. to 2 fl. drm.: of syrup of orange peel, 1 fl. drm. to 2 fl. drm.; of orange flower water, 1 fl. oz. to 2 fl. oz.; of syrup of orange flower water, 1 fl. drm. to 2 fl. drm.

Adulteration. Orange flower water may contain lead, derived from the vessels in which it is imported; this can be detected by passing sulphuretted hydrogen through it; when free from metallic impurity it is not discoloured.

Limonis Cortex. Lemon Peel. The fresh outer part of the rind of the fruit of Citrus Limonum, the Lemon tree. Lemons are imported from Southern Europe.

Limonis Oleum. Oil of Lemons. The oil expressed or distilled from the fresh lemon peel; imported chiefly from Sicily.

Limonis Succus. Lemon Juice. The expressed juice of the ripe fruit of Citrus Limonum.

Description. The *rind*, familiar to all, should have the interior white portion removed; it occurs in thin slices of a yellow colour, dotted with numerous vesicles of oil, with a fragrant odour and aromatic, slightly bitter, taste.

The *volatile oil* is usually obtained by rasping the outer portion

of the rind, and pressing it in hair sacks, sometimes by distillation; it is of a pale yellow colour, with the odour and taste of the peel: the oil obtained by distillation is purer, but less pleasant in flavour.

The *juice*, made by pressing the fruit and straining, forms a slightly turbid, almost colourless mucilaginous acid liquid, possessing a sharp acid taste and grateful odour.

Prop. & Comp. The rind contains the *volatile oil*, a *bitter extractive* and a little *gallic acid;* also a principle, *Hesperidin*, which crystallizes in fine white needles.

The volatile oil, *Limonis Oleum*, sp. gr. 0·85, consists of two isomeric oils (as is the case with most volatile oils). Composition, $(C_{10}H_{16})$.

The juice, *Limonis Succus*, sp. gr. 1·039, contains *citric acid* $(H_3C_6H_5O_7.H_2O)$, described under acids, in the inorganic department, and *mucilage*, with small quantities of malic acid, acid salts, especially those of *potash*, and sugar. Each ounce of lemon juice contains about thirty-two grains of citric acid.

Off. Prep.—Of the Peel. Syrupus Limonis. Syrup of Lemons. (Fresh lemon peel, two ounces; lemon juice, strained, twenty fluid ounces; sugar, two pounds and a quarter.) The product should weigh three pounds and a half, and should have the sp. gr. 1·34.

Tinctura Limonis. Tincture of Lemon Peel. (Fresh lemon peel, sliced thin, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.)

Oil of lemons is contained in Spiritus Ammoniæ Aromaticus.

Lemon juice is contained in syrup of lemons.

Therapeutics. The peel is an aromatic stomachic; the volatile oil a stimulant and carminative when given internally, and stimulant and rubefacient externally applied; the juice is refrigerant, resembling a solution of citric acid, and may be used for making effervescing draughts, in lieu of that acid. It possesses some powers besides, which render it antiscorbutic, whereas citric acid is not; the author attributes this power to the potash salts contained in it. Lemon juice has been proposed as a remedy in rheumatism, but as yet there is no good clinical evidence proving its value in this disease. Many patients with acute rheumatism recover pretty rapidly when taking lemon juice, but many get well equally soon when taking coloured water.

Dose. Of the syrup, 1 fl. drm. to 2 fl. drm. or more; of the tincture, 1 fl. drm. to 2 fl. drm.; of the oil, 1 min. to 5 min.; of the juice, 1 fl. drm. to 4 fl. drm. or more.

Adulteration. Oil of lemons is liable to admixture with oil of turpentine, difficult to detect except when in large quantities.

Lemon juice is frequently mixed with lime juice, which has the same properties; and that used in the navy has a tenth part of brandy added to it to prevent decomposition. A mixture of sugar and water, acidulated with sulphuric acid, has been substituted for lemon juice.

Belæ Fructus. Bael Fruit. The half ripe fruit, dried, of Ægle Marmelos. From Malabar and Coromandel.

Description. A round fruit about the size of a large orange, with a hard rind of a woody consistence. It is usually met with in dried slices or fragments, consisting of the rind, with some adherent dried pulp and seeds; the rind is about a line and a half thick, externally covered with a smooth greyish epidermis, and internally brownish orange or red. The moistened pulp is mucilaginous.

Prop. & Comp. The chemical composition of bael has not been accurately determined; it contains some astringent principle, probably more or less allied to tannic acid.

Off. Prep. Extractum Belæ Liquidum. Liquid Extract of Bael. (Made by exhausting one pound of bael by repeated macerations in twelve pints of water, evaporating the solution to fourteen fluid ounces, and then adding two fluid ounces of rectified spirit.)

Each fluid ounce of the extract represents one ounce of bael.

Therapeutics. Indian bael has obtained much reputation in India in the treatment of diarrhœa and dysentery. From the author's experience of its powers in chronic diarrhœa, he is not disposed to consider it superior to some other vegetable astringents. The fruit, when ripe, yields a pulp which can be made into a jelly, and acts as a mild aperient.

Dose. Of the liquid extract of bael, 1 fl. drm. to ½ fl. oz.

BYTTNERIACEÆ.

Oleum Theobromæ. Oil of Theobroma.

Synonym. Cacao Butter. A concrete oil obtained by expression and heat from the ground seeds of Theobroma Cacao; a tree growing in the West Indies and South America.

Description. The tree yields the chocolate nuts. The oil obtained from them has the consistency of tallow, is of a yellowish colour, and odour like chocolate, with a bland and agreeable taste; it breaks with a clean fracture, presenting no appearance of foreign matter; does not become rancid from exposure to the air.

Prop. & Comp. Oil of theobroma melts at about 95° Fah.; it is insoluble in water, soluble in alcohol, ether, and oil of turpentine. It is composed chiefly of stearin, with a little olein, and forms about fifty-two per cent. of good shelled cacao beans.

Use. Cacao butter is introduced into the Pharmacopœia on account of its physical properties, and is used in the formation of some of the suppositories.

CAMELLIACEÆ.

Thea. Tea. The dried leaves of Thea sinensis. Cultivated in China, Assam, &c. (Not officinal.)

Description. The appearance of tea-leaves is well-known. The black and green varieties were at one time believed to be derived from distinct species; it appears, however that the differences between them are due solely to the mode of preparation. Green tea is made by rapidly drying the leaves, while the black teas consist of leaves which have undergone a process of fermentation.

Prop. & Comp. Tea-leaves contain an alkaloid, *theine* or *caffeine*, together with *tannin* and a *volatile oil.* This alkaloid is also present in coffee (the seed of Coffea Arabica, Nat. Ord. Cinchonaceæ), in guarana (*q.v.*) in maté or Paraguay tea (the leaves of Ilex Paraguayensis, Nat. Ord. Aquifoliaceæ). When pure, caffeine forms beautiful silky prisms, soluble in water, alcohol, and ether; it is precipitated by tannin, and sublimes when heated. Formula, $C_8H_{10}N_4O_2$; it is allied to *theobromine*, the active principle of Theobroma Cacao; indeed it may be regarded as methyl-theobromine, $C_7H_7(CH_3)N_4O_2$. Tea contains from one to four per cent. of the alkaloid.

Therapeutics. The experiments of Bennett and McKendrick on animals have led them to conclude that caffeine (whether derived from tea, coffee, or guarana), cocaine (*see* Coca) and theobromine are identical in their physiological action. In small doses they give rise to cerebral excitement and partial loss of sensibility. After large ones, the loss of sensibility is complete; tetanic convulsions and death ensue. The sensory nerves and the sensory

portion of the cord appear to be paralysed without any interference with the functions of the anterior columns and motor nerves; idio-muscular contractility is unaffected. The cardiac and respiratory movements are first accelerated, then retarded.

The effects of tea and coffee on the human subject are not quite the same; the differences between them indicate that their action is not due exclusively to the caffeine which they contain. Their dietetic value used to be ascribed to their power of checking tissue-metamorphosis and so reducing the amount of azotized nutriment required by the organism. The truth of this explanation is doubtful.

Tea and its active principle have been employed medicinally in the treatment of migraine and some intermittent affections; as stimulants in opium coma and the adynamic fevers; in asthma, whooping-cough, and other spasmodic disorders. Green tea is more powerful in its effect on the nervous system than the black varieties; it may cause vertigo, great restlessness, and muscular trembling.

Dose. Of caffeine, 1 gr. to 5 gr. Hypodermically, ½ to 1 gr.

GUTTIFERÆ.

Cambogia. Gamboge. The gum resin obtained from Garcinia Morella, *var.* pedicellata. Imported from Siam. The Ceylon variety, which is not officinal, is derived from Hebradendron gambogioides.

Description. The Siam gamboge occurs in pipes or cylinders, streaked externally, from the impression of the bamboo reeds in which the juice is collected; the pipes are from ½ inch to 1½ inch or more in diameter. Gamboge is hard, brittle, breaking with a vitreous fracture, of a bright yellow colour: inferior varieties, in fragments and masses, also come from Siam; and a coarse kind is made in Ceylon.

Prop. & Comp. No odour, taste slight at first, afterwards acrid, easily powdered. It consists of about 70 per cent. of a *resin*, which has marked acid properties, *gambogic acid* ($C_{30}H_{35}O_6$?) together with about 25 per cent. of a *soluble gum*. The resin is soluble in alcohol and ether, and precipitated from these solutions by water; rubbed with water, the gum dissolves, forming a yellow emulsion with the suspended resin.

Off. Prep. Pilula Cambogiæ Composita. Compound Gamboge Pill. (Gamboge, one ounce; Barbadoes aloes, one ounce;

compound powder of cinnamon, one ounce ; hard soap, in powder, two ounces ; syrup, a sufficiency.)

Therapeutics. Gamboge acts as a drastic and hydragogue purgative, often causing vomiting and griping ; it sometimes promotes the action of the kidneys. It is seldom given alone, but combined with cream of tartar, calomel, or some vegetable purgative. It may be used in dropsies as a hydragogue purgative combined with cream of tartar, a combination which causes copious watery evacuations ; or with calomel as a derivative in some forms of cerebral disease. It may also be used as an anthelmintic. In all cases some aromatic, as ginger or an aromatic oil, should be added. In large doses, gamboge acts as a powerful irritant to the alimentary canal, at times causing inflammation and death. As a purgative it may be placed between scammony and colocynth, or croton oil and elaterium.

Dose. Of the powder, 1 gr. to 5 gr. ; of the compound pill, 5 gr. to 15 gr.

Adulteration. An emulsion made with boiling water does not become green on the addition of iodine, showing the absence of starch, with which it is sometimes adulterated.

CANELLACEÆ.

Canellæ Albæ Cortex. Canella Alba Bark. The bark of Canella alba, or Laurel-leaved Canella ; growing in the West Indies.

Description. The bark occurs in large quills or flattened pieces about an inch or so in diameter, and of varying length ; externally, of a pinkish-white colour ; internally, very white : it breaks with a starchy fracture.

Prop. & Comp. Odour spicy ; taste warm and bitter. It contains a *resin*, a little *volatile oil*, and *bitter extractive*, besides starch and *mannite sugar ;* no tannic or gallic acids are present.

Prep. Used in Vinum Rhei. A mixture of equal parts of powdered canella bark and aloes was formerly known by the name of Hiera Picra.

Therapeutics. An aromatic bitter stomachic and tonic ; it may be given in cases of atonic dyspepsia. It is now seldom used except in combination, as in rhubarb wine. It has been employed in chronic forms of gout, rheumatism, and secondary

syphilis, in the same way as mezereon, sassafras, and other like drugs.

Dose. Of the powder, 15 gr. to 30 gr.

VITACEÆ.

Uvæ. Raisins. The ripe fruit of Vitis vinifera, or the Grape Vine, dried in the sun or with artificial heat: probably a native of Persia, cultivated extensively in different parts of Europe. Imported from Spain.

Prop. & Comp. Raisins contain a considerable amount of *grape sugar* and *acid tartrate of potash*; it is from the grape that tartaric acid is derived, being obtained from argol, the deposit on the sides of wine-casks.

Off. Prep. Raisins are contained in Tinct. cardamomi comp., and Tinct. sennæ.

Therapeutics. Slightly refrigerant, but never used in medicine for any therapeutic property they possess. Used only to sweeten preparations.

Vinum Xericum. Sherry. Sherry is described under the head of Alcoholic preparations.

ZYGOPHYLLACEÆ.

Guaiaci Lignum. Guaiacum, or Guaiac Wood. Lignum Vitæ. The wood of Guaiacum Officinale, the Officinal Guaiacum Tree; a native of St. Domingo and Jamaica; in the form of shavings or raspings by a turning lathe.

Guaiaci Resina. Guaiacum Resin. A resin obtained from the stem of Guaiacum officinale by natural exudation, by exudation from incisions, or by heat.

Description. Guaiacum *wood* is met with in large logs, and known by the name of *Lignum vitæ*, generally denuded of bark, and consisting of the duramen or heart-wood, of a dark greenish-brown colour, and the alburnum of a yellow tint; it is very hard, tough, and heavy; sp. gr. 1·33; the heart-wood contains a large amount of the guaiacum resin, which is dark brown, transparent in very thin layers, brittle, of aromatic odour, and leaving, when tasted, a peculiar burning sensation in the throat; the tears are

oval, of varying size, and often covered with a greenish powder on the surface. The *resin* is usually procured by boring a longitudinal hole in the log, and putting one end of it into the fire; the resin melts and exudes at the other end, where it is collected. That obtained by natural exudation is in the form of tears of varying size. The *wood* is commonly sold in chips or raspings for medicinal purposes; these when boiled in salt water yield the resin, which rises to the surface.

Prop. & Comp. The most important constituent of the wood is the above-described *resin*, which has a sp. gr. 1·25, is insoluble in water, or yields to that fluid only some extractive matter mixed with it; a solution in rectified spirit strikes a clear blue colour when applied to the inner surface of a paring of raw potato, due to the action of guaiacic acid on the gluten; soluble in alcohol and ether, also in alkaline solutions; precipitated from alcohol by water, and from alkalies by acids; acted on by nitric acid and chlorine, when the colour is first shaded green, then blue, at last brown. The resin contains guaiaretic acid, which is crystalline ($C_{20}H_{26}O_4$), about 10 per cent.; guaiaconic acid ($C_{19}H_{22}O_3$), about 70 per cent.; with other vegetable matter.

Off. Prep.—Of the Resin.

Mistura Guaiaci. Mixture of Guaiacum. (Powdered guaiacum, half an ounce; sugar, half an ounce; gum-arabic, powdered, a quarter of an ounce; cinnamon water, one pint.)

Tinctura Guaiaci Ammoniata. Ammoniated Tincture of Guaiacum. (Guaiac resin, in fine powder, four ounces; aromatic spirit of ammonia, one pint.)

Guaiacum *resin* also enters into the composition of pilula hydrargyri subchloridi composita.

Guaiacum *wood* forms an ingredient of decoctum sarsæ compositum.

Therapeutics. Guaiacum resin, when taken internally, often causes heat in the throat, irritation of the intestinal canal, and, in large doses, purging. When absorbed it acts as a stimulant, diaphoretic and alterative, and is by some considered to be an emmenagogue. It is employed in chronic forms of rheumatism, especially that variety called cold rheumatism, in which the symptoms are relieved by warmth; also in periosteal affections connected with a syphilitic taint, and other chronic affections, as gout, skin diseases, and dysmenorrhœa.

Dose. Of guaiac resin, 10 gr. to 30 gr. ; of the mixture, 1 fl. oz. to 1½ fl. oz. ; of the ammoniated tincture, ½ fl. drm. to 1 fl. drm.

Adulteration. Other resins, as that from coniferous trees, detected by their terebinthinate odour, and solubility in oil of turpentine. A simple tincture of guaiacum, when thrown into water, becomes milky, from the precipitation of the resin : if a solution of potash is now carefully added, it is cleared, and remains so after excess of the alkali, provided guaiacum only be present, but not if other resins are contained in the tincture. The presence of guaiacum resin can be shown by the potato test given above.

RUTACEÆ.

Ruta. Rue. The leaf of Ruta graveolens, or Common Rue ; a plant growing throughout Europe. (Not officinal.)

Rutæ Oleum. Oil of Rue. Distilled from the fresh leaves and the unripe fruit of Ruta graveolens or common rue.

Description. The leaves are supra-decompound, the leaflets oblong and ovate, glaucous green, fleshy, and dotted. The oil is of a greenish-yellow colour, sp. gr. about 0·837.

Prop. & Comp. The leaves owe their properties chiefly to the *volatile oil*, which has a strong, disagreeable odour, and acrid taste ; becomes brown by keeping. The composition of this oil appears to be complex ; it is stated to consist chiefly of euodic aldehyde ($C_{11}H_{21}O.H$), mixed with a small amount of lauric aldehyde ($C_{12}H_{24}O$), and a hydrocarbon isomeric with oil of turpentine and borneol. Rue leaves contain, besides this oil, *a bitter extractive* matter, soluble in water.

Therapeutics. Rue, or its oil, acts as a powerful topical stimulant, and has been used in flatulent colic ; it also appears to be an antispasmodic and emmenagogue, and seems useful in hysterical affections, and in epilepsy ; by some it has been thought anthelmintic. Externally, rue may be used as a rubefacient. Sometimes employed in the form of enema.

Dose. Of the powdered leaves, 20 gr. to 40 gr. ; of oil of rue, 2 min. to 6 min.

Buchu Folia. Buchu Leaves. The dried leaves of Barosma betulina, Barosma crenulata, and Barosma serratifolia ; imported from the Cape of Good Hope.

Description. The leaves of all three species are smooth, and marked with pellucid dots (oil glands) at the indentations and apex, and possess a powerful odour and camphoraceous taste.

The leaf of *Barosma betulina* is about three quarters of an inch long, coriaceous, obovate, with a recurved truncated apex, and sharp cartilaginous spreading teeth.

The leaf of *Barosma crenulata*, about an inch long; oval-lanceolate, obtuse, minutely crenated, five-nerved.

The leaf of *Barosma serratifolia*, from an inch to an inch and a half long, linear-lanceolate, tapering at each end, sharply and finely serrated, three-nerved.

Prop. & Comp. Buchu contains a *volatile oil*, which gives the odour to the leaves, and a *bitter extractive* matter, soluble in water.

Off. Prep. INFUSUM BUCHU. Infusion of Buchu. (Buchu leaves, half an ounce; boiling distilled water, ten fluid ounces.)

TINCTURA BUCHU. Tincture of Buchu. (Buchu, bruised, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.)

Therapeutics. Buchu seems to be a slight tonic and stomachic, but is used chiefly on account of its action on the urinary organs, in chronic catarrh of the bladder, and irritable condition of these parts; it acts, also, as a diuretic, and occasionally as a diaphoretic.

Dose. Of the powder, 20 gr. to 40 gr.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, 1 fl. drm. to 2 fl. drm.

Cuspariæ Cortex. Cusparia Bark. The Bark of Galipea Cusparia, Angustura bark tree; from tropical South America.

Description. In curved pieces, or quills, several inches in length, about an inch or rather more in breadth, and one-eighth of an inch thick; the edges are feathered. Externally it is covered with a yellowish grey, uneven epidermis; internally, light brown, and separable into thin layers. It breaks with a resinous fracture; has a rather peculiar odour, and very bitter, but aromatic taste; the cut surface, examined with a lens, usually exhibits numerous white points or minute lines. The inner surface touched with nitric acid does not become blood red.

Prop. & Comp. Cusparia bark contains a trace of *volatile oil*, some *resin*, and a principle, *cusparine*, in tetrahedral crystals, soluble in alcohol, acids, and alkalies; composition unknown. The infusion of cusparia is precipitated by tannin, so also is cusparine.

Off. Prep. INFUSUM CUSPARIÆ. Infusion of Cusparia. (Cusparia bark, in coarse powder, half an ounce; distilled water, at 120°, ten fluid ounces.)

Therapeutics. An aromatic stomachic, probably with some antiperiodic properties. Used in atonic dyspepsia, diarrhœa, and dysentery, also in convalescence from acute diseases. In South America it has been much employed in the treatment of low malignant fevers, occurring in marshy districts; it is not much prescribed in England, nor have its powers been fully investigated.

Dose. Of the powdered bark, 10 gr. to 40 gr.; of infusion of cusparia, 1 fl. oz. to 2 fl. oz.

Adulteration. The bark of strychnos nux vomica has been substituted for true cusparia or angustura bark, and hence named false angustura bark; as this substitution has been the cause of fatal accidents, the knowledge of the distinction between the two becomes important. The false bark is usually in shorter pieces, more irregularly twisted, with little or no odour, and much more bitter than the true bark; it breaks with a shorter and more resinous fracture, and is not separable into layers; the epidermis is whitish but spotted red; nitric acid turns the inner surface blood-red, the epidermis greenish or black; applied to the epidermic surface of the true cusparia bark, nitric acid may render it slightly orange-red; applied to the inner surface, it turns it of a bluish-black colour. False cusparia bark yields *brucia* and *strychnia;* the true bark contains neither of these alkaloids.

SIMARUBACEÆ.

Quassiæ Lignum. Quassia Wood. The Wood of Picræna excelsa: from Jamaica. This forms Jamaica quassia. The wood of Quassia amara was formerly imported as Surinam quassia, but is not met with at present in English commerce.

Description. Quassia occurs in cylindrical logs or billets of varying size, seldom thicker than the thigh; externally greyish-brown, internally light yellow. The wood is tough, dense, without odour, but intensely bitter: it is generally sold in chips or raspings.

Prop. & Comp. Quassia yields its bitterness to water and spirit; it contains a crystallizable neutral principle, *quassine* ($C_{10}H_{12}O_3$), which possesses the bitterness of the wood; it is devoid of tannin or gallic acid, and may, therefore, be suitably combined with salts of iron.

Off. Prep. Extractum Quassiæ. Extract of Quassia. (Prepared by the maceration of the wood in water, percolation, and evaporation to a proper consistence.)

Infusum Quassiæ. Infusion of Quassia. (Quassia in chips, sixty grains; cold distilled water, ten fluid ounces.) Very liable to become decomposed in warm weather.

Tinctura Quassiæ. Tincture of Quassia. (Quassia in chips, three quarters of an ounce; proof spirit, a pint.)

Therapeutics. Quassia acts as a pure bitter stomachic, devoid of astringency: used in atonic indigestion, such as occurs in gout, or from alcoholic abuse and other causes. It is sometimes given as a tonic after acute diseases, and has been employed as an antiperiodic in fevers. It probably acts on the nervous system when given in large doses. It is destructive to some of the lower animals, and is employed in the form of enema to destroy threadworms.

Dose. Of the powder, 10 gr. to 20 gr.; of the extract, 2 gr. to 5 gr.; of infusion of quassia, 1 fl. oz. to 2 fl. oz.; of tincture of quassia, ½ fl. dr. to 2 fl. dr.

Sub-Class II. Calycifloræ.

RHAMNACEÆ.

Rhamni Succus. Buckthorn Juice. The juice of the fruit of Rhamnus catharticus: indigenous.

Description. The berries, the juice of which was formerly officinal, are when ripe, about the size of a pea, black, smooth, and containing four seeds, and a green juicy parenchyma; the odour of the rhamnus is somewhat nauseous.

Prop. & Comp. The juice has the same odour and is of the same colour as the parenchyma; it becomes of a bright green colour on the addition of lime-water or an alkali; evaporated to dryness with lime-water it forms sap green. It contains sugar, mucilage, and a crystallizable principle called *Rhamnine*, also a principle possessing purgative properties; but it is not certain whether this is identical with the aforesaid rhamnine.

Prep. Syrupus Rhamni. Syrup of Buckthorn. (Juice of buckthorn, four pints; ginger sliced, pimento bruised, each, six drachms; sugar, five pounds; rectified spirit, six fluid ounces. Set aside the juice for three days, that the dregs may subside,

and strain. To a pint of the strained juice add the ginger and pimento, then macerate with a gentle heat for four hours, and strain; boil down the rest of the juice to a pint and a half. Mix the liquors and dissolve the sugar in them; lastly, mix in the spirit.)

Therapeutics. Buckthorn acts as a brisk hydragogue purgative, but its operation is often attended with griping and nausea; formerly it was much employed in dropsical affections, gout and rheumatism, but its use is now almost abandoned, except in the form of the syrup, which is sometimes given to children; it is however more frequently prescribed as a domestic remedy than by the medical practitioner.

Dose. Of syrup of buckthorn, ½ fl. oz. to 1 fl. oz.; for a young child, ½ fl. drm. to 1 fl. drm. or 2 fl. drm.

ANACARDIACEÆ.

Mastiche. Mastich. A resinous exudation flowing from the stem of Pistacia Lentiscus, native of the countries bordering on the Mediterranean; chiefly imported from Turkey and the Levant.

Description. In its best condition it occurs in small masses called tears, which are of a light yellow colour, friable, becoming soft and ductile when chewed; the fracture vitreous, shining, and transparent; the surface of the tears is often covered with a whitish dust, produced by the rubbing together of several pieces. The larger masses are less pure than the small; they are formed by the agglutination of several tears, and often mixed with bark and earthy matter. It has a faint agreeable odour.

Prop. & Comp. It is wholly soluble in ether and chloroform, but scarcely at all so in the fixed oils; it contains a small quantity of volatile oil; alcohol dissolves about four-fifths of it ($C_{20}H_{30}O_2$), and the remainder, which is soluble in ether, has been called *Masticine* ($C_{20}H_{31}O$).

Therapeutics. The action is the same as that of the resin of turpentine; it is but little used. From the agreeable odour which it communicates to the breath, it is sometimes employed as a masticatory. Dissolved in chloroform or ether, it is often used for stopping carious teeth.

Dose. 20 gr. to 40 gr. if administered internally.

Rhus Toxicodendron. The leaves of the Rhus Toxicodendron, or Poisoned Sumach (not officinal).

Description. The leaves are trifoliate, leaflets entire, or rarely toothed : ovate, deep shining green on the upper surface, hairy on the under.

Prop. & Comp. The leaves contain a peculiar *acrid resin*, and gummy extractive. It is on the presence of the former substance that the properties of the plant depend.

Prep. For topical application a tincture of the leaves is made.

Therapeutics. It is chiefly used as a topical irritant. The juice of the leaves causes inflammation and vesication of the part to which it is applied. Internally administered, it is supposed to act on the spinal system in a manner similar to strychnia ; in large doses it causes inflammation of the stomach. It has been recommended in palsy, but further investigation as to its efficacy is required.

Dose. Of the powder, ½ gr. to 1 gr., gradually increased.

Olibanum. Frankincense. Gum resin from various species of Boswellia (not officinal).

Description. It occurs in small oblong tears, of a peculiar balsamic odour.

Prop. & Comp. It burns with an aromatic odour, and contains a *volatile oil*, *resin*, and gum.

Therapeutics. It is stimulant, like the other gum resins, but is chiefly used for burning as an incense in Roman Catholic countries.

AMYRIDACEÆ.

Myrrha. Myrrh. A gum-resin exuding (probably) from the stem of Balsamodendron Myrrha. It is obtained from Arabia Felix and Abyssinia.

Description. The best sort is in irregular fragments of varying size ; of a reddish-brown or reddish-yellow colour ; translucent, but the surface often covered with powder ; fractured surface irregular and somewhat oily ; of a peculiar aromatic odour, and pungent warm acrid bitter taste. The inferior variety is in much larger masses than the pure, darker coloured, less transparent, and contains earthy and other impurities. The former variety is known as Turkey Myrrh, from its having been imported into

England from that country. At the present day, myrrh is imported exclusively from the East Indies.

Prop. & Comp. It contains a *volatile oil, gum, resin,* salts, &c. The resin is bitter, soluble in alcohol, but partly only in ether. With water, myrrh forms an emulsion of a milky-white colour, from the suspension of the resin by the gum which is held in solution.

Off. Prep. Pilula Aloes et Myrrhæ. Pill of Aloes and Myrrh. (Socotrine aloes, two ounces; myrrh, one ounce; saffron, dried, half an ounce; confection of roses, two ounces and a half.)

Tinctura Myrrhæ. Tincture of Myrrh. (Myrrh in coarse powder, two ounces and a half; rectified spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Myrrh is also contained in mist. ferri c.; pil. assafœtidæ c.; pil. rhei c.; and decoct. aloes c.

Therapeutics. Myrrh acts as a stimulant in a manner not unlike other resinous substances; it increases the secretion of the mucous membranes, especially of the bronchial tubes, and is supposed to possess antispasmodic and emmenagogue properties, combined with tonic powers.

Myrrh is frequently administered in conjunction with iron and aloetic preparations in amenorrhœa; also in leucorrheal and other mucous discharges connected with debility: sometimes as an expectorant in chronic bronchitis and phthisis. Externally, as a topical stimulant, it is applied to aphthous sore mouths, spongy gums, &c.

Dose. Of myrrh, 10 gr. to 30 gr.; of tincture of myrrh, ½ fl. drm. to 1 fl. drm. Of pill of aloes and myrrh, 5 gr. to 15 gr. The tincture is more frequently used externally, mixed with water (2 fl. drm. to 4 fl. oz.), to form a gargle.

Adulteration. Gum bdellium and other gum resins are occasionally met with in samples of myrrh, and an inferior kind is often substituted for good myrrh.

Elemi. Elemi. A concrete resinous exudation from an uncertain plant, probably Canarium Commune. Chiefly imported from Manilla.

Description. It occurs in masses of various sizes, usually of a soft consistence, more or less transparent, of a yellowish colour, with a peculiar fennel-like odour, and a bitter aromatic taste.

Prop. & Comp. The odour is due to the presence of *volatile oil;* the *resin* is soluble in alcohol.

Off. Prep. UNGUENTUM ELEMI. Ointment of Elemi. (Elemi, quarter of an ounce; simple ointment, one ounce.)

Therapeutics. Action as the turpentines generally: chiefly used externally, in the form of ointment, as a topical stimulant.

Dose. Not given internally.

LEGUMINOSÆ.

PAPILIONACEÆ.

Glycyrrhiza. Liquorice root. The recent and dried root or underground stem of Glycyrrhiza glabra; cultivated in England; the fresh root should be kept in dry sand.

Description. In cylindrical branched pieces, brown on the surface and yellow within, about the size of the little finger; tough and pliable; sweet and mucilaginous to the taste.

Prop. & Comp. Contains a peculiar sweet brownish substance, *glycyrrhizine* ($C_{24}H_{36}O_9$); not fermentable nor crystalline; soluble in water and spirit; its aqueous solution is precipitated by acids (sulphuric); when boiled with hydrochloric acid, it is resolved into a resinous matter (glycyrretin) and glucose. Liquorice also contains *asparagine*, gum, mucilage, &c.

Off. Prep. EXTRACTUM GLYCYRRHIZÆ. Extract of Liquorice. (Obtained by maceration and percolation of liquorice root with water and subsequent evaporation to a proper consistence.)

Powdered liquorice root is contained in some pills, and other officinal preparations; and the extract in compound decoction of aloes and the confection of senna, &c.

EXTRACTUM GLYCYRRHIZÆ LIQUIDUM. Liquid Extract of Liquorice. (Obtained by macerating the root, in coarse powder, in water. The expressed liquid is heated to 212° and strained through flannel. An eighth of its volume of rectified spirit is added, to prevent decomposition.)

PULVIS GLYCYRRHIZÆ COMPOSITUS. Compound Powder of Liquorice. (Senna and liquorice root in fine powder, of each, two ounces; powdered sugar, six ounces.)

Therapeutics. A sweet demulcent, useful in allaying cough, to sheathe the mucous membranes, &c., but more frequently employed on account of its sweetness to cover the taste of other

medicines. The compound powder is an agreeable form in which to administer senna ; the corresponding preparation in the German Pharmacopœia contains fennel-seed and sublimed sulphur in addition to the above ingredients.

Dose. Of the extract, 10 gr. to 30 gr. ; of the liquid extract, 1 fl. drm. ; of the compound powder 30 gr. to 60 gr.

Tragacantha. Tragacanth. The gummy juice (hardened in the air) exuding from the stem of Astragalus verus, the Milk Vetch, and possibly other species ; collected in Asia Minor.

Description. In semi-transparent flakes, waved concentrically, rough, and difficult to powder, without odour or taste ; rendered more easily pulverizable by a heat of 120°. Sparingly soluble in cold water, but swelling into a gelatinous mass, which is tinged violet by iodine, indicating the presence of but little starch. After maceration in cold water the fluid portion is not precipitated by the addition of rectified spirit, showing absence of gum acacia.

Prop. & Comp. Forms with water a very thick tenacious mucilage, and contains two distinct gums: *Arabine*, like that contained in gum Arabic, soluble in water, &c., about 53 per cent. ; and *Bassorine*, a gum not soluble in water, and therefore suspended only in the mucilage, about 33 per cent. ; together with a little starch. By the action of alkalies, it is rendered soluble in water and converted into true gum ; the prolonged action of boiling water produces a similar change in the nature of bassorine. Nitric acid converts it into mucic and oxalic acids.

Off. Prep. Mucilago Tragacanthæ. Mucilage of Tragacanth. (Tragacanth, sixty grains ; distilled water, ten fluid ounces.)

Pulvis Tragacanthæ Compositus. Compound Tragacanth Powder. (Powdered tragacanth, powdered gum acacia, starch, each one ounce ; refined powdered sugar, three ounces.)

Therapeutics. Simply demulcent, used as gum Arabic ; the mucilage is usefully employed to suspend heavy powders, as subnitrate of bismuth, &c. One part of tragacanth is said to give more viscosity to water than 25 parts of gum arabic.

Dose. Of simple tragacanth powder, or of the compound powder, 20 gr. upwards ; of the mucilage, 1 fl. oz. upwards.

Mucuna. Cowhage. (Not officinal.) The hairs of the fruit of Mucuna pruriens, Cowhage plant; growing in the West Indies.

Description. The legume or pod is shaped like the italic letter *f*, about four inches long and half an inch broad, coriaceous, and covered with numerous stiff, brown, stinging hairs, which have serrations near their points; these are removed, and employed in medicine.

Therapeutics. Cowhage has been used as an anthelmintic, and is supposed to act by its mechanical peculiarities, irritating the entozoa and thus causing their expulsion. The watery or alcoholic solutions of mucuna do not possess the same powers.

Dose. Of an electuary of the hairs made with syrup, honey, or treacle, from a tea-spoonful to a table-spoonful or more, followed after a short time by the administration of some purgative.

Scoparii Cacumina. Broom tops. The fresh and dried tops of Sarothamnus Scoparius, or Common Broom; indigenous, and growing throughout Europe.

Prop. & Comp. The tops, when fresh, have a peculiar odour, which is lost in drying; the taste is bitter; they contain a neutral principle, *Scoparine* ($C_{21}H_{22}O_{10}$), forming a pale yellow, brittle amorphous mass, tasteless and inodorous; also *Sparteia* ($C_{15}H_{26}N_2$) a viscid oil, of a pale colour when fresh, but becoming brown on exposure; forming crystalline salts with perchloride of platinum and corrosive sublimate; besides which, extractive matters and salts are found in the tops.

Off. Prep. Decoctum Scoparii. Decoction of Broom. (Broom tops dried, an ounce; distilled water, a pint.)

Succus Scoparii. Juice of Broom. (Expressed juice of fresh broom tops, three fluid parts; rectified spirit, one fluid part.)

Therapeutics. Broom tops have long been reputed diuretic, the alkaline salts contained in the tops are insufficient to account for their activity, which in some cases of disease is undoubted. Broom tops are especially useful in dropsies, depending on cardiac disease. In large doses they cause vomiting and purging.

Experiments on animals have shown that the action of sparteia is analogous to that of conia. It greatly diminishes the reflex excitability of the spinal cord and paralyses the motor nerves; moreover, it is said to paralyse the cardiac inhibitory branches of the vagus. It kills mammals by impairing the activity of the

respiratory centre in the medulla oblongata ; their life may be prolonged by artificial respiration. Careful experiments on a healthy man have shown that sparteia causes tingling and weakness of the extremities, without influencing either the composition or the quantity of the urine. Similar experiments with pure scoparine in large doses led to equally negative results as regards the urine. (J. W. Paton.)

Dose. Of decoction of broom, 1 fl. oz. to 3 fl. oz. ; of the juice of broom, 1 fl. drm. to 2 fl. drm. or more.

Pterocarpi Lignum. Red Sandal-wood. The wood of Pterocarpus santalinus ; growing in Coromandel and Ceylon.

Description. Sandal wood occurs in billets, which are dense, externally of a dark brown colour, internally, if cut transversely, hard-grained, variegated with dark and lighter red rings. The powder is blood-red, of a faint peculiar odour, with an obscurely astringent taste. The wood occurs also in chips.

Prop. & Comp. Sandal wood contains a principle called *Santalin*, crystalline and reddening in the air. The colour of the wood is extracted by alcohol and ether, and also by alkaline solutions.

Use. It is used to give colour to the compound tincture of lavender, and through this to the arsenical solution.

Kino. Kino. The juice (hardened in the sun) flowing from the incised bark of Pterocarpus marsupium, or Indian Kino Tree ; growing near the Malabar Coast. Other varieties of Kino are met with, as African Kino, from Pterocarpus erinaceus ; Botany Bay Kino, from Eucalyptus resinifera, &c.

Description. In small angular pieces, broken reddish-black tears, translucent and ruby-red at the edges, shining, and brittle. The powder of kino is dark red, it has no odour, the taste is astringent, and when chewed it tinges the saliva blood-red.

Prop. & Comp. Kino contains a species of *tannin*, called mimotannic acid (or catechu-tannic acid, $C_{18}H_{18}O_8$), and another astringent principle, found also in catechu, called *Catechin* ($C_{20}H_{18}O_8$), together with *red gummy matter*, &c. (See Catechu.)

Off. Prep. Pulvis Kino Compositus. Compound Powder of Kino. (Kino, in powder, three ounces and three quarters; opium, in powder, a quarter of an ounce ; cinnamon, in powder, one ounce.)

One grain of opium is contained in twenty grains of the powder.

Tinctura Kino. Tincture of Kino. (Powdered kino, two ounces; rectified spirit, one pint. Prepared by maceration.) If made with proof spirit, it is apt to gelatinize after a little time from the gummy matters being deposited.

Kino is also contained in pulvis catechu compositus, one grain in five of the powder.

Therapeutics. A powerful astringent; may be given where tannin is indicated; it is less soluble than catechu; often employed in pyrosis and diarrhœa, and as a gargle in relaxed throat. Sometimes it is chewed, and the soluble portion is thus brought into contact with the relaxed parts. Custom has led to the use of certain astringents, as kino, catechu, hæmatoxylum, in the treatment of affections of the bowels; and this has doubtless arisen from their being of more value in such cases than the more soluble forms of tannin; the catechin probably in a great measure escapes absorption in the first portions of the alimentary canal, and hence acts more powerfully as an astringent upon the lower parts of the tube.

Dose. Of powdered kino, 10 gr. to 30 gr. or more; of the compound powder of kino, 5 gr. to 20 gr., the dose depending more on the opium than the kino. Of the tincture of kino, ½ fl. drm. to 2 fl. drm.

Balsamum Peruvianum. Peru Balsam. The balsam flowing from the incised trunk of Myroxylon Pereiræ; obtained from Salvador in Central America.

Description. A thick, viscid, almost opaque, substance, like treacle, but when in thin layers, dark red in colour, and translucent; of a fragrant peculiar odour, with an acrid but aromatic taste.

Prop. & Comp. Peru Balsam is of sp. gr. 1·15; is soluble in five parts of rectified spirit, and undergoes no diminution in volume when mixed with water. It contains *cinnamein* (cinnamate of benzyl, $C_{16}H_{14}O_2$), which is a neutral oil; *metacinnamein*, a crystallizable solid, isomeric with the former; *cinnamic acid* ($C_9H_8O_2$), and *resins*, the two latter probably produced by the oxidation of metacinnamein. It also contains *styracin* (cinnamate of cinnyl, $C_{18}H_{16}O_2$), which latter, by the action of potash, becomes

converted into cinnamate of potash and styrone (cinnylic alcohol), thus :—

$$\left.\begin{matrix}C_9H_7O\\C_9H_9\end{matrix}\right\}O+\left.\begin{matrix}K\\H\end{matrix}\right\}O=\left.\begin{matrix}C_9H_9\\H\end{matrix}\right\}O+\left.\begin{matrix}C_9H_7O\\K\end{matrix}\right\}O.$$

Fremy regards the other resins present as hydrates of cinnamein. The amount of resin increases with age, and about six or seven per cent. of cinnamic acid is always present; this was formerly thought to be benzoic acid.

Therapeutics. A stimulant and expectorant, chiefly used in chronic bronchitis and rheumatism. It acts also on the mucous membranes, and may be used to restrain excessive discharges, as gleet, leucorrhœa, &c. Externally, it also acts as a stimulant; useful to bed-sores and unhealthy ulcers; it may be conveniently rubbed up with yolk of egg, and applied to any part.

Dose. 10 min. to ½ fl. drm., and upwards, made into an emulsion with mucilage, or yolk of egg.

Balsamum Tolutanum. Tolu Balsam. The balsam (indurated) flowing from the incised trunk of Myroxylon toluiferum, or Balsam of Tolu Tree; growing in Central America, Carthagena, mountains of Tolu, &c.

Description. A reddish-yellow substance, not unlike resin; soft when first imported, becoming hard by age; more or less transparent. Odour and taste the same as balsam of Peru, but less powerful.

Prop. & Comp. Softens by heat, becomes brittle in the cold; is soluble in alcohol, ether, and in rectified spirit; yields cinnamic acid to water; it is similar in composition to balsam of Peru, containing *styracine* or *meta-cinnameine*, *cinnamic acid*, and *resin*.

Off. Prep. Syrupus Tolutanus. Syrup of Tolu. (Balsam of Tolu, one ounce and a quarter; distilled water, one pint, or a sufficiency; sugar, two pounds. Boil the balsam in the water for half an hour in a covered vessel, frequently stirring, remove from the fire and add distilled water, so that the liquid shall measure sixteen ounces, and strain the liquor when cold; then add the sugar and dissolve it.) The product should weigh three pounds, and should have the specific gravity 1·33.

Tinctura Tolutana. Tincture of Tolu. (Balsam of Tolu, two ounces and a half; rectified spirit, one pint. Prepared by maceration.)

Balsam of Tolu is also contained in tinct. benzoini comp.

Therapeutics. Exactly the same as the balsam of Peru.

Dose. Of the balsam, 10 gr. to 30 gr. ; of the syrup, 1 fl. drm. to 3 fl. drm. ; of the tincture, ½ fl. drm. to 1 fl. drm.

Physostigmatis Faba. Calabar Bean. The seed or bean of Physostigma venenosum. Western Africa.

Description. The beans have a shining integument of a brown coffee colour ; they are about an inch in length, and half an inch in thickness, reniform in shape, with a shorter or concave and a longer or convex margin, and on the convex edge is a furrow with elevated ridges, pierced by a foramen at one extremity. The kernel consists of two large concavo-convex cotyledons of a white colour, weighing on an average forty-six grains, easily pulverizable, tasting like edible leguminous seeds, neither bitter, aromatic, nor acrid. It yields its virtue to alcohol ; imperfectly to water.

Prop. & Comp. The active principle, *physostigmia* or *eseria* ($C_{15}H_{21}N_2O_2$?) is contained to the greatest extent in the kernel, and may be extracted by alcohol. Recently it has been separated as a yellowish amorphous mass, sparingly soluble in water ; moderately so in ether and alcohol. The aqueous solution is alkaline and bitter in taste. The solution in acids is generally red.

Off. Prep. Extractum Physostigmatis. Extract of Calabar Bean. (Calabar bean, in powder, a pound ; rectified spirit, four pints.)

Therapeutics. Given to warm-blooded animals in a poisonous dose, Calabar bean may cause death either by asphyxia, or by cardiac paralysis, independently of its action on the respiratory movements. The alternative is decided by the rapidity with which poisoning is induced. In medium doses, or when the poison is gradually absorbed, the animal succumbs to asphyxia ; when the dose is large, or when the poison is directly introduced into the circulation, to cardiac paralysis. The asphyxia is not due to palsy of the motor nerves, but to a *reduction and final abolition of the diastaltic function of the spinal cord*, the most characteristic action of the poison. A small but still fatal dose, given to a frog, gradually produces paralysis of the motor nerves and exalted tactile sensibility of the afferent nerves.

Physostigma acts on the heart as a depressant, reducing the frequency of its pulsations. Section of the vagi does not prevent this, showing that the poison does not slow the heart by stimu-

lating its inhibitory nerves. It exerts no specific action on the muscular tissue of the organ. Hence it probably acts by paralyzing the accelerator nerves and ganglia. When a large dose has caused death by syncope, the heart is found at rest in diastole, with its cavities full of blood. Physostigma paralyzes the cervical sympathetic nerves of the rabbit before the death of the animal. When the capillary circulation of the frog's web was examined, it was found that soon after the exhibition of the poison, the small arteries and veins underwent slight contraction, followed by a rapid and permanent dilatation. This seems to occur all over the body, and is evident, though less marked, in birds and mammals. Physostigma has no specific action on the blood, which is found dark after death.

Applied to the eye, Calabar bean makes the pupil contract. Contraction of the pupil occurs whenever birds and mammals are rapidly poisoned by the internal administration of the drug ; but this contraction may be slight and of short duration and easily overlooked owing to the subsequent dilatation.

Physostigma has no specific action on the voluntary muscles of the frog ; in warm-blooded animals it causes fibrillar twitchings, which continue even after the muscle is completely detached from the nervous system. It acts as an excitant of the secretory organs, increasing the action of the alimentary, mucous, lacrymal and salivary glands. It does not appear to exert any direct influence on the cerebral functions. (The above is a brief summary of results arrived at by Dr. T. R. Fraser.)

Dr. Christison had previously made known some of the physiological effects of Calabar bean from an experiment on his own person when taking about twelve grains of the seed : the chief symptoms experienced were vertigo, intense prostration, pallor, a very weakened condition of pulse, and irregular action of the heart ; also a loss of power over the muscles ; the contraction of the pupil was not looked for. Dr. Fraser has since demonstrated the existence of a very perfect physiological antagonism between atropia and physostigma. (*See* Atropia.)

The physiological action of the drug has led to its use in the treatment of strychnia-poisoning, tetanus, chorea, general paralysis of the insane, and certain conditions of the eye.

I. Calabar bean may be applied to the eye in the form of a watery solution of the extract, or in a gelatin disk. These disks are so made that a single one suffices to cause complete contraction of the pupil of the eye to which it is applied. Similar disks are prepared with atropia, and of such a strength that the dilatation

produced by one of them is exactly neutralized by a corresponding disk of Calabar bean. The drug causes :—1. Dilatation of conjunctival vessels ; the redness and irritation soon pass off. 2. Spasm of ciliary muscle—myopia. 3. Spasm of sphincter pupillæ—myosis. Accordingly it is employed to counteract the topical effects of atropia, and to remedy paralysis of accommodation and of the circular fibres of the iris.

II. Its depressant influence on the reflex activity of the spinal cord has led to its administration in strychnia-poisoning and in tetanus. There can be no doubt that it is capable of rendering the rigid muscles of a tetanic patient perfectly flaccid. Moreover, cases are on record of recovery both from poisoning by strychnia and from tetanus, under the influence of the drug. But to produce any effect it has to be given in doses so large as to cause very considerable—perhaps dangerous—depression of the heart. The writer has seen the pulse fall from 120 to 80 in the course of a few minutes after the subcutaneous injection of one-third of a grain of the extract. Moreover, it causes nausea and vomiting, purging, and abundant perspiration.

III. Calabar bean has been given in chorea. But for this disease we possess other remedies, probably as effectual, and certainly less dangerous. Besides, it is doubtful whether chorea be due to exalted reflex activity of the spinal cord at all.

IV. Dr. C. Browne has found it of use in general paralysis of the insane, probably by its influence upon the circulation.

V. The physiological antagonism between atropia and physostigma points to the use of the latter drug as an antidote in poisoning by the former. Clinical evidence on this head is still very inadequate.

Doss. 1 gr. of the powder, gradually increased ; $\frac{1}{16}$ to $\frac{1}{4}$ gr. of the extract. In tetanus, enough must be given to produce the physiological symptoms of the drug. $\frac{1}{3}$ gr. of the extract, rubbed up with 10-15 minims of water and neutralized with a little carbonate of soda, may be injected every two or three hours subcutaneously, where swallowing causes pharyngeal spasm. If given by the stomach, 1 gr. of the extract, rubbed up with a little weak spirit.

Cæsalpinieæ.

Hæmatoxyli Lignum. Logwood. The sliced heart-wood of Hæmatoxylon campechianum : a native of Campeachy ; grows in the West Indian Islands and in India.

Description. It occurs in billets, consisting of the heart-wood only, which is heavier than water, of a dark red colour, and with a very astringent taste. It is cut into chips, which have a feeble agreeable odour; a small portion chewed imparts to the saliva a dark pink colour.

Prop. & Comp. Water and alcohol dissolve the colouring and astringent principles: the solutions are deepened in colour by alkalies, and rendered rather turbid by acids. It contains *hæmatoxyline* ($C_{16}H_{14}O_6$), which, when quite pure, forms white crystals, either with one or three atoms of water of crystallization; soluble in alcohol and ether, but sparingly so in water; when acted on by alkalies or oxidizing agents it becomes red. There are also present *tannin*, *resin*, and the ordinary constituents of wood. Hæmatoxyline is occasionally found crystallized in the crevices of the wood.

Off. Prep. Decoctum Hæmatoxyli. Decoction of Logwood. (Logwood, in chips, one ounce; cinnamon, in powder, sixty grains; distilled water, one pint. Reduced by boiling to sixteen fluid ounces.)

Extractum Hæmatoxyli. Extract of Logwood. (Logwood chips, one pound; boiling distilled water, one gallon. Prepared by maceration and evaporation to a proper consistence.)

Therapeutics. Logwood is chiefly employed as an astringent in affections of the alimentary canal, as diarrhœa, chronic dysentery, and some forms of atonic dyspepsia; it is often given to children. The urine of patients taking logwood exhibits a pink colour when that fluid becomes alkaline from any cause; in strongly acid urine the colour may not be seen, but the addition of ammonia readily brings it out.

Dose. Of decoction of logwood, 1 fl. oz. to 2 fl. oz.; of extract of logwood, 10 gr. to 30 gr.

Senna Alexandrina. Alexandrian Senna. The leaf of Cassia lanceolata and Cassia obovata.

Senna Indica. Tinnevelly Senna. The leaf of Cassia elongata; growing chiefly in Southern India.

Description. There has been some considerable difficulty and confusion about the plants yielding senna, arising from different plants having been called by the same name, and different names given to the same plant. Dr. Royle thinks that the species, Cassia officinalis, may include the varieties, C. elongata, C. lanceolata, and

C. acutifolia ; besides which there are other species, cassia obovata, cassia ovata, and cassia Forskalii. The leaflets of the three varieties of senna are of a greenish colour, with a faint peculiar odour and sweetish taste ; they are all *unequally* oblique at the base. The leaves of *Cassia lanceolata* are lanceolate, about an inch in length ; those of *Cassia obovata*, rather shorter and obovate ; those of *elongata* (Tinnevelly) about two inches long, lanceolate and acute.

Alexandrian senna usually consists of leaflets of cassia *officinalis* (var. lanceolata), and of cassia *obovata*, with pods and broken leaf-stalks ; together with the leaves of *solenostemma argel*, and sometimes, but not in English commerce, with those of *colutea arborescens*, and *coriaria myrtifolia*. Alexandrian senna has been stated to have about the following proportions of ingredients : five parts of the leaflets of cassia officinalis (var. lanceolata), three parts of cassia obovata, and two parts of cynanchum argel. As now sold, it is usually picked and the argel separated ; it should be carefully freed from the flowers, pods, and leaf-stalks, and from the leaves, flowers, and fruit of *solenostemma* (*Cynanchum*) *argel*.

Solenostemma argel leaves are distinguished by being about one inch long, equal at the base, no lateral nerves on the under-surface : pale in colour, thick and coriaceous in consistence. This addition to senna is important, as the argel is supposed to gripe and nauseate.

The leaflets of *colutea arborescens*, or bladder senna, are ovate, and equal at the base ; those of *coriaria myrtifolia* have a strongly marked lateral nerve on each side of the mid-rib.

The leaflets of *tephrosia apollinea*, distinguished by having parallel transverse veins, and being silky on the under-surface, have sometimes been met with in Alexandrian senna.

Indian senna may be divided into Tinnevelly senna and the ordinary East India variety : the former is by far the finest, the leaflets being large and thin, from one to two inches in length, of a greenish colour, and generally entire ; unequally oblique at the base ; this variety only is officinal ; in the latter, the leaflets are smaller, browner in colour, and many of them broken ; stalks and pods are also frequently met with. All the Indian sennas are obtained from one variety of cassia officinalis, viz., C. elongata.

Another variety of commercial senna is called *Tripoli* senna :

when good, it consists chiefly of leaflets of *C. Æthiopica*, a variety of cassia *ovata*, mixed with cassia *obovata*.

Prop. & Comp. Senna has a faint odour and nauseous taste; it imparts its virtues to water, either hot or cold; also to alcohol: it contains *Cathartine*, which can only be separated as a yellowish-red deliquescent substance, not crystallizable, with a trace of volatile oil, and the ordinary constituents of leaves. The cathartine is stated by some not to be the active principle.

Off. Prep. Confectio Sennæ. Confection of Senna. (Senna, in fine powder, seven ounces; coriander, in fine powder, three ounces; figs, twelve ounces; tamarinds, nine ounces; cassia pulp, nine ounces; prunes, six ounces; extract of liquorice, three quarters of an ounce; refined sugar, thirty ounces; distilled water, twenty-four fluid ounces.)

Infusum Sennæ. Infusion of Senna. (Senna, an ounce; ginger sliced, thirty grains; boiling distilled water, ten fluid ounces. Macerate for an hour in a closed vessel, and strain.)

Mistura Sennæ Composita. Compound Mixture of Senna. (Sulphate of magnesia, four ounces; extract of liquorice, half an ounce; tincture of senna, two and a-half fluid ounces; compound tincture of cardamoms, ten fluid drachms; infusion of senna, a sufficiency. To make a pint.)

Pulvis Glycyrrhizæ Compositus. (*See* Glycyrrhiza.)

Tinctura Sennæ. Tincture of Senna. (Senna, broken small, two ounces and a half; raisins free from seeds, two ounces; caraway and coriander, each half an ounce; proof spirit, one pint.)

Syrupus Sennæ. Syrup of Senna. (Senna, broken small, sixteen ounces; oil of coriander, three minims; refined sugar, twenty-four ounces; distilled water, five pints, or a sufficiency; rectified spirit, two fluid ounces. Digest the senna in seventy ounces of the water for twenty-four hours; press and strain. Digest the mass in thirty ounces of the water for six hours; press and strain. Evaporate the mixed liquors to ten fluid ounces; and when cold add the rectified spirit, previously mixed with the oil of coriander. Clarify by filtration, and wash what remains on the filter with distilled water, until the washings make up the filtrate to sixteen fluid ounces; then add the sugar, and dissolve by means of a gentle heat.) The product should weigh 42 ounces, and should have the sp. gr. 1·31.

Therapeutics. Senna is a rather brisk purgative, increasing considerably the peristaltic action, and also to some extent the liquid flow from the intestines; it appears to act chiefly on the small intestines, and less on the colon and rectum than aloes; sometimes nausea and griping are produced if the drug is given alone; it is generally combined with salines, as Epsom salts or tartrate of potash, and some aromatic; such combination forms the "black draught," and the compound senna mixture of the Pharmacopœia. Senna is given when constipation is present in dyspepsia, and in almost all febrile and inflammatory diseases; as it is somewhat drastic, it should not be given when the alimentary canal is much affected.

Dose. Of the powdered leaf, 30 gr. to 120 gr. (a bad form). Of the infusion, 1 fl. oz. to 2 fl. oz.; of compound senna mixture, 1 fl. oz. to 1½ fl. oz.; of the tincture, 1 fl. drm. to ½ fl. oz.; of the confection, 60 gr. to 120 gr.; of the syrup, 1 fl. drm. upwards (generally given to infants). The present syrup is an effectual preparation.

For the *Adulterations* of Senna, see *Description.*

Cassiæ Pulpa. Cassia Pulp. The pulp of the pods of Cassia fistula; Pudding Pipe Tree, or Purging Cassia; from the East Indies, or recently extracted from pods imported from the East or West Indies.

Description. The fruit is a cylindrical pod or legume, from 1 to 2 feet long, about the size of the thumb, having 3 bands extending the whole length, divided internally into numerous cells by spurious dissepiments, each containing a seed, surrounded by a blackish soft pulp, which is the part made use of in medicine. The heavier the pod the more pulp it contains.

Prop. & Comp. The pulp has a sweetish, rather disagreeable, taste; is of a blackish brown colour, usually mixed with the seeds and dissepiments; it contains sugar, pectin, mucilage, and some principle probably similar to that found in senna.

Cassia is contained in Confectio Sennæ.

Therapeutics. A slight laxative, apt to disturb the bowels by producing flatulence; seldom given alone.

Dose. Of the prepared pulp, 120 gr. upwards.

Tamarindus. Tamarind. The pulp of the fruit of Tamarindus indica or Tamarind Tree; growing in the East and West Indies. The East Indian pod is larger than that from the

West Indies: at present it chiefly comes from the West Indies.

Description. The pods are about 4 or 5 inches long, and ¾ inch broad, flattened and curved; internally divided into cells containing oval seeds, surrounded by the pulp, which is soft, of a brownish-red colour, and sweet acidulous taste, and contains strong fibres; the seeds are brown and shining, and enclosed in membranous coats.

Prop. & Comp. It contains sugar, pectin, free *citric* and *tartaric* acids, *bitartrate of potash*, &c. A piece of bright iron left in contact with the pulp for an hour, should not exhibit any deposit of copper.

Off. Prep. Tamarinds are contained in Confectio Sennæ.

Therapeutics. Tamarinds act as a very slight laxative, besides which they are refrigerant from the acids they contain, and useful, when infused, as a cooling drink in febrile affections.

Dose. ¼ oz. upwards. A whey may be made by boiling the pulp with milk.

Copaiba. Copaiva; Balsam of Copaiva. An oleo-resin flowing from the incised trunk of Copaifera multijuga and other species, the varieties of Copaiva Tree; growing in the West Indies and tropical parts of America, and obtained chiefly from the valley of the Amazon.

Copaibæ Oleum. Oil of Copaiva. Oil distilled from the oleo-resin.

Description. The oleo-resin is a transparent liquid, about the consistence of thick oil, of a yellow colour, characteristic odour, and slightly acrid, nauseous, terebinthinate taste. The Brazilian variety, which is chiefly met with, is much paler than the West Indian. The volatile oil is a colourless liquid, with the odour and taste of copaiva.

Prop. & Comp. Copaiva consists of about 52 per cent. of *resin*, and 40 per cent. of the *volatile oil*, but the proportions vary with age and exposure; its sp. gr. is about 0·95; the resin, copaivic acid ($C_{20}H_{30}O_2$), closely resembles common resin or pinic acid, and is crystalline. The volatile oil ($C_{10}H_{16}$), except in odour and taste, is closely allied to oil of turpentine. Besides these principles, about 1½ or 2 per cent. of a soft brown resinous matter is contained in copaiva, the nature of which is unknown; it seems to increase in amount as the copaiva becomes old.

The oleo-resin is perfectly soluble in an equal volume of benzol ; does not become gelatinous after having been heated to 270°, showing the absence of East Indian wood oil, which otherwise closely resembles copaiva. It is not fluorescent. It dissolves one fourth of its weight of carbonate of magnesia by the aid of heat, and remains transparent.

Therapeutics. Copaiva acts as a stimulant like other terebinthinate drugs ; its influence is more particularly directed to the mucous membranes, especially that of the genito-urinary organs ; when taken into the stomach it becomes absorbed, and can be detected both in the breath and urine by the peculiarity of its odour ; from the latter fluid it may be separated by ether. It has been shown that only the resinous acid appears in the urine ; the volatile oil being either exhaled from the lungs or destroyed in the body.

The action of copaiva upon the urethra appears to be, at least in part, local, but the topical application of the drug in the form of injection fails to produce the same effect as its internal administration, probably from its not being presented to the parts in the same condition. If cold nitric acid be added to the urine of patients taking copaiva, a milkiness is produced, as from albumen, but this disappears when heat is applied ; the turbidity is due to the separation of the copaivic acid, which melts and becomes transparent when the urine is heated. In large doses it occasionally gives rise to a papular eruption on the skin, often attended with much irritation.

Copaiva is used with great success in affections of the urethra and bladder, as gonorrhœa, gleet, and cystitis. It may also be given advantageously in chronic bronchitis, accompanied by excessive secretion of mucus, and in diseased conditions of the mucous membrane of the rectum ; it should be avoided in febrile states of the system. The action of the *volatile oil* resembles that of the balsam itself. Copaiva is a very powerful diuretic. It should not be given in cases of renal dropsy, or when there is evidence of renal congestion. It is most efficacious in simple ascites from cirrhosis of the liver, without attendant albuminuria. Dr. Wilks has found that the pure resin is as efficacious as the oleo-resin in causing diuresis, while it is free from the nauseous odour of the oil.

Dose. Of copaiva, 15 min. to 1 fl. drm. ; of oil of copaiva, 5 min. to 20 min. Of the resin (as a diuretic) 15 to 20 grs. in almond emulsion.

Copaiva may be taken rubbed up with the yolk of egg, or float-

ing upon water or some other liquid, or made into pills with burnt magnesia; or, lastly, dissolved in water by the aid of liquor potassæ, with which it forms a soap. Sometimes to hide its disagreeable taste it is put into membranous or gelatinous capsules.

Adulteration. Turpentine and fixed oils may be mixed with copaiva: if a little of the suspected drug is heated on paper, turpentine can be detected by the odour, and all fixed oils by a greasy ring surrounding the resinous stain which pure copaiva leaves. Its power of dissolving carbonate of magnesia may also be used as a test.

Mimoseæ

Acaciæ Gummi. Gum Acacia. A gummy exudation from the stems of one or more undetermined species of Acacia, hardened in the air; collected chiefly in Kordofan in Eastern Africa, and imported from Alexandria.

Description. Gum is usually a natural exudation from the tree; sometimes, however, incisions are made to favour its flow; it occurs in small rounded or spheroidal tears of different sizes, usually from half an inch to an inch in length, or in fragments with shining facets; and opaque from innumerable fissures on the surface; brittle, devoid of odour, and with a bland mucilaginous taste. Varieties of gum, as Senegal and Barbary gum, in larger tears, more coloured, and less pure, are found in commerce; the produce of different Acacias, as A. Senegal and A. gummifera.

Prop. & Comp. Gum is entirely soluble in water, forming a mucilage, but it is insoluble in alcohol. It consists of *gummic acid* ($C_{12}H_{22}O_{11}$), in combination with lime, magnesia, and potash, 70 per cent.; water, 17 per cent.; and a small quantity of acid malate of calcium, chlorides of calcium and potassium, with traces of iron, silica, and phosphate of calcium; the solution forms an opaque white jelly of gummate of lead, with subacetate of lead. Gummic Acid is converted by the action of nitric acid into mucic acid, but is not convertible into sugar. The addition of iodine to the powder, or to a solution formed with boiling water, produces no violet or blue colour, showing absence of starch.

Off. Prep. Mucilago Acaciæ. Mucilage of Gum Arabic. (Gum arabic, in small pieces, four ounces; distilled water, six fluid ounces; strain through muslin, if necessary.)

Gum is also contained in mistura cretæ; mistura guaiaci; pulvis amygdalæ compositus; pulvis tragacanthæ compositus; also in all the Trochisci or Lozenges.

Therapeutics. Gum acts simply as a demulcent, and is employed to allay irritation of the mucous membranes, as of the fauces, pharynx, and stomach ; it is likewise frequently used for the purpose of suspending heavy powders, as subnitrate of bismuth, oxide of zinc, &c., when administered in the liquid form, but for this purpose tragacanth is preferable. Gum has been proposed as a substitute for amylaceous food in the treatment of diabetes mellitus, as it is not converted into sugar, but its use does not appear to have been attended with any benefit : whether or no it passes through the kidneys unchanged has not been clinically determined. The author has failed to detect gum in the urine, after having administered as much as half a pound a day to a patient. It is, however, often used in irritation of the bladder and urethra, from an idea of its acting as a demulcent upon the mucous membrane of the urinary passages : but it is probable that the increased quantity of fluid which is taken along with the gum diminishes the acidity of the urine in such cases.

Dose. Gum may be given *ad libitum* ; the author has given ½ lb. per diem in diabetes, without any perceptible symptom being produced.

Catechu Nigrum. Black Catechu. (Not officinal.) An extract from the wood of Acacia Catechu ; imported from Pegu.

Description. It occurs in irregular masses, consisting of layers enveloped in rough leaves, hard, yet brittle ; of a blackish-red colour and shining surface, with a very astringent and bitter taste, followed by an impression of sweetness. (See Pale Catechu.)

Indigo. $C_{16}H_5NO_2$, or C_8H_5NO. Prepared from several species of Indigofera ; is introduced into the Appendix of the Pharmacopœia for making the following preparation.

Solution of Sulphate of Indigo. (Appendix.)

Prep. By dissolving five grains of indigo in one fluid drachm of sulphuric acid with the aid of heat, and then diluting with sulphuric acid till the whole measures ten fluid ounces.

Prop. & Comp. Indigo Blue, or indigotin (C_8H_5NO), is insoluble in water, but by the action of deoxidating agents it is changed into white indigo, which contains one more atom of hydrogen than indigotin ; this is soluble in water, and by exposure to the air becomes reconverted into the blue variety. The solution of sulphate of indigo contains a peculiar compound of the acid and

the colouring matter, called sulphindigotic acid ($C_8H_5NO.SO_3$). This solution is used as a test for free chlorine in hydrochloric acid and liquor sodæ chloratæ; if free chlorine be present, the colour is destroyed.

Therapeutics. The action of indigo as a therapeutic agent requires further investigation; it has been employed in epilepsy; it colours the urine green or bluish-green. Indigo is occasionally found in the urine in disease.

ROSACEÆ.

Rosæ Centifoliæ Petala. Cabbage Rose Petals. The fresh petals of Rosa centifolia, the Cabbage, Damask, or Hundred-leaved Rose; cultivated in Europe; a native of Persia and the Caucasus. The petals should be obtained from plants cultivated in Britain.

Description. The petals, familiar to all, are ordered to be used when fresh, as they lose their odour by drying. They have a sweetish-bitter and faintly astringent taste, odour roseate; both readily imparted to water.

Prop. & Comp. Odour fragrant, depending upon a *volatile oil;* besides this, some colouring matter, and a slight laxative principle exist in the petals, and a trace of *tannic* or *gallic acid.* The volatile oil, known under the name of Attar of Roses, is prepared in India; a very small quantity exists in the rose petals.

Off. Prep. AQUA ROSÆ. Rose Water. (Fresh petals of the hundred-leaved rose, ten pounds; water, two gallons. Let a gallon distil.)

Therapeutics. Rose water is used only as an agreeable vehicle for the administration of medicines; much employed in making lotions.

Dose. Of rose water, *ad libitum.*

Rosæ Gallicæ Petala. Red Rose Petals. The fresh and dried petals of the unblown flower of Rosa gallica, the Red or French Rose; grows in Austria and South of Europe; cultivated in England.

Description. The flower-buds deprived of the calyx and claws are employed in medicine; they are about the size of a nutmeg, of a purplish-red colour, with an astringent taste, and a roseate odour, developed by drying.

Prop. & Comp. The petals contain *red colouring matter, tannic,* or *gallic acid,* and a trace of *volatile oil;* the colour is acted on by light. An infusion of the petals becomes bright red with acids and green with alkalies.

Off. Prep. CONFECTIO ROSÆ GALLICÆ. Confection of Roses. (Fresh red rose petals, one pound; sugar, three pounds. Pound the rose petals in a stone mortar; add the sugar, and pound them again until incorporated.)

INFUSUM ROSÆ ACIDUM. Acid Infusion of Roses. (Red rose petals, a quarter of an ounce; dilute sulphuric acid, one fluid drachm; boiling distilled water, ten fluid ounces.) It is of a bright red colour, from the action of the sulphuric acid on the colouring matter of the rose petals.

SYRUPUS ROSÆ GALLICÆ. Syrup of Red Roses. (Dried red rose petals, two ounces; refined sugar, thirty ounces; boiling distilled water, one pint. The product should weigh two pounds fourteen ounces, and should have the sp. gr. 1·335.)

Therapeutics. Red rose petals are astringent, from tannin or gallic acid; they are, however, oftener used on account of their colouring matter. The confection is employed as a pill basis, occasionally as a slight astringent, and is applied in aphthous conditions of the mouth in the form of a linctus. The acid infusion makes an excellent gargle, and is given internally as an astringent or as a vehicle for more powerful medicines, as Epsom salts, sulphate of quinia, &c. A preparation made with honey, mel rosæ, not now officinal, is a favourite astringent application to aphthæ in children.

Dose. Of the confection, 60 gr. or more; of the acid infusion, 1 fl. oz. to 2 fl. oz.; of the syrup, 1 fl. drm. or more, if given internally.

Rosæ Caninæ Fructus. Hips. The fresh fruit of Rosa canina the Dog Rose, and other allied species; indigenous.

Description. The ripe fruit of indigenous plants deprived of their hairy seeds (achenes), an inch or more in length, ovate, scarlet, smooth, shining; taste sweet, subacid, pleasant.

Prop. & Comp. The pulp contains *citric* and *malic* acids, with citrates, malates, sugar, a little tannin, and a trace of volatile oil.

Off. Prep. CONFECTIO ROSÆ CANINÆ. Confection of Hips. (Hips, deprived of their seeds, one pound; refined sugar, two pounds. Rub the pulp, gradually adding the sugar, until thoroughly incorporated.)

Therapeutics. A slight refrigerant, also somewhat astringent. In the form of the confection it is used to form a linctus, and also as a pill basis in pilula quiniæ.

Dose. Of confection, 60 gr., or more.

Amygdala Amara. Bitter Almond. The seed of the Bitter Almond Tree, Amygdalus communis, var. Amara. Brought chiefly from Mogadore.

Amygdala Dulcis. Sweet Almond. Jordan Almonds. The seed of Amygdalus communis (the sweet variety), the Sweet Almond Tree; growing in Syria, Persia, also in Northern Africa and Southern Europe. The seed, from trees cultivated about Malaga.

Amygdalæ Oleum. Almond Oil. The oil expressed from the seeds of Amygdalus communis (both bitter and sweet varieties).

Description. The character of the *almond seed* is well known; it is above an inch in length, lanceolate, acute, with a clear cinnamon-brown seed-coat, and a bland, sweetish, nutty-flavoured kernel: the bitter almond is the smaller of the two. The *oil* is of a very pale yellow colour, made by expression, and whether obtained from the sweet or bitter variety is the same in properties and composition, being nearly inodorous, or having a nutty odour with a bland oleaginous taste.

Prop. & Comp. Both varieties of almonds contain about 50 per cent. of the *fixed oil*, chiefly olein—an albuminous principle, soluble in water, called *emulsine*,—with sugar, gum, and woody fibre; the bitter variety, in addition to these, possesses a peculiar white crystalline glucoside, *Amygdaline* ($C_{20}H_{27}NO_{11}+3H_2O$), soluble in water and alcohol, the solutions having a slightly bitter taste. It is to the presence of this body that the peculiar properties of the bitter almond are due, for when amygdaline is acted upon by the emulsine, as occurs on moistening the almond, a species of fermentation ensues, and *hydrocyanic acid* (HCN) and *volatile oil of bitter almonds* or hydride of benzoyl (C_7H_5O,H) are formed, with a little glucose and formic acid, and hence poisonous effects may result from such a decomposition, which may be represented thus,

$$C_{20}H_{27}NO_{11}+2H_2O=CNH+C_7H_6O+2C_6H_{12}O_6.$$

The *volatile oil*, when deprived of prussic acid, is not poisonous, and resembles in appearance other volatile oils; it is chiefly composed of hydride of benzoyl ($C_7H_5O.H$); on exposure it absorbs

oxygen, and is converted into benzoic acid ($C_7H_6O_2$); it is procured by distilling the marc, left after the expression of the fixed oil from bitter almonds, with water; that sold in the shops is intensely poisonous from the large amount (from 4 to 8 per cent.) of prussic acid contained in it.

Off. Prep.—Of Almonds. MISTURA AMYGDALÆ. Almond Mixture. (Compound powder of almonds, two ounces and a half; distilled water, one pint.)

PULVIS AMYGDALÆ COMPOSITUS. Compound Powder of Almonds.

Synonyms. Confectio Amygdalæ, *Lond.*; Conserva Amygdalarum, *Edin.*

Jordan almonds, eight ounces; refined sugar, in powder, four ounces; gum acacia, in powder, one ounce.

Of Almond Oil.

Used in unguentum cetacei, unguentum simplex, &c.

Therapeutics. Sweet almonds are nutritive, from the albuminous, oleaginous, and saccharine matters contained in them; they are likewise demulcent, and are either used on account of this property, or more commonly the officinal preparations are employed as vehicles for the exhibition of other remedies: the fixed oil may be also used as a demulcent; in large doses it is purgative. Bitter almonds are poisonous in large quantities, and their exhibition is not advisable, the amount of prussic acid generated being very variable, and the officinal acid can always be prescribed with equal advantage and much greater safety. (See Acidum Hydrocyanicum Dilutum.)

An almond cake made from the non-amylaceous powder of the sweet almond has been proposed by Dr. Pavy as a substitute for bread in the treatment of diabetes.

Dose. Of compound powder of almonds, 60 gr. to 120 gr of almond mixture, 1 fl. oz. to 2 fl. oz.; of almond oil (fixed), 1 fl. drm. to ½ fl. oz.

Prunum. The Prune. The dried drupe of the Prunus domestica, or Common Plum Tree; growing in Syria and in different parts of Europe.

Description. The finest and sweetest varieties are used as a condiment; the smaller kind, more acid and less pleasant, are employed in medicine. They are about an inch long, ovate, wrinkled, black, sweet, and somewhat austere.

Prop. & Comp. Prunes contain a little malic acid, sugar, and a purgative principle the nature of which is unknown.

Prunes are contained in confect. sennæ.

Therapeutics. Seldom prescribed by the physician, but often used as a domestic laxative medicine; they are somewhat apt to cause flatulence and griping.

Dose. 2 oz. and upwards. Prunes are often added to an infusion of senna to increase its purgative action and render it more palatable.

Lauro-Cerasi Folia. The fresh leaves of Prunus Lauro-Cerasus, the Cherry Laurel; a native of Asia Minor, but cultivated in English gardens.

Description. The leaves of the cherry laurel are four or five inches long, and about two broad; coriaceous in texture, ovate-lanceolate or elliptical, with a few dentations; shining and smooth on the upper surface, dull on the under and of a lighter colour, with two or four glands, and strong short foot-stalks; emitting a ratafia odour when bruised.

Prop. & Comp. On distillation with water they yield volatile oil and some prussic acid: neither of the substances are present in the leaves; *Amygdaline*, however, exists in them, and it is by the decomposition of this principle that the above products are obtained. (See Amygdala.)

Off. Prep. Aqua Lauro-Cerasi. Laurel Water. (Fresh leaves of common laurel, one pound; water, two pints and a half. Distil one pint, shake the product, and filter through paper; preserve in a stoppered bottle.)

Therapeutics. Action as that of prussic acid. The strength of the above preparation is very variable, and this fact constitutes the great objection to its use, especially as all the valuable effects may be obtained by the use of the officinal acid. It is considered by some physicians to be an elegant mode of administering hydrocyanic acid.

Dose. 5 min. to 30 min.

Cusso. Kousso. The flowers and tops of Brayera anthelmintica; they are said to be dicœcious. The tree is a native of Abyssinia, growing chiefly on elevated ground, several thousand feet above the level of the sea.

Description. Small reddish-brown flowers, on hairy stalks the

outer limb of calyx five parted, the segments oblong or oblong-lanceolate reticulated. The general colour of kousso, viewed *en masse*, is yellowish-green, with the purple edges of the petals of the flower appearing pretty frequently and streaking the ground colour. It has a peculiar odour, somewhat like that of tea. It is safer to buy it with the flowers whole than in a state of powder, as in the latter case it is more readily adulterated.

Prop. & Comp. Kousso may be obtained either in the form of powder or of the dried flowers. It contains a volatile oil, gum, sugar, &c., and a crystallizable principle, *koussine*, but whether its active properties are due to the latter substance is unknown.

Off. Prep. INFUSUM CUSSO. Infusion of Kousso. (Kousso in coarse powder, a quarter of an ounce. Boiling distilled water four fluid ounces. Prepared without straining.)

Therapeutics. Kousso acts as an efficient anthelmintic. Whether it is superior to other remedies of the same class, is as yet doubtful; it has little or no cathartic power, and the subsequent administration of a purgative is generally required to bring away the entozoa, which the kousso seems to destroy. It has been chiefly employed in cases where tape-worm is suspected, or known to be present. Nausea, and even vomiting, are frequently induced by the drug.

Dose. Of kousso, ½ oz. for an adult; ⅛ oz. to ¼ oz. for a child. Of the infusion (including the infused flowers), 4 fl. oz. to 8 fl. oz.

MYRTACEÆ.

Caryophyllum. Cloves. The unexpanded flower-bud, dried, of Caryophyllus aromaticus, or Clove tree; growing in the East Indian Islands, Penang, Bencoolen, and Amboyna.

Caryophylli Oleum. Oil of Cloves. The oil distilled in England from cloves.

Description. The *clove* is a small, tapering, nail-like body, about six lines long, consisting of a four-toothed calyx, between which the unopened corolla is seen as a round ball; of a dark reddish-brown colour, and hot taste. It emits oil when indented with the nail. The *oil*, light yellow when fresh, gradually becoming red-brown, from a resinous change in the eugenic acid, sp. gr. 1·055 to 1·060, has the odour and burning taste of the clove. It is one of the few volatile oils heavier than water.

Prop. & Comp. Cloves, besides the *volatile oil*, contain *resin*, *tannin*, and woody fibre. The volatile oil consists of a *hydro-*

carbon ($C_{10}H_{16}$), holding in solution *eugenic acid* ($C_{10}H_{12}O_2$), and a crystallizable body, *caryophylline* ($C_{10}H_{16}O$), isomeric with camphor; and lastly, *eugenine*, probably isomeric with eugenic acid.

Off. Prep. INFUSUM CARYOPHYLLI. Infusion of Cloves. (Bruised cloves, quarter of an ounce; boiling distilled water, ten fluid ounces.)

Cloves are also contained in infusum aurantii compositum; mistura ferri aromatica; and vinum opii.

Therapeutics. Cloves and the oil are stimulant, aromatic, and carminative; employed in atonic dyspepsia, to allay vomiting in pregnancy, and to relieve flatulence. The oil may be used as an adjunct to purgatives; or locally, to arrest the pain of carious teeth.

Dose. Of the powdered clove, 5 gr. to 20 gr., or more; of the infusion, 1 fl. oz. to 2 fl. oz.; of the oil, 1 min. to 5 min., or more.

Incompatibles. Solutions containing cloves strike black with salts of iron, on account of the tannin they contain.

Pimenta. Pimento. The unripe fruit of Eugenia pimenta, the Pimento or Allspice Tree; growing in the West Indian Islands.

Pimentæ Oleum. Oil of Pimento. The oil distilled from the fruit in England.

Description. Pimento is a small round two-celled berry, rather larger than pepper; brown and rough on the surface, crowned with the teeth of the calyx, and containing two seeds; of an aromatic odour, and hot, aromatic taste.

Prop. & Comp. The *volatile oil*, yellow, heavier than water, consists of two portions, like that of cloves, with which it appears to be identical; besides which allspice contains a fixed oil, *resin*, *tannic acid*, and less important ingredients. The cortical portion is the most active.

Off. Prep. AQUA PIMENTÆ. Pimento water. (Pimento, bruised, fourteen ounces; water two gallons. Let a gallon distil.)

Therapeutics. The same as cloves.

Dose. Of the powder, 5 gr. to 20 gr., or more; of pimento water, 1 fl. oz. to 2 fl. oz.; of the oil, 1 min. to 5 min.

Oleum Cajuputi. Oil of Cajeput. The oil distilled from the leaves of Melaleuca minor, or Cajeput Tree; growing in

the Molucca Islands. The oil is imported from Batavia and Singapore.

Description. A very transparent mobile oil, of a fine pale bluish-green colour, with a strong camphoraceous and cardamom-like odour and taste ; a small quantity only is yielded by the leaves.

Prop. & Comp. Sp. gr. 0·925 ; when distilled, at first a colourless oil passes over, which is the hydrate of cajputene ($C_{10}H_{16}.H_2O$), and constitutes about two-thirds of the crude oil.

Off. Prep. SPIRITUS CAJUPUTI. Spirit of Cajeput. (Oil of Cajeput, one fluid ounce ; rectified spirit, forty-nine fluid ounces.)

Therapeutics. A powerful topical and general stimulant and antispasmodic, employed in flatulent colic, hysteria, and cholera ; also in chronic rheumatism and low states of the system. Externally, when mixed with olive oil, it is used over chronic rheumatic and gouty parts. It is contained in linimentum crotonis.

Dose. 1 min. to 5 min., or more ; of spirit of cajeput, ½ fl. drm. to 1 fl. drm., or upwards.

Adulteration. Copper has been detected in certain samples, but is not essential to the green colour of the oil. Camphor, dissolved in oil of rosemary, and coloured by copper, is said to have been substituted for the genuine oil.

Eucalypti Folia. The leaves of Eucalyptus globulus, the Blue Gum tree. Native of Tasmania. Cultivated in Southern Europe, Algeria, &c. (Not officinal.)

Description. The leaves of the full-grown tree are short-stemmed, smooth, entire, ensiform, 6-12 inches long, ½-1 inch in breadth. Glaucous when fresh ; yellowish-green and coriaceous when dry. Held up to the light, they are seen to be studded with oil-glands. Smell faintly camphoraceous, taste rather bitter and pungent. The leaves of the young plant differ in form and colour from those of the full-grown tree ; they are said to be useless for pharmaceutical purposes, probably because their glands are imperfectly developed. For a like reason the dried leaves are less effectual than fresh ones.

Prop. & Comp. The glands of the leaves contain a colourless, volatile oil, *eucalyptol*, the smell of which resembles that of cajuput oil. Like most substances of the kind, it probably consists of two portions: a simple hydrocarbon and an oxidized product, the proportion of the latter increasing with age. No

trace of any of the cinchona alkaloids can be detected in the bark or leaves. (Broughton.)

Therapeutics. There seems to be adequate evidence to show that plantations of this rapidly-growing tree have the power of destroying the paludal miasm in malarious districts. This property is due, not, as has been supposed, to any impregnation of the air with balsamic vapours, but to the draining power of the roots, which suck up the moisture from the soil.

The therapeutic value of the leaves depends on the volatile oil which they contain. Binz and Siegen have shown that the antiseptic power of eucalyptol is greater than even that of quinia. It lowers reflex excitability by acting on the cord and its prolongations. It reduces the temperature of the body somewhat in health, and has a very decided antipyretic influence on the septic fever produced artificially in dogs by the injection of putrilage into their veins. Seventy-five grains of eucalyptol taken by a healthy man within a period of two hours, caused a moderate sensation of dulness and weight in the limbs, followed by mental depression and exhaustion lasting for several hours. The appetite was not disturbed ; there was no irritation of the kidneys ; very little eucalyptol appeared unchanged in the urine, but a considerable quantity of resin was found in it. The breath smelt of the drug for many hours.

The tincture has been highly recommended as a febrifuge in the treatment of intermittent fever. It has also been employed as a stimulant and antispasmodic. The leaves have been smoked to relieve asthma, bronchitis, and whooping-cough.

Dose. The tincture employed at Vienna is prepared by bruising 100 parts of the fresh leaves in a mortar with 200 parts of rectified spirit ; the mixture is digested for a fortnight at a moderate temperature ; it is then pressed and filtered. The dose of this tincture is 30 min. to 2 fl. drm. and upwards. Eucalyptol may be given in doses from 15 min. to 60 min. In intermittent fevers, a full dose of the tincture should be given two hours before the paroxysm.

The gum which exudes from the bark of EUCALYPTUS RESINIFERA and other species has been employed for its astringent properties under the name of Botany Bay Kino. It resembles catechu or kino in its properties and composition.

Granati Radicis Cortex. Pomegranate Root Bark. The dried bark of the root of Punica granatum ; growing on the

shores of the Mediterranean; chiefly imported in the dried state from Germany.

Description. The *fruit* of this tree resembles an orange, but has a coriaceous rind, and is crowned with a toothed calyx; it was formerly officinal. The *root-bark* occurs in thin quilled pieces, of a greyish colour externally, yellow within, having a short fracture, slight odour, and bitterish but astringent taste.

Prop. & Comp. The rind of the fruit contains *tannin*, about 20 per cent., with extractive and mucilaginous matters; the root-bark contains about the same quantity of *tannin*, and a principle called *punicine* has also been detected.

Off. Prep. Decoctum Granati Radicis. Decoction of Pomegranate Root. (Pomegranate root, fresh or dry, sliced, two ounces; distilled water, forty fluid ounces. Boil down to twenty fluid ounces, and strain.)

Therapeutics. The rind of the fruit is somewhat astringent, from the tannin contained in it, and may be used externally and internally when astringents are indicated. The pomegranate root bark, which is slightly astringent, has been employed for the expulsion of tape-worms; but it is far less efficacious than the extract of male fern.

Dose. Of decoction, 1 fl. oz. to 3 fl. oz., or more.

CUCURBITACEÆ.

Colocynthidis Pulpa. Colocynth Pulp. The dried decorticated fruit, freed from the seeds, of Citrullus colocynthis, Colocynth Gourd; a plant growing on the shores of the Mediterranean and India; imported chiefly from Smyrna, Trieste, France, and Spain.

Description. The fruit was formerly imported from Mogador unpeeled, now only from the Mediterranean ports peeled. It consists of a globular pepo, about the size of an orange; the rind is hard and yellow, the pulp very light yellow, porous or spongy, tough, and enclosing the seeds, which form about 72 per cent. of its weight, and are ordered to be removed, as seen in the definition.

Prop. & Comp. Intensely bitter; contains a glucoside, *colocynthin* ($C_{56}H_{84}O_{23}$), capable of being crystallized; soluble in water, alcohol, and ether; decomposed by boiling with acids into glucose and a resin ($C_{40}H_{54}O_{13}$).

Off. Prep. Extractum Colocynthidis Compositum. Compound Extract of Colocynth. (Colocynth, free from seeds, six ounces; extract of Socotrine aloes, twelve ounces; resin of scammony, four ounces; hard soap, in powder, three ounces; cardamoms, free from the pericarps, in fine powder, one ounce; proof spirit, one gallon. Prepared by macerating the colocynth in proof spirit, mixing the solution thus made with the extract of aloes, scammony, and hard soap, distilling off the spirit, and reducing the residue in a water bath to the consistence of an extract, adding the cardamoms towards the end of the process, and reducing by evaporation to a pilular consistence.)

Pilula Colocynthidis Composita. Compound Colocynth Pill. (Colocynth, in powder, one ounce; Barbadoes aloes, two ounces; scammony, two ounces; sulphate of potash, quarter of an ounce; and oil of cloves, two fluid drachms.)

Pilula Colocynthidis et Hyoscyami. Pill of Colocynth and Hyoscyamus. (Compound colocynth pill, two ounces; extract of henbane, one ounce.)

Therapeutics. Colocynth is a drastic purgative, producing watery evacuations, and stimulating powerfully the pelvic organs; when given alone it is apt to gripe, by producing irregular peristaltic movements, and hence it is usually given in conjunction with other purgatives and carminatives; in which combination it imparts great briskness of action. It is employed in obstinate and habitual constipation, febrile conditions, and to relieve the portal system in dropsical effusions, amenorrhœa and other uterine obstructions; also as a derivative in head affections. The compound extract and pill are efficient combinations, and the compound pill with henbane is found to act efficiently and with less griping from the addition of the latter drug, which not only makes the vermicular movement of the intestines more uniform, but even increases the purgative action. In very large doses, colocynth produces inflammation of the intestines.

Dose. Of the powdered pulp, 2 gr. to 8 gr.; of the compound extract, 3 gr. to 10 gr.; of compound colocynth pill, 5 gr. to 10 gr.; of pill of colocynth and hyoscyamus, 5 gr. to 10 gr.

Adulteration. The extract is not unfrequently made with the pulp and seeds, which yield a larger, but a less active product; the use of the pulp free from seeds should be strictly adhered to in making the officinal preparations.

Ecbalii Fructus. Squirting or Wild Cucumber Fruit; growing in Greece and southern parts of Europe; also cultivated in England.

Elaterium. Elaterium. A sediment from the juice of the fruit of Ecbalium Officinarum.

Description. The fruit of Ecbalium officinarum is a small elliptical pepo, about 1½ inch long, covered with soft prickles, containing the seeds surrounded by a juicy tissue: these, when ripe, are expelled forcibly, hence the English name of the plant. Elaterium itself occurs in the form of thin flattened or slightly incurved pieces about 1 line thick; light, friable; of a green colour when fresh, becoming grey on exposure to light. The fracture is finely granular.

Prep. Elaterium is prepared by cutting the fruit lengthwise, and lightly pressing out the juice, which is strained through a hair sieve; the expressed juice is set aside to deposit; the sediment poured on a linen filter and dried on porous bricks at a gentle heat. This was formerly called the extract.

Prop. & Comp. Elaterium contains an active principle, *elaterine* or *momordicine* ($C_{10}H_{14}O_2$?), which forms hexagonal plates, soluble in alcohol, but very slightly so in water or ether, forming in good elaterium from 20 to 30 per cent.; also a *green resinous matter*, soluble in ether, probably chlorophyll, together with woody fibre, &c.

Off. Prep. Pulvis Elaterii Compositus. Compound powder of Elaterium. (Elaterium, ten grains; sugar of milk, ninety grains.) One grain of elaterium in ten grains of the powder.

Therapeutics. A very powerful drastic hydragogue purgative, used chiefly in dropsical affections, especially those connected with cardiac disease; it sometimes causes nausea and great depression, hence should be carefully administered; elaterium is apt to produce gastro-enteritis if incautiously given. It is said that elaterin, convolvulin, and some other purgative principles are unable to exercise their evacuant powers unless they are brought into contact with the bile, almost the only fluid in the body capable of dissolving them.

Dose. Of elaterium (good), $\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.; of the compound powder of elaterium, $\frac{1}{2}$ gr. to 5 gr.; of crystallized elaterine or momordicine, $\frac{1}{40}$ gr. to $\frac{1}{6}$ gr.

Adulteration. Elaterium is often very inferior, containing

starch or flour, also chalk, and but little elaterine, often not more than 4 or 6 per cent. It should not give a blue colour with iodine, nor effervesce when an acid is added. It yields half its weight to boiling rectified spirit; and when this solution is concentrated and added to a warm solution of potash, at least 20 per cent. of crystallized elaterine should be precipitated on cooling. The green colouring matter is soluble in the alkaline solution, but the elaterine is insoluble.

UMBELLIFERÆ.

Conii Folia. Hemlock Leaves. The fresh leaves and young branches of Conium maculatum, spotted Hemlock; also the leaves separated from the branches and carefully dried; gathered from wild British plants when the fruit begins to form.

Conii Fructus. Hemlock Fruit. The ripe dried fruit of the same plant.

Description. The *leaves* are decompound, smooth, arising from a short stem with dark purple spots; they are deep green, shining, tripinnate, with pinnatifid leaflets, petioles furrowed and sheathing at the base. The *seeds*, or rather *fruit*, are broadly ovate, compressed laterally, and distinguished from other umbelliferous fruits by having undulating crenulated ridges and no vittæ.

Prop. & Comp. The leaves, when fresh, have a peculiar odour, due to the presence of a *volatile oil*. Both leaves and fruit contain *Conia* ($C_8H_{15}N$), a liquid volatile alkaloid, in combination with an acid. Conia is colourless when pure; has a strong, characteristic odour, which has been compared to that of mice; sp. gr. ·87; soluble in ether and alcohol; slightly soluble in water, with which it combines. It produces a greasy stain on paper, which disappears entirely when warmed. The conia is always associated with a variable proportion of *Methyl-conia* ($C_8H_{14}.CH_3.N$), a base closely resembling it in physical properties. Hemlock also contains a small quantity of another base, *Conhydrine* ($C_8H_{15}N.H_2O$), which sublimes in colourless needles and is strongly alkaline. The vapour of conia is inflammable. The alkaloid is set free from its combination in the plant by potash, when it may be distilled and recognized by its odour and the fumes it gives with hydrochloric acid. Commercial conia is never free from methyl-conia, and may contain it in considerable proportion.

Off. Prep.—Of Conium (leaves). Cataplasma Conii. Hemlock Poultice. (Hemlock leaf, in powder, one ounce; linseed meal, three ounces; boiling water, ten fluid ounces.)

Extractum Conii. Extract of Hemlock. (Prepared in the same manner as the other green extracts.)

Pilula Conii Composita. Compound Pill of Hemlock. (Extract of hemlock, two and a half ounces; ipecacuanha, in powder, half an ounce; treacle, a sufficiency.)

Vapor Coniæ. Inhalation of Conia. (Extract of hemlock, sixty grains; solution of potash, a fluid drachm; distilled water, ten fluid drachms. Mix. Put twenty minims of the mixture on a sponge in an inhaler containing hot water.)

Succus Conii. (The expressed juice of the fresh leaves with one part of rectified spirit added to every three parts of the juice.)

Of the Conium Fruit. Tinctura Conii. Tincture of Hemlock. (Hemlock fruit, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.) At least twice the strength of the tincture of the leaves of the last London Pharmacopœia.

Therapeutics. The physiological effects of hemlock are due to the conia and methyl-conia it contains. These alkaloids being very volatile and liable to become decomposed, the strength of the various preparations of the plant is in the highest degree uncertain. Moreover, the quantitative relation of the two alkaloids to each other seems to be exceedingly variable; not an unimportant circumstance, since their actions, though similar, are not identical.

The chief effect of conia is paralysis of the voluntary muscles. This is due to a selective action, similar to that of curare, on the end-organs of the motor nerves; the spinal cord, the brain, the muscular tissue, and the afferent nerves remaining unaffected. The respiratory muscles are gradually enfeebled, and death results by asphyxia from their ultimate paralysis. The action of the heart is not directly interfered with; it may continue to beat after all respiratory movements have ceased.

But this, the action of pure conia, is considerably modified by the invariable association of methyl-conia with it. The latter alkaloid, as the researches of Fraser and Crum-Brown have shown, is equal to conia in lethal energy; but its action is not limited to the end-organs of the motor nerves; it exerts a

specific influence on the cord as well, first exalting, then abolishing its reflex function. Commercial conia was found to exhibit spinal-stimulant and spinal-depressant actions in addition to its proper effect on the motor nerves. Inasmuch, however, as those actions were less marked in proportion to the freedom of the drug from methyl-conia, Fraser and Crum-Brown conclude that the spinal symptoms are wholly due to the latter alkaloid and that pure conia would confine its action to the terminations of the motor nerves. The tetanoid spasms, antecedent to the paralysis in point of time, which occur in some warm-blooded animals poisoned by conium, are therefore, in all likelihood, caused by the methyl-conia it contains.

A full dose of any active preparation of conium, given to a healthy man, causes weakness of the legs and staggering gait. The third nerve is early implicated, dilatation of the pupils and ptosis resulting. The cerebral functions are not interfered with; sensation is retained: the heart and pulse are unaffected. The muscular weakness increases; drowsiness comes on, followed by sleep; coldness of the extremities, pallor and nausea are not unfrequently present. The drug may be taken for months, without causing any disturbance of digestion.

Conium is well fitted to allay muscular spasm in chorea, paralysis agitans, mercurial tremor, and the violent twitching of the legs which sometimes occurs in paraplegia. It is useless in tetanus and strychnia-poisoning. It has been employed to relieve cough in bronchitis, pertussis, and phthisis; for such purposes the Vapor Coniæ is adapted. It was at one time held to be a remedy for cancer; it often alleviates the disease, by allaying pain and improving the general health. It may be applied to the diseased surface in the form of poultice. It has also been recommended in the paroxysms of acute mania.

The author has made many observations on the action of conium, the results of which were brought before the Royal College of Physicians in 1864, in a short course of lectures on "The Value of the New Remedies of the British Pharmacopœia." He showed that the tincture, both of the leaves and fruit, might be given in very large doses, from half to one fluid ounce, with impunity. Dr. John Harley has recently repeated these observations on the tinctures, and extended them to other preparations of hemlock. He regards the succus as the only reliable preparation of the drug for internal use, adding that even this cannot always be depended on, owing to the very variable proportion of the active principle contained in it.

Dose. Of the powdered leaf, 2 gr. to 8 gr., or more; of the extract, 2 gr. to 6 gr., or more; of the compound pill, 5 gr. to 10 gr.; of the juice of hemlock, 30 min. to 2 fl. drm. or more; of the tincture, 20 min. to 2 fl. drm., or more.

Assafœtida. The gum resin exuding, after incision, from the living root of Narthex assafœtida; a native of Persia, Affghanistan, and the Punjaub.

Description. Generally in masses of agglutinated tears, sometimes in separate tears; moist or dry. The masses, when cut, are amygdaloid in appearance, consisting of the harder whitish tears, with softer and brownish-red uniting matter; assafœtida becomes pink, then dark red on exposure; its odour is very strong and alliaceous; taste bitter, and rather acrid.

Prop. & Comp. Assafœtida dissolves almost entirely in rectified spirit. It contains *volatile oil*, about 4 per cent., consisting of sulphide of allyl [$(C_3H_5)^2S$], *resin* 65 per cent., *gum* 25 per cent., and some saline matters. When rubbed with water, the gummy matters dissolve, and the resin and volatile oil are suspended, and hence an emulsion is formed.

Off. Prep. Enema Assafœtidæ. Enema of Assafœtida. *Synonym.* Enema Fœtidum. *Edin., Dub.* (Assafœtida, thirty grains; water, four fluid ounces.)

Pilula Aloes et Assafœtidæ. Pill of Aloes and Assafœtida. (Socotrine aloes, in powder, one ounce; assafœtida, one ounce; hard soap, in powder, one ounce; confection of roses, one ounce.)

Pilula Assafœtidæ Composita. Compound Pill of Assafœtida. (Assafœtida, two ounces; galbanum, two ounces; myrrh, two ounces; treacle by weight, one ounce.)

Spiritus Ammoniæ Fœtidus. Fetid Spirit of Ammonia. (Assafœtida, one and a half ounce; strong solution of ammonia, two fluid ounces; rectified spirit, a sufficiency. Macerate the assafœtida in fifteen ounces of the spirit for twenty-four hours, distil off the latter, add the solution of ammonia, and make the bulk to a pint with more spirit.)

Tinctura Assafœtidæ. Tincture of Assafœtida. (Prepared by maceration. Assafœtida in small fragments, two ounces and a half; rectified spirit, twenty ounces.)

Therapeutics. Assafœtida acts on the nervous system as a stimulant and powerful antispasmodic, and is especially useful in hysterical convulsive affections; likewise in pertussis, asthma, and

other nervous diseases; in tympanitis it may be administered as an enema. It is useful also in some forms of chronic bronchitis, as an expectorant.

The author is inclined, from the result of much observation, to regard assafœtida as one of the most valuable remedies of the Materia Medica; far above all other ordinary antispasmodics; and he thinks the value of the drug is chiefly due to the sulphur oil contained in it. The resin probably acts as a stimulant expectorant. Galbanum and ammoniacum are devoid of the sulphur oil, and possess little or no true antispasmodic power when given alone, not more than myrrh or other resinous matters.

Dose. Of the gum resin, 5 gr. to 30 gr., or more; of the tincture, ½ fl. drm. to 1 fl. drm., or more; of pill of aloes and assafœtida, 4 gr. to 10 gr.; of compound pill of assafœtida, 5 gr. to 15 gr.; of fœtid spirit of ammonia, ½ fl. drm. to 1 fl. drm.

Adulteration. Mechanical impurities, as sand, stones, &c., occasionally met with.

Galbanum. A gum resin derived from Ferula galbaniflua. It is probably obtained by cutting the stick a little above the root and allowing the exuded juice to solidify in the air. It comes from the Levant and India.

Description. In masses, consisting of agglutinated tears, or more rarely in separate tears, about the size of a pea; of a greenish-yellow colour, translucent. Harder, lighter coloured, of less intense odour, and more agreeable than assafœtida, with a bitter acrid taste.

Prop. & Comp. Galbanum contains a *volatile oil* isomeric with oil of turpentine ($C_{10}H_{16}$), about 3·5 per cent. The *resin* can be made to yield umbelliferone ($C_6H_4O_2$); a blue oil ($C_{20}H_{30}O$); a colourless oil ($C_{20}H_{30}$); and a yellowish oil ($C_{40}H_{58}O$), which may be represented as the alcohol, hydride, and ether of $C_{20}H_{29}$.

Off. Prep. Emplastrum Galbani. Galbanum Plaster. (Galbanum, one ounce; ammoniac, one ounce; yellow wax, one ounce; lead plaster, eight ounces.)

Galbanum forms an important ingredient in pilula assafœtidæ composita.

Therapeutics. Supposed to act as assafœtida, but to be much less powerfully antispasmodic. Galbanum is probably more allied to ammoniacum in its action, and may be given as a stimulating expectorant; it is supposed to act upon the uterus as a stimu-

lant, and has been used in amenorrhœa. Externally it is slightly stimulating, and is applied to indolent tumours, with an idea of its possessing discutient powers.

Dose. Of the gum resin, 10 gr. to 30 gr., or more.

OPOPONAX, in London Pharmacopœia of 1836; a gum resin in tears, obtained from Opoponax chironium. Its properties are similar to those of the other fœtid gum-resins.

Ammoniacum. Ammoniacum. A gum-resinous exudation from the stem and pedicel of Dorema ammoniacum, indurated by the air; growing in Persia and the Punjaub. Usually stated to exude from punctures in the plant made by beetles; but by some to be obtained from the root by incision.

Description. In separate tears, or in masses; the tears from two to eight lines in diameter, pale cinnamon-brown colour, fracture smooth, white and opaque, but becoming yellow on exposure; the masses are composed of agglutinated tears presenting an amygdaloid appearance, very similar to some specimens of gum benzoin; ammoniacum is brittle when cold, but softens readily with heat; its odour is slight but peculiar; taste bitter and rather acrid; it forms a milky emulsion when rubbed with water.

Prop. & Comp. *Resin* about 70 per cent., *gum* 20 per cent., *volatile oil* 4 per cent. When rubbed with water the resin and oil are suspended by the dissolved gum. The oil differs from that of assafœtida in not containing sulphur.

Off. Prep. EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Ammoniac Plaster with Mercury. (Ammoniacum, twelve ounces; mercury, three ounces; olive oil, one fluid drachm; sulphur, eight grains.)

MISTURA AMMONIACI. Ammoniac Mixture. (Ammoniacum, a quarter of an ounce; distilled water, eight fluid ounces.)

Ammoniac is also contained in pilula scillæ composita; pilula ipecacuanhæ cum scillâ, and emplastrum galbani.

Therapeutics. Ammoniacum in large doses is apt to cause nausea; when it is absorbed, its action appears to be chiefly directed to the mucous membranes, more especially of the bronchial tubes; it is a powerful stimulating expectorant, and is very serviceable in some cases of chronic bronchitis, when unattended with febrile disturbance. Ammoniacum possesses very little action

upon the nervous system, and therefore cannot be substituted for assafœtida.

When applied externally, it acts as a local irritant, and the ammoniacum and mercury plaster sometimes causes a papular, or even a pustular eruption; ammoniacum is often used to cause the dispersion of indolent tumours, and to diminish chronically enlarged joints.

Dose. Of the gum resin, 10 gr. to 30 gr. or more; of the mixture, ½ fl. oz. to 1 fl. oz.

Anisi Oleum. Oil of Anise. The oil distilled in Europe from the fruit of Pimpinella anisum, or Anise. Also from the fruit of Illicium anisatum, Star anise (natural order, Magnoliaceæ), distilled in China.

Description. The mericarps, commonly called *seeds*, not now officinal, are oblong-ovate, downy, have five primary ridges, three vittæ in each channel; of a dingy yellowish-green colour. The *volatile oil*, oleum anisi, upon which the activity of the mericarp depends, is of a light straw colour; sp. gr. from 0·977 to 0·99. It concretes at 50°.

Prop. & Comp. Oil of anise consists of two portions, about $\frac{1}{5}$th being a liquid oil, isomeric with oil of turpentine ($C_{10}H_{16}$), and $\frac{4}{5}$ths being an oil solidifying below 50°. This latter oil has the composition $C_{10}H_{12}O$; it is easily oxidized, and then yields substances which may be regarded as compounds containing the radicle anisyl ($C_8H_7O_2$), which latter may be regarded as salicyl ($C_7H_5O_2$) in which an atom of hydrogen has been replaced by methyl ($C_7H_4.CH_3.O_2$). These substances are, hydride of anisyl ($C_8H_8O_2$), anisic acid ($C_8H_8O_3$), &c.

Off. Prep. Essentia Anisi. Essence of Anise. (Oil of anise, a fluid ounce; rectified spirit, four fluid ounces.)

Therapeutics. Stimulant, aromatic, and carminative; used to relieve flatulence, and to diminish the griping of purgative medicines.

Dose. Of the oil, 2 min. to 5 min.; of the essence, 10 min. to 20 min.

Fœniculi Fructus. Sweet Fennel Fruit. The fruit of Fœniculum dulce, Fennel; grows in most parts of Europe, imported from Malta.

The fruit is about three lines long and one broad, elliptical,

slightly curved, beaked, having eight pale brown longitudinal ribs, the two lateral being double.

Description. The mericarps, often called seeds, are oblong, convex on one surface, flat on the other; many of the mericarps are connected together by their flat surfaces, some single, of a dark grayish colour; footstalk often attached. The oil is of a light yellow colour, with the characteristic odour of the seeds.

Prop. & Comp. The oil, which is the active ingredient, is the same as oil of anise (*quod vide*).

Off. Prep. AQUA FŒNICULI. Fennel Water. (Sweet fennel fruit bruised, one pound; water, two gallons, distil one gallon.)

Therapeutics. Stimulant, aromatic, and carminative; used to relieve flatulence and diminish griping.

Dose. Of the oil of fennel, 2 min. to 5 min.: of fennel water, 1 fl. oz. to 2 fl. oz.

Coriandri Fructus. Coriander Fruit. The ripe dried fruit of Coriandrum sativum, Coriander; native of Italy, cultivated in England, and naturalized in most parts of Europe.

Oleum Coriandri. Oil of Coriander. The oil distilled in England from Coriander.

Description. Of the fruit. The fruit is of a globular form, beaked, finely ribbed, yellowish brown, nearly as large as white pepper, consisting of two adherent carpels, which are readily separated; odour and taste, aromatic.

Prop. & Comp. The *oil*, which is the active ingredient, is yellowish, and has the odour of coriander; it is a mixture of several oils, chiefly a volatile oxygenated, and a less volatile non-oxygenated oil.

Off. Prep. Coriander is an ingredient of many of the compound preparations of the Pharmacopœia, as confection of senna, gentian mixture, syrup of senna, and tincture of rhubarb and senna. Oleum coriandri is contained in syrupus sennæ.

Therapeutics. Stimulant, aromatic, and carminative; rarely given alone.

Dose. Of the oil, 2 min. to 5 min. ; of the powdered fruit, 10 gr. to 30 gr., or more.

Carui Fructus. Caraway Fruit. The dried fruit of Carum carui, or Caraway : cultivated in England and Germany.

Carui Oleum. Oil of Caraway. The oil distilled in England from caraway fruit.

Description. The caraway *seeds* (mericarps) are slightly curved, with fine filiform ridges, and contain a single vitta in each channel. The longitudinal ridges of a lighter colour than the intervening interstices. Colour, brownish, with a peculiar aromatic odour and warm taste. The *oil* is of a pale yellow colour, with the odour of the fruit, and a spicy taste.

Prop. & Comp. The fruit, besides the common constituents of a mericarp, yields the *volatile oil*, on the presence of which its medicinal virtues depend. The sp. gr. of the oil is 0·946 ; its colour is darkened by long keeping. It consists of two liquid portions, the unoxidized *carvene* ($C_{10}H_{16}$), the oxidized *carvol* ($C_{10}H_{14}O$).

Off. Prep. AQUA CARUI. Caraway Water. (Caraway, bruised, one pound ; water, two gallons, distil one gallon.)

Caraway is contained in many officinal preparations.

Therapeutics. Caraway is an aromatic, stomachic, and carminative, often used as a corrector of flatulence, and as an adjunct to other medicines ; the oil is often added to purgative medicines to prevent griping.

Dose. Of caraway water, 1 fl. oz. to 2 fl. oz. ; of the oil of caraway, 2 min. to 5 min.

Anethi Fructus. Dill Fruit. Fruit of Anethum graveolens, or Dill ; cultivated in England, or imported from middle and southern Europe.

Anethi Oleum. Oil of Dill. Oil distilled in England from the fruit.

Description. The seeds (fruit) are of a brown colour, oval, somewhat flattened, about a line and a half in length, convex on one side, and concave on the other ; they have five primary ridges, and one vitta in each channel. Pale membranous alæ. The oil is of a pale yellow colour, and aromatic odour ; taste, acrid sweetish.

Prop. & Comp. Dill owes its peculiar properties to the *volatile*

oil. This oil resembles in appearance that of caraway; its sp. gr. is 0·881. Its composition is probably analogous to that of the other umbelliferous oils.

Off. Prep. Aqua Anethi. Dill water. (Bruised dill, one pound; water, two gallons; let a gallon distil.)

Therapeutics. Stimulant, aromatic, and carminative; chiefly used in the flatulence of infants.

Dose. Of dill water, 1 fl. oz. to 2 fl. oz.; for infants, 1 fl. drm. to 2 fl. drm.; of the oil of dill, 2 min. to 5 min.

Sumbul Radix. Sumbul Root. Musk Root. Derived from Euryangium Sumbul, a native of Bokhara. It comes through Russia and Bombay.

Description. The drug as obtained in this country is in circular pieces, consisting of transverse sections of the root from $2\frac{1}{2}$ to 5 inches in diameter, and from $\frac{3}{4}$ to $1\frac{1}{2}$ inch in thickness. The epidermis of a light brown colour, wrinkled; the inner substance consists of coarse irregular fibres, easily separated: on looking at a transverse section, it appears porous through the greater part of its diameter, and the bundles of fibres are loosely packed together. The odour is strong and musk-like, hence its name. That brought from India differs from the Russian, being closer in texture, more dense and firm, and of a reddish tint.

Prop. & Comp. It yields, on distillation, a *volatile oil, resin, starch,* and an acid capable of crystallization, named *sumbulic* acid.

Off. Prep. Tinctura Sumbul. Tincture of Sumbul. (Sumbul root, in powder, two and a half ounces; proof spirit, a pint.)

Therapeutics. It appears to be a nervine stimulant, similar in its action to valerian. In Russia it has been used in cholera, and febrile diseases of a typhoid or adynamic type. It has been recommended in epilepsy, chorea, and other nervous disorders, and its use is said to be attended with much benefit in cases of delirium tremens. Its action requires further investigation.

Dose. Of the tincture, 10 to 30 min. Sometimes the resin separated from the root, has been employed in doses of from $\frac{1}{2}$ gr. upwards.

CAPRIFOLIACEÆ.

Sambuci Flores. Elder Flowers. The recent flower of Sambucus nigra; indigenous.

Description. The flowers are small, white, having a peculiar odour, in five-parted cymes.

Prop. & Comp. They yield on distillation a *volatile oil*, to the presence of which they owe their odour. Their active ingredients are soluble in water; no peculiar crystallizable principles have been obtained from them; they contain ingredients common to most flowers.

Off. Prep. AQUA SAMBUCI. Elder-Flower Water. (Fresh elder flowers, or an equivalent quantity of the flowers preserved while fresh, with common salt, ten pounds; water, two gallons, Let a gallon distil.)

Therapeutics. The flowers are gently stimulant in their action, and are used as a topical application, in the form of ointment, made by heating the flowers in hot lard; the water is employed as a pleasant vehicle for the exhibition of medicines or for lotions. The inner bark of the elder tree possesses hydragogue and cathartic powers, and has been used with success to remove the fluid in dropsies. It may be given in the form of decoction, the strength being about four ounces to the pint; of this, two to four ounces may be given as a dose.

Dose. Of elder-flower water, 1 fl. oz. to 2 fl. oz.

CINCHONACEÆ.

Cinchonæ flavæ Cortex. Yellow Cinchona Bark. The bark of Cinchona calisaya. Collected in Bolivia and Southern Peru.

Cinchonæ pallidæ Cortex. Pale Cinchona Bark. The bark of Cinchona condaminea. Collected about Loxa in Ecuador.

Cinchonæ rubræ Cortex. Red Cinchona Bark. The bark of Cinchona succirubra. Collected on the western slopes of Chimborazo.

Quiniæ Sulphas. Sulphate of Quinine. A crystalline salt, prepared from the bark of Cinchona flava (calisaya), and from the bark of Cinchona lancifolia.

All the different species of Cinchona inhabit the Andes, chiefly on the eastern face of the Cordilleras, from 4,000 to 12,000 feet above the sea, and extending from 10° of North latitude to 20° of

South latitude, growing therefore in Peru, Bolivia, and Columbia. Dr. Karsten gives the following description of the locality favourable to the growth of Cinchona :—" The Cinchonæ which are rich in alkaloids inhabit the peculiar cloudy region of the Andes, in which, during the rainy season, which continues for nine months in the year, a steady rain is only interrupted during the day by short gleams of sunshine, interchanging with clouds and mist; whilst in that part of the year which answers to our winter, cold nights, in which the temperature of the air descends to freezing point, are followed by days in which the rays of the sun, piercing here and there through the thick clouds, raise the temperature to 77° Fahr.; whilst the leaves are kept almost continually bedewed by the mists. Ravines stretching upwards into the grass-covered region, and filled with forest vegetation, are the channels by which the streams of air ascend, when the mid-day sun warms the leafy covering of the mountain side. Here the mist first begins to form, when the strata of warm air, containing much aqueous vapour, mix with the colder atmospheric currents descending from the icy summits, and there ensues a frequently-repeated alternation of thick mist, which entirely bedews the surface of plants, and of warm sunbeams, which dry and warm the moistened leaves. This lasts till late in the afternoon, when misty clouds overspread the whole district, until they are condensed by the cold of the night, to be again raised into vapour by the morning sun. This is the peculiar climate of those Cinchonæ which are rich in organic bases." Endeavours are now being made to cultivate the more important species of cinchona plants in India (Neilgherries), Ceylon, Java, Jamaica, and Trinidad. In India the tree chiefly grown is the cinchona succirubra, which appears to grow quickly, and to thrive better than the cinchona calisaya, and the bark contains a large amount of quinine. Cinchona officinalis and cinchona lancifolia also grow well, at moderate heights, that is below 6,000 feet; their barks are also very rich in alkaloids, of which quinine forms nearly one half.

Description. Until recently great doubt existed as to the origin of many of the different kinds of cinchona barks; but the researches of Weddell and others have thrown much light upon this subject, which is one of considerable interest and importance.

Cinchona flava, or true yellow bark, which has been shown by Weddell to be obtained from Cinchona calisaya (of which there are at least two varieties, vera and Josephiana, the latter a shrub), occurs in two forms, in quills or flat pieces; the former, the quills,

are from 6 to 18 inches in length, and from $\frac{1}{2}$ to 2 inches in diameter, with a thickness varying from $\frac{1}{8}$ to $\frac{1}{3}$ of an inch. The quills are generally single, and the bark is covered with a brown epidermis, mottled with white or yellowish lichens, and marked with longitudinal wrinkles and transverse or circular fissures. The latter, or flat pieces, from 6 to 18 inches long, are more fibrous, denuded of the epidermis, and of a cinnamon colour. Both varieties are very bitter in taste, and break with a fibrous fracture and the escape of a powder.

Yellow bark is rich in quinine; and 100 grains should yield not less than 2 grains of that alkaloid.

Cinchona pallida, pale Crown or Loxa bark, is the produce of Cinchona condaminea; always occurs in quills, which are single or double, from 6 to 15 inches in length, from $\frac{1}{6}$ to $\frac{3}{4}$ inch in diameter, from $\frac{1}{20}$ to $\frac{1}{10}$ inch in thickness: it is marked with longitudinal wrinkles, and transverse or circular cracks; the epidermis brown or grey, and frequently covered with crustaceous and stringy lichens; the inner surface cinnamon-brown in colour, and smooth: the taste is bitter and astringent; the fracture short and not fibrous, except in the larger pieces: the medium-sized quills are the most esteemed.

Pale bark yields cinchonine chiefly; and 200 grains of the bark treated in the manner directed in the test for yellow cinchona bark, with the substitution of chloroform for ether, should yield not less than 1 grain of alkaloids.

Cinchona rubra, red bark, from Cinchona succirubra, occurs in quills or flattened pieces, more frequently the latter; covered with a brownish-red epidermis, rarely white from adherent lichens; occasionally strongly tuberculated on the surface, and then termed warty; internally rough, fibrous, and of a dark red chestnut colour: the taste is very bitter and astringent, the fracture finely fibrous and red; the bark varies from 6 to 24 inches in length, and the flattened pieces are sometimes 4 or 5 inches broad, and $\frac{1}{2}$ inch or more in thickness.

Red bark yields quinine and cinchonine in about equal quantities: and 100 grains of the bark, treated in the manner directed in the test for Cinchona pallida, should yield not less than 1·5 grains of alkaloids.

Besides the above described officinal barks, from which alone the pharmaceutic preparations should be made, there are others which are at the present day extensively employed for the extraction of the alkaloids; among these the most important are the orange Carthagena bark and the grey bark.

Fibrous Carthagena Bark, called also Spongy or Orange Carthagena Bark, Bogota, and Coquetta Bark, the produce of Cinchona lancifolia (*Mutis*), is referred to in the Pharmacopœia as one of the sources of quinine. It occurs in quills or flattened pieces, according to the age of the stems from which it is peeled; the surface is often covered with crustaceous lichens, giving it a silvery appearance. This bark is characterised by its extremely fibrous texture, often breaking with long stringy splinters; the texture is loose and spongy; the colour, especially of the larger pieces, is strongly yellow or sometimes orange; hence the name. The powder is also yellow, with an orange tint.

This bark yields quinine, much quinidine, also some cinchonine.

Cinchona lancifolia grows at a great elevation in the forests near Bogota in New Granada, and is now known as Cinchona condaminea (var. δ lancifolia).

Cinchona Cinerea, silver, grey, or Huanuco Bark, formerly officinal in the Edinburgh and Dublin Pharmacopœias, but now difficult to procure, is the produce of Cinchona micrantha and Cinchona nitida; it occurs in quills, which are in general larger and coarser than those of the Crown bark; with a greyish epidermis, less wrinkled longitudinally, and less completely cracked transversely; the smaller quills are often twisted spirally; and on the inner surface the bark is more uneven, and of a redder colour than Loxa or Crown bark. The produce of Cinchona nitida and Cinchona micrantha are usually mixed together; that from the former tree is superior. These trees grow in the forests of Cuchero and Huanuco in northern Peru. The barks are rich in quinine, quinidine, and cinchonine.

For the description of other cinchona barks used in commerce for the extraction of the alkaloids, the reader is referred to more extended works on the subject, especially to the article Cinchona, the last effort of the late Dr. Pereira, and to Howard's Illustrations of the Cinchona barks.

Prop. & Comp. The different barks are closely allied to each other in composition: they all contain acid and alkaline principles peculiar to the genus Cinchona, together with other matters common to many kinds of barks. The acids and alkaloids of the cinchona barks are as follows:

Quinic Acid ($C_7H_{12}O_6$) can be crystallized in oblique rhombic prisms, resembling tartaric acid in appearance; soluble in water, and acid in taste; less soluble in alcohol, and very sparingly soluble in ether; it yields a yellow, crystallizable, pungent sub-

limate, *quinone* ($C_6H_4O_2$), when distilled with some oxidizing agents. This acid is also called *kinic acid.*

Quino-tannic Acid ($C_{42}H_{30}O_{35}$?) differs from ordinary tannic acid in precipitating the persalts of iron, green, and rapidly absorbing oxygen, especially when united with an alkali.

Cinchona-red, produced by the oxidation of quino-tannic acid; a red substance, almost insoluble in water, but soluble in alcohol, ether, alkalies, and acids; the solutions have a deep red colour.

Quinovin ($C_{30}H_{48}O_8$) an amorphous substance, nearly insoluble in water; soluble in ether, and much more so in alcohol. It is decomposed by hydrochloric acid into quinovic acid and quinova sugar.

Quinovic Acid ($C_{24}H_{38}O_4$) found in many kinds of barks. It is produced from quinovin. It is a crystalline weak acid, sparingly soluble in alcohol and ether, insoluble in water.

Quinine ($C_{20}H_{24}N_2O_2$), with one or three equivalents of water when crystallized, the most important alkaloid contained in the barks, exists in the largest quantities in Calisaya bark; when pure, it is white, crystallizing with some difficulty as the hydrate; soluble in about 350 parts of cold water, 60 parts of ether, and very soluble in alcohol; fuses, when heated, into a resinous mass; forms salts with acids, and its solutions exhibit a fluorescent appearance, and when treated with excess of chlorine water, and ammonia afterwards added, a dark emerald-green liquid is produced. Quinine forms crystallizable salts with acids; the best known is the officinal salt, Quiniæ Sulphas or sulphate of Quinine.

Cinchonine ($C_{20}H_{24}N_2O$), an alkaloid, contained chiefly in the pale varieties of bark; it readily crystallizes from its alcoholic solution in brilliant colourless four-sided prisms; it is almost insoluble in water and ether, and requires about thirty parts of rectified spirit to dissolve it; unites with acids, and forms soluble salts, the solutions of which are not fluorescent, and do not give the green colour with chlorine and ammonia, but merely become light brownish-yellow. An alkaloid has been obtained, isomeric with cinchonine, but which is more soluble in water, alcohol, and ether; it resembles it in most other respects.

Quinidine ($C_{20}H_{24}N_2O_2.2H_2O$), a third alkaloid, contained in many of the cinchona barks, especially in those of New Granada, and isomeric with quinine with two equivalents of water when crystallized, occurs, when pure, in white prisms, readily crystal-

lizing from alcohol, and also when precipitated from the watery solutions of its salts, by means of an alkali ; it is very bitter, but less intensely so than quinine, and its solutions are fluorescent ; it is much less soluble in water than quinine, and less soluble in ether, and its sulphate is also much more soluble than that of quinine, much less so than that of cinchonine. The solutions of quinidine, when treated with chlorine water and ammonia, show the emerald-green appearanec, as in the case of quinine.

Cinchonidine ($C_{20}H_{24}N_2O$), a fourth alkaloid, found in cinchona barks, and isomeric with cinchonine, occurs in hard, brilliant, striated, rhomboidal prisms, which are anhydrous, and almost insoluble in ether ; it forms crystallizable salts ; the solutions are fluorescent, but when treated with chlorine water, and subsequently with ammonia, do not give rise to the emerald-green colour.

M. Pasteur, from an examination of *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*, finds that *quinine*, by being carefully heated in the form of a salt, as the tartrate, is changed into an isomeric body, *quinicine*, and *cinchonine*, under like circumstances, into *cinchonicine*, substances similar to them, but amorphous ; and he also finds that *quinidine* and *cinchonidine* are converted into the same isomeric substances, *quinicine* and *cinchonicine*. According to Pasteur, *quinine* and *quinidine* strike green with chlorine and ammonia, but *cinchonine* or *cinchonidine* do not, and the alkaloid usually designated *quinidine* commonly consists chiefly of *cinchonidine*.

The following are the relations in which the four alkaloids and their isomeric modifications stand in regard to their action upon polarized light.

Quinine turns the plane of polarization powerfully to the left hand.
Cinchonidine " " " "
Cinchonine turns the plane of polarization strongly to the right hand.
Quinidine " " " "
Both quinicine and cinchonicine turn the plane of polarization feebly to the right hand.

An alkaloid *aricine* ($C_{23}H_{26}N_2O_4$) was found by Pelletier in Arica bark ; it forms white prismatic crystals, of a bitter taste, but little soluble in water ; easily soluble in alcohol, less so in ether ; it is decomposed by nitric acid, forming a deep green solution.

The substance known by the name of *quinoidine* consists of resinous and colouring matters, with the above alkaloids more or

less changed by the processes to which they have been subjected; it is obtained from the liquors from which the sulphate of quinine has been crystallized; it was from this substance that Liebig obtained his *amorphous quinine*, which bears the same relation to the crystallized alkaloid as uncrystallized syrup does to ordinary sugar; probably it is closely allied to quinicine.

The salts of the cinchona alkaloids commonly used in medicine are as follows :—

Quiniæ Sulphas. Sulphate of Quinia ($C_{40}H_{24}N_2O_4,HO,SO_3+7HO$, or $2C_{20}H_{24}N_2O_2.H_2SO_4.7H_2O$), occurring in snow-white feathery crystals, requiring for solution about sixty parts of strong spirit, and 750 parts of water; and the watery solution, treated with chlorine and ammonia, gives the green test before noticed, and also exhibits fluorescence; it has all the characters of a neutral salt. With chloride of barium it gives a white precipitate, insoluble in nitric acid. Twenty-five grains of the salt should lose 3·6 grains of water by drying at 212°. For the adulterations, &c., of sulphate of quinia, see page 284.

Prep. The following are the directions given for the preparation of the sulphate in the British Pharmacopœia :—"Take of yellow cinchona bark, in coarse powder, one pound; hydrochloric acid, three fluid ounces; distilled water, a sufficiency; solution of soda four pints; dilute sulphuric acid, a sufficiency. Dilute the hydrochloric acid with ten pints of the water. Place the cinchona bark in a porcelain basin, and add to it as much of the dilute hydrochloric acid as will render it thoroughly moist. After maceration, with occasional stirring for twenty-four hours, place the bark in a displacement apparatus, and percolate with the diluted hydrochloric acid, until the solution which drops through is nearly destitute of a bitter taste. Into this liquid pour the solution of soda, agitate well, let the precipitate completely subside, decant the supernatant fluid, collect the precipitate on a filter, and wash it with cold distilled water, until the washings cease to have colour. Transfer the precipitate to a porcelain dish containing a pint of distilled water, and applying to this a steam heat, gradually add dilute sulphuric acid until very nearly the whole of the precipitate has been dissolved, and a neutral liquid has been obtained. Filter the solution while hot through paper, wash the filter with boiling distilled water, concentrate till a film forms on the surface of the solution, and set it aside to crystallize. The crystals should be dried on filtering paper without the application of heat.

In this process hydrochloric acid is made to dissolve the quinine from the bark, forming a chloride, which is decomposed by the addition of solution of soda; the impure quinine which is thus precipitated is removed from the solution of chloride of sodium and washed to remove colouring matter; it is then dissolved in sulphuric acid, and crystallized out.

Besides the sulphate, the VALERIANATE OF QUININE (described under Valerian), the CITRATE OF IRON AND QUININE (described under Iron Salts), and the ARSENIATE OF QUININE are occasionally employed, but their special value is somewhat doubtful. The SULPHATES OF QUINIDINE, CINCHONINE, and CINCHONIDINE may also be prescribed. The cinchona alkaloids also form with acids, salts which are acid in reaction; and when the ordinary sulphates are given dissolved in excess of acid, as they usually are, such salts are produced. The neutral HYDROCHLORATES of QUININE and CINCHONINE are very useful when it is desired to employ neutral solutions of either of these alkaloids; for they are more soluble in pure water than any other of the commercial salts.

Tartrates, phosphates, citrates, tannates of the cinchona alkaloids have been occasionally proposed as remedial agents.

Off. Prep.—Of the Yellow Cinchona Bark. DECOCTUM CINCHONÆ FLAVÆ. Decoction of Yellow Cinchona Bark. (Yellow bark, in coarse powder, one ounce and a quarter; distilled water, one pint; boil and add water till the product measures a pint.)

EXTRACTUM CINCHONÆ FLAVÆ LIQUIDUM. Liquid Extract of Yellow Cinchona. (Yellow cinchona bark, in coarse powder, one pound: distilled water, a sufficient quantity; rectified spirit, one fluid ounce; prepared by maceration, percolation, subsequent evaporation (at a temperature not exceeding 160°) to three fluid ounces, or until the specific gravity of the liquid is 1·2. When cold add the spirit. The specific gravity should be about 1·1.) Four fluid ounces represent one pound of the bark. It must not be supposed that the extract is a representative of the amount of bark used in its preparation; it has been found that the bark, after the operation, is far from exhausted, and still valuable from its richness in quinine: the liquid extract is an imitation of the liquor cinchonæ, long a favourite medicine.

INFUSUM CINCHONÆ FLAVÆ. Infusion of Yellow Bark. (Yellow cinchona bark, in coarse powder, half an ounce; boiling distilled water, ten fluid ounces.)

TINCTURA CINCHONÆ FLAVÆ. Tincture of Yellow Bark. (Yellow cinchona, in coarse powder, four ounces ; proof spirit, one pint. Prepared by maceration and percolation.)

Of the Pale Bark. TINCTURA CINCHONÆ COMPOSITA. Compound Tincture of Cinchona. (Pale cinchona bark, in coarse powder, two ounces ; bitter orange peel, cut small and bruised, one ounce ; serpentary, bruised, half an ounce ; saffron, sixty grains ; cochineal, in powder, thirty grains ; proof spirit, one pint. Prepared by maceration and percolation.)

Pale bark is also contained in mistura ferri aromatica.

Of Quinia. PILULA QUINIÆ. Pill of Quinine. (Sulphate of quinine, sixty grains ; confection of hips, twenty grains.)

TINCTURA QUINIÆ. Tincture of Quinine. (Sulphate of quinia, one hundred and sixty grains ; tincture of orange peel, twenty fluid ounces.) One fluid drachm contains a grain of sulphate of quinia.

TINCTURA QUINIÆ AMMONIATA. Ammoniated Tincture of Quinine. (Sulphate of quinia, one hundred and sixty grains ; solution of ammonia, two and a half fluid ounces ; proof spirit, seventeen and a half fluid ounces). One fluid drachm contains a grain of sulphate of quinia.

VINUM QUINIÆ. Quinine Wine. (Sulphate of quinine, twenty grains ; citric acid, thirty grains ; orange wine, a pint.)

If the infusion and decoction of red or pale bark are wished for, these may be made of the same strength as the corresponding preparations of yellow bark.

Therapeutics. Cinchona barks owe their efficacy chiefly to the alkaloids contained in them, but some influence is also exercised by the cincho-tannic acid and red cinchonic, which produce a slight difference of action between the barks and the alkaloids derived from them.

Action of the Cinchona Alkaloids.

Quinia has been experimentally shewn to possess the following properties :—

1°. It is fatal to the lowest forms of animal and vegetable life. Its poisonous effect on Bacteria explains its power of preventing, arresting, or retarding putrefaction.

2°. It exerts a like inhibitory action on various fermentations ; thus it hinders the solvent operation of the gastric juice, that of emulsin upon amygdalin, the vinous and butyric fermentations.

3°. It enfeebles or arrests the spontaneous movements of the colourless blood-corpuscles, and is able to check their emigration from the vessels.

4°. In large doses it paralyses the heart, causing a sudden fall of blood-pressure, convulsions, and death.

5°. It has a powerful sedative influence upon the spinal cord and brain, diminishing and finally abolishing reflex movements.

6°. It lowers the heat of the body in healthy animals; but this action is most manifest in the pyrexia artificially induced by the injection of putrilage into the circulation. It is believed to produce this result by checking oxidation within the organism. (Binz).

Quinidine, *Cinchonia*, and *Cinchonidine*, also exhibit the three first properties enumerated above. As regards their antiseptic power, the four cinchona alkaloids are very nearly equal. Quinia and quinidine stand on the same level; next comes cinchonidine; last, though at no great distance, cinchonia.

Quinia is employed in medicine :—

1°. As a tonic. In small doses, it increases the appetite, especially of weak patients; hence it improves their general health and muscular power. It also checks the colliquative sweating of extreme debility. It should not be given with food.

2°. As an antiperiodic. In all the protean disorders which are caused by the paludal miasm, quinia acts as a specific. It cures quotidian, tertian and quartan ague, malarious remittents, miasmatic neuralgia, hepatic and splenic engorgements, &c.

3°. Quinia is able to cure or relieve certain forms of neuralgia which are *not* due to malaria. Its value seems most marked when the pain assumes a periodic character. It may be advantageously combined with alkalies and iodide of potassium, or even with local depletion or counter-irritation.

4°. As an antipyretic. Doses of 5-20 grs. have a marked effect in reducing temperature in pyrexia, to whatever cause it may be due. The reduction of temperature is not permanent, but varies in duration from 1 to 48 hours. Trials were made in enteric, typhus, and rheumatic fevers, in scarlatina and pneumonia, and the hectic of phthisis. (Committee of Clin. Soc.)

5°. In acute inflammation of various tissues and organs, quinia appears to check the tendency to suppuration, apart from its action on the heat of the body.

6°. In various septic conditions of the blood, quinia in large doses has been found of great value. (Puerperal and surgical septicæmia, &c.)

7°. Quinia has been employed in the continued fevers. It is useful in combating particular symptoms, but exerts no specific action on the course of the disease: *e.g.*, it cannot prevent the relapse in relapsing fever.

8°. Externally, quinia may be applied as a stimulant and antiseptic to unhealthy ulcers; it may be used as a gargle in putrid sore throat, and as a dentifrice to spongy gums.

Large doses of quinia cause symptoms of *Quinism;* buzzing in the ears, deafness, vertigo, wakefulness, and sometimes nausea and complete anorexia. The therapeutic uses of the drug, enumerated above, rest on clinical observation; any attempt to connect them with those properties which have been studied experimentally, would at present be premature.

The actions of *Quinidine, Cinchonia,* and *Cinchonidine,* probably resemble those of Quinine. The author has repeatedly proved that all three are capable of curing ague. He has abundant evidence to shew that peculiar effects often result from salts of Cinchonia, which are not produced by the same amount of the corresponding salts of Quinine; there is often great dryness of the mouth, and an absence of noise in the ears. As regards the comparative antiperiodic power of the four alkaloids, the Madras Cinchona Commission of 1868 reported that quinidine was equal to quinia in febrifuge action; that cinchonidine was only a little less efficacious; and that cinchonia was somewhat inferior to the other three.

Action of Cinchona Bark.

Although the efficacy of bark is chiefly due to the alkaloids it contains, yet it possesses certain properties of its own. The *cincho-tannic* and *red cinchonic acids* are powerfully astringent—like tannic and gallic acids; and they contribute in some measure to the total effect. Bark may be employed for all the purposes for which quinia is administered; but it is least suited to such cases as require massive doses. *E.g.*, the quantity of bark needed to cut short an ague is more likely to upset the stomach than the comparatively limited bulk of the corresponding dose of alkaloid; moreover the latter, given in solution, is more quickly absorbed. On the other hand, the astringent property of bark renders it better fitted for the treatment of relaxed conditions of the habit

than quinine. As a tonic, in cases of great debility with weak heart, bark is more agreeable and beneficial than quinine. In large doses, it may cause all the symptoms of Quinism.

No very well marked difference in the action of the different barks has yet been established: there can be no doubt, however, that their effects depend on the alkaloids contained in them, and consequently any peculiarity of the bark would be that of the prevailing alkaloid.

As a rule, quinia exists in large quantities in yellow bark, cinchonia in pale bark, and the red bark is stated to contain about equal amounts of the two alkaloids. Quinidine and cinchonidine are more especially found in the Carthagena barks. According to the results of many examinations, collected in the form of a table by the late Dr. Pereira:—

Yellow or Calisaya barks yield from 2·5 to 3·8 per cent. of quinine.

Pale or Loxa barks from about 0·7 to 1·4 per cent. of alkaloids, chiefly cinchonine or quinidine, with a little quinine.

Best red barks, 2·6 per cent. of quinine, and 1·5 per cent. of cinchonine.

Gray or Huanuco barks, from 1·7 to 2·1 per cent. of alkaloids, chiefly consisting of cinchonine and quinidine, with occasionally some quinine.

Dose and Mode of Administration. Of any cinchona bark, in powder, 10 gr. to 60 gr.; of the decoction, 1 fl. oz. to 2 fl. oz.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the liquid extract of yellow cinchona, 10 m. to 1 fl. drm.; of the tinctures (simple or compound), 1 fl. drm. to 2 fl. drm.; of sulphate of quinine, 1 gr. to 10 gr., or even 20 gr.; of pill of quinine, 2 gr. to 10 gr.; of tincture of quinine, 1 drm. to 2 drm.; of the ammoniated tincture ½ dr. to 2 drm.; of wine of quinine, ½ to 1 fl. oz.; of sulphate of cinchonine, 1 gr. to 10 gr.; of sulphate of quinidine, 1 gr. to 20 gr.; of sulphate of cinchonidine, 1 gr. to 10 gr.; of hydrochlorate of quinine or cinchonine, 1 gr. to 10 gr.

In intermittents, or when the dose of bark is required to be large, the salts of quinine or cinchonine are preferred; powdered bark was formerly given in such cases, but it is apt to disagree with the stomach, and cause nausea and vomiting; the liquid extract may be made use of, but its strength is by no means equivalent to the amount of bark made use of in its preparation, and the same holds good of all the pharmaceutic preparations made with water, the solvent powers of that fluid being unequal to abstract all the principles from the bark. In the treatment of

ague, quinine may be given by the mouth in two ways, either in a very large dose, a short time before the expected paroxysm, or in small doses, frequently repeated during the whole of the interval between the paroxysms ; sometimes the first method is at once effectual, but there is some fear of producing unpleasant symptoms of quinism ; the second method is, as a rule, quite successful, and without hazard. Ague may also be treated by the hypodermic injection of the alkaloids ; the dose required is much smaller, and the method is very effectual ; the neutral hydrochlorates, dissolved in warm water, should be employed.

Adulteration of Cinchona Barks. Inferior non-officinal cinchona barks may be substituted for the officinal, and barks of other kinds may be sold for those of the genus cinchona ; these are distinguished by their physical characters, and by finding the presence and amount of the cinchona alkaloids contained in them. The structure of the bark also affords some test of its value, for it has been found that the bark which exhibits when fractured a homogeneous texture, with a large amount of short fusiform ligneous fibres, uniformly distributed in the cellular tissue, contains a large amount of quinine ; this is the character of true Calisaya barks. Barks rich in quinine generally contain much lime, and the strong infusions are precipitated by sulphate of soda; which is not the case with the barks yielding cinchonine. The same holds good with regard to the amount of tannin. Many methods of ascertaining the per-centage of alkaloids have been proposed ; the following is the method given in the Pharmacopœia for the examination of yellow cinchona bark :—One hundred grains of the bark are reduced to powder and thoroughly exhausted by boiling, maceration, and percolation, with water acidulated with hydrochloric acid. To this solution, subacetate of lead is added until all the colouring matter is removed, care being taken to keep the fluid acid. The precipitate is removed by filtration, and to the filtrate caustic potash, enough to re-dissolve the precipitate which is at first formed, is added, and the solution then well shaken with successive quantities of ether, until a drop of the ether evaporated to dryness yields no perceptible residue. The mixed ethereal solutions are then evaporated to dryness, and the residue, which consists of nearly pure quinine, and should be readily soluble in dilute sulphuric acid, is weighed, and in this case should not be less than two grains. Pale and red barks are tested in a similar manner, with the substitution of chloroform for ether in the process.

Of Sulphate of Quinine. On account of the high price of this salt, many adulterations have been practised. *Sulphates of cinchonine, quinidine, and cinchonidine, salicine, sugar of milk, cane sugar, mannite, starch,* and *stearic acid,* form the most frequent organic adulterations; and *sulphate of lime,* precipitated to imitate the quinine salt, *chalk, magnesia,* and *boracic acid,* are among the most frequent inorganic additions. These latter, with the exception of boracic acid, are readily detected by their not dissolving in alcohol, and by heating the suspected salt on a piece of platinum foil, where they leave an ash, the nature of which can be ascertained by the ordinary tests: the organic impurities are more difficult of detection; cinchonine, cinchonidine and quinidine can be discovered by their different solubilities in water, alcohol, and ether; salicine, by the blood-red colour produced by sulphuric acid; the sugars, by the solution of the salt, after the precipitation of the alkaloids by means of an alkali, being sweet; starch, by its striking blue with iodine; and stearic acid, by not dissolving in dilute acids. Boracic acid, if present, gives to its alcoholic solution the property of imparting a green tinge to flame. The British Pharmacopœia gives the following quantitative test:—Ten grains with ten minims of diluted sulphuric acid and half a fluid ounce of water form a perfect solution, from which ammonia throws down a white precipitate. This redissolves on agitating the whole with half a fluid ounce of pure ether, without the production of any crystalline matter floating on the lower of the two strata, into which the agitated fluid separates on rest. Crystals, if present, consist of quinidine, which is very slightly soluble in ether. The upper stratum of fluid, if entirely removed by a pipette and evaporated, leaves a white residue, which, when dried in the air without heat, weighs 8·6 grains.

Ipecacuanha. Ipecacuanha or Ipecacuan. The dried root of Cephaelis ipecacuanha; growing chiefly in the Brazils, and sent from Rio Janeiro.

Description. Annulated or Brazilian ipecacuanha, as it is named to distinguish it from another kind, called *striated* or Peruvian ipecacuanha, the produce of Psychotria emetica, is in the form of contorted pieces, from two to four inches in length, about the size of a small quill, knotted, having very deep circular fissures extending down to the woody axis or meditullium, and giving the appearance of a series of brownish or ash-coloured rings, strung on a white cord. The odour of ipecacuanha is slight, but disagreeable; the taste bitter, aromatic, and slightly acrid: it breaks

easily, with a resinous fracture. The active ingredients chiefly reside in the cortex. The powder of ipecacuanha is pale brown.

Prop. & Comp. Ipecacuanha contains a feeble alkaloid, *emetin*, separable as a whitish or yellowish amorphous powder, of a bitter taste, soluble in alcohol, sparingly so in water and ether, and precipitated by tannin; also a peculiar acid, *cephaelic* or *ipecacuanic acid*, allied to catechin, formerly thought to be gallic acid, and striking green with the persalts of iron; gum, starch, fatty or oily matter, are also present in the root. Water, spirit, and wine take up the active part, namely, the salt of emetin.

Off. Prep. PILULA IPECACUANHÆ CUM SCILLA. Pill of Ipecacuanha and Squill. (Compound powder of ipecacuanha, three ounces; squill and ammoniacum in powder, each an ounce; treacle, a sufficiency.) One grain of opium in twenty-three and a half grains of the pill mass.

PULVIS IPECACUANHÆ COMPOSITUS. Compound powder of Ipecacuanha; Dover's Powder. (Powdered ipecacuanha, half an ounce; powdered opium, half an ounce; powdered sulphate of potash, four ounces.) One grain of opium and ipecacuanha are contained in ten grains of this powder.

TROCHISCI IPECACUANHÆ. Ipecacuanha Lozenges. (Ipecacuanha in powder, one hundred and eighty grains; refined sugar in powder, twenty-five ounces; gum acacia, an ounce; mucilage of gum acacia, two fluid ounces; water, a sufficiency. To make 720 lozenges. Each lozenge contains $\frac{1}{4}$ gr. of ipecacuanha.)

VINUM IPECACUANHÆ. Ipecacuanha Wine. (Bruised ipecacuanha, one ounce; sherry wine, twenty fluid ounces. Prepared by maceration. Each fluid ounce contains about twenty-two grains of ipecacuanha.)

Ipecacuanha is also contained in pilula conii composita, and in trochisci morphiæ et ipecacuanhæ.

Therapeutics. Ipecacuanha and emetin exert an irritant effect on mucous membranes and raw surfaces, when topically applied. Experiments on animals have shown that emetin, hypodermically injected, causes vomiting. It is said to do so more readily, and in smaller doses, when introduced into the stomach. It lowers the pulse, and relaxes muscular spasm induced by strychnia. After death from a poisonous dose of emetin, the lungs are found to be engorged.

Ipecacuanha in large medicinal doses is an emetic, not so speedy in its action as sulphate of zinc or mustard; some-

what depressing to the system, but less so than tartar emetic : in smaller doses, short of inducing either nausea or vomiting, it becomes absorbed and acts upon the different mucous membranes, especially of the respiratory passages and of the alimentary canal, and is, therefore, expectorant, and sometimes laxative ; it also acts upon the skin as a diaphoretic. Ipecacuanha is well suited for an *emetic* in chest affections accompanied with fever, as in bronchitis, phthisis, and croup, in which the after-expectorant effect is of great service ; also to unload the stomach in dyspepsia when of an inflammatory character. As an *expectorant*, it is used in the various forms of bronchitic disease. *On account of its action on the alimentary canal*, it is of value in chronic dysentery and diarrhœa, for which diseases it was at one time held in great estimation. In the acute dysentery of the tropics, it is regarded as almost a specific. Large doses are given at intervals of 8 – 10 hours ; to prevent their being vomited, no liquids are allowed to be swallowed for some time after the dose, or the ipecacuanha is combined with a small proportion of opium. Ipecacuanha is often a useful adjunct to purgative medicines. As a *diaphoretic*, in the form of Dover's powder, it is frequently employed in catarrhal affections ; the combination with opium appears to increase its sudorific action.

Ipecacuanha has also been given in agues before the paroxysm, to prevent or cut it short ; and, on account of the *sedative* effect on the vascular system which follows the nausea, in hæmorrhages of various kinds.

Some individuals are peculiarly susceptible of the influence of ipecacuanha, the effluvia from the powdered drug being sufficient to cause sneezing, cough, and a species of asthma.

Dose. Of ipecacuanha (powdered) as an *emetic*, 15 gr. to 30 gr. ; as an *expectorant*, &c., ½ gr. to 2 gr. ; of pill of ipecacuanha and squill, 5 gr. to 10 gr. ; of powder of ipecacuanha, 5 gr. to 14 gr., in acute dysentery 20 gr. to 30 gr ; of ipecacuanha wine, as an *emetic*, 3 fl. drm. to 6 fl. drm. ; as an *expectorant*, 5 min. to 40 min. The dose of compound ipecacuanha powder depends on the amount of opium desirable to administer rather than on the quantity of ipecacuanha.

Adulteration. Striated ipecacuanha above alluded to, and other roots, have occasionally been mixed with or substituted for ipecacuanha. Powdered ipecacuanha is sometimes largely adulterated with almond meal. If moistened with water, and put

aside in a warm place for half an hour, the admixture is detected by the odour of hydrocyanic acid which is given off.

Catechu Pallidum. Pale Catechu. An extract from the leaves and young shoots of Uncaria gambir ; prepared at Singapore, and in the islands of the Eastern Archipelago.

Description. It occurs in cubical pieces about an inch in diameter, which are porous in texture ; externally of a reddish-brown colour, internally ochrey yellow or pale brick red ; of dull earthy fracture ; bitter and astringent taste. The pieces are now less irregular in shape. There are many other trees which yield catechu, as the Acacia catechu, the source of the black catechu, not now officinal ; also Areca catechu, or Betel-nut, &c. In fact, the extracts of the different parts of many plants possess properties not unlike the substance under consideration.

Prop. & Comp. Sp. gr. 1·39. The different varieties of catechu consist mainly of *catechu-tannic* (mimotannic) acid and *catechin*. Catechu-tannic acid is soluble in cold water, and is distinguished from gallotannic acid by its yielding a greenish precipitate with persalts of iron ; by not precipitating tartarized antimony ; and by not yielding pyrogallic acid when heated ; when exposed in a moist state it becomes dark red from the absorption of oxygen, and is rendered insoluble. Catechin is nearly insoluble in cold water, but soluble in boiling water, alcohol, and ether ; the solutions do not precipitate gelatine, and strike green with persalts of iron ; it is converted by the action of alkalies and their carbonates into *Japonic* and *Rubinic* acids. It crystallizes in colourless needles ; its composition is represented by the formula, $C_{20}H_{18}O_8$. Besides these substances, an extractive matter, mucilage, and insoluble compounds, are contained in catechu. Sir H. Davy found the following per-centage of principles in pale and dark catechu. Under the head of tannin, catechin and mimotannic acid are included.

	Tannin?	Extractive.	Mucilage.	Insoluble Matters.
Pale Catechu .	48·5	36·5	8·0	7·0
Dark Catechu .	54·5	34·0	6·5	5·0

The pale variety is entirely soluble in boiling water. The decoction when cool is not rendered blue by iodine.

Off. Prep. Infusum Catechu. Infusion of Catechu. (Powdered catechu, one hundred and sixty grains ; cinnamon, bruised, thirty grains ; boiling distilled water, ten fluid ounces.)

Pulvis Catechu Compositus. Compound Powder of Catechu.

(Catechu, four ounces; kino, rhatany, each two ounces; cinnamon and nutmeg, each one ounce.)

TINCTURA CATECHU. Tincture of Catechu. (Powdered catechu, two ounces and a half; cinnamon, bruised, one ounce; proof spirit, one pint. By maceration and percolation.)

TROCHISCI CATECHU. Catechu Lozenges. (Catechu, seven hundred and twenty grains; refined sugar, twenty-five ounces; gum acacia, an ounce, all in powder; mucilage of gum acacia, two fluid ounces; water, a sufficiency. Divide into 720 lozenges.) Each lozenge contains one grain.

Therapeutics. Catechu acts as a very powerful astringent, from the catechu-tannic acid and catechin contained in it. The catechin is astringent, but as it is very insoluble, its action is probably more local than that of the catechu-tannic acid, which probably is identical with that of ordinary tannic acid. (See Tannic and Gallic Acid.)

Catechu is used chiefly in affections of the alimentary canal, as in diarrhœa, and in some forms of atonic dyspepsia, accompanied with pyrosis; it may also be employed as a remote astringent in hæmorrhages and mucous discharges. Externally it may be used in the form of ointment, but has no advantage over the ointment of gall-nuts. It may be chewed, and the juice gradually swallowed in relaxed conditions of the uvula, palate, &c., and in some forms of hoarseness.

Dose. Of the powder, 10 gr. to 30 gr. or more; of infusion of catechu, 1 fl. oz. to 1½ fl. oz.; of tincture of catechu, 1 fl. drm. to 2 fl. drm.; of compound catechu powder, 20 gr. to 40 gr.; of catechu lozenges, from one to three or more.

VALERIANACEÆ.

Valerianæ Radix. Valerian Root. The root of Valeriana officinalis, dried; indigenous and cultivated; the wild plant growing on dry soils is to be preferred.

Description. As met with, it consists of a short rhizome, with numerous radicles two or three inches long; of a light yellowish-brown colour, a strong characteristic and disagreeable odour, and a bitter, acrid, camphoraceous, and nauseous taste.

Prop. & Comp. Valerian root owes its activity to a *volatile oil* and *valerianic acid;* resinous, extractive, and gummy matters are

also present. The volatile oil of valerian, sp. gr. 0·94, has a light greenish colour, and the odour of valerian ; it consists of valerole, and a hydrocarbon, borneéne.

Valerole ($C_6H_{10}O$) is a crystalline body at a low temperature ; it forms a blood-red solution with sulphuric acid, and when exposed to the air, gradually absorbs oxygen, acquires a peculiar strong odour, and is converted into valerianic acid.

Borneéne is a hydrocarbon identical with that found in Borneo camphor ($C_{10}H_{16}$).

Valerianic acid ($C_5H_{10}O_2$) can be procured in small quantities from valerian root by distillation with very dilute sulphuric acid ; it is an oily liquid, sp. gr. 0·9, with the intense odour of valerian ; it forms salts with the metallic bases, most of which are crystalline. This acid can also be formed, and much more economically, by the oxidation of Fousel oil or amylic alcohol.

Off. Prep.—Of Valerian. Infusum Valerianæ. Infusion of Valerian. (Valerian, bruised, one hundred and twenty grains ; boiling distilled water, ten fluid ounces.)

Tinctura Valerianæ. Tincture of Valerian. (Valerian, bruised, two ounces and a half ; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Tinctura Valerianæ Ammoniata. Ammoniated Tincture of Valerian. (Valerian, bruised, two ounces and a half ; aromatic spirit of ammonia, twenty fluid ounces. Prepared by maceration.)

Therapeutics. Valerian acts as a powerful stimulant and anti-spasmodic, and is peculiarly adapted for the treatment of the various symptoms occurring in hysterical subjects, as spasm, hemicrania, globus, palpitation, &c. ; it has also been found useful in some cases of chorea, epilepsy, hypochondriasis, and, as an adjunct to tonics, in intermittents. The volatile oil is probably the chief active ingredient of the drug. Some physicians have even doubted the value of the valerianic acid, but it can hardly be conceived that such a powerfully smelling body as the acid is devoid of anti-spasmodic properties. Although valerian doubtless possesses anti-spasmodic powers, they are very inferior to those of assafœtida.

Dose. Of valerian, in powder, 15 gr. to 30 gr. ; of infusion of valerian, 1 fl. oz. to 2 fl. oz. ; of tincture of valerian, 1 fl. drm. to 2 fl. drm ; of ammoniated tincture of valerian, ½ fl. drm. to 1½ fl. drm.

Sodæ Valerianas. Valerianate of Soda. $NaO,C_{10}H_9O_3$, or $NaC_5H_9O_2$.

Prep. Prepared by distilling Fousel oil with a mixture of sulphuric acid and bichromate of potash, and saturating the distilled fluid with soda. In this process Fousel oil, which is the alcohol of the amyl series, and is represented by the formula $C_5H_{12}O$, undergoes oxidation by the chromic acid which is set free when the sulphuric acid is mixed with bichromate of potash, and is converted into valerianic acid, which distils over. This acid bears the same relation to Fousel oil as acetic acid does to ordinary alcohol, or formic acid to wood spirit or methylic alcohol. The fluid containing the valerianate of soda is evaporated to dryness and the valerianate is fused and allowed to cool.

Prop. It is presented in dry white masses, not alkaline in reaction, entirely soluble in rectified spirit, evolving an odour of valerian when sulphuric acid is added.

Therapeutics. Valerianate of soda seems to resemble valerian in its action, and may be used in cases where the administration of valerian is desirable. It is introduced into the British Pharmacopœia for manufacturing the valerianate of zinc.

Dose. ½ gr. to 2 gr. or more.

Zinci Valerianas. Valerianate of Zinc. $ZnO,C_{10}H_9O_3$, or $Zn(C_5H_9O_2)_2$.

Prep. Prepared by mixing a solution of sulphate of zinc and valerianate of soda, and separating and purifying the crystals which are formed.

Prop. This salt occurs in pearly crystalline scales, with an odour and taste of valerianic acid ; soluble in alcohol and hot water ; sparingly so in cold water and ether. Heated to redness in an open crucible it leaves a residue of oxide of zinc, soluble in dilute sulphuric acid, and the solution is precipitated white by sulphide of ammonium. This salt has been frequently adulterated, especially with sulphate of zinc ; to show the absence of this latter salt, the solution of valerianate of zinc in hot water should give no precipitate with chloride of barium. When valerianate of zinc is distilled with dilute sulphuric acid, the distillate (valerianic acid) when mixed with a solution of acetate of copper, should not immediately affect the transparency of the fluid, but form after a little time oily drops, passing gradually into a bluish-

white crystalline deposit : this shows the absence of butyric acid (the butyrate of zinc being a common adulteration of the salt as found in commerce.)

Therapeutics. Valerianate of zinc is a nervine tonic and antispasmodic, and has been given with advantage in cases where the combined action of the metal and valerian seems desirable, as in hysteria, chorea, epilepsy, and various neuralgic affections, as headache ; it is said also to act as an anthelmintic.

Dose. ½ gr. to 4 gr. ; the dose may be increased till some nausea is produced.

Valerianate of Quinine (not officinal) forms white silky needles, with a strong odour and taste ; soluble in alcohol, and sparingly so in water, especially when cold ; it is decomposed by heat with the escape of valerianic acid.

Therapeutics. It is sometimes employed in medicine ; it is said to be particularly useful in some forms of intermittent and spasmodic neuralgic affections.

Dose. 1 gr. to 5 gr.

Valerianate of iron and *valerianate of ammonia* have also been used in medicine, and may be given in the same doses as the corresponding salt of zinc.

COMPOSITÆ.

Pyrethri Radix. Pellitory Root. The root of Anacyclus pyrethrum, or Pellitory of Spain ; growing in Barbary, Spain, and imported from the Levant.

Description. A fusiform root, cut into cylindrical pieces two or three inches long, and about the thickness of the little finger, with a thick brown bark, studded with shining black points ; breaking with a resinous fracture, and exhibiting a radiated structure, dark brown in colour, studded with black shining points.

Prop. & Comp. It contains at least two *resins*, one of which has been named *pyrethric* acid, or pyrethrin ; an *acrid oil*, and tannin.

Off. Prep. TINCTURA PYRETHRI. Tincture of Pellitory. (Pellitory, in coarse powder, four ounces ; rectified spirit, one pint ; by maceration and subsequent percolation.)

Therapeutics. A topical irritant, causing pricking in the mouth and flow of saliva and buccal mucus ; it is used as a masticatory in paralysis of parts about the mouth, also as a local stimulant in

neuralgia in the teeth, also in relaxed conditions of the throat, and in aphonia.

Dose. The tincture diluted with water and used as a gargle. Pellitory is not given internally.

Absinthium. Wormwood. (Not officinal.) The flowering herb of Artemisia absinthium ; indigenous, growing in thickets and mountainous places.

Description. It occurs in bundles of the dried herbs, having a silky touch, disagreeable odour, and intensely bitter taste.

Prop. & Comp. The plant yields its bitterness to water and spirit, and contains a *volatile oil*, green in colour, with the odour of the plant, also a bitter extract yielding *absinthine* ($C_{16}H_{22}O_5$) and absinthic acid. The absinthine is the bitter principle.

Therapeutics. A powerful bitter stomachic and tonic, useful in atonic dyspepsia ; it is also reputed to be anthelmintic. It has been lately asserted that the long continued use of absinthe in the shape of bitters, has an injurious effect upon the nervous system. Wormwood is largely used on the Continent in the above form.

Dose. Of the powder, 20 gr. to 40 gr. It may be infused with advantage (1 oz. to 20 fl. oz.), of which 1 fl. oz. to 2 fl. oz. may be given. It strikes blue with iron salts.

Santonica. Santonica. The unexpanded flower-heads of undetermined species of Artemisia. Imported from Russia.

Santoninum. Santonin. A crystalline neutral principle obtained from santonica. $C_{30}H_{18}O_6$, or $C_{15}H_{18}O_3$.

Description. The flower-heads, which resemble seeds in appearance, are nearly half a line in breadth, and more than a line long, fusiform, blunt at the ends, greenish-brown in colour, smooth, not hairy, formed of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers ; strong odour, bitter camphoraceous taste.

Prep. Santonin is prepared by boiling bruised santonica for some time with water and lime, straining and reducing the bulk of the solution by evaporation. To this, while still hot, hydrochloric acid is added, until the liquid becomes slightly and permanently acid, and it is then set aside for the precipitate of santonin which forms to subside. The oily matter floating on the surface is removed by skimming, and the fluid decanted off from the precipitate, which is collected on filtering paper, washed

first with cold distilled water, then with solution of ammonia, and again with water, till the washings are colourless. The precipitate is then dried at a gentle heat; purified by re-dissolving in boiling spirit with a little animal charcoal, filtering, and setting aside the liquid in a dark place to allow crystals of santonin to deposit. The crystals should be dried on filtering paper in the dark, and preserved in a bottle protected from the light.

Prop. Santonica contains traces of volatile oil and a crystallizable substance, *santonin* ($C_{15}H_{18}O_3$), which occurs in brilliant, white, four-sided, flat prisms, tasteless or feebly bitter, odourless; scarcely soluble in cold water, sparingly in boiling water, but abundantly in chloroform, and boiling rectified spirit; soluble also in ether; not dissolved by dilute mineral acids; the crystals become yellow by exposure to light. Santonin is neutral or feebly acid. It dissolves in solutions of the caustic fixed alkalies, forming definite compounds called santonates. Santonate of soda is more soluble than santonin, and has been employed in its stead. Prolonged boiling in dilute nitric acid converts santonin into succinic acid. When heated up to 277° Fahr. it melts to a colourless liquid, which solidifies to a crystalline mass on cooling; but by prolonged fusion it becomes amorphous, following in this the analogy of other crystalline resins.

Therapeutics. Administered internally, santonin causes xanthopsy or yellow vision, sometimes preceded by an exaggerated sensitiveness to the violet rays of the spectrum. This effect may last for several hours. It is not due to coloration of the ocular media, but to some specific influence either upon the retina or the visual centre in the brain. The sensibility of the retina for violet rays appears to be first stimulated, then blunted. Again, santonin, even in a three-grain dose, stains the urine of a yellow colour: this effect may continue for two or three days, and is sometimes attended by irritation of the bladder. In larger doses, the drug has been known to cause giddiness, headache, vomiting, convulsions, and even death.

It is employed as an anthelmintic. Its small bulk and comparative tastelessness render it very suitable for children. It kills the round-worm (Ascaris lumbricoides), but is useless against the tape-worm or the thread-worm (Oxyuris vermicularis), though it is often given with a view to the destruction of the latter parasite. It should be followed by a mild purgative.

Dose. Of santonica or worm seed, from 10 gr. to 60 gr. Seldom used in this form. The dose of santonin is from 1 gr. to 3 gr. for

a child ; 2 gr. to 6 gr. or more for an adult, given in the form of powder.

Anthemidis Flores. The Flower of Anthemis nobilis, or Common Chamomile ; indigenous, growing in pastures on gravel, and cultivated.

Anthemidis Oleum. English Oil of Chamomile. The oil distilled in England from the flower.

Description. The *flowers* may be either single or double, consisting of a yellow convex disk and white rays. The florets of the ray are numerous, white, and three-toothed ; those of the disk, yellow ; by cultivation many of the latter are converted into white ray florets, and the flower is then said to be double. The single variety consists of yellow tubular and white strap-shaped florets ; the double, of white strap-shaped florets only.

Prop. & Comp. The flowers contain a *volatile oil*, and a bitter *extractive matter*. The oil is of a pale blue or greenish blue colour, becoming yellowish by age ; it has the peculiar odour and aromatic taste of the flowers ; sp. gr. 0·91 ; it probably is a mixture of a hydrocarbon ($C_{10}H_{16}$), the real volatile oil, with an oxidized substance (angelic aldehyde), which when treated with potash is converted into angelate of potash ($C_5H_7KO_2$).

Off. Prep.—Of the Flowers. Infusum Anthemidis. Infusion of Chamomile. (Chamomile flowers, half an ounce ; boiling distilled water, ten fluid ounces.)

Of the Flowers and Oil.

Extractum Anthemidis. Extract of Chamomile. (An infusion of the flowers evaporated, and having a subsequent addition of fifteen minims of the oil for each pound of flowers employed.)

Therapeutics. Chamomile is an aromatic stomachic and tonic ; in large doses, especially in the form of a warm infusion, it acts as an emetic ; it is used in atonic dyspepsia, also to assist the action of emetics. It is thought to be an anti-periodic. The oil is stimulant and carminative, a useful adjunct to purgatives.

Dose. Of the infusion, 1 fl. oz. to 4 fl. oz. ; of the oil, 1 min. to 5 min. ; of the extract, 2 gr. to 10 gr. The extract forms a useful adjunct to stomachic and other pills.

Taraxaci Radix. Dandelion Root. The recent root of Taraxacum Dens leonis or Common Dandelion ; indigenous ;

gathered between September and February from meadows and pastures in Britain.

Description. The root is tapering and branched, yielding a bitter milky juice when cut, which becomes brown by exposure; smooth and dark; of a brown colour externally, white within; of a sweetish bitter taste; the juice should not be watery, nor the root wrinkled or pale externally, and any adherent leaves runcinate and smooth.

Prop. & Comp. The juice contains resinous matters, sugar, gum, and a *bitter extractive*, from which a crystalline principle named *taraxacine* has been obtained, bitter in taste; soluble in alcohol, ether, and hot water, sparingly so in cold. *Mannite* has been also extracted, but whether it is a product of the fermentation of the juice or exists in the root is as yet undecided.

Off. Prep. Decoctum Taraxaci. Decoction of Taraxacum. (Dried dandelion root, one ounce; distilled water, thirty fluid ounces, reduced by boiling to twenty ounces.)

Extractum Taraxaci. Extract of Taraxacum. (Prepared as the other extracts, from the expressed juice of the fresh root.)

Succus Taraxaci. Juice of Taraxacum. (The juice expressed from the dandelion root, to every three measures of which one measure of rectified spirit is added.)

Therapeutics. The value of taraxacum as a remedy is a matter which admits of some doubt. It is supposed to have a specific action on the liver, modifying and increasing its secretion; hence its widely spread use in hepatic diseases, more particularly when attended with an habitually engorged state of the vessels of that viscus. Given for some time, it is thought to act as an alterative on that organ. In dropsies from hepatic obstruction, it is generally administered in combination with a purgative. Many patients assert positively that when taking dandelion their digestion is made more perfect, and it is not uncommon to find dyspeptics resort to its use of their own accord; but it is difficult by ordinary clinical observation to make out the powers of the remedy. In some patients a well-marked diuretic action is observed.

Dose. Of decoction of taraxacum, 2 fl. oz. to 4 fl. oz.; of extract of taraxacum, 5 gr. to 30 gr. or more; of juice of taraxacum, 1 fl. drm. to 2 fl. drm. or more.

Lactuca. The flowering plant of Lactuca virosa, the Wild Lettuce; indigenous.

Lactucarium. (Not officinal.) The inspissated juice of Lactuca sativa and of Lactuca virosa, the Wild Lettuce.

Description. The lettuce is too familiar to need description. *Lactucarium*, which is prepared by pressing out the milky juice of the flowering herbs and afterwards inspissating with a gentle heat, occurs in small masses or lumps of a brown colour, with an odour very similar to opium, and a bitter taste.

Prop. & Comp. The only peculiar substances contained in the lettuce are those found in lactucarium. Lactucarium yields to alcohol a bitter extractive matter; it is also sparingly soluble in water. A crystalline substance, *lactucone*, soluble in alcohol and ether, but not in water, has been extracted from lactucarium, forming 42 per cent. of the fresh drug; and two other substances, *lactucic* acid and *lactucine*, soluble in water, the latter being crystalline and resembling *mannite*.

Off. Prep. Extractum Lactucæ. (Prepared as other green extracts from the expressed juice.)

Therapeutics. The lettuce has been asserted to possess some narcotic powers, and has been occasionally eaten at bed-time to induce sleep. Extract of the fresh juice and lactucarium are generally employed by the physician, and have been prescribed, in cases in which opium disagrees with the patient, to procure sleep, allay cough, &c. Lettuce has certainly very feeble powers compared with opium, and the author has given thirty grains and more of good lactucarium, and repeated the dose every four hours, without noticing any decided narcotic effect from its administration.

Dose. Of lactucarium, or extract of lettuce, 5 gr. to 30 gr.

Arnicæ Radix. The rhizome and rootlets of Arnica montana; found in the mountainous parts of Europe.

Description. The rootstock from one to three inches long, and two or three lines thick, cylindrical, contorted, rough from the scars of the coriaceous leaves, and furnished with numerous long slender fibres. The flowers of arnica are of a dark yellow colour, calyx green; the ray florets ligulate, much longer than the calyx; the florets of the disk tubular.

Prop. & Comp. The flowers, the leaves, and root of this plant, all of which are often employed, have a peculiar odour when fresh, and are apt to excite sneezing. The active properties are taken up by water. In addition to the other constituents of

plants, arnica contains a *volatile oil* and a bitter principle identical with *cytisin:* a *volatile alkaloid*, resembling lobelina, has also been procured from it, and an acrid *resin*, soluble in alcohol.

TINCTURA ARNICÆ. Tincture of Arnica. (Arnica root, in fine powder, one ounce; rectified spirit, one pint. Prepared by maceration and percolation.)

Therapeutics. Given internally, arnica acts as a stimulant and irritant: it has been supposed to influence the spinal cord; its action upon the system has not, however, been satisfactorily made out, but it is said to be useful in some forms of nervous headache, also in chronic rheumatic pains. It is chiefly employed as an external application for the discussion of tumours, and for sprains and bruises. The author has reasons for questioning the virtues of arnica as a remedy in these cases, and his grounds for so doing are the following:

Bruises, made by means of cupping glasses, were thus dealt with: some were treated with spirit and water; some with tincture of arnica of the same alcoholic strength; and others were left to themselves.

It was found that bruises treated with spirit became much more rapidly well than those left to themselves; but it was also found that the alcoholic solution of arnica had no more power in expediting the return of the skin to its normal condition than spirit of the same strength. The same relative results were arrived at when the injuries produced by the cupping glasses were treated before ecchymosis occurred; spirit and tincture of arnica appeared to be equal in their power of preventing the development of the bruises. These results were brought before the College of Physicians in 1864.

Dose. Internally, the tincture may be given in doses of from 30 min. to 1 fl. drm. or more; externally, the tincture is employed either alone or diluted with water; it is sometimes added to liniments.

LOBELIACEÆ.

Lobelia. Lobelia. The flowering herb of Lobelia inflata, Indian Tobacco; indigenous in the United States.

Description. The whole herb is officinal; stem angular; leaves alternate, ovate, toothed; somewhat hairy beneath; capsule ovoid, inflated, ten-ribbed; herb acrid. It is generally found in oblong, compressed cakes.

Prop. & Comp. It has a peculiar odour, and a burning taste, not observed for a short time after the substance has been chewed. Besides colouring matters and the common constituents of plants, it contains a volatile oil or peculiar acid, the *lobelic acid*, and an alkaline principle, *lobelina*. This substance forms a yellowish liquid, lighter than water, very soluble in ether and alcohol, and forms crystalline salts with the mineral acids; it is probably the active agent of the plant.

Off. Prep. TINCTURA LOBELIÆ. Tincture of Lobelia. (Lobelia, dried and bruised, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.)

TINCTURA LOBELIÆ ÆTHEREA. Ethereal Tincture of Lobelia. (Lobelia, dried and bruised, two ounces and a half; spirit of ether, one pint. Prepared by maceration.)

Therapeutics. In small doses it is expectorant and diaphoretic; in larger, emetic or cathartic. In too large quantities it produces much depression, nausea, cold sweats, and even death, preceded by convulsions; it closely resembles tobacco in its action. It has been much lauded in attacks of spasmodic asthma, and also in other affections of the air-passages, attended with dyspnœa. In some cases it forms a useful adjunct to diuretics.

Dose. Of the alcoholic tincture or ethereal tincture, 10 min. to ½ fl. drm. or more, carefully watching any symptom of vascular depression.

ERICACEÆ.

Uvæ Ursi Folia. Bearberry Leaves. The leaf of Arctostaphylos Uva Ursi, Whortleberry, Bearberry, or Trailing Arbutus; growing in the northern parts of Europe and America.

Description. The leaves are dark green, obovate, obtuse, entire, shining on upper surface, reticulated underneath, coriaceous in consistence, about three-fourths of an inch in length. Not dotted beneath nor toothed on the margin.

Prop. & Comp. Taste astringent, odour like hay or tea; the infusion giving a bluish black precipitate with perchloride of iron. Contains *tannin* about 35 per cent., with a trace of gallic acid, one or two crystallizable principles, bitter extractive, &c.

Off. Prep. INFUSUM UVÆ URSI. Infusion of Bearberry. (Bearberry leaves, half an ounce; boiling distilled water, ten fluid ounces.)

Therapeutics. An astringent and diuretic, used in vesical and urethral affections, as catarrhus vesicæ (chronic), to diminish irritability and mucous discharge, also in gleets ; sometimes employed in kidney affections ; it may be given with alkalies or acids.

Dose. Of powder, 10 gr. to 30 gr. ; of the infusion, 1 fl. oz. to 2 fl. oz.

Adulteration. Leaves of *Red Whortleberry* or *Vaccinium Vitis Idæa* may be added, distinguished by being dotted and not reticulated on the under surface, and the margins crenated : also common *box* leaves, which can be recognised by their want of astringency.

SAPOTACEÆ.

Gutta-Percha. Gutta-percha. The inspissated juice of Isonandra gutta, the Gutta-percha or Taban tree, growing in Borneo, Sumatra, and the other Islands of the Eastern Archipelago.

Description. In tough, flexible pieces of a light-brown or chocolate colour.

Prop. & Comp. Almost wholly soluble in chloroform, the solution being more or less turbid. Also in carbon disulphide. Insoluble in water. At a temperature below 212° Fahr., gutta-percha becomes so soft that it may be moulded like wax, or welded together : on cooling, it retains the form which has been impressed upon it. It is an insulator of electricity, and is hence largely employed for coating telegraph wires, &c. Commercial gutta-percha consists of three distinct portions : *pure gutta*, a milk-white solid, having the formula $C_{20}H_{32}$; this forms about 80 per cent. of the whole ; a crystalline resin, $C_{20}H_{32}O_2$; and an amorphous resin, $C_{20}H_{32}O$. Pure gutta-percha slowly absorbs oxygen when exposed to air and light, and is gradually converted into a brittle resin, wholly devoid of plasticity.

Off. Prep. Liquor Gutta-Percha. Solution of Gutta-percha. (One ounce of gutta-percha, in thin slices, is dissolved by agitation in six fluid ounces of chloroform. One ounce of finely powdered carbonate of lead, mixed with two fluid ounces of chloroform, is then added, and the whole is shaken up. The solution is set aside to allow any insoluble matter to subside, and the clear liquid decanted and kept in a stoppered bottle.) Employed in the preparation of Charta Sinapis.

Use. Chiefly employed on account of its physical properties, for making splints, &c. Gutta-percha tissue, mackintosh cloth,

and similar articles are used to prevent the evaporation of lotions, to cover poultices and fomentations, &c.

STYRACACEÆ.

Benzoinum. Benzoin. A balsam (indurated in the air) flowing from the incised bark of Styrax Benzoin or Benjamin tree; growing in Sumatra, Siam, Borneo, and other islands of the Eastern Archipelago. (*See* also STYRAX PRÆPARATUS.)

Acidum Benzoicum. Benzoic acid. $HO,C_{14}H_5O_3$, or $HC_7H_5O_2$. A crystallized acid prepared from gum benzoin by sublimation.

Description. Benzoin occurs either in the form of reddish-white tears, separate or slightly adherent, or more frequently in masses consisting of the tears completely agglutinated with a brownish-red substance; on fracture, it presents an amygdaloid appearance; this forms *Siam* benzoin. Benzoin has little taste, but an agreeable odour. An inferior darker kind, called *Calcutta* benzoin, is sometimes met with.

Prop. & Comp. Benzoin contains from 10 to 20 per cent. of *benzoic acid;* the remainder consists of a resin, partly soluble in ether. Benzoin is soluble in alcohol and liquor potassæ; and gives off, when heated, fumes of benzoic acid. *Benzoic acid,* when pure, forms soft, feathery, flexible, white crystals, with a pearly lustre; generally impregnated with empyreumatic oil, which gives it a strong odour; slightly soluble in water, but readily so in rectified spirit; it is dissolved also by solutions of ammonia, potash, soda, and lime, from which it is precipitated by hydrochloric acid, unless the solution be very dilute. It melts at 248°, and boils at 462°. When heated to the last-named temperature, it should sublime without residue.

Off. Prep. TINCTURA BENZOINI COMPOSITA. Compound Tincture of Benzoin. (Benzoin, coarsely powdered, two ounces; prepared storax, one and a half ounce; balsam of tolu, half an ounce; Socotrine aloes, one hundred and sixty grains; rectified spirit, one pint. Prepared by maceration.)

Benzoin is also contained in Benzoated Lard.

BENZOIC ACID is prepared by subliming benzoin in an iron vessel, and collecting the sublimed acid by means of a cylinder of stiff paper inverted over the vessel.

Benzoic acid is contained in Tinctura Camphoræ Comp., Benzoate of ammonia, and Tinctura Opii Ammoniata.

Therapeutics. *Benzoin* is a stimulant expectorant, formerly used in chronic bronchitic affections; externally in the form of the tincture (FRIAR'S BALSAM) it is applied as a stimulant to ulcers and wounds. *Benzoic acid*, when taken internally, is converted into and appears in the urine as hippuric acid, rendering this fluid more acid and somewhat irritating, but not diminishing the amount of uric acid; it also acts as a diuretic.

Benzoic acid is used when we wish to stimulate the mucous membrane of the bladder and produce an alterative effect in cases of chronic inflammation of that organ, especially when accompanied with alkaline urine; it often corrects the slight fetor of the urine which accompanies cases of irritable bladder from enlarged prostate, &c.

Dose. Of benzoin, 10 gr. to 30 gr.; of the compound tincture, ½ fl. drm. to 1 fl. drm., suspended in water by means of mucilage or yolk of egg; of benzoic acid, 10 gr. to 15 gr.

Ammoniæ Benzoas. Benzoate of Ammonia. $NH_4O,C_{14}H_5O_3$, or $NH_4C_7H_5O_2$.

Prep. (Solution of Ammonia, three fluid ounces; benzoic acid, two ounces; distilled water, four fluid ounces: dissolve and set aside to crystallize.)

Prop. In colourless laminar crystals, which are readily soluble in water, in this respect differing from benzoic acid; soluble also in alcohol. The watery solution, when acidulated with hydrochloric acid, deposits benzoic acid; heated with caustic potash it evolves ammonia. It is entirely sublimed by heat. The aqueous solution gives a bulky yellow precipitate with persalts of iron.

Therapeutics. Benzoate of ammonia acts as a diuretic and slight stimulant; it is employed in cases of chronic inflammation of the bladder, where there is a tendency to phosphatic deposits. On account of its ready solubility it is much more easily administered than benzoic acid, which it resembles in its action. It appears in the urine as hippuric acid.

Dose. 10 gr. to 20 gr.

OLEACEÆ.

Olivæ Oleum. Olive Oil. An oil expressed from the ripe fruit of Olea Europæa, the European Olive; growing near the shores of the Mediterranean.

Sapo Durus. Hard Soap. Soap made of olive oil and soda.

Sapo Mollis. Soft Soap. Made of olive oil and potash.

Sapo Animalis. Curd Soap. Made of soda and a purified animal fat consisting chiefly of stearin.

Glycerinum. Glycerine. A sweet principle, $C_6H_8O_6$, or $C_3H_5O_3$, obtained from fats and fixed oils, and containing a small percentage of water.

Descrip., Prop., & Comp. The olive fruit, used at dessert, is a smooth, elliptical, single-seeded drupe, about $\frac{3}{4}$ inch long, and $\frac{1}{2}$ inch in diameter, of a dark green colour. The oil, *Oleum Olivæ*, called also Salad oil, is of a pale straw colour, with a slight and agreeable odour and taste; sp. gr. 0·92; congeals partially at about 36°; and consists of about 72 per cent. of *Oleine*, and 28 per cent. of *Palmitine;* it unites with alkalies and other bases, forming soaps ; the two alkaline soaps are named Sapo durus and Sapo mollis.

Sapo durus, or the combination of the oil with soda, called also hard soap, is greyish white, horny and pulverizable when kept in warm dry air, easily moulded when heated. It is often marbled blue or red when of the Castille variety, from the presence of a little oxide of iron. Hard soap is soluble in water; the solution is precipitated by lime, lead, and some other metallic salts ; it is composed of *oleate* and *palmitate* of soda. Incinerated it leaves an ash which does not deliquesce.

Sapo mollis, the combination of the oil with potash, forms a yellow, transparent, very soft substance, inodorous, of the consistence of thick honey ; it is usually spotted with white points, from some crystallization having taken place ; in other respects it agrees with soda soap ; it is a compound of *oleate* and *palmitate* of potash. Both hard and soft soap should be entirely soluble in rectified spirit, and should not impart an oily stain to paper. Incinerated it leaves an ash which is very deliquescent.

Sapo animalis, or curd soap, introduced here for the sake of convenience, as it is not made with olive oil. It is white, or of a very light grey hue ; dry ; nearly inodorous ; horny and pulverisable when kept in a dry, warm place. Soluble in rectified spirit, and hot water ; the solution is almost neutral to test-paper. Does not give a greasy stain to paper. May be easily moulded when heated.

Glycerine, a substance which is separated when all ordinary fats and oils are saponified or distilled with superheated steam, from the oleine, palmitin, or stearine, contained in them; it is a slightly-yellow or colourless syrupy-looking liquid, sp. gr. 1·260, very sweet, oily to the touch, mixing readily with water and alcohol; the watery solution does not ferment with yeast, nor does glycerine itself evaporate or dry at an ordinary temperature. Its composition is represented by the formula ($C_3H_8O_3$), or ($C_3H_5.H_3.O_3$); it is a triatomic alcohol, which by replacement of three of its atoms of hydrogen by the radicals of the fatty acids forms fats and oils: thus palmitin occurs in three forms, (1) $C_3H_5.H_2C_{16}H_{31}O.O_3$; (2) $C_3H_5.H(C_{16}H_{31}O)_2O_3$; and (3) $C_3H_5.(C_{16}H_{31}O)_3O_3$; where one, two, and three atoms of hydrogen are respectively replaced by the same number of atoms of $C_{16}H_{31}O.$, the radicle of palmitic acid. When decomposed by heat it evolves intensely irritating vapours of acrolein. Glycerine possesses very remarkable solvent powers: arsenious acid, carbolic acid, borax, many vegetable alkaloids and acids dissolve freely in it. Heated with starch, it forms a "plasma" (Glycerinum Amyli), which can be employed as an ointment.

Off. Prep.—Of Olive Oil. Olive oil is used in the preparation of the linimentum calcis, linimentum camphoræ, of several plasters, many of the ointments, and enema magnesiæ sulphatis.

Of Sapo durus.

Emplastrum Cerati Saponis. Soap Cerate Plaster. (Hard soap, ten ounces; yellow wax, twelve and a half ounces; olive oil, a pint; oxide of lead, fifteen ounces; and vinegar, a gallon.)

Emplastrum Saponis. Soap Plaster. (Hard soap, six ounces; litharge plaster, two pounds and a quarter; resin, one ounce.)

Linimentum Saponis. Liniment of Soap. (Hard soap, two ounces and a half; camphor, one ounce and a quarter; oil of rosemary, three fluid drachms; rectified spirit, eighteen fluid ounces; distilled water, two fluid ounces.) This Liniment is commonly known by the name of Opodeldoc.

Pilula Saponis Composita. Compound Soap Pill. See preparations of Opium.

Hard soap is also used in the preparation of many pills and plasters, and in that of extract. colocynth. co.

Of Sapo Mollis.

Soft soap is used in making the Turpentine liniment.

Of Sapo Animalis.

Suppositoria Acidi Carbolici cum Sapone, Suppositoria Morphiæ cum Sapone, Suppositoria Acidi Tannici cum Sapone. It is also contained in Pil. Scammonii comp.

Of Glycerine.

Glycerinum Acidi Carbolici. Glycerine of Carbolic Acid. (Carbolic acid, an ounce; glycerine, four fluid ounces. Rub together until the acid is dissolved.)

Glycerinum Acidi Gallici. Glycerine of Gallic Acid. (Gallic acid, an ounce; glycerine, four fluid ounces.)

Glycerinum Acidi Tannici. Glycerine of Tannic Acid. (Tannic acid, an ounce; glycerine, four fluid ounces.)

Glycerinum Amyli. Glycerine of Starch. (Starch, an ounce; glycerine, eight fluid ounces. Mix, heat to 240° till a jelly is formed.)

Glycerinum Boracis. Glycerine of Borax. (Borax, in powder, an ounce; glycerine, four fluid ounces.)

Therapeutics. *Olive Oil* is used in medicine internally as a demulcent in the form of emulsion; it may also be used as an enema: if taken in large doses it is slightly laxative, as is the case with almost all fixed oils: externally it is much employed in the form of liniment as a lubricating substance.

Soap acts as an antacid, but is apt to disagree with the stomach from the liberation of the fatty acids contained in it, especially, as often happens, when not made of olive oil: it possesses no particular value as an internal remedy, and is more used as an adjunct to other drugs and to aid in the formation of pills, than for its medicinal virtue. Soap is used as an external application, and is more valued for its mechanical effect than for any special property it possesses.

Glycerine is used on account of its physical properties, as an adjunct to lotions in skin diseases, to prevent the surface becoming dry, or in the form of plasma; it has also been proposed as a substitute for sugar in the dietary of diabetic patients. It has likewise been used internally as a substitute for cod liver oil, but without much benefit.

Dose. Of olive oil, 1 fl. drm. to 1 fl. oz. or more, as a demulcent or laxative; of hard soap or soft soap, as an antacid, &c., 5 gr. to 20 gr.; of glycerine, ½ fl. drm. to 2 fl drm.

Adulteration. Soap made from animal oils or fats and potash is very commonly employed in place of the officinal soft soap, and common hard soap is substituted for the Castille variety.

Manna. Manna. A concrete saccharine exudation from the incised bark of Fraxinus rotundifolia and Fraxinus ornus; obtained by making incisions in the stems of the trees, which are cultivated for the purpose chiefly in Sicily and Calabria. It is probable that both trees yield manna, and a similar substance can be obtained from Fraxinus excelsior, when growing in the southern part of Europe.

Description. Manna of the best description, called flake manna, forms long white pieces not unlike stalactite masses, from one to six inches in length, and about one to two inches broad, hollowed out and discoloured on the side which was attached to the tree; it is porous and friable; it may also occur in small masses, or tears, and when of an inferior kind, in broken and coloured fragments mixed with impurities. Manna has a sweetish odour and taste, but it is also rather bitter.

Prop. & Comp. Manna is soluble in five parts of water; it dissolves also in alcohol, and consists almost entirely of a peculiar sugar, named *Mannite* ($C_6H_7O_6$, or $C_6H_{14}O_6$), which crystallizes in four-sided prisms, is sweet, and differs from grape or cane sugar in not fermenting with yeast; a small amount of *bitter matter* also exists in manna, the nature of which is unknown, with some common sugar. The mannite constitutes about eighty per cent. and can be extracted by boiling alcohol, from which it separates on cooling in shining crystals.

Therapeutics. A very mild laxative, adapted for children; also a pleasant adjunct to some purgative draughts; it sometimes causes flatulence and griping. The laxative effect is probably due to the extractive, not to the mannite.

Dose. 60 gr. to ½ oz. or more.

The leaves of **Fraxinus Excelsior,** or Common Ash (not officinal), have long been used in medicine, and within the last few years they have been much extolled in Germany and France in the treatment of gout and rheumatism; their real composition is unknown. From the author's experience of their effects in acute gout, he is not at all inclined to think highly of their value, for in several cases they failed to afford the slightest alleviation, when the use of other treatment was immediately followed by relief;

in the treatment of chronic gout, when taken for a long time and in large quantities in the form of decoction of the leaves (half an ounce to the pint), they probably may have some influence in keeping off attacks.

LOGANIACEÆ.

Vomica. The seeds of Strychnos Nux Vomica. Nux vomica, or Koochla Tree ; growing in and imported from the East Indies.

Strychnia. Strychnia ($C_{42}H_{22}N_2O_4$, or $C_{21}H_{22}N_2O_2$), an alkaloid obtained from Nux Vomica.

Description. The fruit is a round berry, like an orange, filled, when ripe, with a jelly-like pulp, and containing the *seeds*, which are round, flattened, and concavo-convex, from half an inch to an inch in diameter, very tough and horny, covered with a velvety down consisting of fine hairs; their colour is yellowish-grey, with no odour, but of an intensely bitter taste.

Prop. & Comp. Nux vomica contains two alkaloids, *strychnia* and *brucia*, united with a peculiar acid. Strychnia crystallizes in four-sided prisms or octahedra ; it requires about one thousand parts of water to dissolve it, but communicates to it an intensely bitter taste ; soluble in boiling rectified spirit and chloroform, but not in absolute alcohol or ether ; it forms crystallizable salts with acids. Strychnia yields a colourless solution with pure sulphuric acid, which, on the addition of bichromate of potash, acquires an intensely violet colour, speedily passing through red to yellow. It is not reddened by nitric acid. Brucia ($C_{23}H_{26}N_2O_4$) crystallizes with four equivalents of water ; much more soluble in water. but less bitter than strychnia ; soluble in alcohol ; forms salts with acids ; it is coloured red by nitric acid, but does not give the test with the bichromate of potash. *Igasuric* or *Strychnic* acid is united with the alkaloids ; its solution precipitates copper salts bright green ; it can be crystallized. A third alkaloid, *Igasuria*, has been stated to exist in nux vomica, which is more soluble in water than strychnia or brucia : recently, Schutzenberger has asserted that many bases, allied to brucia in being reddened by nitric acid, are contained in the seeds of nux vomica ; he detected them in the so-called Igasuria.

Off. Prep.—Of the Seeds of Nux Vomica.

EXTRACTUM NUCIS VOMICÆ. Extract of Nux Vomica. (Prepared by first softening the seeds by steam, reducing them to powder, and subsequently macerating in rectified spirit and evaporating to a proper consistence.) A pound of the seeds yields about one and a half ounce of extract.

TINCTURA NUCIS VOMICÆ. Tincture of Nux Vomica. (Nux vomica, two ounces; rectified spirit, twenty fluid ounces. Apply steam to the nux vomica until it is thoroughly softened, then dry rapidly, and reduce it to fine powder. Macerate the powder for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.)

Of the Alkaloid Strychnia.

LIQUOR STRYCHNIÆ. Solution of Strychnia. (Strychnia, four grains; dilute hydrochloric acid, six minims; rectified spirit, two fluid drachms; distilled water, six fluid drachms.) A solution of strychnia in rectified spirit and water, slightly acidulated with hydrochloric acid; one grain of strychnia is contained in two fluid drachms.

STRYCHNIA is prepared by the following process. Nux vomica is reduced to powder; this is accomplished by submitting it to the action of steam, and then drying in a vapour bath or hot air chamber, and grinding it in a coffee mill. The powder is digested with a gentle heat in spirit and water, the spirit distilled off, and a solution of acetate of lead added, by which the colouring matters, resin, igasuric acid, &c., are precipitated, while the acetates of strychnia and brucia remain in solution. The precipitate is separated by filtration, and to the filtered liquid ammonia is added in slight excess, throwing down both the alkaloids; it is allowed to stand for twelve hours, and then the precipitate is collected on a filter, washed and dried. The dried product is boiled in rectified spirit till the fluid ceases to taste bitter, the greater part of the spirit distilled off, and the liquid evaporated to a small bulk and set aside to cool. The yellowish mother liquor, containing the brucia, is poured off from the white crust of strychnia, the white crust thrown on a filter and washed with two parts of rectified spirit and one of water to remove traces of brucia, till the washings no longer become red with

nitric acid. The strychnia is finally dissolved by boiling in rectified spirit, and the solution set aside to crystallize.

Therapeutics. The action of nux vomica is chiefly, if not wholly due to the *Strychnia* it contains. This alkaloid exaggerates the reflex excitability of the spinal cord, so that the most trifling stimulus excites tetanic spasms. This effect is manifested both in cold-blooded and warm-blooded animals. It does not directly influence the cerebral centres, the motor nerves, the voluntary muscles, or the heart. It is said to cause contraction of the peripheral arterioles and a rise of blood-pressure. *Brucia* resembles strychnia in its physiological action, but is far less powerful. Crum Brown and Fraser have shewn that the methyl and ethyl derivatives of strychnia and brucia possess no convulsant properties, but cause death by paralyzing the end-organs of the motor nerves in a manner analogous to curare.

In man, strychnia causes twitching and rigidity of the muscles, followed by tetanic paroxysms, without loss of consciousness. In the intervals between the paroxysms, the muscles are relaxed. Death may ensue from exhaustion between the fits of spasm, or from apnœa during a paroxysm, owing to protracted rigidity of the muscles of respiration. Paralyzed parts are more readily affected by the alkaloid than those which are sound. Strychnia is eliminated in the urine. Brucia appears to be clinically inert; from the author's experience, it does not, *when pure*, produce any of the effects of strychnia, even in large doses; perhaps it is tonic and antiperiodic.

The fatal effects of an overdose of strychnia have been averted by the administration of chloroform, chloral, and physostigma, and by keeping up artificial respiration.

It acts as a bitter stomachic, and in some forms of dyspepsia, as in pyrosis, often relieves; it likewise appears to give tone or contractile power to the intestines, and when combined with purgatives increases their power and effectiveness. Nux vomica is also much used in the treatment of paralysis, more especially when depending on lead poisoning, and in other forms of local paralysis, such as atony of the bladder; sometimes, however, it is employed in paraplegia, and even in hemiplegia, when all inflammatory symptoms have subsided. Nux vomica is also of service in giving tone to the muscular system, in cases where debility has arisen after severe illnesses, such as rheumatic fever. Nux vomica has been found to have considerable power in relieving some functional affections of the nervous system, as low spirits, of an hysterical character; also to give tone in

impotence from nervous exhaustion; its power as an aphrodisiac is often well marked. Lastly, this remedy is used in chorea and other spasmodic affections, when of a chronic character.

Dose. Of powdered nux vomica, 2 gr. to 5 gr.; of the extract, $\frac{1}{4}$ gr. to 2 gr.; of the tincture, 10 min. to 20 min.; of strychnia, $\frac{1}{30}$ gr. to $\frac{1}{12}$ gr., or $\frac{1}{8}$ gr., cautiously increased; of the solution, 5 min. to 10 min. or more. Some patients are extremely sensitive to the action of nux vomica and strychnia; the author has seen 10 min. of the tincture of nux vomica and $\frac{1}{48}$ gr. of the alkaloid cause severe symptoms. For hypodermic administration, $\frac{1}{120}$ to $\frac{1}{60}$ gr. of the sulphate of strychnia may be employed.

Adulteration of *strychnia.* The presence of *brucia*, in varying, sometimes large, quantities, rendering the alkaloid much less powerful, is detected by the red colour produced by nitric acid. The bark of strychnos nux vomica contains the same alkaloids as the seeds; it is know as False Angustura Bark, being sometimes employed to adulterate the true Angustura Bark; for the method of distinguishing this adulteration, *vide* Cusparia.

Faba Sancti Ignatii. St. Ignatius' Bean. The seed of the Strychnos Ignatia; inhabiting the Philippine Islands. (Not officinal.)

Description. The seeds are of a brown colour, as large as olives, semi-transparent, of a tough horny texture; convex on one side; somewhat triangular, with irregular facets on the other.

Prop. & Comp. These beans are remarkable for the large proportion of *strychnia* they contain, the quantity being greater than that yielded by the nux vomica seeds. They yield about 1·2 per cent. of the alkaloid, and their activity is due to the presence of this substance; they also contain *Brucia.*

Therapeutics and *Use.* St. Ignatius' Beans are often used as a source of strychnia. An extract has been prepared from them, and given as a remedy; thought by some to differ in its properties from that of nux vomica, but there can be no doubt the difference is in degree only, strychnia being the active ingredient.

Spigeliæ Radix. Carolina Pink. The root of Spigelia Marilandica; native of the south and south-western parts of North America. (Not officinal.)

Description. The root consists of a thick globular head, from

which numerous thinner and tortuous fibres branch out; it has a brown colour.

Prop. & Comp. The root contains, in addition to saccharine and mucilaginous matters, a *volatile* and fixed oil, and a peculiar *bitter principle*, soluble in water. The oily and bitter matters probably give activity to the drug.

Therapeutics. Much employed in the United States as an anthelmintic; it produces, in moderate doses, considerable cathartic action, and in some cases, peculiar narcotic effects. It may be administered in substance, or in the form of infusion; generally combined with a purgative.

Dose. 60 gr. to 120 gr. for an adult.

Gelsemii Radix. The root of Gelsemium sempervirens, the Yellow Jasmine. (Not officinal). Grows in the Southern States of N. America.

Prop. & Comp. The active properties of the root are due to an alkaloid, *gelsemia*, found in combination with *gelseminic acid*. The alkaloid has been isolated as a colourless, amorphous solid, intensely bitter, and with strong basic properties. The root also contains a *resin*, devoid of specific properties.

Prep. TINCTURA GELSEMII (not officinal). By macerating one ounce of the root in eight ounces of proof spirit for a week.

Therapeutics. Gelsemium acts chiefly on the nervous system. In cold-blooded animals, it causes first sensory, then motor paralysis, by its action on the spinal cord. In warm-blooded animals and man it acts primarily on the motor tract of the cord, causing loss of power over the voluntary muscles. It does not affect the end-organs of the motor nerves, or diminish idio-muscular contractility. The anæsthetic property of the drug is not manifested in warm-blooded animals unless it be given in poisonous doses. Death results from apnœa, due to paralysis of the respiratory muscles. The cerebral functions and the heart are not directly influenced.

The action of gelsemium is somewhat like that of conium; it differs from the latter, however, in acting primarily on the nerve-centres instead of their end-organs, and in affecting the sensory as well as the motor functions.

It has been employed in various forms of neuralgia, rheumatism, and muscular spasm, as a sedative. Fatal results have occurred from an over-dose. Though much used in America, it has hitherto been little investigated in this country.

Dose. Of the tincture 10 min. to 30 min. or more.

ASCLEPIADACEÆ.

Hemidesmi Radix. Hemidesmus Root. The Root of Hemidesmus Indicus. Indian Sarsaparilla. Native of and imported from India.

Description. In yellowish brown long cylindrical pieces; the colour of the cortex is dark, marked by longitudinal divisions and deep circular rings; the central portion ligneous; it has a somewhat fragrant odour, and an agreeable bitter taste.

Prop. & Comp. It yields its active properties to boiling water, and contains a peculiar volatile, crystallizable substance, with acid properties: this has been called hemidesmic acid, but little is known concerning it.

Off. Prep. Syrupus Hemidesmi. Syrup of Hemidesmus. (Hemidesmus, four ounces; refined sugar, twenty-eight ounces; boiling distilled water, twenty fluid ounces.) Sp. gr. 1·335.

Therapeutics. Its action is supposed to be the same as that of sarsaparilla, and it has been used as a substitute for that root, especially in India, in syphilitic cutaneous eruptions, &c., and also in some diseases of the kidney.

Dose. Of the Syrup, 1 fl. drm. to 2 fl. drm. The Syrup of Hemidesmus must be looked upon more as a flavouring than a medicinal agent, as the amount of the drug contained in an ordinary dose of this preparation is very small.

A decoction may be made from it, in lieu of sarsaparilla, when the real action of hemidesmus is required. Dose from 1 fl. oz. to 4 fl. oz.

Condurango. The dried stems and bark of Gonolobus Condurango (not officinal). Indigenous in Ecuador and other parts of S. America. Imported from New York.

Description. Pieces of dried stems, one inch to one and a half inches in diameter, consisting of a light-coloured wood enclosing a small central pith, from which numerous medullary rays radiate towards the exterior. Bark rather thick, light brownish-grey, longitudinally wrinkled, blotched with lichens. Smell not unlike that of cascarilla. When chewed, has a slightly bitter, mawkish taste.

Therapeutics. Was introduced into this country as a remedy for cancer. Careful trials made at the Middlesex Hospital by

Messrs. Campbell de Morgan and Hulke have shewn that it exerts no appreciable influence on the disease. No physiological effects were noticed even after large doses of the decoction and the fluid extract of the bark.

Solenostemma Argel, the leaves of which have been referred to as constituting one of the adulterations of senna, belongs to this natural order.

GENTIANACEÆ.

Gentianæ Radix. Gentian Root. The dried root of Gentiana lutea, or Yellow Gentian ; growing chiefly in the European Alps and Pyrennees : imported from Marseilles and other French ports.

Description. The root occurs in lengthened cylindrical pieces, from ½ inch to 1 inch in diameter, and several inches long ; wrinkled longitudinally, and often twisted ; brown externally, yellow and spongy, yet tough, within. Of a sweet odour, and bitter and sweet taste.

Prop. & Comp. Gentian yields to water and spirit its bitter principle, *gentianite*, which has not been crystallized, also *gentianin* or gentianic acid ($C_{14}H_{10}O_5$), which can be crystallized in yellow needles, but is not bitter, whose colour is deepened by alkalies ; formerly this was supposed to be the active principle. Sugar, gum, and pectin, &c., are also present in gentian root.

Off. Prep. Extractum Gentianæ. Extract of Gentian. (Prepared by maceration and subsequent decoction, and reduction by evaporation to a proper consistence.)

Infusum Gentianæ Compositum. Compound Infusion of Gentian. (Gentian root, sliced, and bitter orange peel, each sixty grains ; fresh lemon peel, a quarter of an ounce ; boiling distilled water, ten fluid ounces.)

Mistura Gentianæ. Gentian Mixture. (Gentian root, a quarter of an ounce ; bitter orange peel and coriander fruit, each thirty grains ; proof spirit, two fluid ounces ; distilled water, eight fluid ounces. Prepared by maceration, first in proof spirit and afterwards in the proof spirit and cold water.)

Tinctura Gentianæ Composita. Compound Tincture of Gentian. (Gentian root, one and a half ounce ; bitter orange peel, three quarters of an ounce ; cardamoms, one quarter of an ounce ; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Gentian is a simple bitter, or stomachic tonic, improving the appetite and giving tone to the stomach; hence useful in convalescence from acute disease, and in cases of dyspepsia attended with an atonic condition of that viscus.

Dose. In substance from 10 gr. to 30 gr.; of extract, 2 gr. to 10 gr.; of the compound infusion, 1 fl. oz. to 2 fl. oz.; of mixture, ½ fl. oz. to 1 fl. oz.; of the compound tincture, ½ fl. drm. to 2 fl. drm.

Chirata. Chiretta. The entire plant, Ophelia Chirata, grows in the northern parts of India.

Description. As imported, it is in bundles consisting of the stems of the plant, about 3 feet long, about the size of a goose quill; smooth, pale brown, with numerous small flowers, and part of the roots attached; the stems have a yellow pith.

Prop. & Comp. The plant is very bitter, and yields to water and alcohol a bitter extractive, similar to that obtained from gentian.

Off. Prep. INFUSUM CHIRATÆ. Infusion of Chiretta. (Chiretta, a quarter of an ounce; distilled water, at 120°, ten fluid ounces.)

TINCTURA CHIRATÆ. Tincture of Chiretta. (Chiretta, two and a half ounces; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Exactly the same as gentian.

Dose. Of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.

Other plants belonging to this order, as ERYTHRÆA CENTAURIUM, the Common Centaury, and MENYANTHES TRIFOLIATA, the Common Buck-bean, contain a similar bitter principle, and have been occasionally employed in the place of gentian root.

CONVOLVULACEÆ.

Scammoniæ Radix. Scammony Root. The dried root of Convolvulus Scammonia. Growing in Syria and Asia Minor, and exported chiefly from Smyrna.

Scammonium. Scammony, a gum resin, exuding from the cut and living root of Convolvulus Scammonia, chiefly in Asia Minor.

Scammoniæ Resina. Resin of Scammony. A resin obtained by means of rectified spirit, from dried Scammony Root, or from Scammony itself.

Description. The *root* is tap-shaped, sometimes three inches in diameter at the top, brown without, white within, odorous, but with little taste. Ether agitated with the powder and evaporated leaves a residue having the properties of scammony resin.

Scammony occurs in masses, irregular in shape and size, of a blackish-green colour, covered with a fine powder, porous, brittle, with a shining fracture. It has a musty odour, makes a lather when rubbed on the surface with water ; the taste is nauseous and acrid after a few minutes. It is easily triturated, and forms an emulsion with water. The *resin* obtained by means of rectified spirit from scammony root or scammony is in brownish, translucent pieces, brittle, resinous in fracture, and if prepared from the root, of a sweet fragrant odour.

Prop. & Comp. Scammony consists chiefly of a *resin, Scammonin*, sometimes in the form of a glucoside, sometimes, in part, as a resinous acid ; the latter is soluble in ammonia : scammony resin is soluble in alcohol and ether, but precipitated from its solution on the addition of water. The resin is probably identical with jalapin (*q. v.*). The remaining portion of pure scammony which is not soluble in ether consists chiefly of *gum.*

Scammony should emit no bubbles of gas when treated with hydrochloric acid, nor, when digested in water at 170° Fah., should the fluid be tinged of a blue colour on the addition of iodide of potassium and dilute nitric acid, or free iodine. Of pure or virgin scammony, 80 or 90 per cent. should be soluble in ether. The above tests show the absence of chalk or starch, and also the amount of resin. The resin cannot form singly an emulsion with water, as it contains no gum. Its tincture should not render the fresh cut surface of a potato blue ; this shows the absence of guaiacum, with which it is often adulterated.

Off. Prep.—Of the root. Resina. The resin is prepared by exhausting the root by maceration and percolation with rectified spirit. The tincture thus made is diluted with water, and the spirit distilled off. The residue is allowed to become cold, the supernatant fluid poured off, the resin washed two or three times with hot water, and dried on a porcelain plate.

Of Scammony.

Confectio Scammonii. Confection of Scammony. (Scam-

mony, in fine powder, three ounces; ginger, in fine powder, an ounce and a half; oil of carraway, one fluid drachm; oil of cloves, half a fluid drachm; syrup, three ounces; clarified honey, one ounce and a half.)

Pulvis Scammonii Compositus. Compound Scammony Powder. (Scammony, four ounces; jalap, three ounces; ginger, one ounce. Rub them separately into a very fine powder, and mix.)

Of Scammony Resin.

Mistura Scammonii. Scammony Mixture. (Made by triturating four grains of resin of scammony with two fluid ounces of unskimmed milk, so as to form an emulsion.)

Pilula Scammonii Composita. Compound Scammony Pill. (Resin of scammony, and resin of jalap, of each one ounce; curd soap, one ounce; strong tincture of ginger, one fluid ounce; rectified spirit, two fluid ounces.) This is the only aperient pill in the Pharmacopœia which does not contain aloes.

Scammony resin also forms an important ingredient in extractum colocynthidis compositum, and Scammony in pilula colocynthidis composita and pilula colocynthidis composita et hyoscyami.

Therapeutics. A drastic purgative, generally causing much watery discharge, and often griping; useful to give activity to other purgatives, which appear to diminish its violence. It is employed in cerebral and dropsical effusions, torpidity of bowels, and as a vermifuge for children; it is contra-indicated in inflammatory affections of the digestive organs.

Dose. Of powdered scammony (pure) 5 gr. to 10 gr.; of scammonin (the pure resin), 3 gr. to 8 gr.; of the confection of scammony, 10 gr. to 30 gr. or more; of the mixture of scammony, ½ fl. oz. to 2 fl. oz. (for a child); of the compound powder of scammony, 10 gr. to 20 gr.; of compound scammony pill, 5 gr. to 15 gr. As an adjunct to other purgatives it may be given in smaller quantities.

Adulteration. Scammony is most extensively adulterated with *chalk*, *flour*, other *resins*, and *extracts*. Sometimes the drug contains but a small percentage only of real scammony. The frauds may be detected by the tests given above.

Jalapa. Jalap. The dried tubercules of Exogonium Purga, or true Jalap plant; imported from Mexico; it was named from the city Xalapa. True Jalap is known commercially

as Vera Cruz Jalap; another kind has lately been introduced, Tampico Jalap, the origin of which has not been determined, possibly from Ipomœa simulans.

Jalapæ Resina. Resin of Jalap. A resin obtained from Jalap by means of rectified spirit.

Description. Jalap tubers are ovoid, more or less pointed, varying from half an inch to three or four inches in diameter, from the size of a nut to that of an orange; of a brown colour, and wrinkled externally; internally yellowish-grey, and with dark brown concentric layers. Structure dense and resinous in appearance; occasionally it is found worm-eaten. Sometimes the tubers are sliced.

The *Resin of Jalap* is in dark brown opaque fragments, translucent at the edges, breaking with a resinous fracture, and readily reduced to a pale brown powder.

Prop. & Comp. Jalap has a sweetish odour and taste, at the same time nauseous; it contains from 12 to 21 per cent. of resin, usually about 15 per cent., and likewise about 20 per cent. of a watery extractive matter, with starch, &c. *Jalap resin* is insoluble in water; soluble in alcohol, but only partially so in ether; it becomes crimson with oil of vitriol. Jalap resin from the true jalap plant contains *Convolvulin* (Rhodeoretin) ($C_{31}H_{50}O_{16}$), a strongly purgative substance; homologous with jalapin from the fusiform root. It is colourless and transparent, and insoluble in ether, thus differing from jalapin. It dissolves in aqueous solutions of the alkalies, forming salts of convolvulic acid.

Jalapin, or Pararhodeoretin, probably identical with scammonin ($C_{34}H_{56}O_{16}$), is the chief constituent of spurious or fusiform jalap. It is soluble in alcohol and ether, and but little soluble in water. By acting on jalapin with alkaline solutions, salts of jalapic acid are produced.

Both these resins are present in each variety of jalap, but in different proportions.

The so-termed jalapin of the shops is the resin of jalap extracted by spirit from the tuber, and afterwards precipitated by means of water.

Off. Prep. Extractum Jalapæ. Extract of Jalap. (This is a mixed spirit and cold water extract, made by treating the powdered jalap first with rectified spirit, and afterwards with

cold water, evaporating the tincture and watery solution separately to a soft state, and afterwards mixing them together, and evaporating the whole to the consistence of an extract of a suitable consistence for forming pills at a temperature not exceeding 140°).

Pulvis Jalapæ Compositus. Compound Powder of Jalap. (Jalap, in powder, five ounces; acid tartrate of potash, nine ounces; ginger, in powder, one ounce.)

Tinctura Jalapæ. Tincture of Jalap. (Jalap, coarsely powdered, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.) Proof spirit takes up both the resin and watery extract.

Jalap is also an active ingredient in Pulvis scammonii compositus. The resin of jalap is contained in Pilula scammonii composita.

Therapeutics. Jalap is a brisk purgative, causing watery discharge; much allied to, but less irritant than, scammony; its action appears to be exerted more upon the small than the large intestines. Jalap is used as an ordinary purgative in costiveness and inflammatory affections, especially when combined with aromatics, which diminish the griping; it is also given as a hydragogue in dropsies, especially when joined with the acid tartrate of potash or calomel; on account of its little taste jalap is a convenient purgative for children, and frequently given as a vermifuge.

Dose. Of the powder, 10 gr. to 30 gr.; of the resin, 2 gr. to 5 gr.; of the extract of jalap, 5 gr. to 15 gr.; of the tincture of jalap, ½ fl. drm. to 2 fl. drm.

Adulteration. Other roots, as of Ipomœa orizabensis, &c., distinguished by the absence of the characters of true jalap.

SOLANACEÆ.

Dulcamara. Dulcamara. The young branches, dried, of Solanum Dulcamara, Woody Nightshade, or Bitter-Sweet; indigenous, growing in hedges.

Description. The dried twigs are met with in small cylindrical pieces, one or two inches long, about the size of a goose quill; of a brown colour externally, pale within, light from containing much pith: the twigs should be collected in autumn, when devoid of leaves.

Prop. & Comp. Without odour; of a sweetish-bitter taste;

contains an alkaloid *Solania* ($C_{21}H_{35}NO_7$), crystallizing in white pearly scales or needles; insoluble in water and ether; soluble in alcohol; found also in Solanum nigrum and Solanum tuberosum. It is stated to be poisonous to rabbits in doses of from two to three grains, death being preceded by paralysis of the hinder extremities. A bitter-sweetish extract, named *Dulcamarine* or *Picroglycion*, exists also in the twigs: the acid is probably the malic.

Off. Prep. INFUSUM DULCAMARÆ. Infusion of Dulcamara. (Dulcamara, one ounce; boiling distilled water, ten fluid ounces.)

Therapeutics. The real action of dulcamara is unknown; it does not dilate the pupils or produce dryness of the throat like belladonna, henbane, or stramonium, but it seems to act on the skin and kidneys; it has been employed chiefly in chronic skin diseases, as lepra and psoriasis; occasionally it has been used as an alterative in cachectic states of the system, as in syphilis. The author has given as much as sixty fluid ounces of the infusion (concentrated) during the day, and with no unpleasant symptoms; he has also administered half a pound of the ripe fruit of this tree as a conserve, and without any definite effect. In the case of a girl suffering from severe psoriasis it appeared to cure the disease, but she had undergone much previous treatment; and after three years, when the affection returned, the free use of the drug was unattended with any good result.

Dose. Of the infusion, 1 fl. oz. to 2 fl. oz., or more.

Capsici Fructus. Capsicum Fruit. The dried ripe fruit of Capsicum fastigiatum; Guinea Pepper, Pod Pepper, Chillies; imported from Zanzibar.

Description. A small oblong, cylindrical or conical membranous pod, of a bright scarlet or orange-red colour, shining, but somewhat corrugated on the surface, divided internally into two or three cells, containing some spongy pulp and numerous white, flat, reniform seeds. This fruit is from five to eight lines long, and about two lines broad.

Prop. & Comp. No odour, taste hot and acrid. It contains a volatile principle, *capsicin*, somewhat like a concrete volatile oil, which is soluble in alcohol, ether, essential oils, and slightly so in water; intensely hot in taste, and crystallizable when pure; it possesses basic properties, and forms crystallizable salts with some vegetable and mineral acids. The pod also contains a red extractive or colouring matter, of which little is known.

Off. Prep. TINCTURA CAPSICI. Tincture of Capsicum. (Capsicum, three quarters of an ounce ; rectified spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Capsicum acts as a powerful topical stimulant, and also on the general system ; used chiefly as a condiment, sometimes in atonic dyspepsia, diarrhœa, and extreme prostration ; as a gargle in cynanche maligna and scarlatina ; externally it can be used as a rubefacient.

Dose. Of powder, $\frac{1}{2}$ gr. to 1 gr. in pills ; of tincture, 5 min. to 20 min. As a gargle, $\frac{1}{2}$ fl. drm. to 2 fl. drm. in 5 oz. of fluid.

Adulteration. The powdered capsicum (cayenne pepper) has been extensively adulterated with red lead and other coloured substances

ATROPACEÆ.

Belladonnæ Folia. Belladonna Leaves. The recent and dried leaves, with the branches to which they are attached, of Atropa Belladonna, or Deadly Nightshade ; also the leaves separated from the branches and carefully dried ; gathered from wild and cultivated plants when the fruit has begun to form.

Belladonnæ Radix. Belladonna Root. The dried root of Atropa Belladonna ; cultivated in England or imported from Germany.

Atropia. Atropia. $C_{34}H_{23}NO_6$, or $\mathbf{C_{17}H_{23}NO_3}$. A crystalline alkaloid, usually prepared from the root of Belladonna.

Description. The *leaves* are alternate, 3 to 6 inches long, ovate, acute, entire, smooth, and soft, fœtid when bruised ; the upper ones placed in pairs, unequal in size ; the flowers are of a dirty violet brown ; the *root* is from 1 to 2 feet long, from $\frac{1}{2}$ an inch to 2 inches thick, tapering, and branched ; its colour is brownish white. The uncultivated plant is stated to be preferable to the cultivated ; an infusion of either dropped into the eye dilates the pupil.

Prop. & Comp. All parts of the plant contain the officinal alkaloid, *Atropia* ($\mathbf{C_{17}H_{23}NO_3}$), which occurs in white crystalline acicular prisms ; soluble to some extent in water, freely in chloroform and alcohol, sparingly in ether ; its solution in water has an alkaline reaction, yields a citron-yellow precipitate with terchlo-

ride of gold, and has a bitter taste. If pure, it dissolves completely in ether, and is entirely dissipated by heat. Atropia probably exists in the plant in combination with malic acid. Other principles have been described, as *Belladonnine*, &c., but little is known about them.

Off. Prep.—Of the Leaves.

EXTRACTUM BELLADONNÆ. Extract of Belladonna. (A green extract prepared from the juice of the leaves and young branches of belladonna.)

EMPLASTRUM BELLADONNÆ. Belladonna Plaster. (Extract of belladonna and resin plaster, each three ounces ; mix the extract with six ounces of rectified spirit, decant from insoluble matter, distil off the spirit, and add the resin plaster.)

TINCTURA BELLADONNÆ. Tincture of Belladonna. (Belladonna leaves, in coarse powder, one ounce ; proof spirit, one pint. Prepared by maceration and percolation.)

This tincture has about half the strength of tinctura belladonnæ, *Lond.*, *Dub.*

SUCCUS BELLADONNÆ. Juice of Belladonna. (Seven pounds of the fresh leaves and young branches are bruised in a mortar, and to every three parts by measure of the juice, one part of rectified spirit is added.) Must be kept in a cool place.

UNGUENTUM BELLADONNÆ. Belladonna Ointment. (Extract of Belladonna, eighty grains ; prepared lard, one ounce.)

Off. Prep.—Of the Root.

ATROPIA. This alkaloid is prepared by exhausting the recently dried root with rectified spirit, and precipitating the colouring matter and organic acid by means of lime. The filtered solution is then treated with sulphuric acid ; this throws down any excess of lime, and converts the impure alkaloid into a sulphate. Three-fourths of the spirit are then distilled off, water added, and the liquid evaporated at a gentle heat till it no longer smells of alcohol. The aqueous solution of sulphate of atropia is still acid from the presence of sulphuric acid. Carbonate of potash is then added cautiously, to render the fluid *nearly neutral* ; this precipitates a resin which prevents the crystallization of the alkaloid. The fluid is then set aside for six hours and filtered. The filtrate is rendered *strongly alkaline* with carbonate of potash, which liberates the atropia ; it is then shaken up with chloroform ; the chloroform with the alkaloid dissolved in it is allowed to subside,

and is then drawn off and distilled in a water-bath. The residue of impure atropia is dissolved in warm rectified spirit, and finally decolorized with a little animal charcoal. The solution is filtered and allowed to evaporate. The pure alkaloid now crystallizes out. Two pounds of the root should yield about forty grains of atropia.

LINIMENTUM BELLADONNÆ. Belladonna Liniment. (Made by exhausting, by maceration and percolation, belladonna root with rectified spirit, and afterwards adding a little camphor. Each fluid part of the liniment represents a solid part of the root.

Of Atropia.

LIQUOR ATROPIÆ. Solution of Atropia. (A solution of atropia in water, with the addition of one-eighth of rectified spirit.) One ounce contains four grains of the alkaloid.

UNGUENTUM ATROPIÆ. Ointment of Atropia. (Eight grains of atropia dissolved in spirit and made into an ointment with one ounce of lard.)

ATROPIÆ SULPHAS. Sulphate of Atropia. (Atropia, a hundred and twenty grains; distilled water, four fluid drachms; dilute sulphuric acid, a sufficiency. Add the acid to the atropia mixed with the water until the alkaloid is dissolved and the fluid is neutral. Evaporate to dryness at a temperature of 100°.)

A colourless powder, more soluble in water than atropia, forming a solution which is neutral to test paper, and when applied to the eye dilates the pupil in the same manner as the solution of atropia. It leaves no ash when burned with free access of air.

Intended for external application and subcutaneous injection.

LIQUOR ATROPIÆ SULPHATIS. Solution of Sulphate of Atropia. (Sulphate of atropia, four grains; distilled water, a fluid ounce.)

Therapeutics. The physiological action of belladonna is exclusively due to the atropia it contains. It must be remembered that the pigeon, the dog, and especially the rabbit, are singularly insusceptible to the action of this alkaloid; 15 gr. being the minimum fatal dose for the last-mentioned animal. Hence experimental results must not be too hastily extended to the human organism.

Topically applied to the frog's web, atropia causes contraction of the arterioles, followed by stasis of blood in the veins, which soon extends to the arteries,—anæmia, followed by congestion. Applied to the conjunctiva, it dilates the pupil and impairs

accommodation; both effects being probably due to paralysis of the terminal filaments of the motor oculi nerve. The same effects on the iris and ciliary muscle are produced by atropia, when introduced into the blood; but they are now symmetrical instead of being unilateral.

A small dose of the alkaloid, injected into the jugular vein of a dog, quickens the cardiac and respiratory movements, at the same time raising the blood-pressure in the arteries. The first of these phenomena is due to a selective action upon the cardiac inhibitory filaments of the vagi, which are paralyzed by the drug; the second, to stimulation of the respiratory centre in the medulla oblongata; the third, to contraction of the systemic arterioles, probably through the medium of the sympathetic.

Atropia exerts both a paralyzing and a stimulant action upon the spinal cord; but the former is greater in amount than the latter. Accordingly, to demonstrate its spinal-stimulant powers, we have recourse to an animal whose respiratory muscles may be paralyzed without causing death. In the frog, a dose below the fatal minimum paralyzes, first the cutaneous sensory nerves, next the motor nerves and spinal cord; it does not impair idio-muscular contractility. The only remaining sign of life is the persistent, though feeble, beating of the heart. After the lapse of a variable number of hours or days, tetanic symptoms, not unlike those caused by strychnia, are developed. These are due to an excitant action of the alkaloid upon the spinal cord. This curious succession of paralysis and spasm may be imitated by the administration of a pure convulsant, such as strychnia, together with a purely paralyzing agent, such as methyl-strychnia. In warm-blooded animals, the two sets of phenomena are manifested simultaneously. (Fraser.)

Atropia causes purging and diuresis in dogs. It is eliminated in the urine, in which its presence may be readily demonstrated. It checks all other secretions, such as milk, saliva, &c. Its action on the submaxillary gland has been studied by Heidenhain, who found that it arrested secretion by paralyzing the terminal filaments of the chorda tympani. This paralysis may be removed by the subsequent administration of an appropriate dose of physostigma.

Fraser and Crum Brown have shown that the methyl and ethyl derivatives of atropia resemble the latter alkaloid in their action on the pupil, and on the cardiac inhibitory fibres of the vagi; they differ from it, however, in causing no diuretic or cathartic effects, and in exerting no stimulant action on the cord.

Methyl and ethyl-atropium prove fatal in smaller doses than atropia; they cause paralysis without co-existent or consequent spasm; and this paralysis is wholly due to a selective action upon the end-organs of the motor nerves, the sensory nerves and cord remaining unaffected.

The action of atropia is stated to be antagonistic to that of opium, hydrocyanic acid, and physostigma.

1°. As regards opium. It has been asserted by Dr. Anderson, that in cases of poisoning by opium, belladonna may be usefully employed as an antidote; the clinical evidence of the truth of this statement is not very satisfactory, as most of the sufferers from opium poisoning thus treated have died.

Opium and belladonna are undoubtedly antagonistic in some of their effects, but not in all. Opium given internally in full doses causes contraction of the pupil; belladonna, dilatation; but opium, when applied to the conjunctiva, causes no more contraction than any other irritant, no lasting contraction; whereas belladonna causes a well marked dilatation when thus applied. Again, opium given in many painful affections, as in spasm, relieves both pain and spasm; belladonna often does the same; and there has been no good evidence afforded that the combination of opium and belladonna is less effectual than either of the drugs given alone. There is one other point in which opium and belladonna appear to be somewhat opposed in action; namely, in their effect upon the bowels; opium usually producing constipation, while belladonna has a tendency, though only occasionally observed, to cause looseness of the bowels. Furthermore, opium acts very powerfully upon children; belladonna is far more readily borne by young subjects than by adults.

2°. The primary lethal action of hydrocyanic acid is said by Preyer to be antagonized by atropia. The former poison interferes with the respiratory function by stimulating the pulmonary terminations of the vagi and depressing the activity of the respiratory centre in the medulla oblongata; it embarrasses the heart, by over-stimulation of the cardiac terminations of the vagi. Atropia, which paralyzes the cardiac inhibitory and the pulmonary fibres of the vagi, and stimulates the respiratory centre, may thus be expected to serve as an antidote to prussic acid. The clinical value of Preyer's results is still in need of confirmation.

3°. The physiological antagonism between atropia and physostigma has been fully established by the elaborate researches of Dr. Fraser. He has shown that within certain limits of time and

dose, the fatal effect of either poison may be prevented by the simultaneous or subsequent administration of the other. Beyond those limits, however, the antidotal power ceases. This is probably due to the fact that the one drug does not neutralize all the effects of the other, but only some of them; and if the non-neutralized residue of toxic action reach a certain pitch, it suffices to cause death.

When belladonna is taken by a healthy man, the first effect he observes is dryness of the throat, thirst, and difficulty of swallowing; if he continue the drug, or take larger doses, the pupils are dilated, and the power of accommodation impaired; his vision becomes indistinct for near objects. The further effects of the drug are: an erythematous rash, not unlike that of scarlet fever, dryness of the skin, acceleration of the pulse, vertigo, sleeplessness, excitement passing into delirium, generally of a harmless character, and attended by hallucinations and confusion of speech. The bowels may be relaxed, and there may be frequent calls to pass water. Beyond this, belladonna produces muscular weakness and tremors, hurried breathing, convulsions, coma, and death. It exerts no appreciable influence on the heat of the body.

Belladonna and its alkaloid may be topically applied to relieve pain, to check secretion, to moderate inflammatory action, and for certain ophthalmic purposes:

1°. Belladonna plasters and fomentations are of use in certain forms of hyperæsthesia and neuralgia, especially when due to spinal irritation.

2°. Applied to the female breast, it checks the secretion of milk. Applied to the skin of any part of the body, it checks sweating: *e.g.*, the sweating of the head in rickets (Ringer).

3°. It is said to exert a favourable influence on carbuncles, and even to check suppuration if applied early enough to the inflamed part.

4°. In ophthalmic practice it is used:—

(*a*) To dilate the pupil for ophthalmoscopic examination. In early stages of central cataract to admit more light into the eye. In iritis, to prevent posterior synechiæ. To counteract the effect of calabar bean.

(*b*) To paralyze accommodation—as in hypermetropia.

(*c*) To reduce intra-ocular tension, as in some forms of corneal ulcer, and glaucomatous conditions of the globe.

It is worthy of notice that atropia, applied to the conjunctival surface, may be absorbed, sometimes, though rarely, giving rise to constitutional effects.

As a constitutional remedy, belladonna may be given in the form of extract, tincture, or juice; the sulphate of atropia should be reserved for subcutaneous injection. Belladonna is administered:

1°. As an antidote in poisoning by opium, prussic acid, or physostigma.

2°. As a laxative in chronic constipation.

3°. To check incontinence of urine in children and paraplegic patients.

4°. To check profuse sweating. Dr. Ringer found that the hypodermic injection of $\frac{1}{200}$ gr. of atropia arrested sweating for a whole night in a case of phthisis.

5°. In the idiopathic (non-mercurial) salivation of children.

6°. In many nervous disorders: epilepsy, chorea, pertussis, laryngismus stridulus, asthma.

7°. To allay pain and spasm in neuralgic affections, gastrodynia, colic, and spasm of the different sphincters, as of the uterus, bladder, and rectum.

8°. To diminish polyuria in diabetes insipidus and mellitus.

9°. Belladonna has been said to act as a prophylactic against scarlatina, more especially by homœopathic practitioners; but in addition to other evidence against this idea, a case recently occurred in the hospital practice of the author, where a child who at the time was fully under the influence of belladonna, administered for epilepsy, caught scarlatina from another patient who came into the institution suffering from that disease.

Dose. Of the extract, $\frac{1}{6}$ gr. to 1 gr.; of the tincture, 5 min. to 30 min.; of the juice, 5 min. to 15 min.

Atropine is unsuitable for internal administration; if prescribed, the dose should be from $\frac{1}{100}$ gr., carefully increased. The author has seen very uncomfortable symptoms resulting from $\frac{1}{25}$ gr. If injected under the skin, the amount should be from $\frac{1}{250}$ gr., upwards. The sulphate of atropine is employed only for the preparation of its solution, which is much used by ophthalmic surgeons, because it is free from alcohol. The extract or ointment of belladonna smeared round the eye may be used for the same purpose.

Incompatibles. Caustic fixed alkalies, as soda and potash, when in contact with preparations of belladonna or atropine, destroy their activity by causing the decomposition of the atropine contained in them.

In 1858, the author sent two communications to the Medico-Chirurgical Society on the influence of liquor potassæ and other caustic alkalies upon the therapeutic properties of henbane, belladonna, and stramonium, and as the results then published in the Transactions of that Society have been again advanced as novel, it may be well that they should be recapitulated. In the first communication it was shown that—

1. Caustic fixed alkalies, such as exist in liquor potassæ or liquor sodæ, entirely destroy the activity of henbane, preventing its action on the pupil when topically applied, and its influence upon the system when internally administered; and, combined with a proper amount of these alkalies, the largest doses of the preparations of henbane may be given without the production of any symptom.

2. The same influence is exerted by the fixed caustic alkalies upon belladonna and stramonium.

3. The carbonates and bicarbonates of potash and soda produce no injurious effect upon the preparations of any of the three above-named plants.

The deductions naturally to be drawn from these results are—

α. That neither liquor potassæ nor any caustic fixed alkali should be prescribed with tincture or extract of henbane, as the virtues of the latter drug are thereby completely neutralized.

β. That when it is desirable to administer an alkaline remedy with henbane, either a carbonate or bicarbonate should be selected, which would probably be equally efficacious upon the stomach if such influence be required, and certainly as efficient in altering the condition of the urine and the mucous membrane of the urinary passages.

γ. That the same precautions should be observed with regard to belladonna and stramonium if at any time prescribed in conjunction with alkalies.

In the second communication it was proved—

1. That the active principles of the plants are absolutely destroyed by the influence of caustic potash.

2. That a certain ratio must exist between the different prepara-

tions of the plants and the alkali for the neutralization to be perfect.

3. That a certain short time is required for the decomposition to be complete.

4. That clinical observation illustrates the influence of the alkali, when mixed with the preparations of these atropaceous plants, in preventing the occurrence of their ordinary symptoms.

Stramonii Folia. The dried leaves of Datura Stramonium, or Thorn Apple ; an indigenous plant growing in waste places and cultivated in Britain.

Stramonii Semina. Stramonium Seeds. The ripe seeds of Datura Stramonium.

Description. The *leaves* are large, ovate, smooth, unequally sinuate, toothed, dark-green, of a rank odour, strongest when they are drying ; they should be gathered when the plants are in flower. The *seeds* are brownish-black, reniform, flattened, and rough, feebly bitter and mawkish in taste, odourless, except when bruised.

Prop. & Comp. All parts of the plant contain *daturia* ($C_{17}H_{23}NO_3$), an alkaloid identical with atropine. When obtained from the plant, it occurs in white prisms. The author, some fifteen years since, in extracting the alkaloids from corresponding parts of belladonna and stramonium plants, found that the latter yielded a very much smaller amount than the former. It is united with malic acid.

Off. Prep.—Of Seeds.

Extractum Stramonii. Extract of Stramonium. (Stramonium seeds, in coarse powder, one pound ; ether, one pint, or a sufficiency ; distilled water and proof spirit, of each a sufficiency. Shake the ether in a bottle with half a pint of the water, and after separation decant the ether. Pack the stramonium seeds in a percolator and free them from oil by passing the washed ether slowly through them. Having removed and rejected the ethereal solution, pour the spirit over the residue of the stramonium in the percolator and allow it to pass through slowly until the powder is exhausted. Distil off most of the spirit from the tincture and evaporate the residue by a water bath until the extract has acquired a suitable consistence for forming pills.)

Tinctura Stramonii. Tincture of Stramonium. (Stramonium seeds, two and a half ounces ; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Of the Leaves.

There are no officinal preparations; they are, however, used in the dry state for smoking in asthma.

Therapeutics. The action of stramonium appears to be exactly the same as that of belladonna; dryness of the throat, dilatation of the pupils, delirium, coma, and death ensue from poisonous doses of the drug. Stramonium has been supposed to influence especially the respiratory organs as an anti-spasmodic, and has been much used in asthma, chiefly in the form of smoke from the burning leaf employed in the same way as tobacco. The extract has also been used in convulsive coughs as an anti-spasmodic, and as an anodyne in gastrodynia and other painful affections. About fifteen years since, the author made many comparative clinical observations on stramonium and belladonna, and on stramonium and henbane; he could not, however, distinguish between the action of the three plants when they were administered in corresponding doses. The alkaloids obtained from belladonna and stramonium were found to be identical in their influence on the pupil, both as regards character and intensity.

Dose. Of leaves (powdered), 1 gr. upwards; of the extract, $\frac{1}{4}$ gr. to $\frac{1}{2}$ gr.; of the tincture, 10 min. to 30 min. When smoked, any dryness of the throat or dilatation of the pupils indicates the propriety of discontinuing its use for a time.

Incompatibles. Caustic fixed alkalies, as soda and potash, when in contact with the preparations of stramonium, decompose their active principle, and render them inert in the same manner as when mixed with those of belladonna. (See Belladonna.)

The leaves of the DATURA TATULA, a plant of the same genus as Stramonium, have recently been much used in the form of a cigar, or in a pipe, as a remedy for spasmodic asthma; this plant doubtless owes its activity to the same alkaloid as stramonium.

Hyoscyami Folia. Hyoscyamus Leaves. The fresh and carefully dried leaf and young branches of Hyoscyamus niger, or Henbane; gathered when about two-thirds of the flowers are expanded, from the second year's herb, which is indigenous, growing in waste places, or cultivated in Britain.

Description. The leaves are green in colour when fresh, sessile, oblong, acutely sinuous, woolly or hairy, and viscid. The fresh herb has a strong unpleasant odour, and a slightly acrid taste, which nearly disappears on drying. The fresh juice dropped into

the eye dilates the pupil. The seeds are very small and brown, not officinal, but sometimes employed medicinally.

Prop. & Comp. All parts of the plant contain *Hyoscyamia*, an alkaloid only once or twice obtained in a crystalline state ; an acid, probably *malic*, and a volatile principle are also present.

Off. Prep. Extractum Hyoscyami. Extract of Hyoscyamus. (A green extract prepared from the juice of the fresh leaves and young branches, as the other green extracts.)

Succus Hyoscyami. Juice of Hyoscyamus. (Seven pounds of the fresh leaves and young branches are bruised in a mortar, and to every three measures of the juice one measure of rectified spirit is added.) To be kept in a cool place.

Tinctura Hyoscyami. Tincture of Hyoscyamus. (Dried hyoscyamus leaves, two and a half ounces ; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Extract of Hyoscyamus is contained in pilula colocynthidis et hyoscyami.

Therapeutics. Henbane appears to act as belladonna and stramonium, but is much milder, and is used chiefly as a sedative in certain excited conditions of the nervous system when opium is not advisable ; it is also employed to diminish pain and allay irritation of the bladder, to prevent the griping of purgative medicines, ease cough, and diminish spasm in very many diseases. It, as well as stramonium, may be used to dilate the pupil in place of belladonna. Henbane has been stated to differ from belladonna in being directly sedative in its action upon the heart, but it would be desirable to obtain the results of comparative trials on the same patient. The author has found that henbane, when internally administered in large doses, causes the same symptoms as belladonna and stramonium ; namely, dilatation of the pupil and presbyopia, dryness of the mouth and fauces, delirium, eruption on the skin, and loss of power over the bladder in cases of slight paraplegia.

Dose. Of the extract, 5 gr. to 10 gr., or more ; of the tincture, 30 min. to 1 fl. drm., or upwards ; of the juice, 30 min. to 1 fl. drm.

Incompatibles. Caustic fixed alkalies, as potash or soda, when in contact with the preparations of henbane, destroy their activity by causing the decomposition of the active principle contained in them. (See Belladonna.)

Tabaci Folia. Leaf Tobacco. The dried leaves of Nicotiana Tabacum ; Virginian Tobacco ; growing chiefly in tropical America.

Description. The leaves are large, ovate, or oblong, lanceolate acuminate, with numerous short glandular hairs ; odour slight when fresh, but becoming heavy or narcotic in drying ; taste bitter and somewhat acrid : pale green when fresh, mottled-brown when dry. Officinal tobacco is not manufactured.

Prop. & Comp. Tobacco leaves when distilled with caustic potash yield a liquid alkaloid, having a peculiar odour, *Nicotine* ($C_{10}H_{14}N_2$) ; when pure, it occurs as a colourless oil, but becomes yellow by exposure ; sp. gr. 1·027 ; volatilizes at 480° Fah. It is soluble in water, alcohol, and ether ; it neutralizes acids, but the salts are difficult to crystallize ; its solutions give rise to a precipitate with perchloride of platinum and tincture of galls. Nicotine is very poisonous, and is contained in tobacco smoke ; when given internally it is stated to dilate the pupils. Virginian tobacco contains about 6 or 7 per cent. of the alkaloid. The acid of the plant is probably malic acid. A volatile oil, named *Nicotianin*, is also present.

Off. Prep. Enema Tabaci. Enema of Tobacco. (Tobacco, twenty grains ; boiling water, eight fluid ounces.)

Therapeutics. Tobacco, when internally administered, acts as a powerful sedative, especially affecting the heart ; it frequently causes diuresis, and has been used in dropsy. It is, however, seldom employed as an internal remedy, on account of the dangerous depression sometimes induced. Enema Tabaci was occasionally prescribed (although seldom since the introduction of chloroform) in strangulated hernia, ileus, &c., to produce great muscular relaxation. Externally, tobacco acts as a powerful irritant, and is occasionally ordered medicinally in the form of snuff, as an errhine in head affections, &c. ; also in the form of smoke, as a sedative and expectorant in some varieties of asthma. The frequent use of tobacco in the form of snuff, or of cigars, &c., influences much the susceptibility of individuals to this drug ; a dose which might prove extremely depressing to one, might scarcely affect another person ; for by use a tolerance of the drug is established, as in the case of opium.

Dose. The Enema of Tobacco contains about the quantity of the drug safe to administer at a time.

SCROPHULARIACEÆ.

Digitalis Folia. Digitalis Leaf. Foxglove. The dried leaf of Digitalis purpurea, or Purple Foxglove; collected from wild indigenous plants, when about two-thirds of the flowers are expanded.

Digitalinum. Digitaline. The active principle obtained from Digitalis.

Description. The leaf is ovate, lanceolate, or oblong; crenate, rugose, and downy, more especially on the under surface, which is veined; subsessile, or with a short petiole: of a dull green colour.

Prop. & Comp. Digitalis leaves have but little odour; their taste is somewhat bitter and acrid, they contain a non-nitrogenized amorphous principle, *digitaline*, which occurs in white, or slightly yellow scales or porous mamillated masses; very bitter, without odour, but irritating to the nostrils; little soluble in water and ether, but readily soluble in spirit. Crystalline digitaline has recently been extracted from the leaves; but it is not officinal. Soluble in acid solutions, but without neutralizing them; its solution in hydrochloric acid is of a faint yellow colour, but soon becomes green: when burnt on platinum foil it leaves no residue. Several other substances have been said to occur, to which peculiar names have been given, but whose nature and properties are but ill-understood. The leaves, however, contain some *tannin*. Digitaline is an active poison.

Off. Prep. Of Digitalis. Infusum Digitalis. Infusion of Digitalis. (Dried digitalis leaves, thirty grains; boiling distilled water, ten fluid ounces.)

Tinctura Digitalis. Tincture of Digitalis. (Digitalis leaves, dried, two and a half ounces; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Digitaline is prepared by making a strong tincture of the leaves by digestion in rectified spirit at a temperature of 120°; and treating the extract obtained from the evaporation of the tincture with water acidulated with acetic acid; this dissolves the digitaline, leaving most of the extractive matters behind; the solution is digested with animal charcoal, to remove colouring matter, and filtered. It is then nearly neutralized with ammonia, and the digitaline is precipitated by tannic acid; the tannate of digitaline

is then rubbed up with oxide of lead and spirit; by which means an insoluble tannate of lead is formed, and the digitaline set free and dissolved by the spirit. This solution after decolorization with a small amount of animal charcoal is evaporated, and the residual digitaline washed repeatedly with ether, in which it is not soluble, to remove oily impurities.

Therapeutics. Small doses of digitalis induce contraction of the systemic arterioles and raise the blood-pressure in the arteries; the heart contracts more slowly and powerfully, owing partly to the increased pressure with which it has to contend. In poisonous doses, the drug causes quick and irregular action of the heart by directly influencing its nervous apparatus, together with a relaxation of the capillary system and a fall of blood-pressure. Finally, the heart stops beating with its ventricles firmly contracted.

When administered to a patient, the most marked effect produced by the drug is slowing of the pulse; some observers assert that this is preceded by a transient quickening. If the dose be increased, alarming symptoms may arise, such as nausea, vomiting, purging, faintness, and syncope; this is especially apt to occur when the patient attempts to make any exertion, even to sit or stand up; in fact, patients under the full influence of digitalis, which is sometimes purposely induced, are only safe when in a horizontal posture.

Digitalis is given as a cardiac sedative in almost all cases where there is excited action, whether it be of sympathetic origin, or due to organic disease of the heart or great vessels, as hypertrophy, valvular disease, aneurism, &c. It is perhaps most useful in cases of mitral disease with dilated heart, very irregular pulse, and low arterial tension; it is least serviceable, sometimes even hurtful, in aortic disease with full compensatory hypertrophy. It should be given with caution when the vascular system is generally atheromatous, and the muscular tissue of the heart fatty.

Digitalis is also employed as a diuretic, more especially when the deficient flow of urine is due to heart-disease, and associated with dropsy; in such cases, it frequently causes a greatly increased secretion of water, and a rapid removal of the œdema. When the dropsy is associated with normal or exalted blood-pressure, digitalis is not a suitable remedy. It should not be used in the dropsy of chronic Bright's disease.

Digitalis occasionally acts as a sedative and soporific; but only when the restlessness and insomnia are due to an over-excited state of the heart.

It has been largely used in acute inflammatory disorders such as pneumonia and erysipelas; also in enteric fever, acute rheumatism, &c. It reduces the pulse and temperature, but without affecting the course of the disease.

Digitalis is of value in the treatment of hæmorrhage, especially from the lungs. It has been recommended in phthisis, but it is not productive of any permanent benefit in this disease; sometimes it does positive harm.

Digitalis has also been used as a remedy in delirium tremens and acute mania. Mr. Jones, of Jersey, has used it largely in the former disease; Dr. Lockhart Robertson in the latter. The author has certainly seen many cases of delirium tremens rapidly recover under its influence, sleep being speedily produced; but the doses administered have been very large, from 2 to 4 fluid drachms of the tincture, repeated every four hours for three times only. He has also seen well-marked good arise from giving 30 min. doses every 2 to 4 hours until sleep is induced.

Digitalis is commonly said to have a *cumulative* action; by this we understand that during its continued use, alarming symptoms may arise suddenly, and without any previous increase of dose to account for them. The true explanation of the phenomenon appears to be this: the physiological effect of the drug depends on the amount present in the blood at any given time; and this depends on two factors—the rate of its absorption, and the rate of its elimination. If the dose be augmented, elimination remaining constant, dangerous symptoms will arise. A moment's reflection will show that a similar explosive effect may be produced by any check to the process of elimination (and a very trifling cause may suffice to do this), the dose and interval of administration remaining unaltered. Hence the caution with which digitalis should be administered in cases where the renal functions are interfered with, *e.g.*, in chronic Bright's disease.

Dose. Of the powdered leaves, $\frac{1}{2}$ gr. to 2 gr.; of infusion, 2 fl. drm. to 4 fl. drm. or more; of tincture, 5 min. to 30 min. and upwards; of digitaline, $\frac{1}{60}$ gr. to $\frac{1}{30}$ gr.

Adulteration. Digitalis leaves are occasionally found mixed with those of *Verbascum thapsus* and other plants. Attention to the characters of the true leaf, given above, will readily distinguish the admixture.

LABIATÆ.

Rosmarini Oleum. Oil of Rosemary. The oil distilled in England from the flowering tops of Rosmarinus officinalis,

or rosemary; growing chiefly on the hills in the South of Europe.

Prop. & Comp. This oil has the fragrant odour and taste of the plant, colourless, sp. gr. 0·888. It is an oxidized oil, or a hydrocarbon ($C_{10}H_{16}$) containing a species of camphor ($C_{10}H_{16}O$) in solution.

Off. Prep. SPIRITUS ROSMARINI. Spirit of Rosemary. (Oil of rosemary, one fluid ounce; rectified spirit, forty-nine fluid ounces.)

The oil of rosemary is contained also in tinct. lavand. comp. and linimentum saponis.

Therapeutics. A powerful stimulant; useful in hysteria, and nervous headaches; externally, it is used as a rubefacient and for its odour.

Dose. Of the oil, 1 min. to 5 min.; of the spirit, 10 min. to 50 min. or more.

Lavandulæ Oleum. Oil of Lavender. The oil distilled in Britain from the flower of Lavandula vera or Common Lavender; a native of Southern Europe; much cultivated in gardens in Surrey. Oil of Spike (French Lavender) is often used in lieu of the English oil.

Description, Prop., & Comp. Oil of Lavender, which gives the odour and taste to the plant, is either colourless or of a pale yellow colour, and a hot bitter aromatic taste. Sp. gr. 0·877. It is an oxidized volatile oil or a hydrocarbon ($C_{10}H_{16}$) containing a camphor ($C_{10}H_{16}O$) dissolved in it.

Off. Prep. SPIRITUS LAVANDULÆ. Spirit of Lavender. (Oil of lavender, one fluid ounce; rectified spirit, forty-nine fluid ounces.)

TINCTURA LAVANDULÆ COMPOSITA. Compound Tincture of Lavender. (Oil of lavender, one fluid drachm and a half; oil of rosemary, ten minims; cinnamon and nutmeg, bruised, each one hundred and fifty grains; red sandalwood, three hundred grains; rectified spirit, forty fluid ounces. Prepared by maceration.)

Oil of lavender is also contained in lin. camphor. comp.

Therapeutics. Oil of lavender is stimulant and carminative: used in hysteria, hypochondriasis, and other nervous affections, also in flatulence and colic.

Dose. Of the oil, 1 min. to 5 min.; of spirit of lavender, ½ fl.

drm. to 1 fl. drm.; of the compound tincture, ½ fl. drm. to 2 fl. drm.

Adulteration. Oil of spike is sometimes mixed with or substituted for the true oil of lavender; oil of turpentine is also mixed with it.

Menthæ Piperitæ Oleum. Oil of Peppermint. The oil distilled in Britain from the fresh flowering plant of Mentha Piperita, Peppermint; indigenous, growing in damp places.

Prop. & Comp. The peppermint plant owes its virtues to the presence of the *volatile oil*, which is colourless or pale yellow, having the odour of peppermint, with a warm aromatic taste, succeeded by a sensation of coldness in the mouth. Sp. gr. 0·92. When kept some time at a low temperature, menthylic alcohol ($C_{10}H_{19}.H.O$), or peppermint camphor is deposited from it. This latter is decomposed by chloride of zinc with the formation of menthene ($C_{10}H_{18}$), a mobile transparent liquid of sp. gr. 0·85.

Off. Prep. AQUA MENTHÆ PIPERITÆ. Peppermint water. (Oil of peppermint, one fluid drachm and a half; water, one gallon and a half; distil one gallon.)

ESSENTIA MENTHÆ PIPERITÆ. Essence of Peppermint. (Oil of peppermint, a fluid ounce; rectified spirit, four fluid ounces.)

SPIRITUS MENTHÆ PIPERITÆ. Spirit of Peppermint. (Oil of peppermint, one fluid ounce; rectified spirit, forty-nine fluid ounces.)

Therapeutics. Oil of peppermint is stimulant and carminative; used as an adjunct to purgatives, to correct flatulency, &c.

Dose. Of the oil, 1 min. to 5 min.; of peppermint water, 1 fl. oz. to 2 fl. oz.; of the essence, 10 min. to 20 min.; of spirit of peppermint, ½ fl. drm. to 1 fl. drm.

Menthæ Viridis Oleum. Oil of Spearmint. The oil distilled in Britain from the fresh herb when in flower of Mentha viridis, Spearmint; indigenous, growing in marshy places.

Prop. & Comp. The plant owes its virtues to the *volatile oil*, which is colourless or pale yellow, with the odour and taste of spearmint, sp. gr. 0·914. It is an oxidized volatile oil or a hydrocarbon, containing a camphor in solution.

Off. Prep. AQUA MENTHÆ VIRIDIS. Spearmint Water. (Oil of spearmint, one fluid drachm and a half; water, one gallon and a half. Distil one gallon.)

Therapeutics. Spearmint oil is stimulant and carminative; and is used as an adjunct to purgative medicines, to correct flatulency, &c.

Dose. Of the oil, 1 min. to 5 min.; of spearmint water, 1 fl. oz. to 2 fl. oz.

Three other plants belonging to this order, namely, ORIGANUM VULGARE, the Common Marjoram, containing a volatile oil, and possessing properties similar to those of Rosmarinus; MENTHA PULEGIUM, or Pennyroyal; and MARRUBIUM VULGARE, or Horehound, possessing a bitter principle as well as a volatile oil, were formerly officinal; the latter is still used in domestic medicine as a tonic, expectorant, and alterative, in phthisis, chronic hepatitis, and in cachexia from various other causes.

SUB-CLASS IV. APETALÆ.

POLYGONACEÆ.

Rhei Radix. Rhubarb Root. The dried root, deprived of its bark, of Rheum officinale, *Baillon*, growing in Western China and Thibet. This definition includes the Russian, the East Indian, and the Dutch-trimmed or Batavian rhubarbs. Rhubarb is imported from Shanghae and Canton; it is no longer brought overland through Russia.

Description. *Russian* or so-called *Turkey* rhubarb occurs in trapezoid, irregular-shaped, flat, or cylindrical, angular pieces, the cortex having been removed by slicing; externally it is smooth and yellow and not turned brown by boracic acid, showing absence of turmeric; the texture is compact; the fracture uneven, and marbled red and grey; the powder is bright buff-yellow, and the odour rather aromatic; taste astringent and disagreeable; it feels gritty, and tinges the saliva bright yellow; the pieces have generally a hole drilled in them.

East Indian, or half-trimmed rhubarb, differs from the last in not being angular, but slightly rounded, with adhering portions of the cortex, as if it had been scraped and sliced; externally it is red and veined, not covered with yellow powder, as the Russian variety; also denser, with a smoother fracture, less gritty, and the powder of a redder hue.

Another variety is called *Dutch-trimmed* or *Batavian* rhubarb; in round or flattened pieces, angular, and drilled with a hole; probably of the same origin as the Russian.

Besides these officinal varieties, others are met with, as the *Himalayan, Canton stick,* and *English* rhubarb. Some of the Himalayan, according to Dr. Royle, is yielded by *Rheum Emodi, Moorcroftianum,* and *Webbianum;* the English variety is derived from *Rheum Rhaponticum,* and grows near Banbury.

Prop. & Comp. Rhubarb contains a principle, *Chrysophanic acid* ($C_{10}H_8O_3$), which occurs in crystalline needles of a golden yellow metallic lustre, sparingly soluble in water, freely so in alkaline solutions, with the formation of a reddish-brown colour; it is soluble also in hot alcohol, ether, and benzene. Various resins have also been obtained from rhubarb; but although numerous analyses have been made, the peculiar purgative principle has not yet been isolated. It also contains some astringent matter in the form of tannic and gallic acid. Rhubarb yields its active properties to boiling water, and also to alcohol. Crystals of oxalate of lime are found in it in considerable quantities, forming at times in the Russian variety, in which they are most numerous, as much as 35 per cent. of the drug.

Off. Prep. Extractum Rhei. Extract of Rhubarb. (Prepared by macerating one pound of rhubarb in five pints of water and ten fluid ounces of rectified spirit, and subsequent evaporation of the solution at a temperature not above 160°.)

Infusum Rhei. Infusion of Rhubarb. (Sliced rhubarb, quarter of an ounce; boiling distilled water, ten fluid ounces.)

Pilula Rhei Composita. Compound Rhubarb Pill. (Rhubarb, powdered, three ounces; socotrine aloes, powdered, two ounces and a quarter; myrrh, powdered, one ounce and a half; hard soap, one ounce and a half; oil of peppermint, one and a half fluid drachms; treacle, by weight, four ounces.)

Pulvis Rhei Compositus. Compound Rhubarb Powder. (Gregory's powder.) (Rhubarb, two ounces; light magnesia, six ounces; ginger, one ounce.)

Syrupus Rhei. Syrup of Rhubarb. (Rhubarb root and coriander fruit, of each, two ounces; refined sugar, twenty-four ounces; rectified spirit, eight fluid ounces; distilled water, twenty-four fluid ounces.)

Tinctura Rhei. Tincture of Rhubarb. (Rhubarb, two ounces; cardamoms, quarter of an ounce; coriander, quarter of

an ounce ; saffron, quarter of an ounce ; proof spirit, twenty fluid ounces. Made by maceration and percolation.)

VINUM RHEI. Wine of Rhubarb. (Rhubarb, one and a half ounces ; canella alba bark, sixty grains ; sherry, a pint.)

Therapeutics. Rhubarb acts as a stomachic and slight astringent in small doses ; as a purgative, in larger ones. Its purgative action is generally followed by constipation, dependent on its astringent constituents ; it differs from many cathartics in not causing irritation of the alimentary canal. The urine becomes coloured by it, as also do the perspiration and the milk. In consequence of its purgative properties it is often used at the commencement of diarrhœa depending on the presence of irritant matter in the canal, which is thus expelled, and the subsequent astringent effect proves very valuable. It is frequently combined with magnesia, especially when given to children, as in the form of Gregory's powder. In cases of atonic dyspepsia, attended with some constipation, it is a valuable remedial agent ; but if prescribed in cases of habitual constipation, it should be combined with some other laxative. In scrofulous children it is sometimes useful, combined with a mercurial alterative, aiding and giving tone to the digestive organs, &c. Externally it has been applied to indolent ulcers.

Dose. Of powdered rhubarb, 1 gr. to 5 gr. as a stomachic ; 10 gr. to 30 gr. as a purgative : of the extract, 5 gr. to 15 gr. ; of infusion, 1 fl. oz. to 2 fl. oz. ; of the syrup, 1 fl. dr. to 4 fl. dr. ; of the tincture, as a stomachic, 1 fl. drm. to 2 fl. drm. ; as a purgative, ½ fl. oz. to 1 fl. oz. ; of compound rhubarb pill, 5 gr. to 10 gr. ; of the compound powder, 5 gr. to 10 gr. for children, for an adult, 20 gr. to 60 gr. ; of the wine, 1 fl. drm. to 2 fl. drm.

Adulterations. Rhubarb is very often extensively adulterated. Inferior varieties of rhubarb, as the English, are substituted for the Russian, &c. If turmeric be present, it is reddened by boracic acid, which has no such effect upon the colouring matter of rhubarb. In English rhubarb starch is generally in excess, oxalate of lime in small amounts only ; the proportions of these ingredients are reversed in the Chinese varieties.

MYRISTICACEÆ.

Myristica. Nutmeg. The kernel of the seed of Myristica officinalis. Cultivated extensively in the Banda Islands of the Malayan Archipelago.

Myristicæ Oleum Expressum. Expressed Oil of Nutmeg. A concrete oil obtained from nutmegs by expression and heat.

Myristicæ Oleum. Volatile Oil of Nutmeg. The oil distilled in Britain from nutmeg.

Description. The *nutmeg* is of a spheroidal shape, resembling that of a small bird's egg, about an inch in length, externally marked with reticulated furrows, greyish-red internally, with dark brownish veins ; it has a peculiar odour and a bitter aromatic taste. It consists of the albumen of the seed ; the inflexions of the reddish-brown inner coat giving the cut surface a mottled appearance, and containing the oil. The *concrete oil,* or fat, is of a firm consistence, an orange colour, and has the odour of nutmeg. The *volatile oil,* obtained by distillation, is colourless, or of a straw yellow colour, with the odour and taste of the nutmeg.

Prop. & Comp. By expression nutmegs yield about 30 per cent. of the concrete oil, soluble in four times its weight of boiling alcohol, and half that quantity of ether, consisting of a *fixed oil* or *fat,* united with a *volatile oil,* which last has a sp. gr. 0·95, and is the same as that obtained by distillation. The fixed fat yields a peculiar acid, myristic acid ($C_{14}H_{27}O.H.O$), crystallizing in silky needles. Nutmeg contains, besides these principles, woody fibre, and the ordinary constituents of seeds.

Off. Prep.—Of Nutmeg. Nutmeg is one of the ingredients of pulvis catechu compositus, pulvis cretæ aromaticus, spiritus armoraciæ compositus, and tinctura lavandulæ composita.

Of the Concrete Oil. This is used in the preparation of emplastrum calefaciens and emplastrum picis.

Of the Volatile Oil. Spiritus Myristicæ. Spirit of Nutmeg. (Volatile oil of nutmeg, one fluid ounce ; rectified spirit, two pints and a half.)

Volatile oil of nutmeg also forms one of the ingredients of pilula aloes socotrinæ and spiritus ammoniæ aromaticus.

Therapeutics. Nutmeg is an aromatic and gentle stimulant, and carminative ; in large doses it is said to possess narcotic properties, well marked, causing drowsiness, and even complete stupor and insensibility. It is perhaps more frequently used for giving flavour to farinaceous and other articles of food, than for its medicinal properties. Applied externally, the expressed oil of

nutmeg acts as a topical stimulant, and has been used in chronic rheumatism, and to add to the effect of other stimulants in the warm and pitch plasters, &c.

Dose. Of nutmeg in powder, 5 gr. to 15 gr.; of the volatile oil, 1 min. to 5 min.; of the spirit of nutmeg, 30 min. to 60 min.

LAURACEÆ.

Cinnamomi Cortex. Cinnamon Bark. The inner bark of shoots from the truncated stocks of Cinnamomum Zeylanicum, imported from Ceylon, and distinguished in commerce as Ceylon cinnamon.

Cinnamomi Oleum. The Oil of Cinnamon, distilled from cinnamon, imported from Ceylon.

Description. Cinnamon bark is about $\frac{1}{5}$th of a line in thickness, in closely-rolled quills, which are about 4 lines in diameter, containing several small quills within them; the colour is a characteristic brown; brittle, and breaks with a splintery fracture; it has an aromatic odour, and warm astringent taste. The *oil* is of a bright yellow colour, with the odour and taste of the bark, but it gradually becomes red; it is heavier than water.

Prop. & Comp. The bark owes its important properties to the *oil*, but besides this oil, *tannic acid* is present in notable quantities, also *resin*, and *cinnamic acid*, &c. The essential part of oil of cinnamon has a composition represented by the formula ($C_9H_7O.H$), or hydride of cinnamyl; but there is likewise a hydrocarbon ($C_{10}H_{16}$) in small amounts. Hydride of cinnamyl, when treated with hydrate of potash, is resolved into cinnamic acid ($C_9H_7O.H.O$) and hydrogen; and when exposed to the air, it gradually absorbs oxygen with the formation of cinnamic acid and a resin; both of which products of decomposition, as above stated, are found in the bark.

Off. Prep.—Of the Bark. Aqua Cinnamomi. Cinnamon Water. (Cinnamon, bruised, twenty ounces; water, two gallons. Distil one gallon.) Used in the preparation of mistura cretæ, mistura guaiaci, and mistura spiritûs vini gallici.

Pulvis Cinnamomi Compositus. Compound Cinnamon Powder. (Cinnamon bark, in powder; cardamoms, in powder; ginger, in powder: of each one ounce.)

Tinctura Cinnamomi. Tincture of Cinnamon. (Cinnamon,

in coarse powder, two ounces and a half; proof spirit, 20 fluid ounces. Prepared by maceration and percolation.)

Cinnamon bark is also contained in the compound tincture of cardamoms and lavender, in tincture of catechu, infusion of catechu, and other preparations.

Therapeutics. Cinnamon is stimulant, aromatic, and carminative, also somewhat astringent; useful as an adjunct in diarrhœa. The oil may be employed in flatulence, and as a corrigent to purgatives.

Dose. Of the powdered bark, 10 gr. to 30 gr.; of cinnamon water, 1 fl. oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.; of the oil of cinnamon, 1 min. to 5 min.

Adulteration. The bark called Cassia, or Chinese Cinnamon (from Cinamomum Cassiæ), is detected by its greater thickness and roughness, and less aromatic odour and taste.

Camphora. Camphor. A concrete volatile oil, prepared by sublimation from the wood of Camphora officinarum, and resublimed in England, in bell-shaped masses. Rough camphor is imported from China and Japan.

Description. Camphor is usually sublimed in the form of hollow hemispherical cakes, and these are broken into small masses, which are crystalline, white, semitransparent and tough, with a peculiar odour and taste, at first pungent, followed by a sensation of cold. Crude camphor, as imported, is in the form of small crystalline grains, of a dirty white colour; this is mixed with lime before it is sublimed.

Prop. & Comp. Camphor is rather tough and difficult to pulverize, except when a few drops of spirit are added: sp. gr. 0·98. It is soluble in alcohol, ether, the volatile and fixed oils; little so in water, yet sufficient is taken up to give a strong taste and odour to that liquid; it sublimes entirely when heated. It has the nature of a concrete volatile oil, and its formula is ($C_{10}H_{16}O$). Boiling point, 399°. It is changed into camphoric acid by nitric acid.

Off. Prep. Aqua Camphoræ. Camphor Water. *Synonym.* Mistura Camphoræ. (Camphor, broken into pieces, half an ounce; distilled water, one gallon. Enclose the camphor in a muslin bag, and attach this to one end of a glass rod, by means of which it may be kept at the bottom of a bottle containing the distilled water, the other end of the rod terminating just below

the stopper of the bottle. Having thus put the camphor into the water, close the mouth of the bottle, macerate for at least two days, and then pour off the solution when it is required.) It is said to contain about half-a-grain of camphor to the ounce.

LINIMENTUM CAMPHORÆ. Camphor Liniment. (Camphor, one ounce ; olive oil, four fluid ounces.)

LINIMENTUM CAMPHORÆ COMPOSITUM. Compound Liniment of Camphor. (Camphor, two ounces and a half ; oil of lavender, one fluid drachm ; strong solution of ammonia, five fluid ounces ; rectified spirit, fifteen fluid ounces.)

SPIRITUS CAMPHORÆ. Spirit of Camphor. (Camphor, one ounce ; rectified spirit, nine fluid ounces.)

TINCTURA CAMPHORÆ COMPOSITA. Compound Tincture of Camphor. *Synonym.* Tinctura Camphoræ cum Opio, 1864. Opium, in coarse powder, forty grains ; benzoic acid, forty grains ; camphor, thirty grains ; oil of anise, half a fluid drachm ; proof spirit, twenty fluid ounces.)

Each fluid drachm contains a quarter of a grain of opium.

Camphor is also contained in many other pharmacopœia preparations, as in several of the liniments and two of the ointments.

Therapeutics. Camphor is a poison to the lowest forms of animal and vegetable life ; it possesses antiseptic properties and arrests protoplasmic movement ; it lowers the pulse and temperature in septicæmic fever. (Cf. EUCALYPTOL.) Upon insects and many animals it acts as a narcotic poison. It is a powerful irritant to raw surfaces and mucous membranes (when applied in substance).

Administered to the human subject in very large doses (30—80 grs.), camphor has been known to cause dangerous symptoms—vertigo, sickness, muscular weakness, coldness of extremities, feeble pulse, loss of consciousness, and even death. In medicinal doses, it acts as a stimulant and antispasmodic ; it appears also to possess some antipyretic power. It has been employed in adynamic fevers and choleraic diarrhœa ; in various spasmodic affections, such as whooping-cough, chorea, and epilepsy ; in the various forms of hysteria ; in chordee ; as a calmative in psychical disorders, especially when connected with sexual excitement. Externally, it is used as a stimulant to stiff and painful parts.

Dose. Of camphor, 1 gr. to 10 gr. ; of camphor water, 1 fl. oz. to 2 fl. oz. ; of the spirit, 10 min. to 30 min., suspended in water (which precipitates it) by means of mucilage ; of the compound tincture of camphor, 15 min. to 1 fl. drm. ; the dose depending on the amount of opium rather than on the camphor contained in it.

Adulteration. Camphor is not often adulterated, but another kind, called Borneo Camphor, from Dryobalanops camphora, a guttiferous plant, is sometimes met with ; heavier than water, less volatile, and more opaque than true camphor. An artificial camphor can be made by passing hydrochloric acid gas through volatile oil of turpentine.

Sassafras Radix. Sassafras. The dried root of Sassafras officinale, or Sassafras Tree ; growing in the United States and Canada.

Description. In branched pieces, sometimes eight inches in diameter at the crown ; the wood, light and spongy, of a pale greyish-brown colour ; the bark, dark reddish-brown, also spongy ; odour agreeable ; taste warm, sweet, and aromatic ; the bark is more powerful than the wood ; it is also met with in chips.

Prop. & Comp. Sassafras root contains a *volatile oil*, *resin*, and a principle called *sassafrin*, with a little tannin, &c.

Off. Prep. It is contained in decoctum sarsæ compositum.

Therapeutics. A stimulant and diaphoretic, seldom given alone ; used in chronic rheumatism, skin diseases, and syphilis. The volatile oil, Oleum Sassafras, may be employed.

Dose. Of the oil, 1 min. to 5 min.

Nectandræ Cortex. Bebeeru Bark. The Bark of Nectandra Rodiæi, the Green-heart Tree. Imported from British Guiana.

Beberiæ Sulphas. Sulphate of Beberia. $C_{35}H_{20}NO_6,HO,SO_3$, or $C_{35}H_{40}N_2O_6.H_2SO_4$. The sulphate of an alkaloid, prepared from the Bebeeru bark.

Description. The bark is found in large flat pieces, from one to two feet long, from two to six inches broad, and about a quarter of an inch thick, heavy, hard, and fibrous ; of a greyish-brown colour externally, reddish or cinnamon brown within ; taste very bitter, with much astringency.

Prep. of Sulphate of Beberia. Sulphate of beberia is prepared by exhausting the powdered bark by maceration and percolation with water, strongly acidulated with sulphuric acid. The colouring and other matters, and the excess of sulphuric acid, are then precipitated from this solution after concentration, by mixing it with milk of lime (not sufficient to render the fluid alkaline), and the deposit separated by filtration. To the filtered solution,

containing the beberia in the form of sulphate, ammonia is added until the fluid has a faint ammoniacal odour; the precipitate of impure beberia which forms is collected on a cloth, squeezed and dried in a vapour bath. It is powdered and exhausted by repeated boiling with rectified spirit, which dissolves the alkaloid, and to the solution water is added, and the spirit recovered by distillation; the residue is treated with dilute sulphuric acid, till the fluid becomes slightly acid, by which means the alkaloid is converted into a sulphate; the solution is then evaporated to dryness on a water bath, the product pulverized and the powder treated with cold water, which dissolves the sulphate of beberia; the filtered solution is evaporated to a syrupy consistence, and spread in thin layers on flat porcelain or glass plates, and dried at a heat not exceeding 140°. It should be preserved in well-stoppered bottles.

Prop. & Comp. Bebeeru bark contains an alkaloid, not yet crystallized, Beberia or Bibirine ($C_{19}H_{21}NO_3$), a yellow resinous-looking body, possibly a mixture of several principles; soluble in alcohol, slightly in ether, scarcely in water; it forms salts with acids; the commercial and officinal salt is the impure sulphate which occurs in dark brown thin translucent scales, yellow when powdered, with a strong bitter taste, soluble in water and alcohol. Its watery solution gives a white precipitate with chloride of barium, and with caustic soda a yellowish-white precipitate which is dissolved by agitating the mixture with twice its volume of ether. The ethereal solution separated by a pipette and evaporated, leaves a yellow translucent residue, entirely soluble in dilute acids. It leaves no ash when burnt; water forms with it a clear brown solution.

Therapeutics. The bark is seldom given; the sulphate of beberia was introduced into medicine as a substitute for quinine, and it was stated to be both tonic and antiperiodic. It resembles the cinchona alkaloids in antiseptic power, preventing the development of bacteria even when used in very minute proportions; it also resembles them in exerting an inhibitory influence upon the migratory movements of the colourless blood-corpuscles. The author has made several observations upon its action in typical cases of ague, but he never succeeded in curing a case, although he increased the dose of sulphate of beberia until it caused disturbance of the stomach; the same cases yielded immediately to the influence of quinine. It is now stated to be useful in periodic

headaches. Beberia may act as a tonic, but it is an imperfect substitute for quinine.

Dose. Of the sulphate of beberia, 1 gr. to 10 gr.

ARISTOLOCHIÆ.

Serpentariæ Radix. Serpentary Root. The dried root of Aristolochia Serpentaria, Serpentary, or Virginian Snake-root; grown in Virginia and other parts of the United States.

Description. A small root-stock with a tuft of numerous small radicles about three inches long, of a pale greyish-brown colour; the root has an aromatic and camphoraceous odour, and bitter camphoraceous taste.

Prop. & Comp. Serpentary contains a *volatile oil* and *resin;* also a *bitter extractive* matter; the latter soluble in water, the former in spirit.

Off. Prep. INFUSUM SERPENTARIÆ. Infusion of Serpentary. (Serpentary, a quarter of an ounce; boiling distilled water, ten fluid ounces.)

TINCTURA SERPENTARIÆ. Tincture of Serpentary. (Serpentary, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Serpentary is also contained in tinctura cinchonæ composita.

Therapeutics. A stimulant and tonic: also diaphoretic and diuretic. It is sometimes used in atonic dyspepsia, chronic rheumatism, in low febrile states, and to promote eruption in the exanthemata. The author, from observations made during many years, is inclined to think that Serpentary is a remedy of some considerable power, acting in a manner not unlike Guaiacum, in stimulating the capillary circulation, and promoting recovery in chronic forms of gouty inflammation; as it does not disturb the bowels, it may often be administered when Guaiacum is not easily tolerated.

Dose. Of the powdered root, if ever administered, 10 gr. to 20 gr. or more; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.

ASARUM EUROPÆUM, or ASARABACCA, belongs to this order; the leaves were formerly used as an errhine: they cause powerful vomiting and purging when administered internally.

THYMELACEÆ.

Mezerei Cortex. Mezereon Bark. The dried bark of Daphne Mezereum, or Mezereon; or of Daphne Laureola, the Spurge Laurel. The latter is chiefly found in commerce; indigenous.

Description. Thin, flat, or curled pieces of various lengths; tough, of a brown colour outside, but white and fibrous within, with slight odour, taste hot and very acrid.

Prop. & Comp. An *acrid volatile oil*, *acrid resin*, and a crystalline principle, *daphnin*. When the root is boiled in water, an acrid vapour rises.

Off. Prep. EXTRACTUM MEZEREI ÆTHEREUM. Ethereal Extract of Mezereon. (Mezereon bark, a pound; rectified spirit, eight pints; ether, a pint. Prepared by maceration in the spirit, evaporation to form a spirit extract, then taking up with the ether and evaporating again.)

This extract is contained in linimentum sinapis compositum.

Mezereon bark is contained in decoctum sarsæ compositum.

Therapeutics. Mezereon is a powerful local irritant, and even vesicant; it causes vomiting and purging in large doses, but in small ones, diaphoresis and diuresis. Used in chronic rheumatism, syphilis, scrofulous and skin diseases. Seldom given internally in this country, except in the compound decoction of sarsaparilla; now employed as an external irritant in combination with mustard in the compound mustard liniment. In America an ointment is used.

EUPHORBIACEÆ.

Cascarillæ Cortex. Cascarilla Bark. The bark of Croton Eluteria, or Cascarilla Bush; growing in the Bahamas.

Description. In small quilled pieces, from 2 to 4 inches long, and from 2 to 5 lines in diameter; about the size of a pencil, fissured in both directions, of a dull brown colour, but spotted white with crustaceous lichens; short fracture; sometimes it occurs in small flattened pieces without lichens.

Prop. & Comp. Odour spicy and pleasant, taste bitter and aromatic, its properties are yielded to water and spirit. It emits a fragrant odour when burned. The bark contains a bitter

matter, in which a crystalline substance, *Cascarilline*, has been stated to exist; besides which, there are present some tannic acid, colouring matter, and a *volatile oil*.

Off. Prep. INFUSUM CASCARILLÆ. Infusion of Cascarilla. (Cascarilla, in coarse powder, one ounce; boiling distilled water, ten fluid ounces.)

TINCTURA CASCARILLÆ. Tincture of Cascarilla. (Cascarilla, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Cascarilla is an aromatic stomachic and tonic, and probably a stimulant expectorant; useful in atonic dyspepsia, and in recovery from acute diseases; also in some forms of chronic bronchitis, in which the expectoration is very excessive. Cascarilla once enjoyed the reputation of possessing antiperiodic powers; but if it has any, it is much less powerful than Cinchona, and is now seldom employed in intermittent diseases.

Doses. Of powdered bark, 10 gr. to 30 gr.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, ½ fl. drm. to 2 fl. drm.

Oleum Crotonis. Croton Oil. The oil expressed in England from the seed of Croton Tiglium; growing in the East Indies.

Description. The oil is slightly viscid, from pale yellow to brownish-yellow in colour, of a disagreeable odour and acrid taste. The seeds from which the oil is expressed are smaller and duller in appearance, but otherwise much resemble castor oil-seeds. The kernels yield from 50 to 60 per cent. of oil.

Prop. & Comp. Croton oil contains a volatile oily acid, *Crotonic acid* (not active), and a fixed oil. It is soluble in ether and volatile oils; agitated with its own volume of alcohol, and gently heated, it forms a clear solution from which about three-fourths of the oil separate on cooling. The best croton oil is expressed from the seeds in England, and such oil is soluble in an equal bulk of alcohol, without the aid of heat, and the mixture does not separate unless much cooled; the oil expressed in India, on the other hand, requires the aid of heat to dissolve it in alcohol, and the mixture soon separates into an alcoholic and oily layer when allowed to cool.

Off. Prep. LINIMENTUM CROTONIS. Liniment of Croton Oil. (Croton oil, a fluid ounce; oil of cajuput and rectified spirit, of each three and a half fluid ounces.)

Therapeutics. A most powerful irritant, drastic purgative, often causing nausea and vomiting; used in obstinate constipation and in cerebral affections, as apoplexy; also in very minute quantities as an ordinary purgative. The author has frequently added a very small quantity of croton oil to castor oil, from one to four minims of the former, to four fluid ounces of the latter oil; by this means the acridity of the croton oil is greatly diminished, and the activity of the castor oil much increased.

Externally croton oil gives rise to pustulation, and diluted with olive oil or soap liniment, is a valuable counter-irritant.

Dose. Of the oil, $\frac{1}{3}$ min. to 1 min., placed on the tongue; or formed into a pill with crumb of bread. As an adjunct $\frac{1}{12}$ min. upwards.

Adulteration. Other fixed oils, as castor oil, might be added, which would be difficult to detect.

Ricini Oleum. Castor Oil. The oil expressed from the seed of Ricinus Communis, the Castor Oil plant; growing in the East Indies and America; imported chiefly from Calcutta.

Description. The oil is thick, viscid, colourless, or of a pale straw-yellow, of peculiar odour, and slightly acrid taste. The seeds, about the size of small beans, are oval, compressed, obtuse at the ends, smooth and shining on the surface, of a light ash colour, marbled with dark spots and veins.

Prop. & Comp. Castor Oil differs from most other fixed oils in being entirely soluble in one volume of alcohol and two volumes of rectified spirit; sp. gr. 0·96; it contains three oily acids, *Ricinic*, *Ricin-oleic*, and *Ricin-stearic*, united with *Glycerine*. It also contains some acrid resinous matter. When expressed without the aid of heat, it is called cold-drawn castor oil.

Use. Castor oil is used in preparing flexible collodion, compound liniment of mustard, and compound calomel pill.

Therapeutics. A mild, yet quick purgative medicine; causing little or no disturbance of the system; little more than the evacuation of the contents of the bowels. Used in delicate subjects, and in irritable conditions of the alimentary canal and neighbouring parts: as in gastritis, enteritis, dysentery, cystitis, &c. The seeds are very active, even dangerous.

Dose. 1 fl. drm. to 1 fl. oz.; often given floating on some liquid; sometimes in gelatine or membranous capsules; or in the form of an emulsion with some aromatic.

Adulteration. Other fixed oils, difficult to detect, as, when mixed with castor oil, they are rendered, to some extent, soluble in alcohol.

Kamala. Kamala. Wurrus. The powder, consisting of minute glands, which adheres to the capsules of Rottlera tinctoria. Imported from India.

Prop. & Comp. An orange-red, or brick-red granular powder, scarcely mixing with water, but for the most part soluble in alcohol and ether, forming a red-coloured solution. The insoluble residue consists chiefly of tufted hairs. Contains 80 per cent. of *resin*, soluble in alcohol and ether, with traces of *tannic acid*, *gum*, and *volatile oil*. It should be free from sand or earthy matter.

Therapeutics. A powerful anthelmintic, found very efficacious in India in the treatment of tape-worm. It usually purges freely. The author has employed it with success in some cases of tape-worm, but he has found its active purgative properties at times rather objectionable.

Dose. 30 gr. to ½ oz. in honey or thick gruel.

In the order Euphorbiaceæ are also contained the—

Euphorbium officinarum, yielding the resin in whitish tears called *Euphorbium*, a very powerful local irritant, used sometimes as a sternutatory, causing violent vomiting and purging when swallowed; also the *Janipha* or *Jatropha Manihot*, of which the fecula of the root, when dried and heated, forms *Tapioca*. Cassava bread is also made from the root; the juice of the tree, when fresh, is acrid and poisonous. Tapioca is a pure form of starch, and is much used as an article of diet.

PIPERACEÆ.

Piper Nigrum. Black Pepper. The unripe berries, dried, of Piper nigrum, or Black Pepper; growing in tropical countries, as Java and Sumatra, now chiefly imported from the East Indies.

Description. A berry about the size of a small pea, black, rough or wrinkled on the outside, the contained seed is grayish; when decorticated it forms *white pepper*.

Prop. & Comp. Odour hot and aromatic; taste acrid; contains a nitrogenized feeble base, *Piperine* ($C_{17}H_{19}NO_3$), in rhomboidal prisms, white, almost tasteless, and inodorous; although the

piperine of commerce is always yellow and acrid from the presence of volatile oil. A *volatile oil* ($C_{10}H_{16}$), lighter than water, giving the odour and taste to the drug, is also present: besides the ordinary constituents of such fruits, there exists also some acrid resin.

Off. Prep. Confectio Piperis. Confection of Pepper. (Black pepper, in fine powder, two ounces; carraway, three ounces; clarified honey, fifteen ounces, rubbed well together.)

This preparation is a substitute for a nostrum long known as Ward's Paste, and much used in the treatment of piles.

Pepper is also contained in confection of opium, and in compound opium powder.

Therapeutics. Pepper is chiefly used as a condiment. It acts as a stimulant stomachic, and appears to influence the mucous membrane of the rectum, hence its value in hæmorrhoids; it also acts on the urethral membrane, and may be used as a substitute for cubebs in gonorrhœa, &c. Piperine probably possesses antiperiodic powers, and is stated to have been used with success in ague. Externally, pepper, or its oil, may be employed as a rubefacient; the oil is sometimes applied topically in relaxed sore throat.

Dose. Of pepper, 5 gr. to 20 gr.; of piperine, 5 gr. upwards; of the confection, 60 gr. to 120 gr. and upwards.

Piper Longum. The unripe fruit of Piper longum, or Chavica Roxburghii. (Not now officinal.) It is sometimes used as a condiment.

Description. The spikes are from one to two inches in length, and studded with eminences arranged spirally; of a light gray colour.

Prop. & Comp. As black pepper; the odour being rather different.

Therapeutics & Dose. The same as of black pepper.

Cubeba. Cubebs. The unripe fruit, dried, of Cubeba officinalis, the Cubeb Pepper; cultivated in Java.

Oleum Cubebæ. Oil of Cubebs. The oil, distilled in Britain, from Cubebs.

Description. Very like black pepper, wrinkled, and having a small stalk or tail attached, of rather more than its own length, which serves to distinguish it; also lighter in colour.

Prop. & Comp. Cubeb pepper has an odour like camphor, in addition to that of pepper; its taste is hot and spicy; it contains *Cubebine*, a crystalline principle, which by some is said to be the same as piperine; but this is doubtful; the *volatile oil* is colourless or pale greenish-yellow, with the odour and taste of cubebs ($C_{15}H_{24}$). There is also some *resin* or oxidized oil in cubeb pepper.

Off. Prep. TINCTURA CUBEBÆ. Tincture of cubebs. (Cubebs in powder, two and a half ounces; rectified spirit, a pint. Macerate and percolate.)

Therapeutics. Cubebs and the oil are used almost exclusively for their action on the mucous membrane of the urethra and bladder, upon which they act as stimulants, and have the power of arresting abnormal discharges from these surfaces.

Dose. Of the powder, 30 gr. to 120 gr.; of the volatile oil, 5 min. to 20 min.; of the tincture, ½ fl. drm. to 2 fl. drm.

Maticæ Folia. Matico Leaves. The leaves of Artanthe elongata or Piper angustifolium, Matico Plant; a native of Peru.

Description. The leaves are from 2 to 8 inches long, oblong, lanceolate, acuminate, tesselated on the upper surface, reticulated and downy beneath; of a green colour, with an aromatic, warm, and slightly astringent taste and aromatic odour; as imported, the leaves are mixed with the spikes and stalks, and in a compressed state.

Prop. & Comp. Matico contains traces of tannic acid, and a peculiar acid, named artanthic acid, which is readily crystallizable; soluble in water and alcohol, but remarkably so in ether; nitrate of potash, colouring matter, and a volatile oil or camphor (?) not yet isolated are also found in the leaves. No piperine has been obtained from them, and they contain no starch.

Off. Prep. INFUSUM MATICÆ. Infusion of Matico. (Matico, cut small, half an ounce; boiling distilled water, ten fluid ounces.)

Therapeutics. The surface of the leaf or the powder applied to bleeding parts, as leech-bites, &c., acts as a powerful styptic; when given internally it is stated to produce astringent effects and to affect the genito-urinary mucous membrane and rectum, like pepper or cubebs; it contains little ordinary astringent matter, and it has been supposed that its power, when applied topically, is due to the mechanical structure of the leaf.

Dose. Of powder, internally, 30 gr. to 60 gr.; of infusion, 1 fl. oz. to 4 fl. oz.

SALICACEÆ.

Salicis Cortex. Willow Bark. Bark of Salix caprea ; indigenous. (Not officinal.)

Description. The bark obtained from the branches is quilled, the epidermis dark-coloured, and the structure fibrous and tough ; it has a slightly aromatic odour, with a bitter and astringent taste.

Prop. & Comp. Its active matters are soluble in water ; it contains *tannin*, gum, extractive matter, and the usual constituents of barks. In addition, it yields a neutral crystalline glucoside, *Salicine*, which, when pure, occurs in white scaly crystals, with a bitter taste, soluble in water and alcohol ; and has the composition ($C_{13}H_{18}O_7$). Concentrated sulphuric acid turns salicine of a bright red colour. By boiling it with dilute sulphuric acid, or acting upon it with emulsine (*see* Amygdala) salicine is converted into Saligenin and glucose : $C_{13}H_{18}O_7+H_2O=C_7H_8O_2+C_6H_{12}O_6$. Salicine and Saligenin may both be converted, by oxidation with sulphuric acid and bichromate of potash, into Salicyl hydride, $C_7H_6O_2$; this is identical with the oil of *Spiræa Ulmaria*, or meadow-sweet, and exhales the same peculiar odour.

Therapeutics. Willow bark is supposed to be tonic and antiperiodic, and has been much recommended in intermittents as a substitute for cinchona ; it is generally administered as salicine ; this is thought to possess considerable antiperiodic power, but is not likely to supersede quinine, though possibly useful as a mild bitter tonic, when given in doses of from ten to twenty grains. The author has made many trials of salicine in cases both of ague and of intermittent neuralgia, and his experience amounts to this : that salicine is a drug devoid of any true antiperiodic property ; twenty to thirty grains, given three times a day, failed to check ague, but the patients were subsequently cured at once by the exhibition of quinine ; and the same negative results were found to follow its administration in neuralgia. The experience of some few physicians appears to differ from the above, but it is a fact that salicine has not come into use as an antiperiodic, although it might be obtained, if required, in almost any quantities, and at a low price. A decoction of willow bark is sometimes useful in chronic skin affections, as psoriasis.

Salicine taken internally appears in the urine as Salicyl hydride

(oil of Spiræa), and causes that fluid to strike purple-red with the persalts of iron.

Dose. Of decoction (1½ oz. to 20 fl. oz.) 1½ fl. oz. to 3 fl. oz.; of salicine, 5 gr. to 30 gr.

LIQUIDAMBARACEÆ.

Styrax Preparatus. Prepared Storax. Liquid balsam from Liquidambar orientale; obtained from the bark in Asia Minor; purified by means of rectified spirit and straining. (*See* Benzoinum.)

Description. Storax occurs in two forms: the *liquid balsam* (officinal), of the consistence of bird-lime, almost opaque, with an aromatic odour, and of a brownish-yellow colour; and the *solid storax*, styrax calamita (not officinal), in the form of masses which are friable, of a brownish-red colour, covered on the surface with a white efflorescence of benzoic or cinnamic acid, and becoming soft and clammy with the heat of the hand. It consists of the liquid storax mixed with powdered liquidambar bark; sawdust, ashes, &c., being often substituted for the latter ingredient.

Prop. & Comp. Storax consists of a principle named *Styracin*, *Cinnamic acid*, a peculiar *resin*, and *Styrol*.

Styracin ($C_{18}H_{16}O_2$), or cinnamate of cinnyl, is a crystalline solid, resolved by the action of alkalies into a cinnamate and *Styrone*, or cinnylic alcohol ($C_9H_{10}O$). It is sometimes obtained in a liquid, uncrystallizable state. It is insoluble in water, but soluble in ether, less so in alcohol.

Cinnamic acid ($C_9H_8O_2$) occurs in crystalline plates, and has powerful acid properties.

Styrol (C_8H_8), a colourless oil, of an aromatic odour, converted into benzoic acid by the oxidizing action of chromic acid.

Storax, when pure, is soluble in alcohol and ether. Heated in a test-tube on the vapour bath, it becomes more liquid, but should give off no moisture. Boiled with solution of bichromate of potash and sulphuric acid it evolves the odour of hydride of benzoyl, from the Styrol contained in it.

Off. Prep. Storax is contained in Tinct. Benzoini Comp.

Therapeutics. The same as the balsams of Peru and Tolu.

Dose. Of the prepared resin, 5 gr. to 20 gr.

ULMACEÆ.

Ulmi Cortex. Elm Bark. The dried inner bark of Ulmus campestris, the Broad-leaved Elm ; deprived of its outer layers ; indigenous to and cultivated in Britain.

Description. Elm bark is of a lightish-brown colour ; the pieces are broad, about half a line thick, and of varying length, and consist of the bark, deprived of its epidermis and outer layer. It is without smell ; taste, mucilaginous, slightly bitter and astringent.

Prop. & Comp. It yields its active properties to water, and contains a large amount of mucilage, and about 2·7 per cent. of tannin. *Ulmin*, a peculiar substance, of dark brown colour, insoluble in cold, and but slightly so in boiling, water, which it tinges of a brown colour, readily soluble in alkaline solutions, received its name from being first obtained from this bark ; it is now thought to be a constituent of many other barks. The decoction is turned green by perchloride of iron, and precipitates with a solution of gelatine.

Prep. Decoctum Ulmi. Decoction of Elm Bark. (Bruised elm bark, two and a half ounces ; distilled water, one pint. Boil down to a pint, and strain.)

Therapeutics. Elm bark is demulcent, slightly tonic and astringent, and has been recommended in chronic skin affections, as psoriasis and lepra. Some practitioners think highly of its powers as an alterative ; diuretic and diaphoretic effects are occasionally produced by the use of the decoction.

Dose. Of the decoction, 2 fl. oz. to 4 fl. oz.

CUPULIFERÆ.

Quercus Cortex. Oak Bark. The dried bark of the small branches and stems of Quercus pedunculata, the Common Oak ; indigenous. The bark should be collected in spring from plants growing in Britain.

Description. The bark, when dry, occurs in long pieces, generally covered with a grayish-white epidermis, of a fibrous consistence, brittle, internally cinnamon-coloured, as also is the outer surface, when denuded of the epidermis ; the taste is very astringent.

Prop. & Comp. Oak bark yields to water and spirit its active principles, viz., *tannic acid* and *gallic acid;* it also contains *pectin.* The amount of tannic acid varies very much with the age of the branches from which the bark is taken; season, and other circumstances, likewise, have an influence upon the amount of astringent matter present in the bark.

Off. Prep. DECOCTUM QUERCUS. Decoction of Oak Bark. (Bruised oak bark, one ounce and a quarter; distilled water, a pint.)

Therapeutics. Seldom used except as an external astringent, in the form of the decoction, which forms a useful and economical lotion, gargle, or injection, in relaxed sore throat, leucorrhœa, &c. It may be given internally in the cases in which tannic acid is useful.

Dose. Of decoction, 1 fl. oz. to 2 fl. oz., when internally administered.

Galla. Galls. Excrescences occurring on the small twigs of Quercus infectoria, the Gall or Dyer's Oak, growing chiefly in Asia Minor, caused by the punctures and deposited ova of Diplolepis Gallæ tinctoriæ.

Acidum Tannicum. Tannic Acid. An acid obtained from Galls.

Acidum Gallicum. Gallic Acid. An acid prepared from Galls.

Description of the Gall. The puncture of the young twig of the tree by a hymenopterous insect, the *diplolepis gallæ tinctoriæ,* causes the growth of an excrescence, made up of parenchymatous tissue, traversed here and there by isolated bundles of vessels; the eggs deposited by the insect become enclosed in the excrescence. Gall-nuts are more or less globular in form, tuberculated on the surface, about the size of a marble, varying from half an inch to three-fourths of an inch in diameter. There are two varieties, blue and white galls; the former, heavy and of a bluish-green tinge, yellowish-white within, with a small central cavity; the latter, white, of a grayish colour, less astringent, and perforated with a small hole, the passage by which the insect escaped.

Prop. & Comp. Gall-nuts contain a very large amount, about 35 per cent., of *tannic acid,* and 5 per cent. of *gallic acid,* also another body, named *ellagic acid,* with gummy and extractive matters, lignin, salts, &c.

Tannic Acid ($C_{54}H_{22}O_{34}$, or $C_{27}H_{22}O_{17}$) is prepared by exposing powdered galls to a damp atmosphere for a few days, and then adding sufficient ether to make a paste; letting this stand for twenty-four hours, compressing it in a linen bag, and preserving the liquid portion. The pressed cake is then pulverized, and made into a paste with ether, to which a sixteenth of its bulk of water has been added, and again pressed. The expressed liquids are mixed and allowed to evaporate by the aid of a little heat till they are of the consistency of a soft extract, which is then dried on earthen dishes at a temperature not above 212°. The mode in which the ether acts in this process is not well understood, anhydrous ether being a very bad solvent of tannic acid.

Tannic acid, a glucoside, occurs in the form of a light glistening spongy mass or powder, yellowish, or almost white; uncrystallizable, of a very astringent taste, freely soluble in water and spirit, but very sparingly soluble in ether; slightly acid in reaction; its solutions precipitate gelatine yellowish-white, and the persalts of iron bluish-black. It leaves no residue when burnt in air.

Gallic Acid ($3HO,C_{14}H_3O_7+2HO$, or $H_3C_7H_3O_5.H_2O$.) is prepared by making powdered galls into a thick paste with water, and keeping them in this state for six weeks at a temperature of between 60° and 70°. This paste is afterwards boiled with distilled water, and strained through calico; the solution is allowed to cool, and the crystals which are deposited are collected on a filter, and drained by pressure between folds of filtering-paper. They are then re-dissolved in boiling water, the liquid allowed to cool to 80°, and the crystals which separate are washed with ice-cold distilled water, and dried at a temperature not exceeding 100°. In this process the gallic acid seems to be formed by the action of a nitrogenous ferment, contained in the nuts, on the tannic acid.

It can also be produced by the action of acids or alkalies on tannic acid, when glucose is formed at the same time, thus: $C_{27}H_{22}O_{17}+4H_2O=3H_3C_7H_3O_5+C_6H_{12}O_6$, but this method is more expensive than that of the Pharmacopœia.

Gallic acid occurs in white or pale fawn-coloured silky needles, very soluble in boiling water, rectified spirit, and ether.

It differs from tannin in not precipitating gelatine, albumen, or the alkaloids, but it strikes bluish-black with the persalts of iron; its taste is acid and astringent, but much less so than that of tannin, perhaps owing to its slight solubility in the saliva. The

crystalline acid when dried at 212° loses 9·5 per cent. of its weight. It leaves no residue when burned with free access of air. Gallic acid is decomposed by heat (410° F.), with the formation of *pyrogallic acid* ($C_6H_6O_3$) and carbonic acid, and if heated rapidly still higher (482° F.) it loses a molecule of water, and *metagallic acid* ($C_6H_4O_2$) is formed. The former acid strikes indigo-blue with ferrous salts, and is a powerful deoxidizing agent.

Ellagic Acid ($C_{14}H_6O_8$) exists in gall-nuts in small quantities; it forms a white crystalline powder, differing from tannin and gallic acid in being almost insoluble in water, alcohol, or ether. Probably ellagic acid is contained in many vegetables, as some of the intestinal concretions, called *bezoars*, found in the intestines of ruminants, are entirely composed of it.

Off. Prep.—Of Galls.

Tinctura Gallæ. Tincture of Galls. (Galls, bruised, two and a half ounces; proof spirit, a pint. Prepared by maceration and percolation.) The tannic acid contained in it is converted after a time into gallic acid.

Unguentum Gallæ. Ointment of Galls. (Galls, eighty grains; benzoated lard, one ounce.)

Unguentum Gallæ cum Opio. Ointment of Galls and Opium. (Ointment of galls, one ounce; opium in powder, thirty-two grains.)

Of Tannic Acid.

Glycerinum Acidi Tannici. Glycerine of Tannic Acid. (Tannic acid, one ounce; glycerine, four fluid ounces. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.)

Suppositoria Acidi Tannici. Tannin Suppositories. (Tannic acid, thirty-six grains; benzoated lard, forty-four grains; white wax, ten grains; oil of theobroma, ninety grains. Divide the mass into twelve suppositories, each of which contains three grains of tannic acid.)

Suppositoria Acidi Tannici cum Sapone. Tannic Acid Suppositories with Soap. (Tannic acid, thirty-six grains; glycerine of starch, fifty grains; curd soap, in powder, one hundred grains. Add enough starch to form a paste, and divide the mass into twelve suppositories.)

Trochisci Acidi Tannici. Tannin Lozenges. (Tannic acid made into lozenges, with tincture of tolu, sugar, gum arabic,

mucilage of gum arabic, and water.) Half a grain of tannic acid is contained in each lozenge.

Of Gallic Acid.

Glycerinum Acidi Gallici. Glycerine of Gallic Acid. (Gallic acid, one ounce; glycerine, four fluid ounces. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.)

Therapeutics. Gall-nuts owe their efficacy to the tannic and gallic acids contained in them ; and the description of the action of these acids applies not only to galls, but to all those vegetables which are made use of for their astringent effects.

Tannic acid, when applied to a living part, acts as a most powerful astringent; if the surface of a mucous membrane is chosen, this effect is well seen in the contraction of the vessels and consequent paleness produced. When the lips, or any part of the mouth, come in contact with this acid, the astringency becomes evident to the taste.

Taken internally, tannic acid sometimes causes a sensation of dryness of the mouth and fauces, thirst, and not unfrequently constipation; it soon becomes absorbed into the blood, and after some alteration in composition, is thrown out, or at least partly so, by the kidneys in the form of gallic and pyrogallic acids, and a brownish-black humus-like matter: sometimes the urine becomes quite dark-coloured, especially after it has been exposed to the air for a short time. The urine of patients taking tannic acid does not precipitate gelatine, showing the absence of tannic acid, but strikes black with persalts of iron, indicating the presence of gallic acid. Upon the alimentary canal, and also after absorption, the action of tannic acid is of the same character ; and hence, not only topical but remote astringent effects are produced by its administration.

Gallic acid appears to differ from tannin in its topical action, being less astringent, probably from its comparatively slight solubility ; it however becomes absorbed, and the remote effects are identical with those of tannic acid.

Tannic acid may be given either on account of its direct or its remote effects ; for the former it is administered in affections of the mucous membrane of the alimentary canal. Probably as a remote astringent, gallic acid is more powerful than an equal quantity of tannic acid, for the latter becomes converted in the blood into gallic acid and grape sugar, and hence only a part of it is available. This was the conclusion at which the author arrived

from extensive trials made twenty years since, in the treatment of various forms of hæmorrhage. Both tannic and gallic acids may be administered in menorrhagia, hæmaturia, and hæmoptysis, also in cases where there is increased mucous discharge, as in diarrhœa and dysenteric affections; likewise to diminish excessive or hectic sweating.

Topically, the decoction of gall-nuts, the solutions of tannic or gallic acid, the glycerine compounds, the lozenge, the suppository, and the ointments, may be employed to suppress hæmorrhage from the gums, nose, or any other part to which they can be applied; also to brace up and lessen discharges from mucous membranes, as in gleet, leucorrhœa, hæmorrhoids, &c.

Dose. Of the tincture of galls (seldom used, except as a test), ½ fl. drm. to 2 fl. drm.; of tannic acid, 3 gr. to 20 gr.; of gallic acid, 3 gr. to 20 gr.; about 4 gr. of gallic acid can be dissolved in 1 fl. oz. of water.

Incompatibles. Salts of iron, especially the persalts, strike black with both tannic and gallic acids; infusions and decoctions of vegetable substances containing alkaloids, solution of gelatine, and many metallic substances, as salts of lead, antimony, &c., are precipitated by tannic acid, and hence should not be administered with them in solution, although the compounds thus formed are probably of value as remedial agents.

MORACEÆ.

Ficus. The Fig; the prepared fruit of Ficus Carica; a native of Asia; imported from Smyrna.

Description. The part usually known as the fruit of the fig, when dry, consists of the fleshy compressed pear-shaped receptacle, soft, tough, brown, and covered with a saccharine efflorescence, containing numerous small hard seeds in the interior, inclosed in a viscid pulp. These are quite shut in, except at the apex, where a small orifice exists. When nearly ripe the fresh figs are dried and exported largely to this country and other parts of Europe.

Prop. & Comp. They contain chiefly saccharine and mucilaginous matters.

Off. Prep. Figs are used in the preparation of Confectio Sennæ.

Therapeutics. Demulcent, nutritive, and laxative; used some-

times as an article of diet for this latter property. Heated and split open, figs are sometimes used as cataplasms.

Dose. Ad libitum.

Mori Succus. Mulberry Juice; the juice of the ripe fruit of Morus nigra; native of Persia, cultivated in Britain.

Description. The fruit from which the juice is obtained is of a dark purple colour, and consists of numerous small berries united together, each containing a single seed, attached to a common receptacle; the fleshy covering of the seeds being formed by the sepals. The juice is of a deep red colour.

Prop. & Comp. The juice has a faint odour and a sweet and acidulous taste; the latter property is said to be due to the presence of tartaric acid.

Off. Prep. Syrupus Mori. Syrup of Mulberries. (Mulberry juice, twenty fluid ounces; sugar, two pounds; rectified spirit, two fluid ounces and a half. Heat the mulberry juice to the boiling point, and when it has cooled filter it. Dissolve the sugar in the filtered liquid with a gentle heat, and add the spirit. The product should weigh three pounds six ounces, and should have the specific gravity 1·33.)

Therapeutics. The juice is refrigerant, and may be used as a drink in febrile diseases. The syrup is often used as a colouring matter.

Dose. 1 fl. drm. or more.

CANNABINACEÆ.

Cannabis Indica. Indian Hemp; the dried flowering tops of the female plants of Cannabis sativa. Hemp from which the resin has not been removed is alone to be employed, and also that only which is cultivated in India.

Description. The tops, consisting of one or more alternate branches, with the remains of the flowers, a few ripe fruits, and small leaves, pressed together in masses, are met with in bundles, about two inches long, of a greenish colour, and with a peculiar odour. In commerce Indian hemp is seen in three principal forms. The resinous exudation of the leaves and flowers is known as *Churrus;* the plant itself, consisting of the stems, leaves, and flowers, packed together lengthwise in long bundles, *Gunjah;* and lastly, a mixture of the leaves and capsules, without the stem.

Bang. The *Hashish* of the Arabs is another form of Indian hemp, sometimes occurring in coils.

Prop. & Comp. The *resin* of the Indian hemp, upon which the peculiar properties depend, is soluble in alcohol and ether, but separates from its solutions on the addition of water. The resin mentioned above has received the name *Cannabin*, and has a bitterish taste and peculiar odour; the plant also contains a little volatile oil.

Off. Prep. Extractum Cannabis Indicæ. Extract of Indian Hemp. (Indian hemp, in coarse powder, one pound; rectified spirit, four pints. Prepared by maceration of the hemp in rectified spirit for seven days, and subsequent separation of the spirit by distillation and evaporation to a proper consistence to form pills.)

Tinctura Cannabis Indicæ. Tincture of Indian Hemp. (Extract of Indian hemp, one ounce; rectified spirit, twenty fluid ounces. Prepared by solution of the extract in rectified spirit.)

Therapeutics. Indian hemp produces a peculiar kind of intoxication, attended with exhilaration of the spirits and hallucinations, said to be generally of a pleasing kind. These are followed by narcotic effects, sleep and stupor. In its anodyne and soporific action it resembles opium, but its after-effects are considered less unpleasant; it does not produce constipation nor loss of appetite.

Indian hemp possesses antispasmodic and anodyne powers, for which it has been chiefly employed in medicine. It has been administered in the different forms of neuralgia, in spasmodic coughs, as pertussis and asthma, also in tetanus, hydrophobia, and other anomalous spasmodic and painful diseases. Sometimes, but very seldom, it has been used to procure sleep. Much further experience of this drug is required before its real action and value can be fully decided upon; it certainly has disappointed the expectations formed of it when it was first introduced into this country; a circumstance, perhaps, in part due to very inferior hemp having been employed. The urine of patients under its influence sometimes acquires a peculiar odour not very unlike that of the Tonquin bean.

The author had under his care, about three years since, a man who took as much as four fluid drachms of the tincture of Indian hemp three times a day without experiencing any unpleasant symptoms; but the same patient was an opium-eater to a very great extent: this would appear to show that a tolerance of opium imparts to the system a similar power of resisting the influence

of Indian hemp. The tincture employed was shown to be genuine, for as little as fifteen minims produced well-marked symptoms in some other patients.

Dose. Of the extract, $\frac{1}{4}$ gr. to 1 gr. or more; of the tincture, 5 min. to 20 min.

Incompatibles. The tincture, when added to water, becomes turbid, from the precipitation of the resin, and hence it should be rubbed up with mucilage, to suspend it, or have a few drops of an alkaline liquid added, as aromatic spirit of ammonia, in order to keep it in solution.

Lupulus. Hop. The dried catkins of the female plant of Humulus Lupulus, the common Hop; cultivated in England, and found in many parts of Europe.

Description. The catkin or strobile of the hop is composed of membranous scales, each of which contains at the base two small seeds, surrounded by a yellow granular powder. The scale is covered with numerous superficial glands; it is thin, semi-transparent, veined, and of a yellowish colour when dry, with a peculiar fragrant odour and bitter taste. *Lupuline* is the name given to the fine resinous powder secreted by the scales, and obtained by rubbing and sifting the strobiles; it occurs as a golden yellow powder, and has the peculiar flavour of the hop: under the microscope it appears to resemble the pollen of plants.

Prop. & Comp. The active principles of hops reside chiefly, though not entirely, in the lupuline. *Lupuline* is a yellow, aromatic powder, containing a volatile oil, a resin, a nitrogenous substance, a gummy substance, and a bitter principle. Tannic acid is also present (about 5 per cent.). The bitter principle, soluble in alcohol, slightly so in water, but insoluble in ether, is called *Lupulite* or *Humulin*. The *volatile oil* when freshly prepared by distillation of the hops, is green, but is made colourless when redistilled; by exposure to the air, it becomes a resinous mass. It contains a hydrocarbon ($C_{10}H_{16}$) with valerol ($C_5H_{10}O$), the latter by the action of caustic potash is converted into valerianic acid, and thus the hydrocarbon may be separated from the valerol. The volatile oil was formerly thought to contain sulphur; this, however, has been lately disproved. The scales of the hop contain some adherent lupuline, though in a small proportion. Lupuline yields about 11 per cent. of the bitter principle.

Off. Prep. Infusum Lupuli. Infusion of Hop. (Hops, half an ounce; boiling distilled water, ten fluid ounces.)

TINCTURA LUPULI. Tincture of Hop. (Hop, two ounces and half; proof spirit, a pint. Prepared by maceration and percolation.)

EXTRACTUM LUPULI. Extract of Hop. (Prepared by maceration of the hop, first in rectified spirit, and afterwards boiling with water, mixing the two products, and evaporating at a temperature not exceeding 140° to a proper consistence.)

Therapeutics. Hops are tonic and stomachic, and slightly narcotic. In the form of bitter beer, taken with meals, they form a useful aid to digestion in some cases of atonic dyspepsia. The volatile oil is probably the narcotic principle, and in the form of a pillow, hops have been found anodyne and narcotic. Hops have been asserted to be useful in diminishing the tendency to nocturnal emissions, and also in allaying chordee. The preparations of hop are not much employed in this country except as adjuncts.

Dose. Of lupulin, 5 gr. to 10 gr.; of the infusion of hops, 1 fl. oz. to 2 fl. oz.; of the extract, 5 gr. to 15 gr.; of the tincture, ½ fl. drm. to 2 fl. drm.

CONIFERÆ OR PINACEÆ.

Terebinthinæ Oleum. Oil of Turpentine. Oil distilled from the oleo-resin or Turpentine of Pinus palustris, Pinus Tæda, and sometimes Pinus Pinaster; imported from America and France.

Resina. Resin. The residue of the distillation of the turpentines from the various species of Pinus and Abies.

Description. American turpentine, as it flows from the trunks of the above-named trees, has the consistence of treacle, altering much with heat and exposure; of a pale yellow colour; with a peculiar characteristic pungent odour and taste. When distilled, the oil of turpentine passes over, the resin remaining in the retort.

Oil of Turpentine, called also Spirits of Turpentine or Camphine, is a limpid colourless fluid, of the same odour and taste as the above.

Resin or *Rosin* is a solid semi-transparent yellowish substance, with but little odour and taste.

Prop. & Comp. Common turpentine consists of a mixture of the resin dissolved in the volatile oil, and separable by distillation.

The *Oil of Turpentine* ($C_{10}H_{16}$) sp. gr. 0·864, is inflammable, it mixes with other oils, fixed or volatile, is soluble in alcohol and ether, and dissolves many bodies, as fats, resins, &c. ; it partly resinifies, partly volatilises, on exposure, and forms an artificial camphor ($C_{10}H_{16}HCl$) with hydrochloric acid gas.

The *Resin* consists of three isomeric acids, Pimaric, Pinic, and Sylvic, differing in their solubility in alcohol. Pinic acid is soluble in cold alcohol ; sylvic in warm alcohol ; pimaric requires boiling spirit ; the formula of these acids is $C_{20}H_{30}O_2$. By the action of heat on resin, water and volatile matters are driven off and the acids left.

Off. Prep.—Of Oil of Turpentine:

Confectio Terebinthinæ. Confection of Turpentine. (Oil of turpentine, one fluid ounce ; liquorice root, in powder, one ounce ; clarified honey, two ounces.)

Enema Terebinthinæ. Enema of Turpentine. (Oil of turpentine, one fluid ounce ; mucilage of starch, fifteen fluid ounces.)

Linimentum Terebinthinæ. Liniment of Turpentine. (Oil of turpentine, sixteen fluid ounces ; camphor, one ounce; soft soap, two ounces.)

Linimentum Terebinthinæ Aceticum. Liniment of Turpentine and Acetic Acid. (Oil of turpentine, acetic acid, and liniment of camphor, each a fluid ounce.)

Unguentum Terebinthinæ. Ointment of Turpentine. (Oil of turpentine, one fluid ounce ; resin in coarse powder, sixty grains ; yellow wax and prepared lard, each half an ounce.)

Of the Resin:

Emplastrum Resinæ. Resin Plaster. (Resin, in powder, four ounces ; litharge plaster, two pounds ; hard soap, in powder, two ounces.)

Unguentum Resinæ. Ointment of Resin. (Resin, in coarse powder, eight ounces ; yellow wax, four ounces ; simple ointment, sixteen ounces.)

Resin also forms an ingredient in several other plasters, in turpentine ointment, and the epispastic or blistering paper.

Therapeutics. In small doses, oil of turpentine becomes absorbed, and acts as a stimulant, antispasmodic, and astringent ; its effects are especially directed to the kidneys, causing diuresis, and from the oil becoming altered in character in passing through the system, it communicates to the urine an odour not unlike violets.

Oil of turpentine influences the mucous membrane of the genito-urinary organs in a manner similar to copaiba, and in large doses produces strangury; its astringent property upon the capillary vessels is seen in its power of arresting hæmorrhage, and controlling some forms of inflammation.

In large doses, turpentine acts as a purgative, and possesses great power in destroying entozoa in the alimentary canal; its purgative operation is often accompanied by nausea and vomiting, and a species of intoxication, resulting from the absorption of a portion of the drug.

Oil of turpentine is occasionally administered by the stomach as an antispasmodic in hysterical affections, but, for the most part, as an enema; it is also used in passive forms of intestinal and urinary hæmorrhage, in purpura, and in some forms of iritis: its most frequent internal use is, however, as an anthelmintic, in cases where tænia, ascarides, or other entozoa are present in the intestines.

Oil of turpentine, when externally applied, produces powerful rubefacient effects, and if the vapour is confined, even vesication: administered as an enema, both the purgative and stimulant effects may be produced. Externally it is used in the form of the Pharmacopœia liniments over chronically inflamed and painful parts, or sprinkled on hot flannel as a fomentation in tympanitic conditions of the abdomen resulting from peritoneal inflammation.

Resin and *Common Turpentine* are seldom used, except as external stimulant applications: the former in the form of ointment or plaster; the latter, not now officinal, was until lately employed either alone or in combination with other resins, as elemi, galbanum, &c.

Dose. Of oil of turpentine, as a stimulant, antispasmodic, or diuretic, 10 min. to 30 min.; as an anthelmintic purgative, 2 fl. drm. to 4 fl. drm.; of the confection, 60 gr. to 120 gr.; of resin, 10 gr. to 30 gr. if administered internally.

Terebinthina Canadensis. Canada Balsam. The turpentine obtained by incision from the stem of Abies balsamea, or Balm of Gilead Fir. From Canada.

Description. A pale oleo-resin, ductile, consistence of thin honey, drying very slowly by exposure in the air into a transparent adhesive varnish. It has a peculiar agreeable odour and acrid and slightly bitter taste; mixed with one-sixth of its weight of magnesia it solidifies.

Therapeutics. Canada balsam resembles the other turpentines in its action, but it is not often given as a medicine.

Dose. 10 gr. to 30 gr.

Use. It is employed in making flexible collodion and blistering paper; it is also used to mount objects for the microscope, and for other optical purposes.

Laricis Cortex. Larch Bark. The bark, deprived of its outer layer, of Larix Europæa (Abies Larix), the Common Larch.

Description. In flattened pieces, 3-6 inches in length and 2-4 inches wide. Inner surface yellow and fibrous; outer surface, where denuded of epidermis, of a warm reddish hue; elsewhere, coated with a greyish epidermis, irregularly fissured and blotched with lichens, or beaded with resinous exudation. Odour faintly terebinthinate.

Prop. & Comp. Contains *larixin* or *larixinic acid* ($C_{10}H_{10}O_5$), a volatile substance forming crystals which resemble those of benzoic acid. Has a slightly bitter, astringent taste. Sparingly soluble in cold water and ether, more so in boiling water and alcohol. Nitric acid converts it into oxalic acid; ferric salts turn its solution purple. This principle is not found in the bark of Abies excelsa or Pinus sylvestris.

Off. Prep. TINCTURA LARICIS. Tincture of Larch. (Larch bark in coarse powder, two and a half ounces; rectified spirit, one pint.) Prepared by maceration and percolation.

Therapeutics. Resembles other terebinthinate and balsamic remedies in its action, but is more agreeable to the taste and less liable to interfere with digestion. It is employed in chronic bronchitis with abundant secretion as a stimulant expectorant. Also in cystitis and purpura.

Dose. Of the tincture 20 min. to 30 min.

TEREBINTHINA VENETA, Venice turpentine, is the liquid resinous exudation of Abies larix. It is occasionally used as a substitute for the other turpentines, which it resembles in its action. It is seldom met with in a pure state. (Not officinal.)

Thus Americanum. Common Frankincense. The concrete turpentine of Pinus Tæda, the Frankincense, and Pinus palustris or Swamp pine; from the southern states of North America. The turpentine after exuding from the bark becomes hardened in the air.

Description. A softish, bright yellow, opaque solid, resinous but tough, with the odour of American turpentine. *True Frankincense*, the natural exudation from Abies excelsa, is not at present imported into this country.

Prop. & Comp. Chemically, American frankincense is not known to differ from common resin ; it may, however, contain more or less volatile oil.

Off. Prep. Contained in Emplastrum Picis.

Pix Burgundica. Burgundy Pitch. A resinous exudation from the stem of Abies excelsa, the Spruce Fir, called also Pinus Abies; melted and strained ; imported from Switzerland.

Description. Hard and brittle, yet gradually taking the form of the vessel in which it is kept ; opaque, varying in colour, but generally dull reddish-brown ; of a peculiar somewhat empyreumatic perfumed odour and aromatic taste. Without bitterness, free from vesicles ; gives off no water when it is heated.

Prop. & Comp. Burgundy pitch consists chiefly of resin, but a little volatile oil is present, imparting to it its odour. The resin probably contains the same or similar acids to those found in American frankincense, or common resin obtained from turpentine.

Off. Prep. Emplastrum Picis. Pitch Plaster. (Burgundy pitch, twenty-six ounces ; common frankincense, thirteen ounces ; resin, four ounces and a half ; yellow wax, four ounces and a half ; expressed oil of nutmeg, one ounce ; olive oil, two fluid ounces ; water, two fluid ounces.)

Burgundy pitch also enters into the composition of the Iron plaster.

Therapeutics. Burgundy pitch acts externally as a slight stimulant to the skin.

Adulteration. True Burgundy pitch is seldom met with in commerce. A fictitious Burgundy pitch is often sold, made of common resin, coloured, and made opaque with yellow ochre, palm oil, water, &c.

Pix Liquida. Tar. A liquid bitumen prepared from the wood of Pinus sylvestris, the Scotch fir, and other pines by destructive distillation.

Description. *Tar* is a reddish-black, treacle-like liquid, with a

peculiar well-known aromatic odour; water agitated with it acquires a pale brown colour, sharp empyreumatic taste, and acid reaction.

Prop. & Comp. *Tar* is very complex in composition; having a sp. gr. about 1·040, it contains altered resin, or *colophonic* acid, and an empyreumatic oil, in which numerous substances, such as *creosote, paraffine, picamar, kapnomor, eupione*, &c., have been discovered. When shaken with water in the proportion of about one part of tar to four parts of water, tar-water is produced, from the solution of the soluble matter of the tar in that fluid.

Pitch is the altered resin, resulting from the distillation of tar.

Off. Prep. Unguentum Picis Liquidæ. Ointment of Tar. (Tar, five ounces; yellow wax, two ounces.)

Therapeutics. Tar is both an internal and external stimulant, useful in certain chronic skin diseases, as psoriasis, eczema, and pityriasis rubra; in some cases of inveterate psoriasis the influence of tar both as an internal and external remedy is very marked; the skin of the patients under its full use becoming quite or all but free from the eruption; the disease is, however, very liable to return. Tar also influences the mucous membranes when given internally, and has been found useful in bronchitic affections, and also in diseases of the mucous membrane of other passages, as an alterative. The vapour of tar has been used with advantage in chronic bronchitis and phthisis. It sometimes causes a black deposit in the urine. (*See* Carbolic Acid.)

Dose. Of tar, 20 min. to 1 drm. and upwards, made into pills with flour, or given as tar-water in doses of 1 fl. oz. to 4 fl. oz.

Juniperi Oleum. Oil of Juniper. The oil distilled in Britain from the unripe fruit of Juniperus communis, or Common Juniper; growing in Northern Europe, &c.

Description. The oil of juniper is colourless or of a pale greenish-yellow colour, having in a high degree the odour and warm aromatic taste of the fruit.

The fruit or berries are about the size of black currants, of a dark purple colour, with a bloom upon the surface, filled with a brownish-yellow pulp; their odour is agreeable, but slightly terebinthinate.

Prop. & Comp. The oil of juniper ($C_{10}H_{16}$) has sp. gr. 0·855. Some *resin* from the oxidation of the oil which quickly becomes

altered, sugar, wax, &c., are found in the fruit in addition to the oil.

Off. Prep. SPIRITUS JUNIPERI. Spirit of Juniper. (Oil of juniper, one fluid ounce; rectified spirit, forty-nine fluid ounces.)

Therapeutics. Oil of juniper is a powerful stimulant, its action being especially directed to the kidneys. It is used in medicine chiefly on account of its diuretic action; and has been found valuable in different forms of dropsies, either given alone, or combined with other diuretics. Experiments on a *healthy* man showed that it increases the urea and solids while slightly reducing the urinary water. It is contained in Hollands and gin,

Dose. Of the oil, 2 min. to 10 min.; of the spirit of juniper, 30 min. to 1 fl. drm.

Oleum Cadinum. Oil of Cade. (Huile de Cade.) (Not officinal.) An oil obtained in Germany and France, from the dry distillation of the wood of Juniperus Oxycedrus. It occurs as a slightly thick black liquid, with a tarry odour. It has long been employed in veterinary medicine; and recently introduced as an external remedy in the treatment of chronic cutaneous diseases, as psoriasis, eczema, favus, &c., in short, in the same affections for which ordinary tar has been found effectual. It may be employed either in the form of an ointment, made with equal parts of the oil and fatty matters, or made into a soap, or diluted with spirit as a lotion. The composition of this oil is probably almost identical with that of common tar oil, and although probably a useful external remedy, it requires trustworthy clinical evidence to show that it is superior to other terebinthinate preparations.

Sabinæ Cacumina. Savin Tops. The fresh and dried tops of Juniperus Sabina; collected in spring from plants cultivated in Britain.

Sabinæ Oleum. English Oil of Savin. The oil distilled in Britain from fresh savin tops.

Description. The *fresh tops* consist of the young branches enveloped in minute imbricated appressed leaves, in four rows, of a dark green colour, strong and peculiar disagreeable odour and taste. The tops can be detected when in coarse powder by means of the microscope, as the woody fibres exhibit the bordered pits which characterise the gymnosperms,

The *Oil* is colourless or pale yellow, with the odour and taste of the tops.

Prop. & Comp. The tops owe their activity to the *volatile oil*, oleum sabinæ ($C_{10}H_{16}$), sp. gr. 0·915 ; besides which, a *resin*, gallic acid, and the ordinary ingredients of young tops are present.

Off. Prep. Of Savin Tops. TINCTURA SABINÆ. Tincture of Savin. (Savin, dried and bruised, two ounces and a half ; proof spirit, one pint. Prepared by maceration and percolation.)

UNGUENTUM SABINÆ. Ointment of Savin. (Fresh savin tops, bruised, eight ounces ; yellow wax, three ounces : prepared lard, sixteen ounces. Melt together the lard and wax in a water-bath, add the savin, and digest for twenty minutes ; then strain through calico.)

Therapeutics. Savin acts as an irritant both internally and externally ; it also appears to exert much power upon the uterus as an emmenagogue. It is used externally, in the form of the ointment, to keep up the discharge from blistered surfaces ; and it is given internally in some cases of deficient menstruation, when unattended with congestion of the pelvic organs. In large doses it causes abortion, and its administration, often criminal, is attended with much danger. Savin should not be given in pregnancy.

Dose. Of dried tops, 4 gr. to 10 gr. upwards ; of the oil of savin, 1 min. to 5 min. (suspended) ; of tincture of savin, 20 min. to 1 fl. drm.

CLASS II. ENDOGENÆ.

ZINGIBERACEÆ.

Zingiber. Ginger. The rhizome, scraped and dried, of the Zingiber officinale (Amomum Zingiber), Ginger ; native of Hindostan, but is cultivated in the West Indies as well as in the East.

Description. The rhizome is generally about three or four inches in length, knotty, yellowish-white, but not chalky on the surface, with a short mealy fracture ; hot taste and agreeable aroma. Powder, yellowish white. In commerce there are two principal varieties, the white or Jamaica, and the black or East Indian ; for the former, the best pieces are selected, scraped

scalded, and dried by exposure to the sun; the black variety is dried without being first scraped, hence it is the larger of the two.

Prop. & Comp. Odour spicy and aromatic; taste warm and pungent. In addition to the ordinary constituents of roots, it contains a *volatile oil* and a *resinous matter*, upon which its pungency seems to depend. The sp. gr. of the oil is 0·893. The quantity of starch contained in the root is considerable.

Off. Prep. SYRUPUS ZINGIBERIS. Syrup of Ginger. (Strong tincture of ginger, six fluid drachms; syrup, nineteen fluid ounces.)

TINCTURA ZINGIBERIS. Tincture of Ginger. (Bruised ginger two ounces and a half; rectified spirit, one pint. Prepared by maceration and percolation.)

TINCTURA ZINGIBERIS FORTIOR. Strong Tincture of Ginger (Ginger, in fine powder, ten ounces; rectified spirit, a sufficiency. Percolate with half a pint of the spirit, and add more till a pint has been collected.)

Ginger is contained in many other officinal preparations.

Therapeutics. Ginger is an aromatic stimulant and carminative. When taken internally it produces an agreeable feeling of warmth at the epigastrium, and appears to aid digestion by giving a healthy tone to the stomach; hence it is used in atonic forms of dyspepsia, especially if attended with much flatulence, and as an adjunct to various purgative medicines to correct their griping tendency. When chewed it acts as a sialagogue, and is sometimes used in relaxed states of the uvula and tonsils.

Dose. In powder, 10 gr. to 20 gr. and upwards; of the syrup, ½ fl. drm. to 1 fl. drm.; of tincture, 15 min. to 1 fl. drm.; of the strong tincture, 5 min. to 20 min.

Curcuma. Turmeric. Appendix. The rhizome of Curcuma longa; native of Ceylon.

Description. The best rhizomes are in small short pieces, yellow externally, deep orange within.

Prop. & Comp. Turmeric contains a peculiar colouring principle soluble in alcohol, and when dried, of a bright yellow colour; by the action of alkalies this is turned to a deep brown.

Off. Prep. In Appendix. TURMERIC PAPER. (Unsized paper steeped in tincture of turmeric and dried by exposure to the air.)

TURMERIC TINCTURE. (Turmeric, bruised, one ounce; proof spirit, six fluid ounces.)

Use. Turmeric acts as a stimulant, but is not used as a remedy ; it is taken as a condiment in the form of curry powder, of which it is an ingredient. In the Appendix of the Pharmacopœia, it is introduced for testing alkalies. When the yellow colouring matter of turmeric is brought in contact with alkaline solutions, its colour is changed to reddish-brown.

Cardamomum. Cardamoms. The seed of Elettaria Cardamomum, the Malabar Cardamom ; native of Malabar.

Description. The seeds are generally met with in their capsules ; the capsules are oblong triangular, the angles being somewhat rounded off, wrinkled, and of a light yellow colour, divided into three compartments, each of which contains numerous seeds of a dark colour, and triangular in shape, corrugated, reddish-brown, internally white. The seeds only ought to be used. Cardamoms are distinguished according to their lengths by the respective names of shorts, short-longs, and longs.

Prop. & Comp. The seeds have a fragrant odour, which depends on the presence of a *volatile oil* ; the amount yielded being about 4·5 per cent. This is of an aromatic taste, and is said to have a sp. gr. of 0·945 ; the seeds contain in addition a fixed oil, together with *colouring matter* and salts, &c.

Off. Prep. Tinctura Cardamomi Composita. Compound Tincture of Cardamom. (Cardamoms bruised, caraway bruised, each a quarter of an ounce ; raisins, freed from their seeds, two ounces ; cinnamon, bruised, half an ounce ; cochineal, in powder, sixty grains ; proof spirit, twenty ounces. Prepared by maceration and percolation.)

Cardamom is also an ingredient of some other preparations, as compound decoction of aloes, aromatic iron mixture, compound senna mixture, and compound tincture of chloroform.

Therapeutics. It is an agreeable aromatic stimulant, stomachic, and carminative ; used in the East as a condiment. Chiefly employed as an adjunct to purgative and other medicines, to correct any tendency to griping.

Dose. Of the seeds, powdered, 5 gr. to 20 gr. ; of the compound tincture, ½ fl. drm to 2 fl. drm.

IRIDACEÆ.

Crocus. Saffron. The stigma and part of the style, dried, of Crocus sativus; native of Greece, and Asia Minor; imported from Spain, France, and Italy.

Description. The stigma, and part of the style of the flower, form a thin filament, broad at one end, and tripartite, of an orange-red colour. Dried carefully, without further preparation, it forms *hay saffron*, and when packed and pressed into parcels, *cake saffron*.

Prop. & Comp. Saffron moistened and pressed upon white paper leaves an orange-coloured stain, and yields to water and alcohol an orange-red colouring matter called *polycroite*, changed into blue by oil of vitriol. It also contains a *volatile oil*. When pressed between folds of white filtering paper it leaves no oily stain.

Off. Prep. Tinctura Croci. Tincture of Saffron. (Saffron, one ounce; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Saffron is also an ingredient of the decoction of aloes, pill of aloes and myrrh, compound tincture of cinchona, ammoniated tincture of opium, and tincture of rhubarb.

Therapeutics. Saffron has a very slight stimulant action; it is rarely given alone, and its chief use in medicinal preparations is as a colouring agent. It is supposed to be useful in the treatment of the exanthemata, from its power of determining to the skin.

Dose. Of dried saffron, from 20 gr. upwards; of the tincture, ½ drm. to 2 drm.

Adulteration. Marigold and safflower petals are often found in saffron; also the stamens of the saffron. The so-called cake saffron consists of the safflower petals gummed together.

SMILACEÆ.

Sarsæ Radix. Jamaica Sarsaparilla. The dried root of Smilax officinalis, Sarsaparilla. Native of Central America, imported from Jamaica.

Description. Sarsaparilla consists of the rhizome or root-stock, called also the chump, with numerous roots attached, generally

several feet long, but of different lengths and thickness in different varieties; these roots often give off secondary rootlets, which are themselves again finely subdivided; they are then said to be bearded. On transverse section, the roots are seen to consist of a cortex or rind, and a ligneous cord or meditullium inclosing the pith. According to the characters of these layers the Sarsaparillas of commerce have been classified by Dr. Pereira into the *non-mealy* and *mealy* varieties.

In the *non-mealy* varieties the cortex is deeply coloured and not mealy. Although some starch granules can be detected under the microscope, still the number is comparatively few. The diameter of the meditullium is generally four or five times greater than that of the cortex. Oil of vitriol applied to a transverse section causes both cortex and wood to become of a dark red tint, and iodine shows but a small amount of starch. Under this division are included the *Jamaica*, the *Lima*, and the *true* or *lean Vera Cruz*.

Jamaica, the only officinal Sarsaparilla, occurs in bundles, from a foot to a foot and a half in length, with spirally twisted roots, not thicker than a goose quill, several feet in length, folded, with numerous rootlets (*bearded*) of a reddish-brown colour. Jamaica Sarsaparilla has a mucilaginous and slightly bitter and acrid taste; it is not mealy, but yields much extractive matter when heated with water.

Lima Sarsaparilla occurs in bundles, about two or three feet long, folded with the chump in the interior, of a greyish-brown colour; it is derived from Smilax officinalis.

True Vera Cruz Sarsaparilla is not often found in commerce; it is lean, unfolded, with few rootlets; the chump is present.

The *mealy* varieties are distinguished by the large amount of starch contained in the inner cortical layers, which are sometimes equal in thickness to the meditullium; they break with a starchy fracture: the cortex is often cracked transversely, and sometimes falls off; they have occasionally a swollen appearance, and are then named gouty. If a drop of sulphuric acid be added to a transverse section, the mealy coat is unchanged, the ligneous zone becomes dark purple, and when a solution of iodine is applied, the starchy layer becomes evident, from the formation of the blue iodide of starch.

The mealy varieties include the *Honduras*, the *Brazilian*, and the *Caraccas*, or gouty Vera Cruz.

Honduras Sarsaparilla occurs in bundles, about three feet long, composed of the folded roots, secured by a few circular twists; of a dirty brown colour, with many lateral fibres, but no chump; it is very mealy. It is brought from the Bay of Honduras. Its botanical origin is doubtful.

Brazilian or *Lisbon* Sarsaparilla occurs in bundles, from three to five feet long, composed of the unfolded roots, bound together very tightly by a flexible stem; of a reddish-brown colour, with few rootlets. It comes from the Brazils, through Lisbon. It is probably derived from Smilax papyracea, and Smilax officinalis.

Caraccas, or *Gouty Vera Cruz* Sarsaparilla is found in bundles, two feet and a half long, and one foot broad, of a pale yellow colour. The chump is present, and it is very mealy. Derived from Smilax officinalis and syphilitica.

Prop. & Comp. Sarsaparilla contains a volatile oil, starch, ligneous fibre, and a peculiar crystallisable principle occurring as a white powder, *Smilacin*, of which little is known; soluble in hot water and alcohol, but almost insoluble in cold water; it colours sulphuric acid red.

Off. Prep. Decoctum Sarsæ. Decoction of Sarsaparilla. (Jamaica sarsaparilla, cut transversely, two ounces and a half; boiling distilled water, thirty fluid ounces. Reduce to a pint.)

Decoctum Sarsæ Compositum. Compound Decoction of Sarsaparilla. (Jamaica sarsaparilla, cut transversely, two ounces and a half; sassafras, in chips; guaiac wood turnings; fresh liquorice root, bruised—of each a quarter of an ounce; mezereon, sixty grains. Boiling distilled water, thirty fluid ounces. Reduce to a pint.)

Extractum Sarsæ Liquidum. Liquid Extract of Sarsaparilla. (Jamaica sarsaparilla, cut transversely, one pound; distilled water, at 160°, fourteen pints; rectified spirit, one fluid ounce. Prepared by macerating and digesting the sarsaparilla in the water, and evaporating by a water bath to seven fluid ounces, or until the specific gravity of the liquid is 1.13; the spirit is added when the liquid is cold. The specific gravity should be about 1·095.)

Therapeutics. Very little that is definite can be stated with regard to the action of sarsaparilla upon the animal economy; it is supposed to be a diaphoretic, diuretic, tonic, and alterative. It is extensively employed in the treatment of constitutional syphilis,

but as it has been generally administered in combination with powerful remedies, it is difficult to ascertain how much influence this drug has had in the cure of the affection. By some practitioners sarsaparilla is regarded as a remedy of great value; by others as possessing but little power: as a rule it is more relied on by surgeons than physicians. Sarsaparilla has also been given in cachectic conditions of the habit depending upon other causes, as scrofula, &c.; and in the form of the compound decoction, in which other stimulant sudorific agents are present, it is employed in chronic forms of rheumatism, gout, and skin diseases.

Dose. Of either decoction, 2 fl. oz. to 10 fl. oz.; of the liquid extract, ½ fl. drm. to 4 fl. drm.

Adulteration. Inferior kinds of sarsaparilla are substituted for the officinal Jamaica variety; these yield much less extractive matter; sometimes other substances are mixed with it, as dulcamara, &c., detected by the difference of structure.

LILIACEÆ.

Scilla. Squill. The bulb, sliced and dried, of Urginea Scilla (Scilla maritima); growing on the southern coasts of Europe bordering on the Mediterranean.)

Description. The recent bulb is pear-shaped, varying in size from a man's fist upwards, and weighing from half a pound to four pounds. It is made of a series of scales overlapping one another; the outer ones are thin and membranous, brownish red or white; the internal thicker, fleshy, white, and juicy. As met with in the shops, it is generally in small, thin transparent pieces, of a white or slight yellow colour, consisting of transverse sections of the bulb.

Prop. & Comp. Squill has a disagreeably bitter taste; the pieces are brittle and easily pulverisable if very dry, but if exposed readily recovering moisture and flexibility. Squill yields its active constituents to water, acetic acid, and alcohol. It appears to contain an *acrid resin*, having very powerful medicinal properties; also a very *bitter principle*, *Scillitine*, together with sugar, mucilage, and citrate of lime, which is found in the form of acicular crystals in the parenchyma of the bulb.

Off. Prep. Acetum Scillæ. Vinegar of Squill. (Squill, bruised, two and a half ounces; dilute acetic acid, a pint; proof spirit, one and a half fluid ounces.)

Oxymel Scillæ. Oxymel of Squill. (Vinegar of squill, a pint; clarified honey, two pounds. Mix and evaporate to a sp. gr. of 1·32.)

Pilula Scillæ Composita. Compound Squill Pill. (Squill, in fine powder, one ounce and a quarter; ginger, ammoniac, hard soap, each one ounce; treacle by weight, two ounces, or a sufficiency.)

Pilula Ipecacuanhæ cum Scillâ. Pill of Ipecacuanha with Squill. (Compound powder of ipecacuanha, three ounces; squill and ammoniacum in powder, of each one ounce; treacle, a sufficiency.) Twelve grains of the pill mass contain about one grain of opium.

Syrupus Scillæ. Syrup of Squill. (Vinegar of squill, a pint; refined sugar, two and a half pounds.)

Tinctura Scillæ. Tincture of Squill. (Squill, bruised, two ounces and a half; proof spirit, one pint. Prepared by maceration and percolation.)

Therapeutics. Squill acts as a stimulant expectorant and diuretic, and in larger doses it produces vomiting and purging. It increases the secretions of the bronchial mucous membrane, and also aids the expectoration of mucus, when abundant and viscid. Its stimulating and acrid properties render it inadmissible in cases of an active inflammatory nature. As a diuretic, it is generally given in combination with a mercurial. It is seldom given as an emetic, as it produces distressing nausea, and sometimes hypercatharsis. As an expectorant, ipecacuanha and ammoniacum are frequently conjoined with it.

Dose. Of the powdered squills, 1 gr. to 3 gr.; of vinegar of squill, 15 min. to 40 min.; of oxymel of squill, ½ fl. drm. to 1 fl. drm.; of compound squill pill, or of the pill of squill and ipecacuanha, 5 gr. to 10 gr.; of syrup of squill, ½ fl. drm. to 1 fl drm.; of tincture of squill, 10 min. to 20 min.

Aloe Barbadensis. Barbadoes Aloes. Inspissated juice of the cut leaf of Aloe vulgaris, the common aloe, growing in the East and West Indies; imported from Barbadoes.

Aloe Socotrina. Socotrine Aloes. The juice of the cut leaf of one or more uncertain species of aloes, hardened in the air; produced chiefly in Socotra, and shipped to Europe by way of Bombay.

Description. *Barbadoes* aloes is usually seen in the gourds in which it is collected and dried; it has a dull appearance, and occurs in yellowish-brown masses, very opaque even in thin layers, with an odour which is extremely nauseous, especially when breathed upon; the taste is intensely bitter; it breaks with a dull conchoidal fracture; when powdered, it has a dull olive-green colour; it dissolves almost entirely in proof spirit, and during solution exhibits under the microscope numerous crystals.

Socotrine Aloes occurs in reddish-brown masses, opaque or translucent at the edges; breaks with a vitreous or resinous fracture; sometimes it possesses considerable transparency; the odour is fruity, and by no means disagreeable, the taste very bitter; the colour of the powder is bright orange-yellow, it dissolves entirely in proof spirit, and during solution exhibits under the microscope numerous minute crystals. The author has found that some specimens of transparent Socotrine aloes fail to show crystals under the microscope; the cause of this is easily seen from what is stated below concerning the aloe juice.

Some twelve years since a large sample of liquid aloes was imported from the coasts of the Red Sea, stated to be the produce of the plant yielding true *Socotrine* aloes; this liquid, which has the consistence of treacle, is at first nearly opaque, but gives rise to a deposit; the upper portion then becomes transparent, and the opaque sediment, under the microscope, is found to consist of myriads of prismatic crystals. When liquid aloes is dried at a very low temperature, as in the sun, an opaque mass, crystalline in structure, and not unlike Hepatic aloes, is produced; when, however, heat is employed, the crystals are dissolved, and a transparent variety, similar to very transparent Socotrine aloes, results. Semi-opaque Socotrine and Barbadoes aloes will also, if heated in thin layers, lose their crystalline structure, and become transparent.

Hepatic Aloes (not now officinal), called also *East Indian Aloes*, has a dark reddish-brown or liver colour; opaque or translucent; usually more or less brittle; possesses an odour which is not disagreeable; taste very bitter; the colour of the powder is yellow; microscopically examined, numerous small crystals are usually observed.

A fourth variety, called *Cape Aloes*, the produce of Aloe spicata and other species, is often met with in masses which break with a conchoidal fracture, of a greenish-brown colour, and having some translucency; the powder is of a greenish-yellow

tint, and does not exhibit any crystalline appearance under the microscope; the odour is often strong, but not nauseous like that of Barbadoes aloes.

An inferior kind of Cape aloes is named Caballine aloes.

Prop. & Comp. A principle named *Aloïne* has been obtained from nearly all the varieties of aloes; it crystallizes in needles, and has the formula $C_{17}H_{18}O_7$; it is probably the same as the crystalline matter contained in the semi-fluid form of aloes, and in the Barbadoes and Hepatic varieties; in addition to this principle aloes contains a substance which has been named *resin*, differing however from ordinary resins in being soluble in boiling water; it is probably formed from aloïne by the action of the air; when aloes is acted upon by nitric acid several crystalline compounds are obtained, as *Polychromic*, *Chrysammic*, and *Chrysolepic* acids, the solutions of which are strongly red and purple in colour. A peculiar acid, named *Aloetic acid*, is also found in aloes, which strikes olive-brown with the persalts of iron.

Off. Prep.—Of Barbadoes or Socotrine Aloes. Enema Aloes. Enema of Aloes. (Aloes, forty grains; carbonate of potash, fifteen grains; mucilage of starch, ten fluid ounces.)

Of Barbadoes Aloes.

Extractum Aloes Barbadensis. Extract of Barbadoes Aloes. (Barbadoes aloes, in small fragments, a pound; boiling distilled water, one gallon. Made by exhausting the aloes with water, and evaporating the solution to a proper consistence.)

Pilula Aloes Barbadensis. Pill of Barbadoes Aloes. (Barbadoes aloes, in powder, two ounces; hard soap, in powder, one ounce; oil of caraway, one fluid drachm; confection of roses, one ounce.)

Pilula Aloes et Ferri. Pill of Aloes and Iron. (Sulphate of iron, one ounce and a half; Barbadoes aloes, in powder, two ounces; compound powder of cinnamon, three ounces; confection of roses, four ounces.)

Barbadoes aloes is also contained in Pilula Cambogiæ Composita, Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami.

Of Socotrine Aloes.

Decoctum Aloes Compositum. Compound decoction of Aloes. (Extract of Socotrine aloes, a hundred and twenty grains; myrrh, bruised, saffron chopped fine, each ninety grains; carbonate of potash, sixty grains; extract of liquorice, an ounce; compound

tincture of cardamoms, eight fluid ounces ; distilled water, a sufficiency to form thirty fluid ounces of decoction after ten minutes' boiling.) Contains 4 gr. of extract of aloes in each fluid ounce.

EXTRACTUM ALOES SOCOTRINÆ. Extract of Socotrine Aloes. (Prepared in the same way as the extract of Barbadoes aloes.)

PILULA ALOES SOCOTRINÆ. Pill of Socotrine Aloes. (Socotrine aloes, in powder, two ounces ; hard soap, in powder, one ounce ; volatile oil of nutmeg, one fluid drachm ; confection of roses, one ounce.)

PILULA ALOES ET ASSAFŒTIDÆ. Pill of Aloes and Assafœtida. (Socotrine aloes, in powder, assafœtida, hard soap, in powder, and confection of roses, of each one ounce.)

PILULA ALOES ET MYRRHÆ. Pill of Aloes and Myrrh. (Socotrine aloes, two ounces ; myrrh, one ounce ; saffron, dried, half an ounce ; confection of roses, two ounces and a half.)

TINCTURA ALOES. Tincture of Aloes. (Socotrine aloes, in coarse powder, half an ounce ; extract of liquorice, one ounce and a half; proof spirit to make twenty fluid ounces.)

VINUM ALOES. Wine of Aloes. (Socotrine aloes, one ounce and a half ; cardamoms, ground, eighty grains ; ginger, in coarse powder, eighty grains ; sherry, two pints. By maceration.)

Socotrine aloes is also contained in extractum colocynthidis compositum, pilula rhei composita, and tinctura benzoini composita.

Therapeutics. Aloes, when taken internally, acts as a purgative, affecting chiefly the lower portion of the intestinal canal, sometimes causing hæmorrhoids. The secretions of the tube are but little augmented, and the action is slow in character ; by some observers the bile is asserted to be increased in quantity, and the drug appears to influence the whole portal circulation. Emmenagogue effects also are frequently produced. Upon the upper part of the canal, tonic and stomachic effects seem to be induced when small doses of aloes are administered.

Aloetic preparations are given in cases of habitual constipation, and are of great value from the little disposition they possess to produce a subsequent confined state of the bowels.

In chronic dyspepsia they frequently form a portion of the habitual pill, and may be combined with tonics and stomachics. They are often used as adjuncts to other purgatives, as colocynth,

rhubarb, scammony, &c., when full cathartic effects are desired, and when there is a defective secretion of bile.

Combined with iron and myrrh, aloes is frequently given in amenorrhœa, connected with defective action of the pelvic organs and an anæmic condition of the blood.

Aloes should be avoided in cases where there is much tendency to hæmorrhoids, or when inflammatory action is present in the abdominal organs.

There appears to be but little difference of action between the officinal species of aloes. Although on this point there is considerable discrepancy of opinion, some physicians think that the extract of Barbadoes aloes is more efficient than the same amount of extract of the Socotrine variety. Cape aloes, however, which is not unfrequently employed, is less active than the others.

Aloes frequently induce much griping, especially if administered alone, and this unpleasant property is frequently ascribed to the resinous portion of the drug. The author made numerous observations on this point in 1860, and found that where the extract and the resinous residue were administered to patients, the extract proved far more active as a purgative than the resin, and also caused much griping: in the same subject the resin caused little or no griping; it often proved almost inert. Dr. F. Farre made similar observations at the same time, and with the same results.

Dose. Of either Barbadoes or Socotrine aloes, in powder, 2 gr. to 6 gr.; of the extract of aloes, 2 gr. to 6 gr.; of the compound decoction of aloes, 1 fl. oz. to 2 fl. oz.; of the Barbadoes or Socotrine aloes pill, 4 gr. to 15 gr.; of aloes and assafœtida pill, 5 gr. to 15 gr.; of aloes and iron pill, 5 gr. to 10 gr.; of aloes and myrrh pill, 5 gr. to 15 gr.; of the tincture of aloes, 1 fl. drm. to 3 fl. drm.; of the wine of aloes, 1 fl. drm. to 2 fl. drm.

Smaller doses may be given as adjuncts to other purgatives, or when the drug is given in combination with stomachics.

MELANTHACEÆ.

Veratrum. White Hellebore. The rhizome of Veratrum album; growing in the Pyrenees and Alps. (Not officinal.)

Description. The rhizome is met with in conical truncated pieces, about two or three inches long, and about one inch in diameter, with numerous radicles proceeding from it; yellowish-brown and wrinkled on the outside, light-coloured within, with little odour when dry, but an acrid bitter taste.

Prop. & Comp. White Hellebore contains the alkaloid, ***veratria***, (*q. v.*), united with an acid formerly considered to be gallic acid, probably *veratric*. It also contains *jervine* ($C_{30}H_{46}N_2O_3$), an alkaloid which crystallizes in colourless prisms, soluble in alcohol, insoluble in water.

Prep. VINUM VERATRI, *Lond.* 1851. Wine of White Hellebore. (White hellebore, sliced, eight ounces; sherry wine, two pints. Macerate for seven days, and strain.)

Therapeutics. Veratrum acts as a powerful emetic and drastic purgative, causing much thirst and irritation of the alimentary canal; when applied to the mucous membrane of the nose, intense sneezing results; and on the skin it also acts as a topical irritant. It is not much employed as a remedy at the present time, but was formerly given in cerebral affections, as mania, epilepsy, &c. It has been proposed as a remedy in gout, in lieu of colchicum, but from the author's experience of its effects, he is sure that its action differs completely from that of colchicum; it appears to produce a burning sensation in the œsophagus, parched mouth, and intense thirst, accompanied by great depression, without any alleviation of the gouty symptoms. Externally veratrum is used in scabies, and occasionally in obstinate skin affections, in the form of the compound sulphur ointment of the London Pharmacopœia, 1851. (*See* Veratria.)

Dose. Of wine of white hellebore, 10 min. to 20 min.

Veratri Viridis Radix. Green Hellebore Root. The dried rhizome of Veratrum viride; American or Green Hellebore; called also Swamp Hellebore and Indian Poke; growing in the marshy and swampy districts of the United States and Canada.

Description. The rhizome is thick and fleshy, and sends off numerous pale yellow radicles; it resembles closely, in appearance and sensible properties, Veratrum album; it has a peculiar acrid taste, and produces the same sensation of tingling about the fauces as the white hellebore.

Prop. & Comp. This rhizome is stated to contain two alkaloids, *Viridia* and *Veratroidea*, the former of which is soluble, while the latter is insoluble in ether. Besides these, it contains a *resin*, which is physiologically inert.

Off. Prep. TINCTURA VERATRI VIRIDIS. Tincture of Green Hellebore. (Green hellebore root, four ounces; rectified spirit, a pint. Macerate and percolate.)

Therapeutics. Veratrum viride appears to act upon the system

in a manner very analogous to Veratrum album, causing topical irritation, as shown by the dryness of the fauces and vomiting; and after absorption it produces extreme depression of the heart, arterial and nervous systems; it has been stated to differ from white hellebore in not causing purging, but cases are on record of poisoning with white hellebore, without the occurrence of this symptom. Possibly the production of purging may depend on the form in which it is given, whether in substance or solution. Veratrum viride is asserted to be a valuable agent in controlling the vascular system in cases of inflammatory disease, and especially in rheumatic fever, gout, and allied affections. The depression and slowness of the pulse appear to be characteristic symptoms of its action. The researches of Dr. H. C. Wood have led him to conclude that Viridia and Veratroidea both exert a depressant influence on the heart, and probably upon the spinal cord. Viridia is slightly, if at all, a topical irritant; it causes neither purging nor vomiting. Veratroidea, on the other hand, causes both these symptoms, and has a somewhat irritant local action. Neither of the alkaloids affects the brain. Dr. Wood concludes that the peculiar sedative influence of veratrum viride may be obtained by the use of viridia, without causing the nausea and vomiting due to the veratroidea.

The effect of this drug has been somewhat extravagantly vaunted by some American practitioners and stated by them to be superior to blood-letting, antimony, digitalis, colchicum, and all other depressing remedies. A careful and impartial clinical study of its therapeutic value is a desideratum.

Dose. Of the powdered rhizome, 1 gr. to 3 gr. or more; of the tincture, 5 min. to 20 min. or more; an extract is sometimes made from the fresh juice, of which the dose is $\frac{1}{4}$ gr. to $\frac{3}{4}$ gr. or more.

This drug should be used with caution, and any symptom of depression carefully watched for.

Sabadilla. Cevadilla. The dried fruit of Asagræa officinalis; imported from Mexico.

Veratria. An alkaloid obtained from Cevadilla; not quite pure.

Description. The *fruit* is about half an inch long, consisting of three light-brown papyraceous follicles, each containing from one to three seeds, which are about a quarter of an inch long, blackish-brown, shining, slightly winged, with an intensely bitter acrid taste. *Veratria* usually occurs in the form of a white or dirty-white powder.

Prop. & Comp. The cevadilla fruit owes its virtues to the alkaloid *veratria*, which is almost insoluble in water, sparingly soluble in ether, but freely soluble in alcohol, and readily so in dilute acids, leaving traces of an insoluble brown resinoid matter. It has no odour, but a strongly and persistently bitter and highly acrid taste. Veratria ($C_{32}H_{52}N_2O_8$) is crystalline, and can be obtained in long needles from an alcoholic solution; though the veratria used in medicine is always in an amorphous state. Brought in contact with strong sulphuric acid, it assumes an intense red colour, and with nitric acid forms a yellow solution. The veratria of commerce contains another principle, *sabadillina*, insoluble in ether, thus differing from veratria; it does not excite sneezing. Gallic acid appears to be united with veratria in the cevadilla fruit.

Off. Prep.—Of Veratria. Unguentum Veratriæ. Ointment of Veratria. (Veratria, eight grains; prepared lard, one ounce; olive oil, half a fluid drachm.)

Veratria. The alkaloid is ordered to be made by macerating cevadilla with boiling distilled water, then drying and separating the seeds, which are ground in a coffee mill, and thoroughly exhausted with rectified spirit. The alcoholic solution is concentrated so long as no deposit forms, and then poured, when hot, into twelve times its bulk of cold distilled water. The precipitate of resin thus formed is removed by filtration, and washed; and to the filtered liquid, which contains the veratria in combination with gallic acid, ammonia is added in slight excess, which combines with the gallic acid, setting the insoluble veratria free; the precipitate of which is allowed completely to subside, then collected on a filter and washed; while still moist, it is diffused through distilled water, and sufficient hydrochloric acid is added to make the fluid acid, forming a hydrochlorate of veratria. It is then decolorized with animal charcoal, filtered, re-precipitated with ammonia, the precipitate washed on a filter till the washings cease to be affected by a solution of nitrate of silver acidulated with nitric acid, and finally dried by imbibition and on a steam bath.

Therapeutics. When brought in contact with the mucous lining of the nasal passages, veratria causes violent sneezing. Applied to the unbroken skin, it excites a sensation of warmth and pricking. Taken internally, it causes nausea and vomiting, diarrhœa, formication in the extremities; the pulse is rendered weak, slow, and ultimately irregular; the temperature falls;

there is muscular weakness and twitching; finally convulsions ensue, collapse and death.

The action of veratria upon the heart is peculiar; its first effect is a transient quickening, ascribed by Bezold to stimulation of the motor ganglia; this is followed by a retardation due to the influence of the alkaloid upon the vagi. Veratria has an immediate effect on the voluntary muscles; the tetanoid spasms which it causes are not arrested by separating the muscles from their connection with the spinal cord (differing in this respect from the spasms due to strychnia). It does not appear to exert any direct influence on the brain or cord.

Veratria has been employed medicinally in acute febrile affections of a sthenic type (erysipelas, lobar pneumonia) to reduce the pulse and temperature; it is undoubtedly capable of producing this effect; but there is no evidence to show that the course of the disease is shortened, or that its issue is rendered more favourable; besides, the vomiting and purging caused by the drug are often very undesirable complications. It has also been used in acute rheumatism and gout; it does not exercise the specific influence of colchicum over the latter disease. Externally, the ointment has been found to relieve pain in neuralgia of the fifth nerve; it may be used as a substitute for aconite. (*See* Veratrum album.)

Dose. $\frac{1}{12}$ gr. to $\frac{1}{6}$ gr. It should be exhibited with great care if used internally.

Colchici Cormus. Colchicum Corm. The fresh Corm of Colchicum autumnale, the Meadow Saffron, collected about the end of June; and the same stripped of its coat, sliced transversely, and dried at a temperature not exceeding 150° Fahr.; wild herb; indigenous.

Colchici Semen. The Seeds, fully ripe, of Colchicum autumnale.

Description. The *corm* is about the size of a chestnut, and of a somewhat similar shape, being convex on one side, and flattened or slightly concave on the other, where it has an undeveloped bud. When recent, it is solid and fleshy with an external brown membranous coat, internally white, and yielding a milky juice on section. There is often a small lateral projection from its base. When dried and deprived of its outer coat, it is of an ash-grey colour; it is generally met with in transverse slices of a somewhat oval shape, about a line thick, firm, flat

whitish, and amylaceous; one border convex, the other concave or slightly hollowed out. The taste is bitter and acrid. The *seeds* are spherical, externally of a reddish-brown colour, white within, rather more than a line in diameter, and about the size of black mustard seed.

Prop. & Comp. The corm, and also the seeds, contain fatty matters, gum, starch, lignin, with a peculiar acid—the *Cevadic* acid—and a crystalline principle, *Colchicine*, formerly supposed to be identical with veratria, but differing from it in many of its properties, its taste being less burning, by its not exciting sneezing, and its solubility in water being very much greater; it is also soluble in alcohol; it has very seldom been isolated.

Off. Prep.—Of the Corm.

Extractum Colchici. Extract of Colchicum. (The expressed juice, heated to 212°, strained and evaporated at a temperature not exceeding 160°, to the proper consistence.)

Extractum Colchici Aceticum. Acetic Extract of Colchicum. (As the above, with the use of six fluid ounces of acetic acid to seven pounds of corms deprived of their coats.)

Vinum Colchici. Wine of Colchicum. (Colchicum corm, dried and sliced, four ounces; sherry, twenty fluid ounces. Prepared by maceration.)

Of the Seeds.

Tinctura Colchici Seminum. Tincture of Colchicum Seed. (Colchicum seed, bruised, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. Colchicum in medicinal doses produces increased action of some of the secreting organs; the bile appears to be thrown out in larger quantities, and the fæces become more coloured, and often give evidence of containing the real organic portion of that fluid as well as the colouring matter.

The urine is sometimes increased in quantity, and it is generally asserted that the urea and uric acid are also augmented, but from numerous trials the author is inclined to question the accuracy of the last assertion; at times, also, the action of the skin is increased.

The heart's action is diminished, and in some patients, intermission of the pulse is produced by the drug; in large doses, vomiting and purging, accompanied by intense prostration, ensue.

In gout, when colchicum is administered to patients suffering from inflammation and pain, these symptoms are usually greatly

relieved, and to such an extent does this occur, that the drug is regarded as almost a specific in an acute attack of the disease. Colchicum is employed very extensively in the different forms of gout; sometimes given in small doses short of inducing purging, at other times to act freely on the bowels; it certainly possesses a power of controlling the pain and inflammation in gout, independent of all evident increase of the secretions; in what way this effect is produced is at present unknown.

In acute rheumatism and other inflammatory affections, colchicum often relieves, probably rather by its controlling power over the heart's action, than by any specific effect of the medicine.

Colchicum may also be very advantageously given in cases of imperfect action of the liver, as a cholagogue, combined with other purgatives; and it may be often substituted for mercurials. It has occasionally been prescribed in dropsies and skin affections.

Some practitioners prefer the seeds, some the corm, some again the flowers; it appears however most probable, that the same principle gives activity to all parts of the plant, and that any difference is in degree rather than in character.

Dose. Of powdered colchicum corm, 2 gr. to 8 gr.; of extract of colchicum, ½ gr. to 2 gr.; of acetic extract of colchicum, ½ gr. to 2 gr.; of tincture of colchicum, 10 min. to 30 min.; of wine of colchicum, 10 min. to 30 min.

PALMACEÆ.

Areca. Areca Nut. The seed of Areca Catechu, the Betel-nut Tree. Imported from the East Indies.

Description. The seeds resemble horse-chestnuts in size and shape; they are of a rusty grey colour, very hard, with a tesselated surface and well-marked hilum. When split open, the albumen is seen to be ruminated; the cut surface resembling that of a nutmeg.

Comp. They contain *catechu-tannic* and *gallic* acid, together with *oily matter*, *gum*, and *areca-red*, a substance of a reddish-brown colour, insoluble in cold water and ether, soluble in boiling water and alkaline liquids. Boiled with nitric acid, it yields oxalic acid.

Therapeutics. Mixed with Chavica leaves and quick-lime

areca nut forms Betel, the well-known masticatory of the East. It is supposed to impart fragrance to the breath, to fortify the teeth and gums, to act as a preservative against dysentery, and to possess certain stimulant and narcotic properties. Areca is undoubtedly astringent, like catechu and kino; it may also be used as an anthelmintic for the expulsion of tapeworm. The powdered charcoal from the nut is employed as a dentifrice.

Dose. As an astringent, 15 gr. to 30 gr. As an anthelmintic, ½ oz. to ¾ oz.

GRAMINACEÆ.

Farina Tritici. Wheaten Flour. The flour of the seed ground and sifted, of Triticum vulgare; growing in Europe, and cultivated also over the greater part of the civilized world.

Mica Panis. Crumb of Bread. The soft part of bread made with wheaten flour.

Amylum. Starch. Starch procured from the seed of Triticum vulgare.

Description. These substances are too well known to need description. Starch occurs in white columnar masses, which become blue with solution of iodine.

Prop. & Comp. Flour consists chiefly of *starch* and *gluten*, together with gum, sugar, mucilage, and water. If kneaded under a stream of water, the starch is washed away, and a tenacious mass left behind, which consists of gluten, constituting from 10 to 12 per cent. of the flour. *Gluten* prepared in the above manner consists of two different substances; one of which is soluble in alcohol, pure gluten, or vegetable fibrine; the other, insoluble in that menstruum, known as vegetable albumen. *Starch* occurs as a white granular powder, without odour or taste, which under the microscope is found to consist of grains of varying size, having more or less of a circular outline and flattened, the hilum in the centre being surrounded by a series of concentric rings reaching sometimes nearly to the circumference. Each grain is formed of a thin external albuminous coat, containing a substance which is termed amidin or gelatinous starch. When rubbed in a Wedgwood mortar with a little cold distilled water, it is neither acid

nor alkaline to test-paper, and the filtered liquid does not become blue on the addition of a solution of iodine.

Amidin is the same from whatever source derived, and it is to the different forms of the external coat that the peculiarities of the different granules of starch, when derived from different sources, are due. Amidin is soluble in hot water, but starch requires boiling for some little time, in order that the contents of the granules may swell and burst the envelope, before a solution can be made. Amidin strikes a fine blue colour on the addition of free iodine, forming a compound (Iodide of Amidin) which is a ready means of detecting its presence; this blue colour is destroyed by a heat of 200° Fahr., but returns when the solution cools. By heating for some time with dilute sulphuric acid, starch is first converted into *dextrine*, and afterwards into *glucose* or grape sugar. Strong nitric acid changes starch into oxalic acid. The composition of amidin or gelatinous starch is represented by the formula $C_{12}H_{20}O_{10}$.

Off. Prep. Of Amylum. Glycerinum Amyli. Glycerine of Starch. (Starch, one ounce; glycerine, eight fluid ounces. Rub them together; then apply heat to 240° Fahr., stirring constantly until the starch particles are completely broken up and a transparent jelly is formed.)

Mucilago Amyli. Mucilage of Starch. (Starch, one hundred and twenty grains; distilled water, ten fluid ounces. Prepared by trituration and boiling.)

Starch also enters into the composition of the compound tragacanth powder.

Therapeutics. Made into bread, *flour* forms a well-known nutritive article of diet. In medicine it is chiefly used in the form of bread crumb (mica panis), for giving consistence to pills; it is also employed as an emollient cataplasm. Flour is used as an ingredient of the yeast poultice. *Starch* is a mild nutritive demulcent; in the form of mucilage, it is used as a vehicle for enemata, and in conjunction with glycerine it forms a useful sheathing compound in cases of chilblains and roughness of the skin.

Hordeum Decorticatum. Pearl Barley. The husked seeds of Hordeum distichon; cultivated in Britain.

Description. Chiefly seen in the shops in the form of pearl barley, white, rounded, retaining a trace of the longitudinal

furrow. It consists of the seeds decorticated and rounded in a mill.

Prop. & Comp. It contains *gluten, starch,* gum, and saccharine matters.

Off. Prep. DECOCTUM HORDEI. Decoction of Barley. (Pearl barley, two ounces ; boiling distilled water, thirty fluid ounces. Prepared by washing the barley well in cold water, rejecting the washings ; and subsequent decoction.)

Therapeutics. Used in medicine in the form of decoction as a mild nutritive and demulcent drink.

Dose. Ad libitum.

Ergota. Ergot. The sclerotium (compact mycelium or spawn) of Claviceps purpurea, produced within the paleæ of the common rye, Secale cereale. Secale cornutum, Spurred Rye.

Description. Ergot occurs in grains, varying in length from one-third of an inch to an inch, and in breadth in the same proportion ; somewhat triangular in form, curved, obtuse at the ends, furrowed on two sides, of a purple or brown colour, covered more or less by a bloom ; moderately brittle ; fracture short, exhibiting a white or pinkish interior ; odour faint, but in large quantities, strong and peculiar. Ergot has been considered as a fungus growing in the place of the ovary between the glumes. The view indicated in the above definition seems to be the one more generally entertained at present.

The healthy grain of rye consists of the seed-coat, composed of outer and inner layers, and the cells, containing gluten ; and next, the cells of albumen, containing starch. In the ergotized grain, the seed-coat and gluten-cells are replaced by a layer of dark cells—the large cells of the albumen by the small cells of the ergot, and the starch grains of the albumen-cells by drops of oil. The bloom consists of the sporidia of the fungus.

The ergot is liable to be fed on by a species of acarus, which sometimes destroys the whole interior, leaving only the outer shell and its own excrementitial matter.

Prop. & Comp. Ergot contains a large quantity of fixed oil, about 35 per cent. ; this was at first thought to be the active principle ; subsequent researches have shown, however, that the fixed oil, when obtained by expression, is inactive, and it would seem that the active principle is extracted with the oil, and

remains dissolved in it, but that the oil itself is not that principle. A peculiar reddish-brown substance having active properties has been named *Ergotine*, soluble in water, forming a red solution, and having a strong bitter taste. It is stated that ergotine constitutes about 15 per cent. of the ergotized grain. By distillation with potash, trimethylamine (C_3H_9N) has been procured from ergot, a substance having the peculiar odour of herring pickle. Ergot yields its virtues to alcohol and water.

Off. Prep. Extractum Ergotæ Liquidum. Liquid Extract of Ergot. (Ergot, in coarse powder, one pound; ether, twenty fluid ounces, or a sufficiency; distilled water, seventy fluid ounces; rectified spirit, eight fluid ounces. The product should measure sixteen fluid ounces. Prepared by removing the oily matters by percolating with well-washed ether, digesting the marc in water at 160°, evaporating this liquid, and then adding spirit, and filtering from the coagulum which is formed.) Each fluid part of this extract represents a solid part of the drug.

Infusum Ergotæ. Infusion of Ergot. (Ergot, in coarse powder, one quarter of an ounce; boiling distilled water, ten fluid ounces.)

Tinctura Ergotæ. Tincture of Ergot. (Ergot, bruised, five ounces; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

Therapeutics. It has been experimentally proved that ergot causes contraction of the minute arteries by acting on their muscular walls, and thereby increases the systemic blood-pressure. Previous division of the vaso-motor nerves does not prevent its action on the arterioles. When injected into the jugular vein it causes contraction of the pulmonary arterioles and thereby suddenly lowers the blood-pressure in the systemic arteries. It also exerts a peculiar influence on the uterus, probably through the spinal cord, causing powerful contractions, especially when the patient is in a pregnant state. When taken for a long period in small quantities, as in the form of bread made from ergotized grain, it produces a species of gangrene, resembling gangrena senilis, probably due to its causing obstruction of the vessels by diminishing their calibre. In large doses it induces nausea, vomiting, delirium, stupor, and even death. Its action is said to diminish the frequency and fulness of the pulse. It is most frequently employed to cause contraction of the uterus in cases of labour, and the contractions induced by it differ from the natural ones in being continued, instead of alternating with

relaxation. In hæmorrhage after delivery it is especially indicated, and it is also of great value in menorrhagia, leucorrhœa, and sometimes in amenorrhœa, when not depending on anæmia, but rather on a torpid condition of the uterus. Moreover, it is a valuable means of checking hæmorrhage, whether from the lungs or bowels. Ergot has been given in many other diseases, as in paraplegia. Ergotin has been administered subcutaneously in order to promote the expulsion of intra-uterine submucous fibroids. It appears to cause considerable local irritation when given in this way.

Dose. Of the liquid extract, 10 min. to 30 min. or to 1 fl. drm.; of the infusion, 1 fl. oz. to 2 fl. oz.; of the tincture, 10 min. to 1 fl. drm.; of the powder, 20 gr. to 30 gr. (Infused in boiling water for about twenty minutes, and both infusion and dregs taken.)

Saccharum Purificatum. Refined Sugar. $C_{24}H_{22}O_{22}$, or $C_{12}H_{22}O_{11}$. The purified crystalline juice prepared from the stem of Saccharum officinarum; cultivated in the West Indies and other tropical climates.

Description. White or lump sugar is too familiar as an article of domestic economy to receive detailed description. It occurs in compact crystalline conical loaves, snow white, dry, scentless, and intensely and purely sweet.

Prop. & Comp. The uncrystallizable liquid forming the mother liquor from which the sugar is crystallized is molasses or treacle; the crystalline portion is clarified and refined in a manner the description of which would occupy too much space in a work of the present size. *Cane sugar* has the formula ($C_{12}H_{22}O_{11}$); it is soluble in half its weight of cold, and in a much less quantity of hot, water; a very strong and viscid solution is called syrup. Carefully crystallized from a strong solution with the addition of spirit, it forms oblique four-sided prisms, *sugar candy*. Heated to 365° Fahr., it melts, forming a viscid liquid, which when suddenly cooled, solidifies into an amorphous transparent substance, called *barley sugar*. It is less soluble in water than grape sugar, and readily converted into that substance by the action of weak acids, or by fermentation.

Off. Prep. Syrupus. Syrup. (Refined sugar, five pounds; distilled water, forty ounces. The sp. gr. should be 1·33.)

Sugar is used in the formation of the other syrups of the Pharmacopœia, and in various other preparations.

Therapeutics. Sugar is demulcent; its sweet taste renders it useful to cover the unpleasant flavour of some remedies.

Dose. Of sugar or syrup, ad libitum.

Adulteration. Sugar is liable to contain some sulphate of lime, and also lead, from its mode of purification; but the proportion of these substances is so minute, as to be innocuous in the amount given medicinally, though not harmless when sugar is daily used in considerable quantities for domestic purposes.

Theriaca. Treacle. Sacchari Fæx. The uncrystallized residue of the refining of sugar.

Prop. & Comp. Treacle occurs as a dark reddish-brown thick fluid; very sweet; sp. gr. 1·40. It consists chiefly of sugar rendered uncrystallizable by heat: it is capable of fermentation with yeast, and then yields rum by distillation. It should be free from a burnt odour and taste.

Theraveutics. Treacle acts as a slight laxative, in doses of a teaspoonful and upwards; it is often given in combination with sulphur.

CLASS III. ACOTYLEDONES.

Sub-Class I. Acrogenæ.

FILICES.

Filix Mas. Male Fern. The dried rhizome with the bases of the footstalks and portions of the root fibres of Aspidium Filix-mas; Male Shield Fern; indigenous; it should be collected in summer.

Description. The central part, or caudex, is thick and cylindrical, with numerous leaf-stalks surrounding the axis; the spaces intervening between are covered with silky scales, and numerous radicles descending beneath them. The dried root is of a greenish-brown colour externally, yellowish within, with a peculiar though slight odour, and a taste at first sweet, then bitter. The colour of the powder is yellowish-green, with a disagreeable odour and a nauseous, bitter, somewhat astringent taste.

Prop. & Comp. In addition to starch, gum, and salts, the male fern contains a *volatile oil*, *resin*, and a *fixed oil*. The active properties of the rhizome are soluble in ether; the ethereal extract

referred to below, commonly known as the *oil of male fern*, is of a dark green colour, containing the volatile and fixed oil, resin, and colouring matter in solution.

Off. Prep. Extractum Filicis Liquidum. Liquid Extract of Fern Root. (Fern root, in coarse powder, two pounds; ether, eighty fluid ounces, or a sufficient quantity to exhaust the root. Prepared by percolation and subsequent evaporation or distillation of the ether.)

Therapeutics. Fern root is used as an anthelmintic, and acts apparently by killing the worms, and thus aiding their expulsion from the intestinal canal. Its use has been attended with much success in cases of tapeworm; it is said to be more useful against the Bothriocephalus latus than against the Tænia solium. It should be given on an empty stomach, and followed after an interval by some mild purgative. Upon the whole, liquid extract of male fern is perhaps the most valuable and most extensively employed of any anthelmintic in this country for the removal of tapeworms, and the small bulk of the dose is a great desideratum.

Dose. Of the powder, 60 gr. to 180 gr.; of the liquid extract, 15 min. to 30 min., or 1 fl. drm.

Sub-Class II. Thallogenæ.

LICHENES.

Cetraria. Iceland Moss. Cetraria islandica; Lichen islandicus; Island Lichen or Moss; Liverwort; the entire lichen obtained in large quantities in Iceland, hence its name.

Description. Iceland moss consists of a foliaceous thallus, the lobes irregularly subdivided, crisp, cartilaginous, brownish-white, paler beneath, fringed at the edges; bitter and mucilaginous.

Prop. & Comp. The soluble portion is taken up by boiling water. The decoction thickens on cooling, and deposits a gelatinous matter; this when dried forms a semi-transparent mass, insoluble in cold water, alcohol, or ether, but soluble in boiling water, and strikes blue with iodine; it is named *Lichenin.* Iceland moss contains also a *bitter principle*, soluble in alcohol and ether, and readily in alkaline solutions, but sparingly so in water; this is crystallizable, and has acid properties; it is called *cetraric acid.*

Off. Prep. Decoctum Cetrariæ. Decoction of Iceland Moss. (Iceland moss, well washed in cold water, one ounce; distilled water, thirty fluid ounces. Reduce to twenty by boiling.)

Therapeutics. Iceland moss, deprived of its bitter principle, is used by the natives of Iceland and Lapland as an article of diet. The decoction is demulcent and slightly tonic. The cetraric acid is said to have been useful in intermittents as a substitute for quinine.

Dose. Of the decoction, 1 fl. oz. to 2 fl. oz.

Lacmus. Litmus. Appendix. A peculiar blue colouring matter, obtained from Roccella tinctoria, Lecanora tartarea, and other lichenous plants. Litmus is extensively prepared in Holland.

Prep. It is prepared by macerating the lichen for some time in water, rendered alkaline by lime and potash, and mixed with urine; a species of fermentation occurs: the mass becomes first red and afterwards blue: it is then removed and reduced to the proper consistence by sand, lime, &c.

Prop. It occurs in small cakes, made up of a granular powder, of a fine blue colour.

Off. Prep. Tincture of Litmus. Appendix. (Made by digesting one ounce of powdered litmus in ten fluid ounces of proof spirit.)

Blue Litmus Paper. Appendix. (Made by steeping unsized paper in the tincture of litmus, and drying by exposure to the air.)

Red Litmus Paper. Appendix. (Made by steeping unsized paper in the tincture previously reddened with a trace of sulphuric acid, and dried in the air.)

Uses.—Blue Litmus Paper is used as a test for acids, as any liquid having an acid reaction turns the colour of the paper from blue to red.

Red Litmus Paper, on the contrary, serves to indicate the presence of any substance having an alkaline reaction, which restores the original blue colour to the paper.

The *Tincture of Litmus,* when diluted with water, may be used as a test for the presence of acids.

ANIMAL KINGDOM.

CLASS, MAMMALIA.

RODENTIA.

Castoreum. Castor. The dried follicles of the prepuce of Castor Fiber, the Beaver, filled with a peculiar secretion; dried and separated from the somewhat shorter and smaller oil-sacs, which are frequently attached to them: from the Hudson's Bay Territory.

Description. The follicles are in pairs, about 3 inches long, fig-shaped, firm and heavy, brown or greyish-black, and contain a dry resinous highly odorous secretion. The castor of commerce is of two varieties, the Russian and Canadian; the former is the most highly prized. This substance is secreted by a pair of membranous pear shaped follicles, situated between the anus and external genitals, and united by a common duct to one another. It is a dark-coloured matter, of the consistence of putty, with a peculiar odour. In Russian castor, the sacs are larger, fuller, and have a stronger smell. In the Canadian variety, they are more or less wrinkled externally, and the contents inferior. The consistence of the contents varies with the amount of water present.

Prop. & Comp. Castor contains *volatile oil*, uric, phosphoric and benzoic acids, combined with potash, soda, and lime, also carbonate of ammonia, *salicine*, *carbolic acid*, and a peculiar principle, *castorin*. Its active properties are taken up by ether and alcohol; slightly by water; but they are decomposed by boiling for some time. The contents of the sacs should be in great part soluble in rectified spirit and ether.

Off. Prep. TINCTURA CASTOREI. Tincture of Castor. (Castor, one ounce; rectified spirit, twenty fluid ounces. Prepared by maceration.)

Therapeutics. Castor is stimulant and antispasmodic; hence it has been used in hysteria and epilepsy, and also to rouse the system in cases of an adynamic type, as in typhoid pneumonia.

Dose. In substance, 5 gr. to 10 gr.; of tincture, ½ fl. drm. to 1 fl. drm.

RUMINANTIA.

Moschus. Musk. The inspissated and dried secretion from the follicles of the prepuce of Moschus moschiferus; native of Thibet and other parts of Central Asia. Imported from China and India.

Description. Musk is contained in a sac situated midway between the umbilicus and the prepuce; the sac is oval and hairy, opening externally by a narrow orifice, small and hairy at its anterior part; internally, lined by a smooth membrane, secreting the musk. There are two chief varieties, the Chinese and the Russian. The sacs are about two inches in diameter, hairy on one side, destitute of hair on the other, with the hairs concentrically arranged round the opening; the Chinese sacs are the smallest, and the colour of the hairs darker than in the Russian variety. From 100 to 200 grains of musk are contained in each sac.

Prop. & Comp. Musk occurs in irregular, reddish-black, rather unctuous grains concreted together, soft to the touch; the odour is very strong, and diffuses itself over a great space; it contains ammonia, stearine, oleine, cholesterine, various salts, and small quantities of animal matter, with a *volatile oil*, thought by some to be in combination with ammonia; the proportion of these substances varies in different specimens; the active ingredients are soluble in alcohol and ether. Potash evolves ammonia and increases the peculiar odour.

Therapeutics. Musk is stimulant and antispasmodic, resembling castor in its action, and is useful in the same class of cases.

Dose. 5 gr. to 10 gr. and upwards.

Adulteration. On account of the high price of this drug, it is very liable to be adulterated; the sac containing the musk is often emptied of its contents, and filled up with a mixture of dried blood, with a greater or less proportion of true musk, and the sac carefully closed again: traces of the opening should be sought for. Sacs are manufactured from the scrotum or skin of the animal, and filled with a spurious mixture of musk, sand, and dried blood. The form and character of the bag should be noted, to see whether it differs from that described as genuine: the bag, if made from any other portion of the skin, may be recognised by

the peculiar arrangement and microscopic character of the hairs; those of the true sac exhibit distinct, regular colour-cells, not found in the hairs of spurious pods.

Sevum Præparatum. Prepared Suet. The internal fat of the abdomen of Ovis Aries, The Sheep; purified by melting and straining.

Description. Suet is the fat of the sheep chiefly obtained from the region of the kidney. It is prepared by melting at a gentle heat, and straining.

Prop. & Comp. Suet is white, soft, smooth, almost scentless, fusible at 103°; it is soluble in ether and boiling alcohol; it consists principally of *stearine* and *oleine*. *Stearine* forms the chief portion of suet; it may be obtained crystallized from an ethereal solution, and then appears in small white shining plates; fuses at 143° Fahr., and when it solidifies, becomes opaque, and loses it crystalline character; it is soluble in alcohol and boiling ether, but insoluble in cold ether; its formula is $C_{57}H_{110}O_6$, or $C_3H_5'''.3C_{18}H_{35}O.O_3$, that is, it is glycerine ($C_3H_5'''.H_3.O_3$), with three atoms of hydrogen replaced by the radicle of stearic acid ($C_{18}H_{35}O$); and it can be decomposed into these substances by the action of alkalies, glycerine and alkaline stearate being formed

$$\left.\begin{matrix} C_3H_5''' \\ 3C_{18}H_{35}O' \end{matrix}\right\} O_3 + 3\left.\begin{matrix} K \\ H \end{matrix}\right\} O = \left.\begin{matrix} C_3H_5 \\ H_3 \end{matrix}\right\} O_3 + 3\left.\begin{matrix} C_{18}H_{35}O \\ K \end{matrix}\right\} O.$$

Oleine is the more liquid constituent of fat: it forms an oily fluid varying in quantity in the different varieties of fat, and generally holds in solution more or less of the solid constituents, from which it is separated completely with some difficulty. It exists in large quantity in the vegetable oils; it is more soluble in alcohol than either stearine or margarine. The composition of oleine is $C_{18}H_{104}O$, or $C_3H_5'''.3C_{18}H_{33}O.O_3$, and it is related to glycerine in the same way that stearine is, three atoms of the radicle of oleic acid ($C_{18}H_{33}O$) replacing three atoms of hydrogen in the glycerine. By the action of an alkali it is converted into glycerine and oleate ($M'C_{18}H_{33}O_2$) of the metal M'.

Therapeutics. Suet is emollient, and is used in the preparation of certain ointments and plasters, sometimes also as an addition to poultices.

Lac. The fresh milk of the cow, Bos Taurus. Used in the preparation of Mist. Scammonii.

Saccharum Lactis. Sugar of Milk ($C_{24}H_{24}O_{24}$, or $C_{12}H_{24}O_{12}$). Crystallized sugar, obtained from the whey of cow's milk by evaporation.

Prep. The milk is coagulated, the curd separated, and after the whey has been evaporated to the crystallizing point, pieces of wood or cord are introduced, upon which the milk sugar crystallizes.

Prop. & Comp. Milk sugar occurs in cylindrical masses, about 2 inches in diameter and several inches in length, having an axis of cord or wood: the masses are composed of crystals, greyish white, translucent and hard; without odour, and with a slightly sweet taste; it is gritty in the mouth from the slight solubility of the sugar in the saliva. Milk sugar consists of a crystalline principle, termed Lactin or Lactose, which has the composition $C_{12}H_{24}O_{12}$; or it may be represented by the formula $C_{12}H_{22}O_{11}.H_2O$, the water in the compound being capable of being removed by a heat above 266° Fahr. Lactose can be obtained in 4-sided prisms, terminated by 4-sided pyramids; it is soluble in about 6 times its weight of water, the solution being much less sweet than that of cane sugar; it is not soluble in alcohol or ether. It is not subject to alcoholic fermentation, but milk is so from the prior slow conversion of the lactose into glucose. When milk ferments in contact with chalk, lactic acid is formed.

Therapeutics. It may be employed for the purpose of rubbing up powerful medicinal powders, as white bismuth, calomel, hydrochlorate of morphia, &c. Its action as a remedy is not readily appreciable. Probably milk sugar might be advantageously employed as a substitute for cane sugar in the diet of infants, being less irritating to the mucous membranes. Cow's milk diluted with water, with the addition of milk sugar, forms a good substitute for the milk of the human female.

Dose. Ad libitum.

Fel Bovinum Purificatum. Purified Ox Bile. The fresh bile of Bos Taurus, the Ox; purified.

Prep. Mix fresh gall with twice its volume of rectified spirit, and after twelve hours, when the sediment has subsided, evaporate the decanted liquid over a water bath until it has acquired the consistence of a vegetable extract. By this process the mucus which is always present in bile is separated by the action of the spirit, and the preparation is thus rendered much less prone to putrefaction.

Prop. & Comp. A yellowish-green substance, somewhat firm and adhesive, having a faint and peculiar odour, and a taste at first very sweet, but soon becoming intensely bitter; it is soluble both in water and spirit. Bile, when separated from the mucus of the gall bladder, consists of two distinct portions, the *true biliary substance* and the *colouring* and *fatty* matters. The former, a species of soap, is of a pale yellow colour, and is composed of two salts, glyco-cholate and tauro-cholate of soda. Glyco-cholic acid ($C_{27}H_{43}NO_5$), when pure, can be crystallized in white acicular needles, as likewise can some of its salts. Tauro-cholic acid ($C_{26}H_{45}NSO_7$), the less abundant acid in ox bile, has not yet been obtained in a crystallized state. These acids, by the action of alkalies, become converted into cholic acid ($C_{24}H_{40}O_5$), and into glycine ($C_2H_5NO_2$) and taurine ($C_2H_7NSO_3$) respectively.

The green colouring matter is derived from the hæmatin of the red blood-corpuscles. The peculiar fat of bile is cholesterine, an alcohol ($C_{26}H_{44}O$), which readily crystallizes, and forms the chief constituent of gall stones.

When bile has been purified by the above-mentioned process, its watery solution is not precipitated on the addition of rectified spirit. A grain or two of bile in 1 fl. drm. of water, when treated with a drop of fresh syrup, and then a little sulphuric acid, cautiously added, exhibits a play of colours from red to violet.

Therapeutics. Dried bile appears to act as a slight laxative on the alimentary canal when given in the ordinary medicinal doses; its use is supposed to be indicated in cases attended with deficient excretion of biliary matter, as shown by the pale colour of the alvine evacuations. It has been also said to be useful as a stomachic in some forms of functional dyspepsia, especially in cases where vomiting occurs after food. More clinical knowledge of its efficacy as a remedy is required before its value can be said to be fairly established.

Dose. Of purified bile, 5 gr. to 10 gr., or more, formed into pills, or given in small gelatin capsules. When the object is to affect the intestines rather than the stomach, the latter mode is preferable.

Pepsina. Pepsin. The digestive principle of gastric juice obtained from the fresh and healthy stomach of the pig, sheep, or calf.

Prep. The stomach of a recently killed animal is cut open and any adherent portions of food, &c., carefully removed; the exposed mucous surface is slightly washed with cold water. The

mucous membrane is then scraped with a blunt knife and the viscid pulp thus obtained spread out on a plate of glass or porcelain and quickly dried at a temperature not exceeding 100° Fah. The dried residue is powdered, and kept in a stoppered bottle. (This method was first proposed by Dr. Beale, who advised the exclusive use of the stomach of the pig; the preparation was formerly known as Bullock's pepsin.)

Boudault's pepsin (not officinal) is made by adding acetate of lead to an aqueous extract of the gastric mucous membrane. The pepsin is thrown down in combination with the metal, and the latter is then removed by sulphuretted hydrogen, which forms a sulphide of lead, while the pepsin is left in solution. A few drops of lactic acid are then added, and the solution evaporated until a gummy mass is left. This is powdered and mixed with dry starch.

Description. A light yellowish-brown powder with a faint but not unpleasant odour, and a slightly saline taste, without any indication of putrescence. Boudault's pepsin is a greyish-white powder, having a sour and often disagreeable odour.

Prop. & Comp. Pure pepsin has been shown by Brücke to differ from proteinaceous bodies in not yielding any precipitate with nitric acid, tannic acid, or mercuric chloride. The officinal pepsin is very little soluble in water or spirit. Two grains in an ounce of distilled water, acidulated with five minims of hydrochloric acid, suffice to dissolve one hundred grains of hard-boiled white of egg, in thin shavings, when they are digested together for about four hours at a temperature of 98° Fah. Lactic, acetic, and other acids may be substituted for hydrochloric acid, but they are less effective; neutralization suspends, without destroying, the action of the dilute acid solution. A temperature above 120° Fah. injures or destroys the solvent power of pepsin.

Therapeutics. Pepsin has been given largely in cases of dyspepsia, especially when of the atonic kind, and has been asserted to be a very valuable remedy. It is found to be much more efficacious when given in conjunction with dilute hydrochloric acid, as its action is reduced in presence of peptones, and can be renewed by the addition of more dilute acid. In cases where anæmia has become so complete that the functions of the stomach are much deranged, the administration of pepsin in combination with iron tends to expedite recovery.

Some cases of spasmodic asthma have been treated with pepsin and dilute acid, when all other remedies have failed, and it has

produced most beneficial results in palliating the symptoms; the researches of Dr. Pavy have proved that this disease is frequently dependent on gastric disturbance.

The author had a patient in extreme old age (above ninety), who suffered from vomiting or regurgitation after each meal, apparently arising simply from debility of the stomach; the administration of a few grains of pepsin mixed with the food, at once and entirely removed the symptom.

Dose. Of pepsin, 2 gr. to 5 gr. given with a meal. Boudault's pepsin is five times weaker than the officinal preparation. The pepsin of commerce varies very widely in strength.

PACHYDERMATA.

Adeps Præparatus. Prepared Lard. Axungia. The prepared internal fat of the abdomen of Sus scrofa, the Hog. Hog's Lard.

Prep. Take of the internal fat of the abdomen of the hog, perfectly fresh, fourteen pounds. Remove as much of the membranes as possible, cut the fat into small pieces, put it into a suitable vessel with about four gallons of cold water, and, while a current of water is running through the vessel, break up the masses of fat with the hands, exposing every part to the water, so that whatever is soluble may be thus dissolved and carried away. Afterwards collect the washed fat on a sieve or in a cloth, drain away as much as possible of the water, liquefy the fat at a heat not exceeding 212°, and strain through flannel, pressing the residue while hot; then put it into a pan heated by steam, and keep it at a temperature a little but not much above 212°, stirring it continually, until it becomes clear and entirely free from water; finally strain it through flannel.

Description. Lard needs but little description. It is a white, fatty substance, melting at about 100°.

Prop. & Comp. Consistence soft; it consists of a large quantity of oleine (60 per cent.), with some palmitin and stearine: these substances have already been described. Palmitin is more soluble in cold ether than stearine. Properly prepared lard has no rancid odour, and dissolves entirely in ether. Distilled water in which it has been boiled, when cooled and filtered, gives no precipitate with nitrate of silver, and is not rendered blue by iodine, showing the absence of common salt and of starch.

Off. Prep. Adeps Benzoatus. Benzoated Lard. (Prepared

lard, a pound ; benzoin, in coarse powder, 160 grains. Melt the lard, add the benzoin, and strain.) The addition of the benzoin prevents the lard from becoming rancid and so irritating the skin.

UNGUENTUM SIMPLEX. Simple Ointment. (White wax, two ounces ; prepared lard, three ounces ; almond oil, three fluid ounces.)

Lard is also used in the preparation of other ointments.

Therapeutics. Lard is emollient, and is sometimes added to poultices to prevent their getting dry and hard.

CETACEA.

Cetaceum. Spermaceti. Nearly pure cetine, obtained, mixed with oil, from the head of the Sperm Whale, Physeter macrocephalus, Linn., inhabiting the Pacific and Indian Oceans. It is separated from the oil by filtration and pressure, and afterwards purified.

Description. A semi-concrete oily substance, which is contained in numerous cells situated in the large cavity of the upper jaw of the sperm whale. The oily matter, on standing, separates into an oil, and a peculiar substance, capable of crystallization, spermaceti. The oil is poured off, and the spermaceti collected.

Spermaceti occurs in white crystalline cakes, very slightly unctuous ; it fuses at 112° Fah., and when quite free from oil has been named *Cetine* ($C_{32}H_{64}O_2$). It has little odour or taste, can be reduced to powder by the addition of a little rectified spirit ; is scarcely unctuous to the touch ; should not melt under 100°. It is combustible, soluble in the fixed oils, and in boiling alcohol or ether. By the action of an alkali it is broken up into an acid, palmitic ($C_{16}H_{31}K.O_2$), and a substance somewhat analogous to glycerin, called Ethal, Cetylic alcohol, or hydrate of cetyl ($C_{16}H_{34}O$). Spermaceti or cetin may be regarded as palmitate of cetyl ($C_{16}H_{33}.C_{16}H_{31}O.O=C_{32}H_{64}O_2$).

Off. Prep. UNGUENTUM CETACEI. Ointment of Spermaceti. (Spermaceti, five ounces ; white wax, two ounces ; almond oil, twenty fluid ounces, or a sufficiency.)

Spermaceti is also used in the preparation of the officinal blistering paper.

Therapeutics. Emollient ; formerly given internally, but now chiefly used externally as an emollient application.

CLASS, AVES.

Albumen Ovi. White of Egg. The liquid albumen of the egg of Gallus Bankiva (var. domesticus).

Ovi Vitellus. The yolk of the Egg.

Description. The *albumen*, or white of the egg, is a transparent, viscid, glairy liquid, miscible with water, coagulated by a heat of 160° Fah., and then becoming opaque and of a milk-white colour; insoluble in water; by careful drying, at a moderate temperature, it may be solidified, retaining its transparency. It is coagulated by ether, in which respect it differs from the albumen of blood; coagulated also by corrosive sublimate.

The yolk of the egg is of a yellow colour, coagulated by heat; it yields a fixed oil by expression. It contains a peculiar albuminous principle, named *vitellin*, oleine, margarine, cholesterine, together with salts of lime, iron, &c., &c.

Prep. The yolk of the egg is used in making the mixture of spirit of French wine (egg flip). (See Spiritus Vini Gallici.)

Therapeutics. The albumen is recommended as an antidote in cases of poisoning by corrosive sublimate and sulphate of copper. The yolk is a mild, nutritious article of diet, and, in the form of egg flip, is a useful and nutritious mixture, much employed in exhausted conditions of the system, when solid food cannot be taken. An astringent application is made by dissolving alum in white of egg; the albumen of the latter is coagulated, and in this form it is applied locally.

CLASS, PISCES.

Isinglass. Appendix. The swimming bladder or sound of various species of Acipenser, prepared and cut into fine shreds.

Description. Isinglass is the dried swimming bladder of the sturgeon, but many fish yield a similar substance.

Prop. & Comp. Isinglass consists of a gelatinous tissue, which, on boiling, yields gelatine, a substance soluble in hot water, and forming a jelly on cooling: it is precipitated by tannic, but not by gallic acid. The combination of gelatine with tannic acid forms the basis of leather, called often tanno-gelatine.

Off Prep. Solution of Gelatine. (*See* Appendix.)

Oleum Morrhuæ. Cod Liver Oil. The oil extracted from the fresh liver of the Cod, Gadus Morrhua, by a steam heat not exceeding 180°.

Description. The liver of the common cod-fish and other species of gadus, frequenting the seas of northern Europe and America, yields the cod-liver oil of commerce.

The most important species of the oil-yielding fish, in a medical point of view, have been thus classified :—

Gadus morrhua, or Asellus major, the common Cod-fish ; found in large quantities on the coasts of England, France, Iceland, and Norway, but especially off Newfoundland.

Gadus callarias, or Asellus striatus, the Dorse ; found largely on the Norwegian coast, and principally near the Lofoden Islands.

Gadus molva, or Asellus longus, the Ling ; found also on the coast of Norway, though less abundantly than the above two species. Plentiful near England.

Gadus carbonarius, or Asellus niger, the Coal-fish ; inhabiting the same localities as the last.

Gadus pollachius, or the Pollack ; found in Norway ; especially near Tromsoe.

Gadus merlangus, or Asellus albus, the Whiting ; inhabiting the coasts of France. Besides many other species of less importance.

The oil may be extracted from the livers by three different methods :—by exposing them to the sun to undergo a process of fermentation ; by boiling them in water for some time ; or by dividing the livers, and permitting the oil slowly to drain from them.

1. The oil is sometimes obtained by packing the livers in tall vats, furnished with three taps placed at different heights, and then exposed to the sun, to favour the separation of the oil. On opening the upper tap a pale oil is obtained ; from the middle tap a light brown oil ; and a darker brown yet transparent oil from the inferior tap. The remaining mass of livers yields, by pressure and heat, a very dark and thick product, not fit for medicinal use, but employed by curriers, &c.

2. The second method of preparing the oil is by boiling the livers in water, and afterwards separating the oil from the surface, and filtering from any albumen or cellular tissue mixed with it.

3. The following is the method now employed in the preparation of the best English cod-liver oil at Messrs. Bell and Co.'s

establishment. The livers are collected daily, so that no trace of decomposition may have occurred, carefully examined, in order to remove all traces of blood and impurity, and to separate any inferior livers ; they are then sliced, and exposed to a temperature not exceeding 180° Fah., till all the oil has drained from them. This is filtered ; afterwards exposed to a temperature of about 50° Fah., in order to congeal much of the solid fat (margarine), and again filtered and put into bottles well secured from the action of the air.

Three chief varieties of cod-liver oil occur in commerce, distinguished by their colour : the pale is that rendered officinal, prepared in England or elsewhere ; besides which there are the light brown and the dark brown oil, from Norway, &c.

The difference in colour in the different oils depends upon the circumstances attending their preparation, as the amount of heat employed, the state of freshness or putridity of the livers, the quantity of decomposed matter present in the oil, the length of exposure to the atmosphere, &c.

Prop. & Comp. The pale oil is almost colourless when first prepared, with a slight fishy but not disagreeable odour, sp. gr. from ·917 to ·920, with a bland fish-like taste. The composition of the three varieties is essentially the same, but the darker contains more empyreumatic matter, and is much less agreeable to the taste. Cod-liver oil contains *oleine, margarine,* various *biliary principles,* as the organic acids and colouring matter of bile ; also phosphoric and sulphuric acid, with salts of lime, magnesia, and iron ; a peculiar substance, *gaduin,* very insoluble in ordinary menstrua, but soluble in sulphuric acid, and giving a blood-red colour to the solution ; also *iodine* and *bromine.* The oleine and margarine of this oil are said by some to differ from that usually met with, inasmuch as no glycerine can be obtained by their saponification, but they yield instead a peculiar body, called propyline. The proportion of iodine is not more than ·05 per cent. When pure cod-liver oil, spread in a thin layer on a plate, has a drop of oil of vitriol added to it, a beautiful lake or crimson colour is produced, rising from the point of contact of the oil and acid, and rapidly spreading over the surface. This is probably due to the action of the acid on the biliary principles present in the oil.

Therapeutics. Cod-liver oil is a remedy which, at the present time, stands in very high estimation, nor does it appear probable that its reputation will be ephemeral ; how it acts is still un-

determined. When taken by patients who have become emaciated from any cause, and whose blood is impoverished, it frequently restores the flesh, and, from Dr. Theophilus Thompson's statements, it appears also to improve the richness of the blood. Under its influence, patients often increase greatly in weight, the increase exceeding many times the amount of oil consumed during the period. The oil also seems to possess the power of arresting the progress of certain morbid actions, such as occur in phthisis, scrofula, and low forms of rheumatic and other inflammation; in fact, many anomalous diseased conditions become ameliorated under its influence. It has been supposed that the iodine and bromine contained in it might produce the beneficial results, but this idea is not tenable, for the effects of these latter remedies are very different from that of the oil; it would seem probable that it acts simply as an *oil*, and that it is superior to other oils on account of its being more readily assimilated. If the statement of Winkler prove correct—namely, that the oleine differs from ordinary oleine in not yielding *glycerine*—this may in part explain its value. It very seldom happens that patients cannot take the remedy, even when ordinary fatty substances disagree with them; it very rarely purges, except in cases where ulceration of the intestines is present. Cod-liver oil is employed extensively in the treatment of the different stages of phthisis, and various forms of scrofula: in chronic rheumatism and neuralgia; in chronic skin affections, and many other diseases of a low type accompanied by a cachectic condition of habit. It has been applied externally in some skin affections, and occasionally rubbed into the surface with the idea of producing by this means its constitutional effects.

Dose. From 1 fl. drm. to 8 fl. drm.; taken upon water, milk, orange wine, ale, or porter, or made into an emulsion with lime-water. Some patients prefer it at the time of a meal, or immediately after food; it is often advantageously administered at bedtime.

Adulteration. Many oils have been mixed with cod-liver oil. The addition of the liver oil from other fish is not, perhaps, very important in a therapeutic point of view, and would be difficult or impossible to detect, as all of them give the test with sulphuric acid. When other oils, not of hepatic origin, are present, the sulphuric acid test is valuable, for the impure specimen either does not give the beautiful lake colour, or this becomes immediately mixed with, and obscured by, a dark brown substance.

from the charring of the oil ; such is the case with whale or seal oil ; also with olive and other vegetable oils.

Trimethylamine or Trimethylia. $(CH_3)_3N$. (Not officinal.)

Prop. & Prep. A colourless gas at ordinary temperatures, smelling strongly of rotten fish. It is readily absorbed by water, to which it imparts a strongly alkaline reaction. It may be obtained by distilling herring-brine with caustic potash, or, if wanted in a state of purity, by heating the iodide of tetramethyl-ammonium. $[(CH_3)_4NI=(CH_3)_3N+CH_3I]$. Trimethylamine is isomeric with propylamine, $C_3H_7.H_2.N$, for which it was mistaken when first introduced into practice. On account of its nauseous smell and taste, it is most suitably administered as a hydrochlorate.

The Hydrochlorate of Trimethylamine is a stable compound, in long needle-shaped crystals, very deliquescent, soluble in water and in alcohol. Its concentrated solutions are caustic. The salt is inodorous ; when heated with a caustic alkali, it emits the characteristic odour of rotten fish.

Therapeutics. It is stated to lower the temperature and pulse, even in health, occasionally causing diuresis. Large doses, administered to animals, caused sensory paralysis, drowsiness, convulsions, and death. Trimethylamine has been much employed in Russia and France as a remedy for acute rheumatism ; the articular symptoms and the fever are said to be rapidly subdued by it, and the duration of the disease lessened. Further clinical investigation is needed, however, to substantiate its claims.

Dose. Of the hydrochlorate, 3 gr. to 10 gr. and more. It should be freely diluted with water and flavoured with tincture of orange-peel. (Dujardin-Beaumetz.)

CLASS, INSECTA.

HYMENOPTERA.

Mel. Honey. A saccharine secretion deposited in the honey-comb by the Apis mellifica, *Linn.*, the Hive bee. British and imported.

Description. It is a viscid fluid, of a light yellow colour ; the purest is obtained by allowing the honey to flow from the comb ; it has a peculiar heavy odour and very sweet taste.

Prop. & Comp. It consists chiefly of grape sugar, formula

$C_6H_{14}O_7$. The sp. gr. is 1·34: it has an aromatic odour dependent in part on the flowers from which it is obtained. It is often adulterated with starch, and this adulteration is recognized by making a solution in hot water, and, when this has cooled, adding iodide of potassium with nitric acid; if no starch be present, no blue colour is produced.

Off. Prep. MEL DEPURATUM. Clarified Honey. (Prepared by melting the honey in a water bath, and straining while hot, through flannel previously moistened with warm water.) This removes organic impurities which render the honey liable to decomposition.

OXYMEL. Oxymel. (Clarified honey, forty ounces; acetic acid, five fluid ounces; distilled water, five fluid ounces.)

Clarified honey is also used in the preparation of mel boracis, oxymel scillæ, confectio piperis, confectio scammonii, and confectio terebinthinæ.

Therapeutics. The action is much the same as sugar, but more laxative; it is generally used as a vehicle for other medicines.

Dose. Of honey, ad libitum; of oxymel, 1 fl. drm. to ½ fl. oz.

Cera Alba. White Wax. Yellow wax bleached by exposure to moisture, air, and light.

Cera Flava. Yellow Wax. The prepared Honey-comb of Apis mellifica, the Hive bee.

Description. When the honey has been separated from the comb, the remaining portion melted constitutes yellow wax. This when bleached forms white wax. The yellow occurs in large irregular masses, firm, breaking with a granular fracture, and having an agreeable honey-like odour; the white, in thin cakes, hard, white, and odourless. Neither yellow nor white wax is unctuous to the touch.

Prop. & Comp. Yellow wax does not melt under 140°, yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine; the white wax does not melt under 150°. Boiling water in which wax has been agitated, when cooled is not rendered blue by iodine.

Wax is separable by means of alcohol into three portions *myricine* ($C_{46}H_{92}O_2$), almost insoluble in boiling alcohol; *cerotic acid* ($C_{27}H_{54}O_2$), soluble in boiling alcohol, but deposited when the liquid becomes cold; and *ceroleine*, which remains in solution in cold alcohol. These substances exist in different proportions

in different specimens of wax. Myricine, by the action of potash, may be converted into palmitic acid, and a neutral substance, melissine; this substance, by oxidation, yields an acid, the melissic, which bears the same relation to melissine that acetic acid does to alcohol. In some varieties of wax a substance, cerotine ($C_{27}H_{56}O$), exists, which stands in the same position with regard to cerotic acid as melissine does to melissic acid.

Off. Prep.—Of White Wax. Unguentum Simplex. Simple Ointment. (White wax, two ounces; prepared lard, three ounces; almond oil, three fluid ounces.)

White wax is also contained in charta epispastica, the suppositories, and several of the ointments of the Pharmacopœia.

Yellow wax is contained in unguentum calefaciens, unguentum cantharidis, unguentum cerati saponis, unguentum resinæ, unguentum terebinthinæ, and in other ointments and some of the plasters of the Pharmacopœia.

Therapeutics. Demulcent, chiefly used in the preparations above-mentioned, to give them consistence.

HEMIPTERA.

Coccus. Cochineal. Coccus Cacti. The female Cochineal insect dried; reared in Mexico and Teneriffe.

Description. Of an oval form, convex on one side, flat and slightly concave on the other, about 2 lines long, wrinkled. One variety is of a reddish-gray colour, due to the presence of a white powder upon the red surface; this powder, when examined by the microscope, has the appearance of fine wool; the other, nearly black, and having but little of the white powder. The female insects are alone preserved; they are procured by brushing them off into bags, and killing them by immersion in hot water. The difference in the two varieties, the silver and the black grains, consists in this; the silver is made up of the impregnated female just before she has hatched her eggs; the black, of the insect after the eggs have been laid and hatched. Cochineal yields when crushed a puce-coloured powder. The gray insect becomes black when warmed before the fire.

Prop. & Comp. Cochineal consists of fatty matters, salts, &c., and a peculiar colouring matter called *carmine:* it occurs in the form of small grains of a purple-red colour, soluble in water and alcohol, but not in ether. Acids increase the red colour, while

alkalies render it violet. The colouring matter of carmine has been found to have acid properties, and has been called Carminic acid ($C_{14}H_{14}O_8$).

Off. Prep. TINCTURA COCCI. Tincture of Cochineal. (Cochineal, in powder, two ounces and a half; proof spirit, twenty fluid ounces. Prepared by maceration.)

Cochineal is also contained in tinctura cardamomi composita, and tinctura cinchonæ composita.

Therapeutics. Chiefly used as a colouring matter, much employed in the arts as a dye; it was formerly much esteemed in the treatment of pertussis.

Dose. Of the tincture, 30 min. to 1½ fl. drm.

Adulteration. Inferior cochineal is sometimes covered with some white powder, as talc, sulphate of barium, or carbonate of lead, to give it the appearance of the finer variety; also with bone black, to give it a black colour.

COLEOPTERA.

Cantharis. Cantharides. Cantharis vesicatoria; the Blister Beetle, or Spanish Fly; collected in Russia, Sicily, but chiefly in Hungary.

Description. The insect is from 8 to 10 lines long; the elytra or wing-sheaths are long, of a fine green colour, and encase two thin brownish membranous wings. The flies swarm upon the trees about May or June, especially on the ash, lilac, and privet, and are brushed off by persons carefully masked, and received into linen cloths; they are killed by plunging into boiling vinegar, and then dried.

Prop. & Comp. The beetles have a peculiar urinous disagreeable odour, and a burning taste; the powder is a grayish brown, containing shining green particles; it should be free from mites. In addition to oily and fatty matters, the beetles contain a crystallizable principle *Cantharidine*, to which their active properties are due. Cantharidine is insoluble in water, bisulphide of carbon, and nearly so in cold alcohol, but more soluble in chloroform, and strong acetic acid; soluble also in acetone and ether, and to some extent in oils and fats; as the active properties of the insect are partially yielded to water and cold alcohol, it would appear that the cantharidine exists in the beetle as a somewhat soluble compound. From 1000 parts of the flies, about 4 parts of pure can-

tharidine have been procured; cantharidine has the formula ($C_5H_{12}O_2$); it may be sublimed without injury; it has very powerful vesicating properties.

Cantharidine is readily prepared by exhausting the powdered beetles with chloroform; distilling off the chloroform, and subsequently treating the extract with bisulphide of carbon, which dissolves the fatty matters, but leaves the cantharidine; this may be afterwards re-dissolved in chloroform and crystallized.

Off. Prep. ACETUM CANTHARIDIS. Vinegar of Cantharides. (Spanish flies, reduced to the finest powder, two ounces; glacial acetic acid, two fluid ounces; acetic acid, eighteen fluid ounces, or a sufficiency. Digest the cantharides in the glacial acid mixed with thirteen ounces of acetic acid, at a temperature of 200°, for two hours; then percolate with the remainder of the acetic acid. Then subject the contents of the percolator to pressure, filter the product, mix the liquids, and add enough acetic acid to make one pint.) Contains 2 oz. to the pint.

CHARTA EPISPASTICA. Blistering Paper. (White wax, four ounces; spermaceti, one ounce and a half; olive oil, two fluid ounces; resin, three quarters of an ounce; cantharides, in powder, one ounce; Canada balsam, one quarter of an ounce; distilled water, six fluid ounces. Prepared by digesting the ingredients, except the Canada balsam, in a water bath for two hours. Stir them constantly, then strain, and separate the plaster from the watery liquid. Mix the Canada balsam with the plaster melted in a shallow vessel, and pass strips of paper over the surface of the hot liquid, so that one surface of the paper shall receive a thin coating of plaster. It may be convenient to employ paper ruled so as to indicate divisions, each of which is one square inch.)

EMPLASTRUM CANTHARIDIS. Cantharides Plaster. (Cantharides, in very fine powder, twelve ounces; yellow wax, seven ounces and a half; prepared suet, seven ounces and a half; resin, three ounces; prepared lard, six ounces.) One in three.

EMPLASTRUM CALEFACIENS. Warm Plaster. (Cantharides in coarse powder, expressed oil of nutmeg, yellow wax, resin, of each four ounces; soap plaster, three pounds and a quarter; resin plaster, two pounds; boiling water, one pint.) One in twenty-four, nearly.

LIQUOR EPISPASTICUS. Solution of Cantharides. *Synonym:* Linimentum Cantharidis, Br. Ph. 1864. (Cantharides, in powder, eight ounces; acetic acid, four fluid ounces; ether, a sufficiency.

Mix the cantharides and acetic acid, pack in a percolator, and after twenty-four hours' maceration, percolate with the ether till twenty fluid ounces are obtained.) One in two and a half.

TINCTURA CANTHARIDIS. Tincture of Cantharides. (Cantharides, in coarse powder, a quarter of an ounce; proof spirit, twenty fluid ounces. Prepared by maceration and percolation.)

UNGUENTUM CANTHARIDIS. Ointment of Cantharides. (Cantharides, one ounce; yellow wax, one ounce; olive oil, six fluid ounces.)

Therapeutics. Cantharides, when applied externally, produce at first rubefacient and irritant effects, followed, if the preparation is strong, or long continued, by vesication; not unfrequently the active principle becomes absorbed, and the symptoms resulting from its internal administration then ensue. When taken internally in medicinal doses, the first indication is generally some diuresis, with a slight sensation referred to the neck of the bladder; and if the urine be then examined, it usually shews a trace of albumen; sometimes also a few blood discs are discovered by the microscope: when continued beyond this, strangury and bloody urine are produced, with priapism, sometimes aphrodisiac effects, and diminution or suppression of urine, and its consequences, convulsions and death; the spinal cord is supposed to be influenced by the drug.

Externally the Spanish fly is often used as a rubefacient in the form of a liniment, made with the tincture or acetum cantharidis, in cases where rubefacients in general are indicated; it has the advantage of acting slowly and for a longer period, and being less irritating to the patient, than strong ammoniacal or acetic acid embrocations: as a vesicant its employment is very general, more so than that of any other agent; it forms the basis of the common blister, or emplastrum cantharidis, liquor epispasticus, and of other blistering applications, as the vinegar of cantharides, &c.; the ointment and blistering paper are used to keep open blistered surfaces. These applications are useful over inflamed deep-seated parts, as in pleuritis, pericarditis, pneumonia, and other internal inflammations, after the more active febrile symptoms have been subdued; and to diseased and painful joints. Vesication is also made use of on account of its revulsive action in internal congestions, as of the head, &c.; and over painful parts unattended with inflammatory action, as in various neuralgic affections; and lastly, in diseased conditions of the skin itself.

Internally the tincture of cantharides is given in chronic affec-

tions of the nervous system, especially of the spinal cord, as in chronic forms of paraplegia and in incontinence of urine from want of tone in the bladder; occasionally it has been found useful in some non-inflammatory forms of albuminuria, and in hydrocephalus; also in skin affections, especially in those of a squamous character; probably its diuretic action may be the cause of its value in the latter class of diseases. Sometimes it has been given in gleet and other mucous discharges.

Precautions to be used in the application and administration of Cantharides.

When the kidneys are acutely affected, the use of the Spanish fly, externally or internally, should be avoided, as the cantharidine is apt to become absorbed. In young or very debilitated subjects vesication by this agent should be cautiously produced, as sloughing may ensue and prove troublesome and even dangerous: placing a piece of tissue-paper over the surface and removing the blistering application before vesication has been fully induced, and the subsequent application of a poultice, will often prevent the occurrence of strangury, and, at the same time, too great injury to the skin; vesication will generally ensue after the poultice has been applied. Even in healthy children, liniments containing cantharides should not be applied to large surfaces without much caution; the writer has known severe hæmaturia, lasting for several days, excited by the application of Liq. epispasticus to the scalp for the cure of ring-worm. Many substitutes for the ordinary blistering plaster have been used, such as the tela vesicatoria and blistering papers made by mixing an ethereal or oily solution of cantharides with wax and fatty matters, and spreading the compound thinly on cloth or tissue paper; the now officinal charta epispastica is one of these; also blistering liquids prepared by dissolving *cantharidine* in acetic acid and ether, or chloroform. The liquor epispasticus of the Pharmacopœia, which the author has extensively employed, vesicates with much certainty; it should, however, be used with caution. These liquid applications are more efficient than the acetum cantharidis, as blistering agents, but the latter may be used as a rubefacient.

Dose. Of tincture of cantharides, 5 min. to 20 min.

Adulteration. A beetle called the golden beetle has been found mixed with cantharides, and occasionally artificial glass tubes or beads coloured to imitate the Spanish fly have been added to increase the weight. It has also been asserted that flies deprived

of their virtues by ether have been sold as genuine, and that euphorbium resin has been employed to adulterate powdered cantharides.

Several other coleopterous insects, as Mylabris chicorii, &c., possess vesicating powers, and have been used in other countries as blistering agents.

CLASS, ANNELIDA.

Hirudo. The Leech. Sanguisuga medicinalis, the Speckled Leech; and Sanguisuga officinalis, the Green Leech. Collected in Spain, France, Italy, and Hungary.

Description. Leeches have an elongated body, 2 or 3 inches long, tapering to each end, plano-convex, wrinkled transversely; of a dark olive-green colour; made up of from 70 to 90 soft rings, with a muscular disc at each extremity, the hinder one the largest; the mouth, which is in the anterior disc, is tri-radiate, and contains three jaws, each of which is furnished with two rows of teeth; the intestinal canal is straight.

The Sanguisuga medicinalis is distinguished by the greenish-yellow colour of the belly, spotted with black, and the Sanguisuga officinalis by the olive-green colour of the belly, which is not spotted. Both are marked with six rusty-coloured longitudinal stripes; in the former variety these also are spotted with black.

Therapeutics. Leeches are employed for the local abstraction of blood from those parts where cupping is not deemed advisable. The quantity of blood drawn by a leech is about one fluid drachm and a half, though by fomentation of the part perhaps half a fluid ounce may be obtained. The skin should be thoroughly cleansed, and washed with a little milk, before leeches are applied. Care should be taken to prevent their entrance into the cavities of the body, such as the mouth, rectum, and uterus: in such cases they may be introduced in leech-glasses, which only allow the head to be protruded. The dangerous accidents which may result from the passage of a leech into the stomach, &c., are combated by injections of salt and water.

Bleeding from leech-bites may be stopped by pressure, by matico, by the application of collodion or of caustic; sometimes they require a suture.

CLASS, SPONGIDA.

Spongia Usta. Burnt Sponge. (Not officinal.)

Prop. & Comp. Burnt sponge contains a large amount of

carbon, mixed with carbonate and sulphate of lime, chloride of sodium and iron ; also from 1 to 2 per cent. of iodide of potassium, with some bromide. It is upon the presence of these latter constituents that its medicinal properties depend.

Therapeutics. Burnt sponge was formerly much recommended in goître and strumous glandular swellings, in which cases it is still sometimes given.

Dose. 30 gr. to 100 gr. or more, made into an electuary.

THERAPEUTICS.

THE object of this portion of the Work is to present to the reader, not any further account of the mode of action of individual drugs, but some general rules as to the method of prescribing remedies, the effects of which have been already detailed; and as to the form, manner, and times at which they should be administered, according to the effect to be produced; also to instruct him how to avoid incompatible combinations, and lastly to give a classification of remedial agents of a practical character, and one which may prove valuable when treating disease.

In endeavouring to accomplish these objects, conciseness will be aimed at, in order not to enlarge the work too much, and at the same time to avoid distracting the mind by unimportant or useless discussions.

At the present day, when it is to be hoped that medicine is emerging from an empiric art to a condition which renders it worthy of a place among the Sciences, it is especially important that that department which is perhaps the most backward, namely, Therapeutics, should receive due attention from both the student and practitioner, and be investigated with every possible care, so as to ensure accuracy; and to effect this, where the human subject has to be dealt with, and where disease is constantly changing and presenting varying aspects, is a task of great difficulty, and one requiring every possible precaution.

In the first place it is important that there should be the greatest simplicity in prescribing; no medicine should be given unless a real reason can be ascribed, and combinations of drugs should be avoided when there are no direct indications for them; much discredit has been thrown upon the whole subject of the medicinal treatment of disease by the practice of indiscriminate prescribing and over-drugging; and this habit has given rise to the adoption of therapeutic systems, which have no more reality than that of being antagonistic to such practices.

Many appear to prescribe with an idea that if numerous drugs are given at the same time, one of them at least may prove

effectual ; but it should not be forgotten that some may do harm instead of good : such indefinite mixtures, often excused under the plea that the power of combination in altering the action of medicines is of much importance, should be carefully avoided by those who wish to gain a clear insight into the real action of medicines and to advance the knowledge of therapeutics. It must not, however, be supposed that all combinations of drugs are injurious ; on the contrary, it is a well established fact that they are occasionally very valuable, and many illustrations can be adduced. It is found, for example, that some purgative medicines act more especially upon one part of the intestinal canal, and some on another portion ; that one drug increases the vermicular or peristaltic action of the bowels, and another causes a large flow of fluid from the mucous membrane ; and in practice it is readily demonstrated that not unfrequently when each of two purgatives given alone causes unpleasant effects, a combination of the same is productive of satisfactory results. Senna, for instance, generally gripes, from causing an irregularity in the contraction of the bowels ; Epsom salts often cause flatulent distension ; but the two combined in the common black draught, form an efficient and valuable cathartic, from which it may be inferred that when we wish for a thorough evacuation of the intestinal canal, a judicious combination of several individual purgatives, which act on different portions and in different ways, is much more efficient than any one of them given separately.

Form in which medicines should be exhibited, and time of administration.

The form in which medicines should be given, whether in a fluid or solid state, as also the time of day, and its relation to the hour of meals, are points of much importance to be attended to. If it be desirable that a medicine should be quickly absorbed into the system, it should, if possible, be given in the form of solution, and care taken that the stomach be completely empty ; when the drug is in a solid form, time is necessary in order to effect its solution in the fluids of the stomach ; if food be present, the current is from the blood into the cavity of the organ, and not from the stomach towards the blood. Let an equal amount of strychnia be given, first in the form of a pill, in which the alkaloid is united with some combining material, and next in the form of a solution, and the difference of time which elapses before the production of the peculiar symptoms of the drug will be well marked. Again, if the extract of nux vomica be given, at one

time on an empty stomach, and at another time directly after a meal, a similar difference in the period at which the physiological effects are manifested will be observed. The same phenomena are seen when other drugs producing well defined effects are substituted for strychnia or nux vomica. If the slow action of any remedy be desirable, the reversed conditions should be ensured; namely, a full state of stomach and little solubility of the drug.

In the exhibition of remedies which influence the alimentary canal a proper selection of the time and form of administration should not be lost sight of.

1. In cases where we seek to allay irritation of the stomach, or to give tone to that organ, the medicine should be taken from half an hour to an hour, or even more, before food.

2. Medicines which have a strong alkaline reaction should either be taken an hour before, or not until three or four hours after a meal. Under the first conditions they neutralize any acid present, and then become quickly absorbed by the veins into the blood; under the second, they neutralize acidity which is left from the digestive process, and relieve the heartburn so often produced by its presence; but if such remedies are administered at the time of the meal, as is often advised, especially with Vichy water, they are apt to cause discomfort from an arrest of the digestive process; it being necessary that the contents of the stomach should be acid, in order that digestion be quickly and perfectly performed.

3. Medicines which are taken with a view to their absorption and the improvement of the state of the blood and general nutrition of the body, are perhaps best administered either at the time of the meal or soon afterwards. This remark applies more especially to the preparations of iron when given as hæmatinics or blood restorers, also to cod-liver oil and such-like substances. Iron taken at such periods appears to be absorbed with the chyle into the blood, and is therefore present during the production of the blood cells, the formation of which it probably aids.

4. Medicines which are apt to irritate the stomach should be taken soon after food, as their topical influence is then considerably lessened; arsenical compounds are thus conveniently taken, and they are often readily borne in such conditions, whereas upon an empty stomach they would cause great annoyance.

5. If a drug is given to promote sleep, the time of its adminis-

tration must vary according to its condition of solubility, the peculiarity of the medicine itself, or the idiosyncrasy of the patient; if in the form of pill, it should be given at a much longer period before the soporific effect is desired, than when in solution; and again, some patients are more quickly brought under the influence of narcotics than others.

6. Custom influences the time required for the action of such remedies: opium, for example, when first taken, may produce its soporific effect in half an hour or so; but after some days or weeks, the same dose may require many hours to cause a similar result. In some patients it is necessary to administer the drug twenty-four hours before the time desirable for it to take effect; that is, to ensure sleep on the night of any one day, it must be given on the evening of the day previous; and hence if the dose be at any time omitted, the absence of sleep is not discovered that night, but the following.

7. The time of administration and the form of exhibition have considerable influence upon the action of purgatives. In giving these remedies, the effect upon the stomach is not often required, but only that on the lower portions of the alimentary canal, and hence it is, as a rule, desirable to administer them either some half hour or so before a meal, or at least four hours afterwards. When prescribed before food, their effect is generally more marked: a dinner pill with one grain of the extract of aloes will often prove efficient if taken before a late dinner, but may produce little effect if taken at bedtime. The object, in cases where a habitual slight aperient is required, is to give it at a time when the stomach may be annoyed by it as little as possible.

8. In the case of anthelmintics, the patient should fast for many hours before they are taken, in order that by coming in close contact with the entozoa they may so destroy them.

Incompatibility in Prescribing.

But a few years have elapsed since the subject of incompatibility in prescribing occupied a considerable space in most works on Materia Medica, and great stress was then laid upon such knowledge; but a more enlightened investigation has clearly shown, that much of the so-called incompatibility was therapeutically ideal: it will be desirable, therefore, to point out the erroneous views which were then held, and at the same time to show the necessary precautions to be observed. It was formerly supposed that if two drugs were ordered in combination which

were capable of forming a compound insoluble in water, such combination was incompatible. If, for example, ipecacuanha was ordered with a vegetable containing tannic acid, it was considered improper so to do, as tannate of emetine is not soluble: but the error of this is at once obvious if it be remembered that many substances insoluble, or not apparently soluble, in water, may be readily dissolved by the secretions of the stomach and intestines, and hence easily absorbed into the blood; tannate of emetine will cause vomiting, tannate of strychnine produce all the medicinal and poisonous effects of that alkaloid, and tannate of morphia induce sleep; probably the tannates of the alkaloids are less readily absorbed than their more soluble salts, but, practically, their combinations are equally effectual as therapeutic agents. If the old view of incompatibility were correct, it would be difficult to account for the activity of calomel, reduced iron, subnitrate of bismuth, and very many other substances which are constantly administered with marked effect upon the system.

However, it must not be supposed that all combinations are admissible: there are certain limits beyond which it is unadvisable to go. If, for example, sulphuric acid, in the form of the acid infusion of roses, is prescribed for its astringent effect as a draught, and acetate of lead is at the same time given as a pill, it is almost certain that the effects of both astringents will be materially diminished if not altogether neutralized, for sulphate of lead, then formed, is not capable of being absorbed in appreciable quantities.

Again, other examples of incompatibility which have occurred in actual practice may be mentioned. Compound camphor liniment has been prescribed with acetic acid as a stimulating embrocation; if the amounts of these separate drugs were proportional, the acetic acid would completely neutralize the ammonia of the former preparation, and but little stimulant or counter-irritant effect would be produced by the combination. Such, then, is one of many instances of both chemical and therapeutic incompatibility.

There is another instance of incompatibility which may be noted. Creasote is often indicated as a remedy in the same cases as oxide of silver, and these two medicines have been prescribed together in the form of a pill: when, however, oxide of silver comes in contact with creasote, the former parts with its oxygen to the latter, much heat is evolved, and instances have been known of combustion taking place on the chemist's counter, from such a combination.

Other instances of real incompatibility are seen in the combina-

tion of caustic alkaline solutions, as the solution of potash, with preparations of henbane, stramonium, and belladonna; after a few hours, the activity of these latter drugs is totally destroyed by the alkali: the alkaline carbonates and bicarbonates, however, have no such destructive influence.

Some instances of incompatibility in a physiological point of view might be adduced by way of example; thus Calabar bean appears to be antagonistic in its effects to belladonna, both when externally applied and when administered internally.

Mode in which Medicines are introduced into the System.

There are several methods by which drugs are introduced into the system, of which a succinct account is here given under their separate heads.

Medicines are administered by the mouth; the rectum; also by causing them to be absorbed by the respiratory mucous membranes in the form of vapour (inhalation); likewise by the skin; by injection into the cellular tissue (hypodermic injection); and, on very rare occasions, by being injected into the veins: for more topical purposes they may also be applied to various other mucous membranes.

1. *By the mouth and stomach.* This is by far the most common mode of giving medicines, and one which appears most natural and convenient, and requires no instrumental aid. It has, however, both its advantages and its disadvantages. The advantages consist in the fact that most soluble substances are readily absorbed by the stomach, and thus quickly introduced into the blood, as is shown by giving full doses of iodide of potassium, for it is not uncommon to find iodine in the urine twenty minutes after it has been ingested. Furthermore, substances which are little soluble in water, are often easily dissolved in the stomach; the solubility of calomel, for example, is scarcely appreciable, and yet there is abundant evidence to show that the system is readily affected by its administration through the mouth.

The disadvantages which sometimes accrue from this mode of giving medicines arise first from the patient tasting the drugs, which, unless in the form of pill, are often nauseous; next, from their sometimes interfering with or disturbing the digestive function, which may prove a serious inconvenience to the patient; and again, from the process of digestion affecting their absorption.

The advantages however of giving medicines by the mouth far outweigh the disadvantages.

2. *By the rectum.* Medicines can be thus administered, either in the form of enemata or suppositories.

If the amount of fluid in an enema is large, as from half a pint to a pint and a half, it is apt to excite peristaltic action of the colon and rectum, and thus cause a purgative effect ; and water, or water thickened with starchy matters (as in the form of gruel, arrow-root, &c.), is frequently administered for this purpose ; purgative drugs, as castor oil, Epsom salts, &c., are often added to increase the cathartic effect.

If, however, the object is to cause absorption of the medicinal agents into the system, the quantity of fluid should be small, say from one to three ounces ; under such circumstances it will generally become absorbed, and produce its effects upon the system at large. Remedies thus given exert a local as well as a systemic action ; for example, in cases of irritable rectum and bladder, a small amount of opium administered by the rectum will often give greater relief than a much larger dose given by the stomach.

It should be remembered that active drugs, *e. g.* the alkaloids, are even more readily absorbed from the mucous membrane of the rectum than from that of the stomach.

Suppositories, of which there are several in the British Pharmacopœia, are convenient forms for the application of drugs when the local effect upon the rectum or neighbouring parts is required.

3. *By inhalation.* The exhibition of medicines in the form of vapour has been getting into vogue of late years, more especially in cases where it is desirable to overpower the system rapidly, as when anæsthetics are given to prevent pain in surgical operations. Inhalation may also be employed when local effects are required, as when stramonium is smoked, or conium, creasote or hydrocyanic acid is required to allay irritation of the respiratory passages. Various non-volatile drugs may be brought in contact with the bronchial mucous membrane by causing their solutions to be inhaled in the form of fine spray, generated by an instrument called an atomizer.

It can be easily proved that the desired effect upon a diseased part of the respiratory tract can be produced by a much less amount of the drug when administered in the way of inhalation, than when given by the stomach.

4. *By the skin.* Medicines may be administered by the skin, either by rubbing them thoroughly in the form of ointment or glycerine compounds into a part where the cuticle is thin, or by applying lotions constantly to the part, at the same time pre-

venting evaporation, or, lastly, a more ready way of causing their absorption is to denude the skin by a blister, and then sprinkle the drug over the raw surface. When the latter process is adopted, irritation is likewise produced, which is occasionally useful over painful or diseased parts. The system can readily be brought under the influence of mercury by simply rubbing in the mercurial ointment; the effects of morphia and other alkaloids are soon observed when these alkaloids are applied to a denuded surface.

5. *By subcutaneous injection.* The method of introducing medicines into the system by subcutaneous injection has gained much ground of late, and has been attended with great success. When a medicine in solution is thus used, its effects are extremely rapid; if morphia, for example, be injected, contraction of the pupil is observed within a minute, and pain or spasm if present is at once alleviated. The influence, at any rate of opium or morphia, is not topical, for it is found that in pain of any part, say of one sciatic nerve, the alleviation is equally wrought whether the injection takes place in one thigh or the other, in the arm, or in fact in any other part of the body.

The dose of any drug for subcutaneous injection is much less than when it is administered by the stomach; for the effect of the whole quantity is at once produced upon the system, when it is introduced into the cellular tissue, whereas some little time is required for absorption by the mucous membrane of the stomach, even when the substance is in a dissolved state.

6. *By injection into the veins.* Injection of medicines into the veins is hardly ever resorted to at the present time: the method was employed occasionally for the purpose of restoring to the blood its watery and saline parts, in cases of choleraic collapse; —there are many objections to the plan.

CLASSIFICATION OF MEDICINES.

Medicines have been very differently classified, at different times, by authors on Materia Medica and Therapeutics; some adopting a chemical and natural historical division, as is the case with the previous part of the present volume; others a physiological and therapeutic classification. For the purpose of rendering a complete account of the action and use of each medicine, the former method is, doubtless, the more convenient and instructive,

as all the facts pertaining to the action of individual drugs are thereby brought before the mind and easily retained ; but when a knowledge of the value of remedies is required for practical purposes, to effect a desired object in the treatment of disease, then a classification based upon some physiological grounds will be found to be the more feasible.

In the following classification, the author has been guided by a desire to make it one of practical utility rather than of scientific interest ; and he feels assured that in the present imperfect state of our knowledge concerning the action of medicines upon the animal economy, he shall best effect this by referring his arrangement to the organs and structures of the body which are influenced by the drugs rather than to the character of the action thereby exercised.

It has been the object of the author to retain such grouping of medicines as experience has long confirmed and ratified, and to avoid such subtleties of division as serve only to perplex the mind and lead to no useful results.

DIVISION I.

Internal remedies ; medicines which are administered for their effects upon the system both before and after absorption into the blood.

Class I.—Medicines which act upon the blood, altering its composition, and hence influencing the whole system, and the nutrition of the body.

Order 1. Blood tonics.
2. Alkaline remedies.
3. Acids and astringents.
4. Refrigerants.
5. Antipyretics.
6. Alteratives (subdivided into several groups).

Class II.—Medicines whose principal effects are seen upon the nervous system.

SUBCLASS 1. Medicines acting especially on the brain proper, but probably also upon other portions of the central nervous system.

Order 1. Exhilarants.
2. Narcotics, soporifics, and anodynes.
3. Anæsthetics.

SUBCLASS 2. Medicines acting especially upon the spinal cord.

Order 1. Spinal stimulants.
2. Spinal sedatives.

SUBCLASS 3. Medicines acting upon some portions of the nervous centres, and on the ganglionic system.

Order 1. Antispasmodics.
2. Nervine tonics and antiperiodics.

Class III. — Medicines acting chiefly on the heart and circulating system; probably often through the vasomotor system of nerves.

Order 1. Vascular stimulants.
2. Vascular sedatives.
3. Vascular tonics.

Class IV. — Medicines acting upon special organs.

SUBCLASS 1. Medicines which act especially on the different portions of the alimentary canal.

Order 1. Sialagogues.
2. Emetics.
3. Purgatives or cathartics.
Group 1. Laxatives.
2. Simple purgatives.
3. Drastic purgatives.
4. Hydragogue purgatives.
5. Saline purgatives.
6. Cholagogue purgatives.
Order 4. Anthelmintics.
5. Stomachic tonics.
6. Stomachic stimulants or carminatives.
7. Stomachic sedatives.

SUBCLASS 2. Medicines affecting the respiratory organs and passages.

Order 1. Errhines.
2. Expectorants (pulmonary stimulants).
3. Pulmonary sedatives.

SUBCLASS 3. Medicines acting on the function of the skin.

Order 1. Sudorifics, diaphoretics.

SUBCLASS 4. Medicines affecting the function of the kidneys and urinary organs.

Order 1. Diuretics.
2. Lithontriptics.
3. Medicines influencing mucous membrane of urinary tract.

SUBCLASS 5. Medicines whose action is upon the generative organs.

Order 1. Emmenagogues and Ecbolics.
2. Aphrodisiacs.
3. Anaphrodisiacs.

SUBCLASS 6. Medicines which act upon the eyes.

Order 1. Pupil dilators.
2. Pupil contractors.

DIVISION II

External remedies; or medicines which act locally, and are not employed to affect the constitution.

Order 1. Irritants.
Group 1. Rubefacients.
2. Epispastics or blistering agents.
3. Pustulants.
Order 2. External sedatives.
3. Emollients and demulcents.
4. Astringents and styptics.
5. Caustics and escharotics.

DIVISION III.

Chemical agents used for other than their medicinal properties.

Order 1. Antidotes.

Order 2. Disinfectants and Antiseptics

DIVISION I.

Class I.—Medicines whose primary action is upon the blood, altering its character and composition, and, through it, influencing the whole system :—

Order 1.—Blood Tonics. Analeptic Tonics. Blood Restoratives.

Medicines which possess the power of improving the quality of the blood, by the restoration of principles in which it is deficient.

Reduced iron.
Magnetic oxide of iron.
Carbonate of iron (saccharated).
Hydrated peroxide of iron.
Sulphate of iron.
Phosphate of iron.
Perchloride of iron.
Pernitrate of iron.
Citrate of iron and ammonia.
Tartarated iron (tartrate of iron and potash).
Citrate of iron and quinine.
Iodide of iron.
Oxide and salts of manganese.
Cod liver oil.
Other animal oils.
Vegetable oils.

Appropriate alteration of diet to suit individual cases.—As fresh fruit and vegetables.

Adjuvants to blood tonics.—Fresh air, light, exercise, &c.

Effects of Blood Tonics. The effects produced by the different blood tonics are necessarily of a very diverse nature. If the blood is deficient in any element or proximate constituent, the exhibition of medicine, or food containing such deficient substance, has the effect of restoring the fluid to a healthy condition.

In the lower animals, when living in a state of nature, it is probable that, so long as they are able to procure food, such a state of blood rarely occurs; for their diet contains all that is essential. If the animal be carnivorous, then he eats all the parts of his prey, including the blood; if herbivorous, the vegetable substances contain all that is necessary in his food.

Man, however, distinguished by being an animal which cooks his food, in doing so, sometimes deprives his diet of some of the essential elements and hence disease may from this cause be

engendered. The most frequent morbid conditions which ensue from deficiency in diet, as also from other causes, are :—

Anæmia, or bloodlessness, caused by a deficiency of red corpuscles in the blood ; wasting or imperfect flesh-making, and true scorbutus or scurvy.

Therapeutic applications. The use of blood tonics is indicated in the above-named conditions. If anæmia be present, then the salts of iron, the peculiar properties and value of which will be found under the respective heads, should be given. The value of the manganese salts in such cases is questionable. If there is wasting of the body from different causes, then cod-liver oil is valuable, or some fatty or oily matter should be added to the food ; and lastly, if there is a scorbutic condition, then fresh vegetables and fruits, and certain salines contained in them, prove almost invariably curative.

Order 2.—Alkaline or Antacid Medicines.

Agents which increase the normal alkalinity of the blood, and through it, either reduce the acidity, or render alkaline the secretions which are acid in health, or increase the alkalinity of such as are normally alkaline.

1. *Direct Alkaline Remedies.*

Solution of caustic potash.
Carbonate of potash.
Bicarbonate of potash.
Solution of caustic soda.
Carbonate of soda.
Bicarbonate of soda.
Solution of caustic lithia.
Carbonate of lithia.
Bicarbonate of lithia in solution (lithia water).
Magnesia.
Carbonate of magnesia.
Bicarbonate of magnesia in solution (fluid magnesia).
Lime water, and strong saccharine solution of lime.
Carbonate of lime (chalk).

2. *Direct but not remote Antacids, at least on the Urine.*

Solution of ammonia.
Carbonate of ammonia.
Aromatic spirit of ammonia.
Wood charcoal.
Animal charcoal.

3. *Remote Alkaline Remedies.*

Salts of potash with a vegetable acid, as acetate, citrate, and neutral tartrate.
Acid tartrate of potash (in small doses).
Salts of soda with a vegetable acid.
Citrate of lithia.

Effects of Alkaline or Antacid Remedies.—It will be seen that a subdivision of these medicines is made into *direct* and *remote* antacids. The direct antacids are alkaline in their reaction, will turn reddened litmus paper blue, and hence when they come in contact with acid in the alimentary canal they neutralize it at

once; after absorption into the blood they probably increase the alkalinity of this fluid, and certainly, with the exception of the salts of ammonia, cause alkalinity of the secretions, especially of the urine. The remote antacids differ from the first subdivision in possessing no alkaline reaction; in fact, one, the cream of tartar, or acid tartrate of potash, has a strong acid reaction; hence they cannot be used if the neutralization of acid in the stomach or intestines is desired. Free ammonia and its carbonate have the power of neutralizing acid in the alimentary canal, but do not affect the urine; their effect on the blood has not been determined. Independent of their alkaline or antacid powers, each group of these remedies has some special effect on different organs; thus, potash salts act more especially on the kidneys, soda salts upon the liver, lime salts tend to cause constipation, and magnesia salts have a purgative effect. Ammonia salts appear to influence the skin and pulmonary mucous membranes; whether they diminish the acidity of the cutaneous secretion has not been clinically demonstrated.

The vegetable acids of the salts of the fixed alkalies and alkaline earths are decomposed in the system, and the bases appear in the urine in the form of carbonates.

Therapeutic applications. 1. To neutralize acidity in the stomach and intestines, and hence relieve heartburn and other symptoms induced by an over-acid state of the alimentary canal.

2. To augment the alkalinity of the blood, which is altered in many diseases—as in febrile states, rheumatism, gout, albuminuria, &c.

3. To alter the secretions from the blood, more especially the urine (see Lithontriptics), and to influence the secreting organs and the mucous membranes of many parts.

From what has been stated under the head of the Effects of Alkaline Medicines, a proper selection of them can readily be made in different diseases.

Order 3.—Acids and Astringents.

Acid and astringent medicines have been grouped together, because it is probable that all the acids, vegetable and mineral, are more or less astringent in their action, although there are other drugs not acid in reaction which still are powerfully astringent; hence the acids form only one group of these latter remedies. Astringents are substances which produce some alteration in the composition and character of the blood, increasing its

disposition to coagulate, and probably causing at the same time contraction of the blood-vessels and a diminution of the secretions from the different organs and secreting surfaces throughout the body.

Vegetable Acids, and substances containing them.

Acetic acid.
Vinegar.
Tartaric acid.
Citric acid.
Tannic acid.
Gallic acid.
Benzoic acid.

Substances containing Tannic, Gallic, Catechuic, or other allied acids—as

Nut galls.
Oak bark.
Catechu.
Kino.
Areca.
Eucalyptus resin.
Logwood.
Rhatany root.
Rose leaves.
Guarana.
Tea

Mineral Acids.

Diluted sulphuric acid.
Diluted hydrochloric acid.
Diluted nitric acid.
Diluted nitro-hydrochloric acid.
Diluted phosphoric acid.

Alum.
Sulphate of iron.
Perchloride of iron.
Pernitrate of iron.
Oxide of zinc.
Carbonate of zinc.
Acetate of zinc.
Sulphate of zinc.
Oxide of lead.
Carbonate of lead.
Acetate of lead.

Oil of turpentine.
Carbolic acid.
Creasote.
Matico.
Ergot of rye.

Effects of Astringent Medicines. The blood is always alkaline in reaction, from the presence of the alkaline phosphate of soda and some alkaline carbonates. An excess of alkalinity appears to give it greater fluidity or less coagulating power, and on the contrary, a diminished alkalinity increases its adhesive quality and property of forming firm clots : it seems probable that the mineral acids, when absorbed into the blood, effect this object and hence are astringents ; most of them possess the property of forming insoluble compounds with albumen. The vegetable acids possess similar properties, but in very different degree ; the most powerful are the tannic, gallic, and other allied acids, as catechuic, and many vegetable substances containing these, as catechu, kino, &c.; the same remarks apply to some of the metallic astringents.

Turpentine, creasote and carbolic acid exert much of their influence by causing contraction of the blood-vessels. Some astringents appear to act through the central nervous system, as opium, ergot of rye, and probably the salts of lead.

Therapeutic applications. 1. To arrest hæmorrhage from any organ or surface. This is effected by altering the character of the blood, and causing contraction of the blood-vessels supplying the bleeding part.

2. To restrain excessive discharges from mucous membranes, an effect also produced by the changes in the blood itself and the blood-vessels.

3. To diminish an abnormal amount of the secretion from any organ, as of the skin in cases of excessive sweating; of the urine in excessive diuresis, &c.

Order 4.—Refrigerants.

The name refrigerant is given to medicines which allay febrile disturbance by relieving the patient's thirst.

Water.	Nitrate of potash.
Acetic acid.	Chlorate of potash.
Citric acid.	Grape juice.
Tartaric acid.	Orange juice.
Cream of tartar in solution.	Lemon juice.
Phosphoric acid.	Tamarinds.

Effects of Refrigerants. It will be observed that these medicines differ very much among themselves, although most of them belong to the group of acid and astringent remedies; their action in lowering the temperature of the body has never been clinically established, and is doubtful: still it is a fact that, when a patient is feverish, the acids and the juices of acidulous fruits are very grateful in relieving thirst.

Therapeutic applications. To allay thirst in febrile disturbance.

Order 5.—Antipyretics.

This term is applied to certain agents which have the power of lowering febrile heat, independently of any specific action on particular organs or morbid products.

Quinia.	Veratria.
Alcohol.	Digitalis
Chloral hydrate.	Cold baths.
Trimethylamine.	Venesection.
Eucalyptol.	Purgatives.
Camphor and essential oils (?).	Blisters.
Aconite.	

Effects of Antipyretics. The precise nature of the action exerted by these agents is still somewhat obscure; it is probable that they

do not all act alike. For instance, chloral may lower temperature by dilating the cutaneous vessels, and so increasing the amount of heat given off; quinia, by checking the processes of oxidation in the blood and tissues; cold baths, by simply removing heat from the body more rapidly than it can be replaced. The influence of antipyretic drugs on the temperature of the body in health is very limited; they produce their maximum effect in cases of pyrexia, especially when due to the presence of septic matters in the system.

Cold baths have been largely employed in the treatment of enteric fever, especially in Germany. Their value is most marked in those cases where life is primarily endangered by the exaggerated degree of heat to which the organs and tissues are exposed. There can be no question that in rheumatism with hyperpyrexia —a rare and hitherto always fatal form of the disease—life has been saved by the judicious use of cold baths.

Order 6.—Alteratives.

The blood tonics and alkaline remedies, as likewise those which are acid and astringent, may all be said to be alterative in character, and their action is, more or less, understood; there are, however, remedies constantly employed in the treatment of disease which are termed alteratives; medicines which produce certain, at present, ill-understood changes throughout the system, but whose influence is frequently valuable. Such alteratives may be conveniently subdivided into groups.

Group 1.—*Mercurial Alteratives.*

Mercury in a highly divided state, as in blue pill and grey powder.
Subchloride of mercury (calomel).
Perchloride of mercury (corrosive sublimate).
Green iodide of mercury.
Red iodide of mercury.

Group 2.—*Iodine Alteratives.*

Iodine.
Iodide of potassium.
Iodide of iron.
Iodide of sulphur.
Iodide of lead.

Group 3.—*Chlorine Alteratives.*

Chlorine water.
Chlorated soda.
Chlorated lime.
Chlorate of potash.
Chloride of sodium.
Chloride of ammonium.
Nitro-hydrochloric acid.

Group 4.—*Arsenical Alteratives.*

Arsenious acid.
Arsenite of potash (in liquor arsenicalis).
Hydrochloric solution of arsenic.
Arseniate of soda.

Group 5.—*Antimonial Alteratives.*

Oxide of antimony.
Sulphurated antimony.
Tartarated antimony.

Group 6.—*Sulphur Alteratives.*

Sulphur (sublimed or precipitated).

Sulphide of ammonium.

Group 7.—*Phosphorus Alteratives.*

Phosphorus (in pill or oil).
Hypophosphite of soda.
Hypophosphite of lime.

Group 8.—*Alteratives of undetermined action.*

Sarsaparilla.
Indian sarsaparilla (hemidesmus).
Dulcamara.
Taraxacum.
Elm bark.

Effects of Alteratives. The effects of the alteratives in the above groups are of so varying a character, that it is almost impossible to define them, unless the detailed operation of all the medicines be given; such effects will be found severally described under each separate substance. They all produce some alteration in the state of the blood, and hence upon the system at large. In some, however, the influence is most marked upon the glandular system, in others, upon the serous membranes, in others upon the mucous membranes, and again, in a fourth class, upon the cutaneous tissue.

Under the influence of these alteratives peculiar morbid systemic affections become alleviated or removed, as is observed in the exhibition of mercurials and iodides in constitutional syphilis and scrofula; also conditions of the body giving rise to cutaneous eruptions. Many of the so-called alteratives appear to exert an influence in chronic inflammatory states of the system, and to have the power of removing the morbid products which have accumulated during such action.

Therapeutic applications. From what has been stated in former parts of this work, the indications for the administration of these remedies will be readily arrived at, and need not be further alluded to in this place.

Class II.—Medicines whose principal effects are upon the nervous system.

SUBCLASS I.—Medicines acting especially upon the brain proper; but probably also upon other portions of the central nervous system.

Order 1.—Exhilarants.

Exhilarants are medicines whose primary effect is to cause an exaltation of the spirits, and through this influence on the brain, a general excitement or augmentation of the functions of the whole body; if taken in large quantities, many of them produce intoxication, and are therefore called *inebriants.*

Alcohol in the form of
- Distilled spirit, as brandy.
- Wine.
- Malt liquors.
- Ether.
- Acetic ether.
- Chloroform.
- Indian hemp.
- Opium (in small doses).

Effects of Exhilarants. These are sufficiently indicated in the definition; they stimulate the vascular system through the influence of the nervous. Their effects are transient.

Therapeutic applications. These remedies are given in low conditions of the nervous system, and in cases in which there is the necessity to stimulate for a time the heart and circulating system.

Order 2.—Narcotics, Anodynes, and Soporifics.

Medicines which act upon the nervous system, alleviating pain (anodynes), and some causing direct sleep (soporifics).

- Opium.
- Salts of morphia.
- Chloral hydrate.
- Croton-chloral hydrate.
- Indian hemp.
- Hops ?
- Lettuce ?
- Bromide of potassium.
- Bromide of ammonium.

} Soporifics and anodynes.

- Belladonna.
- Atropia.
- Stramonium.
- Hyoscyamus.

} Anodyne and antispasmodic.

- Aconite.
- Aconitia.
- Gelsemium.
- Conium ?

- Digitalis.
- Digitalinum.

Effects of Narcotics. All the remedies in the above list, except those to which queries are attached, and probably the bromides, produce stupor if the dose be increased beyond a certain point, and are hence called narcotics; still the different members differ essentially from one another in their action. Certain of them, soporifics, produce direct sleep; this is the case with opium and morphia salts, and chloral hydrate; bromide of potassium and Indian hemp will also cause drowsiness.

Others, which may be termed anodynes, allay pain; but in large doses there is delirium rather than sleep induced. The action of opium differs considerably from that of belladonna: opium causes contraction of the pupil; belladonna dilates it. Indian hemp neither contracts nor dilates the pupil. Under the

influence of opium the brain probably becomes congested; whereas under belladonna it becomes deficient in blood from contraction of the arteries of the organ.

Sleeplessness may arise from different states of the brain, and therefore some of these remedies may prove useful at one time, others at another.

Aconite produces a numbness and loss of sensation in the extremities, and when topically applied it produces local anæsthesia. Digitalis sometimes causes sleep from its influence on the circulation.

Therapeutic applications. Narcotics are used in medicine for different purposes.

1. To procure sleep (soporifics).
2. To allay pain and diminish spasm (anodynes).

Order 3.—Anæsthetics.

Substances which when inhaled in the form of vapour possess the property of destroying consciousness, and at the same time causing insensibility to pain : they are therefore soporifics and anodynes, but their effect is more immediate and much less persistent than that of ordinary narcotics.

Chloroform.	Bichloride of methylene.
Ether.	Protoxide of nitrogen (nitrous oxide).
Tetrachloride of carbon.	

Effects of Anæsthetics. These have been sufficiently detailed under the respective heads of the above anæsthetic agents.

Therapeutic applications. 1. To alleviate pain and spasm.

2. To produce unconsciousness and insensibility to pain during surgical operations and parturition.

3. To procure sleep and diminish violence in delirium tremens and some other forms of cerebral disturbance.

4. To cause relaxation of the muscular system, in order to facilitate the reduction of dislocations and of hernia.

Subclass 2.—Medicines acting especially upon the spinal cord.

Order 1.—Spinal Stimulants.

Medicines which increase the function of the spinal cord.

Nux vomica.	Thebaia.
Strychnia.	Cantharides.
Brucia ?	Phosphorus.

Arnica.	Morphia.
Ergot.	Belladonna.
Opium.	Indian hemp.

Effects of Spinal Stimulants. The action of strychnia, detailed under the therapeutics of that remedy, affords a typical illustration of the physiological effects produced by these bodies. The specific action of many of the substances in the list upon the spinal cord is somewhat doubtful ; their other influences are often more apparent. The spinal properties of opium are best seen in the lower animals, where the cerebral hemispheres are less developed.

Therapeutic applications. The use of these remedies is indicated—

1. In cases of paraplegia, when there is no evidence of inflammatory action.
2. In cases of local paralysis.
3. In some forms of hemiplegia.
4. In cases of functional debility of the cord.

Order 2.—Spinal Sedatives.

Medicines which diminish the function of the spinal cord.

Conium (hemlock).	Bromide of ammonium.
Gelsemium.	Calabar bean.
Bromide of potassium.	Hydrocyanic acid ?

Effects of Spinal Sedatives. The action of conium and its alkaloid is the reverse of that of strychnia ; it causes paralysis of the extremities, the function of the brain remaining intact. The bromides also appear to influence the function of the nervous system. Hydrocyanic acid acts on the whole nervous system, so that its special influence on the spinal cord cannot be readily shown.

Therapeutic applications. Spinal sedatives are used in the following cases :—

1. In irritated conditions of the spinal cord ; as in cases of paraplegia accompanied with inflammatory action.
2. In spasmodic affections, as nervous forms of cough and pertussis. Also in muscular spasm and tremor.
3. In affections in which there is over-excitement of the generative organs.

SUBCLASS 3.—Medicines acting upon some portions of the nervous centres, and on the ganglionic system.

Order 1.—Antispasmodics.

Antispasmodics are medicines which possess the property of allaying spasm, probably by giving tone to the spinal cord.

Direct Antispasmodics (spinal tonics).

Assafœtida.
Galbanum ?
Ammoniacum ?
Valerian.
Sumbul.
Musk.
Castor.
Oil of rue.
Oil of turpentine.
Oil of cajuput.
Camphor.
Ammonia (free).
Carbonate of ammonia.

Indirect Antispasmodics.

1. Spinal sedatives, as conium, &c.
   Bromide of potassium.
   Bromide of ammonium.
2. Nervine tonics, as salts of zinc.
   Salts of silver.
3. Hydrocyanic acid.
   Belladonna.
   Stramonium.
   Henbane.
   Indian hemp.
   Opium.
   Chloroform.
   Ether.
   Acetic ether.

Effects of Antispasmodics. The direct antispasmodics appear to give tone to the spinal cord and other parts of the nervous system, and through these to the muscular system, and hence they diminish the susceptibility to spasm ; their typical action is seen in that of assafœtida.

The indirect antispasmodics in the table act in very different ways ; some by their direct sedative influence upon the spinal cord, as conium ; some by bracing up the whole nervous system, as the zinc salts and other nervine tonics ; and some by their influence upon the brain, as the various narcotic remedies.

Therapeutic applications. The use of the direct antispasmodics is indicated—

1. In spasm depending on hysteria, and other weakened conditions of the nervous system.

2. In other forms of spasm ; in which they should be combined with remedies which remove the cause of the spasm.

Order 2.—Nervine Tonics and Antiperiodics.

Nervine tonics are remedies which give tone to the nervous system in general, and some (antiperiodics) possess the power of arresting intermittent forms of disease.

All cinchona barks. Salts of quinine. Salts of quinidine. Salts of cinchonine. Salts of cinchonidine. Arsenical salts. Sulphate of beberia? Eucalyptus globulus?	Antiperiodics.
Chamomile? Calumba?	Quassia? Salicin?
Nitrate of silver. Oxide of silver. Sulphate of zinc. Oxide of zinc. Sulphate of copper. Salts of iron. Nux vomica. Strychnia. Brucia. Cusparia.	Nervine tonics.

Effects of Tonics and Antiperiodics. Although all the antiperiodics in the above list are tonics to the nervous system, yet there are many substances placed therein which do not possess antiperiodic powers, and hence they must be subdivided into groups, for practical purposes.

The way in which these different tonics act, and the parts upon which the action is exerted, are at present not understood.

It will be seen that queries have been placed to several of the medicines in the list, many substances having been proposed as antiperiodics of which experience has not confirmed the value.

Therapeutic applications. The *antiperiodic tonics* are administered in the following cases :

In all forms of intermittent fevers.

In intermittent forms of neuralgia.

The *nervine tonics* in spasmodic affections of the nervous system, as chorea, epilepsy, hysteria, and other forms of nervous disease, also in cases of nervous debility.

Class III.—Medicines acting chiefly on the heart and circulating system ; probably often through the vasomotor system of nerves.

Order 1.—Vascular Stimulants.

1. *Acting more on the Heart and Larger Vessels.*

Free ammonia as in the solution of ammonia.
Carbonate of ammonia.
Aromatic spirit of ammonia.
Alcohol in the form of
  Brandy.
  Wine.
Ether.
Spirit of ether.
Oil of turpentine.
Aromatic volatile oils.
Camphor.
Assafœtida.
Valerian.
Sumbul.
Chloroform.
Aromatics.

2. *Acting more on the smaller vessels.*

Acetate of ammonia.
Citrate of ammonia.
Guaiacum.
Serpentary.
Sassafras.
Mezereon.
Resin.
Galbanum.
Ammoniacum.

Effects of Vascular Stimulants. There are certain drugs which act more especially as stimulants to the heart and large vessels, others on the minute arteries and capillary system, and in practice it is important to separate them ; thus, if it is desired to rouse the heart quickly to more powerful action, ammonia and the carbonate of ammonia will often effect the object, whereas the salts of ammonia, in which the alkali is combined with a vegetable acid, as the acetic or citric, will be powerless, although the action of these salts may prove of much value in increasing the capillary circulation ; the vascular stimulants which act in these different ways are indicated in the list.

Therapeutic applications. The use of the above remedies which act especially on the heart is indicated in cases in which the function of this organ is very languid ; this condition may occur from many causes, either temporarily from a lowering of the nervous supply of the heart, or more permanently in cases where the walls of the organ have become weakened ; in the latter the stimulants should either be combined with vascular tonics, or the use of the latter should be soon substituted for the former.

Those vascular stimulants which act on the small vessels and capillary circulation are indicated in chronic inflammatory affections in which the circulation of the diseased parts is sluggish ; and also to aid the absorption of matters deposited during the more acute inflammatory stages. Many of these remedies augment the function of various special organs.

Order 2.—Vascular Sedatives.

Vascular sedatives are medicines which possess the power of

depressing the action of the heart or other portions of the circulating system.

Effects of Vascular Sedatives. As in the case of vascular stimulants, so with vascular sedatives; some act more especially on the heart itself, others on the smaller vessels; and the division into the two groups is of real therapeutic importance. Those acting principally on the heart often cause intermission of the pulse, as digitalis, colchicum and aconite.

1. *Acting especially on the heart.*
   - Digitalis.
   - Green hellebore.
   - Tobacco.
   - Aconite.
   - Colchicum.
   - Hydrocyanic acid.
   - Calabar bean.
   - Veratria.

2. *Acting on the smaller vessels and capillary system.*
   - Tartarated antimony.
   - Oxide of antimony.
   - Nitrate of potash.
   - Acetate of lead.
   - Ipecacuanha.
   - Ergot.
   - Amyl nitrite.

Therapeutic applications. When the heart is turbulent in its action, then the sedative remedies which act upon this organ are indicated; the medicine most frequently resorted to is digitalis: it seems probable that this drug in reality stimulates the heart through its nerves, but nevertheless the effect is sedative, the organ becomes quieter, and the circulation more perfect; it must be remembered that a turbulent cardiac condition is often combined with a very imperfect flow of blood through its cavities. The other remedies, as green hellebore, aconite, and colchicum, are sometimes used as direct cardiac sedatives.

The preparations of antimony appear only to depress the heart's action along with that of the general circulating system, and they are employed, as are also green hellebore and other sedatives, to subdue vascular action in inflammations of various organs. It is questionable whether hydrocyanic acid acts on the vascular system, except in an indirect manner; it is most useful as a cardiac sedative when the over-action is dependent on dyspepsia. Colchicum has certainly a very notable, almost specific power, over gouty inflammation. Ipecacuanha, in large doses, has considerable power in lowering the circulation, and both it and acetate of lead may be used in many forms of hæmorrhage with much advantage. Ergot may also be employed, especially in menorrhagia.

Order 3.—Vascular Tonics.

Vascular tonics are medicines which give tone or strength to

the heart and other parts of the circulating system when weakened by disease.

Iron preparations.	Nervine tonics.
Digitalis.	Stomachic tonics.
Acid and astringent remedies.	Blood tonics.

Effects of Vascular Tonics. It will be seen by the above list, that the tonics to the heart and vascular system differ much in their nature, a fact easily explained when it is considered that whatever improves the general nutrition of the system, fortifies the heart and blood-vessels; however, iron preparations are peculiarly useful in cases of cardiac weakness, and the mineral acids are often of great utility. It will be observed that digitalis is placed among the vascular tonics, and it is probable that although sedative in its effects when the heart is turbulent, its action in small doses is that of a tonic to its walls.

Therapeutic applications. From the above it will be at once apparent when these remedies are required; it may, however, be remarked that in certain cases of cardiac weakness, accompanied with dilated ventricles, digitalis is useful, and especially when combined with ferruginous preparations.

Class IV.—Medicines acting upon special organs.

SUBCLASS I.—Medicines which act especially on the different portions of the alimentary canal.

Order 1.—Sialagogues.

Sialagogues are medicines which have the property of exciting the flow of saliva and buccal mucus.

Topical or Direct Sialagogues.	*Remote Sialagogues.*
Pellitory root.	Mercurial salts (given to a certain extent).
Horse-radish.	Iodide of potassium.
Mustard.	Other medicinal iodides.
Tobacco (when masticated).	

Effects of Sialagogues. Some sialagogues produce their effects by their topical action; some by their influence after absorption into the system, and some possess both these properties, more especially tobacco.

When iodide of potassium is administered, a peculiar taste is frequently detected in the mouth, and sometimes a marked increase of mucus is observed; but many of the recorded cases of saliva-

tion and ptyalism are instances of the power of iodine in bringing mercury which had been previously taken by the patient back into the blood, and causing it to reproduce the ordinary symptoms of this metal.

Therapeutic applications. The object to be gained by the use of sialagogues is the relief of dryness of the mouth, which is sometimes present in disease, and occasionally the production of a derivative effect and the alleviation of some neighbouring morbid action. Sialagogue medicines are seldom used medicinally for their action as such.

Order 2.—Emetics.

Emetics are medicines which cause vomiting, by producing an inverted action of the stomach and œsophagus, and the emptying of the stomach of any contents which may be present.

Direct Emetics.	*Indirect Emetics.*
Sulphate of zinc.	Ipecacuanha.
Sulphate of copper.	Tartarated antimony.
Carbonate of ammonia.	Apomorphia.
Mustard flour.	*Emetic Agents.*
Chamomile.	
Common salt.	Titillation of the fauces.

Effects of Emetics. The removal of the contents of the stomach by the act of vomiting is usually the principal effect sought for in the administration of emetics, but there are others which attend this act, sometimes preceding and following it, and the division of the remedies in this group depends upon the amount of the accompanying phenomena. The most constant of these are nausea, an increased secretion of mucus from the stomach and gullet, frequently a flow of bile from the gall-bladder into the duodenum, and its partial regurgitation into the stomach ; also an increased flow of mucus from the bronchial tubes : emetics are therefore to some extent *cholagogues* and *expectorants.* Besides this, the act of vomiting is attended with more or less depression of the nervous system, diminution of nervous energy and of muscular contractility ; there is usually increased action of the skin, sweating or diaphoresis. Direct emetics produce very little of the above phenomena.

Therapeutic applications. The more direct emetics are especially indicated when the emptying of the stomach or the mere act of vomiting is alone desired ; as in cases of poisoning to

remove the peccant matters: in such cases mustard, from the rapidity of its action, and the facility with which it can be procured, is peculiarly adapted. These emetics are also useful in certain cases in which very indigestible food has been taken, and discomfort thereby produced. Sometimes in disease the act of vomiting is useful for its mechanical effects, as in some cases of phthisis, bronchitis, and croup. Sulphate of copper is said to be more powerful than sulphate of zinc, but its administration has disadvantages, for, if absorbed, the copper may cause unpleasant symptoms; it is seldom used. Carbonate of ammonia in large doses is indicated when a stimulant effect upon the heart is required as well as the mechanical effect, as in cases of asthenic bronchitis.

The indirect emetics are used in inflammatory diseases, especially of the chest.

Order 3.—Purgatives or Cathartics.

Purgatives are medicines which cause increased action of the bowels—that is, an unloading of the large and small intestines, with more or less alteration in the character of the evacuations.

1. *Laxative Purgatives.*

Figs.
Prunes.
Honey.
Treacle.
Manna.
Tamarinds.
Cassia.
Sulphur.
Olive oil.
Castor oil.
Magnesia.
Carbonate of magnesia.

2. *Simple Purgatives.*

Rhubarb.
Senna.
Buckthorn juice.
Aloes.
Jalap.

3. *Drastic Purgatives.*

Jalap.
Scammony
Colocynth.
Croton oil.
Podophylline resin.
Gamboge.

4. *Hydragogue Purgatives.*

Gamboge.
Elaterium.
Cream of tartar (in large doses).

5. *Saline Purgatives.*

Phosphate of soda.
Tartrate of potash.
Tartarated soda (tartrate of soda and potash).
Sulphate of soda.
Sulphate of magnesia.
Citrate of magnesia.
Sulphate of potash.
Cream of tartar (in moderate doses).

6. *Cholagogue Purgatives.*

Grey powder.
Blue pill.
Calomel.
Aloes.
Podophyllum resin or podophylline.
Taraxacum (in large doses) ?
Colchicum ?

Adjuvants to Purgatives.

a. By giving tone or contractile power to the intestines :—**Nux vomica** and strychnia, sulphate of iron.
b. By causing more equal contraction and diminishing spasm :—Aromatic and other volatile oils ; henbane, stramonium, and belladonna.
c. By increasing the mucous secretion from the canal and by diminishing spasm :—Ipecacuanha and antimonials, in small doses.
d. Enemata, cold, &c., to abdomen.

Effects of Purgatives or Cathartics. As above stated in the definition, all purgatives cause an increase in the peristaltic action, or of the normal vermicular movement of the intestinal tube ; but the various medicines in this class act so differently in other respects, that they are capable of being subdivided with advantage into groups for practical purposes : all purgatives have also a tendency to diminish the consistency of the fæcal evacuations, for mere increase of the rapidity of transit through the canal effects this, by preventing the complete absorption of liquid in the large intestines.

1. The term *laxatives* is given to purgatives which appear to effect little more than an increased peristaltic movement and a slight softening of the fæces ; some act more powerfully than others, and in the above table they are arranged in order, the mildest being placed at the top of the list.

2. *Simple Purgatives* are medicines the peristaltic action of which is greater than that of laxatives, but the other effects of the drugs in the subsequent groups are produced in a slight degree ; that is, there is no great increase in the secretion of the mucous membrane and its various small glands, nor in the exhalation of fluid from the membrane.

If a more complete knowledge could be obtained of the minute action of different purgative remedies, they would in all probability be capable of subdivision into still smaller groups, for each has doubtless some peculiarity in its action separating it from the rest, although such peculiarity may not be capable of being clearly defined at the present time ; some, for example, act more on the upper part of the small intestines, some on the lower portion, others again on the large bowels. Some purgatives augment the flow of fluid from the general surface of the intestinal canal, some increase in a great degree the peristaltic movement, and lastly, some influence the large secreting organs in connection with the intestinal canal, as the liver and pancreas. Among the simple purgatives these differences are well seen ;—

aloes, for example, acts notably upon the large bowel, and scarcely increases the fluid secretion from it, whereas jalap causes a greater flow; senna produces much contraction of the gut and griping.

In the exhibition of simple purgatives, little more than the emptying of the canal is looked for by the therapeutist.

3. *Drastic Purgatives.* There is no well marked line to be drawn between simple and drastic purgatives; they appear only to differ in the degree of their action. In the administration of drastic purgatives, the unloading of the bowels is but one object; a greater one is looked for in the derivative effect produced by the irritation of a large mucous surface, and also from a rather free elimination of fluid and of glandular secretions.

4. *Hydragogue Purgatives* possess the peculiarity of causing a very large secretion of fluid from the mucous membrane of the bowels. All drastic purgatives are hydragogue to some extent, but in the case of elaterium and cream of tartar, the amount of fluid is in excess of the violence of the operation in other respects. Cream of tartar will sometimes, if given alone, fail to produce a purgative effect, and yet its hydragogue action is fully produced; that is, it causes a copious flow into the intestinal tube, which may be again absorbed if the medicine is not combined with some other drug to cause its elimination. Many authors place gamboge in this group. The effect produced by hydragogues, beyond the ordinary purgative action, is the relief or partial emptying of the veins of the portal system, and hence of the whole circulation, together with the derivative action as in the case of ordinary drastic purgatives.

5. *Saline Purgatives.* The drugs in this group differ from those in the last in the degree of watery discharge which they produce, and in their action not being drastic in character: cream of tartar might fairly be included among them, and regarded as a link between the saline and hydragogue purgatives. Saline purgatives produce a similar effect to the hydragogue purgatives, but much slighter, together with the ordinary action of other purgatives; unless taken in a very diluted state and in large quantities, as in the form of Püllna and Friedrichshall bitter water, they are best given in combination with other aperients.

6. *Cholagogue Purgatives.* Certain purgatives appear to act upon the large secreting glands connected with the alimentary canal, especially the liver, possibly the pancreas also, and cause a

flow of bile into the intestines; to these the name cholagogue is given.

It is questionable if these drugs have any specific effect upon the bile-secreting functions of the liver; and it is probable that many of them act simply by causing an emptying of the gall-bladder, and it is a fact that retention of bile within the ducts and gall-bladder is a very common occurrence in civilized society. It must be remembered that almost all purgatives produce more or less cholagogue effect, the saline less than the rest. It will be observed that some medicines are placed in this group with reservation, as taraxacum and colchicum; those regarded as most efficient are the preparations of mercury and, lately, the resin of podophyllum.

Adjuncts to Purgatives. The purgative action of many drugs may be much aided by combination with others which do not of themselves possess any marked power of acting upon the alimentary canal; illustrations of such combinations have been already given; the medicines most frequently combined with purgatives are seen in the above table, and the peculiarities of their action sufficiently indicated.

Purgative Agents. The use of enemata of any liquid.

The application of cold to the abdomen, as cold affusion, compresses of wet cloths, &c.

Faradisation and mechanical kneading of the abdomen.

Therapeutic applications. The different kinds of purgatives are employed for various purposes:

1. To unload the bowels, if not sufficiently acted upon.
2. To remove any irritating matters.
3. To cause an increased elimination of the secretions from the liver and pancreas, as also from the numerous glands of the mucous membrane of the alimentary canal.
4. To unload the veins of the canal, if full, by causing an increased watery secretion from the membrane; by this means often removing congestion of internal organs, as the kidneys, and increasing their function.
5. To produce a derivative effect or counter-irritation; that is, by causing irritation and increased secretion from a large mucous surface, to relieve distant parts, as the head, &c.

Order 4.—Anthelmintics.

Substances which have the power of destroying the life of entozoa in the alimentary canal.

Direct Anthelmintics or Vermicides.

Oil of male fern (ethereal extract).
Oil of turpentine.
Kousso.
Kamala.
Worm seed and santonin.
Pomegranate (bark of root).
Tin in fine powder.
Cowhage (mucuna).
Areca.

Indirect Anthelmintics, or Vermifuges.

Calomel.
Scammony.
Jalap.
Gamboge.
Castor oil.

Worm Preventives.

Sulphate of iron.
Perchloride of iron.
Other ferruginous salts.
Quassia.
Nux vomica.

Effects of Anthelmintics. The three entozoa commonly found in the alimentary canal of the human subject are, the tape worm (tænia solium and mediocanellata), the round worm (ascaris lumbricoides), and the thread worm (oxyuris vermicularis); the first occupying the small intestines and extending upwards and downwards; the second, chiefly the cæcum and ascending colon; the third, the rectum and descending colon. The true vermicides or direct anthelmintics, when they come into contact with the entozoa, either kill them or produce such an effect upon them that they are easily dislodged. Some of them, as male fern, kousso, areca, and kamala, appear to act more effectually upon the tape worm; worm seed, and its active principle, santoninum, upon the round worm.

Some of the direct anthelmintics are purgative also in their action, as kamala; but the use of others requires to be followed by that of a cathartic. The worm-preventives are medicines which give tone to the intestinal membrane, and prevent the over-secretion of mucus, which forms a nidus in which the entozoa increase and lodge. Quassia and nux vomica are probably vermicides as well as intestinal tonics.

Therapeutic application. Anthelmintics are employed for the following purposes:—

1. The direct, or vermicides, to destroy any worms present in the alimentary canal.

2. The indirect, or vermifuges, to expel any worms, living or dead.

3. The worm-preventives are administered after the expulsion of worms, to fortify the body and prevent their return.

The direct anthelmintics should be taken when the patient has fasted for many hours; it is often advantageous to give a cathartic

some hours before and also three or four hours after; the object of these precautions being to enable the drug to come into close contact with the entozoa, and also to cause their expulsion as soon as they are injured or killed.

Thread-worms are best treated by the exhibition of anthelmintics in the form of enemata, as they inhabit the lower part of the canal.

Order 5.—Stomachic Tonics.

Stomachic tonics, or stomachics, are medicines which act directly upon the stomach, improve appetite, and aid the digestive function.

1. Calumba.
   Gentian.
   Cascarilla.
   Chiretta.
   Quassia.
   Hops.
   Cusparia.
   Absinth.
   Nitric acid.
   Hydrochloric acid.
   Nitro-hydrochloric acid.
2. Nux vomica.
   Strychnia.
   Cinchona bark.
   Sulphate of quinine.
   Sulphate of beberia.
   Salts of iron.
3. Pepsin.
   Ox-gall.
   Pancreatin.
4. Aloes.
   Rhubarb.
   Taraxacum.

Effects of Stomachic Tonics. In the above list it will be seen that the included drugs are separated into several groups, and such subdivision is not without practical value. Some stomachics appear to act simply by altering the vascularity of the mucous membrane, others by acting on the nervous system and giving tone to the stomach; a third group, by adding to the digestive principles; and a fourth, by altering the state of the lower portion of the intestinal canal and thus relieving any morbid condition of the stomach itself.

Therapeutic applications. In cases of simple debility of the mucous membrane of the stomach, caused by long-continued dyspepsia, and by the free use of alcohol, the medicines in the first group are useful.

In atonic indigestion from debility of the nervous system and anæmia, the members of the second group are indicated; iron salts if anæmia is present.

In simple atonic dyspepsia from old age and other causes, pepsin is useful.

When atonic indigestion is combined with a torpid state of bowels and liver, taraxacum, aloetics, and rhubarb, alone or combined with other stomachics, prove of much value.

Order 6.—Stomachic Stimulants or Carminatives.

Carminatives are medicines which act as stimulants to the stomach, causing expulsion of flatulence, also allaying pain and spasm of the intestines.

Ginger.
Capsicum and chillies.
Cardamoms.
Mustard.
Horseradish.
Pepper.
Cinnamon oil.
Nutmeg and oil.
Mace.
Cloves and oil.
Allspice and oil.
Oil of cajuput.
Valerian.
Anise and oil.
Caraway and oil.
Coriander and oil.
Dill and oil.
Fennel.
Oil of peppermint.
Oil of spearmint.
Ether and acetic ether.

Effects of Carminatives. It will be observed that the majority of the substances in the above list contain a volatile oil, which is aromatic in nature ; some are used as ordinary condiments ; they act as stimulants to the mucous membrane of the stomach and intestines, relieve spasm of the muscular coat, and hence give a greater regularity to the ordinary vermicular action of the canal.

Therapeutic applications. These remedies may be used—

1. In cases of distension and colicky pains of the stomach or intestines from flatulence : they may be combined with other indicated medicines.

2. As adjuncts to purgatives, the action of which they often assist, at the same time diminishing their griping tendency.

3. Some of these substances are used in order to assist the digestive process, in cases of atonic dyspepsia ; more especially capsicum, mustard, ginger, pepper, and horseradish.

Order 7.—Stomachic Sedatives.

Medicines which allay irritation of the stomach and upper part of the intestinal canal, by producing a direct sedative action upon the mucous membrane.

Dilute hydrocyanic acid.
Carbonate, subnitrate, and oxide of bismuth.
Citrate of ammonia and bismuth.
Nitrate of silver.
Oxide of silver.
Oxalate of cerium.
Creasote.
Carbolic acid.
Solution of soda.
Solution of potash.
Bicarbonate of soda.
Bicarbonate of potash
Belladonna.
Stramonium.
Henbane.
Opium.

Effects of Stomachic Sedatives. The remedies in this list differ widely in the character of their action, yet under certain circumstances all of them may be employed to allay pain : some appear to act by their direct sedative influence on the nerves of the mucous membrane, others by their influence on more central parts of the nervous system : in the first class are the bismuth and silver salts, the alkaline preparations, and prussic acid ; in the second, belladonna, stramonium, henbane, and opium, more especially the latter.

Therapeutic applications. The use of stomachic sedatives is indicated in—

1. Painful affections of the stomach and duodenum, as in gastrodynia, enterodynia : hydrocyanic acid and belladonna are most useful in these cases.

2. In conditions of the stomach accompanied with pyrosis or water brash : in these cases bismuth salts are peculiarly useful.

3. In vomiting : the selection of the remedy must depend on the condition of the stomach giving rise to this symptom : when there is much increased vascular action and a sub-inflammatory state, prussic acid and alkalies may be taken ; when the affection is chronic, creasote and carbolic acid, or nitrate of silver ; in vomiting from pregnancy, cerium salts are stated to be useful.

SUBCLASS 2.—Medicines affecting the respiratory organs and passages.

Order 1.—Errhines or Sternutatories.

Errhines are medicinal substances which possess the property of exciting a secretion of mucus from the nasal mucous membrane, and this is very frequently accompanied with sneezing.

Tobacco (snuff).
Subsulphate of mercury.
Veratrum album (in powder).
Euphorbium.

Effects of Errhines. The effects of errhines are almost sufficiently described in the definition ; it may, however, be remarked that some of these substances merely cause an irritant effect upon the surface to which they are applied, but others, especially strong tobacco, produce a secondary influence upon the system, from the subsequent absorption of the drug.

Therapeutic applications. In great dryness of the mucous membrane of the nasal passages.

In some forms of headache, which are relieved by these reme-

dies, partly on account of the increased secretion of mucus and the consequent unloading of the blood-vessels of the membrane, and partly from the derivative effect which is caused by the irritation of the membrane, and also by the act of sneezing.

Order 2.—Expectorants.

Expectorants are medicinal substances which affect the mucous membrane of the pulmonary passages, and alter the quantity and quality of its secretion.

1. Ammonia (free).
   Carbonate of ammonia.
   Senega.
   Squill.
   Benzoic acid.
   Benzoate of ammonia.
   Benzoin.
   Balsam of Peru.
   Balsam of Tolu.
   Storax.
   Ammoniacum.
   Galbanum.
   Assafœtida.
   Myrrh.
   Copaiba.
   Larch bark.
   Tar.
2. Ipecacuanha.
   Tartarated antimony.
   Oxide of antimony.
3. Vapour of water.
   Chlorine.
   Ammonia.
   Iodine.
   Creasote.
   Carbolic acid.

Effects of Expectorants. The remedies in the above list appear to be of very diverse kinds, and groups may be usefully formed for practical purposes. In the first division, the drugs are more or less stimulant upon the vascular system; in the second, sedative in their action; still, under certain conditions, each produces a desirable change in the mucous secretion from the bronchial tubes. Watery vapour relaxes the membrane; the vapours of chlorine and ammonia act as direct stimulants.

Therapeutic applications. The remedies of the first group are applicable in chronic forms of bronchitis unattended with febrile disturbance; they often increase cough and produce discomfort if fever is present. The drugs in the second group are distinctly sedative upon the vascular system, and are more adapted for the treatment of the early stages of bronchitic inflammation, and when febrile disturbance is present. The vapour of water is useful in many cases, and is most conveniently applied by allowing steam to enter the patient's apartment. Chlorine and ammonia vapour used in the form of inhalation can only be employed in very chronic forms of disease, as likewise the vapour of creasote and carbolic acid.

Order 3.—Pulmonary Sedatives.

Pulmonary sedatives are substances which produce a direct sedative effect upon the respiratory organs, frequently diminishing the secretion from the mucous membrane of the bronchial tubes.

Opium.
Morphia.
Conium.
Belladonna.
Stramonium.
Hydrocyanic acid.
Acetate of lead.
Tobacco (in smoke).
Stramonium (in smoke).
Conia (vapour of).
Hydrocyanic acid (vapour of).

Effects of Pulmonary Sedatives. Little more can be stated with regard to the action of these remedies than what is contained in the definition; the primary action of the different members may be of diverse character, but the effects on the pulmonary organs very similar.

Conium, for example, acts as a direct sedative upon the spinal cord; acetate of lead as a direct sedative to the vascular system.

Therapeutic applications. When cough is of an irritative or spasmodic character, then hydrocyanic acid, conium, belladonna, and stramonium are useful; also, in many cases, opium or morphia.

When the secretion from the mucous membrane is excessive, opium, morphia, and acetate of lead are indicated. These sedatives may frequently be advantageously combined with expectorants of a sedative character, as antimony and ipecacuanha.

When used in the form of inhalation, or when smoked, these remedies are usefully employed in diminishing cough and spasmodic difficulty of breathing, and usually a much smaller amount of the drug is required under these circumstances, as the effect is first and especially produced upon the affected parts.

Subclass 3.—Medicines acting on the function of the skin.

Order 1.—Sudorifics or Diaphoretics.

Sudorifics or diaphoretics are medicines or medicinal agents which cause an increase of the function of the skin.

Stimulant Sudorifics.

Free ammonia.
Carbonate of ammonia.
Acetate of ammonia.
Citrate of ammonia.
Nitrate of ethyle.
Alcohol (as wine, or distilled spirits).
Ethers.
Chloroform.
Guaiacum.
Serpentary.
Sassafras.

Mezereon.
Sarsaparilla.
Dulcamara.
Senega.
Camphor.
Sulphur.
Opium preparations.
Salts of morphia.

Sedative Sudorifics.

Oxide of antimony.
Tartarated antimony.
Ipecacuanha.

Assistant Sudorifics.

Warmth to the surface.
Hot vapour to the skin.
Warm diluents.

Effects of Sudorifics. The function of the skin may be promoted by two apparently opposite kinds of medicines, namely, those which stimulate the vascular system and those which act as sedatives to the same ; and hence a convenient subdivision may be usefully adopted—into stimulant and sedative sudorifics.

The ammonia salts, with a vegetable acid, are probably decomposed, and the ammonia partly, at least, eliminated by the skin, thus increasing its function. The volatile oils and resins contained in the stimulating vegetable sudorifics appear to increase the cutaneous capillary circulation, and hence the secreting function is necessarily augmented. Opium in small doses is certainly diaphoretic in its action, and probably stimulant as well. The first are especially indicated in cases in which the circulation is sluggish, whereas the sedative sudorifics are adapted to promote sweating in patients whose skin is hot, and in whom febrile disturbance is present.

The therapeutic agents classed under the head of sudorific aids are usefully combined with both kinds of diaphoretics.

It is probable that the skin has a double function ; in the first place it eliminates water from the system by evaporation, and secondly it secretes from the blood certain organic and inorganic matters, in the same way as the kidneys and liver ; it is also probable that certain sudorifics augment the one function especially, certain the other.

Therapeutic application. Sudorific remedies may be used for the following purposes :—

1. To restore the action of the skin in cases in which its function has been checked by cold or other causes.

2. To determine to the surface in febrile cases, as by this means the system becomes relieved both of water and solid excreta.

3. To keep up an increased action of the surface in the different exanthematous diseases, and also in some chronic cutaneous affections.

4. To cause the skin to take on an augmented action, and by

this means relieve certain other organs, especially the kidneys which may be affected with disease.

5. To cause the skin to act vicariously when the action of other secreting organs is excessive, as in diabetes insipidus, chronic diarrhœa, &c. Combination in the prescribing of sudorifics is often of much service ; this is shown in the instance of the compound ipecacuanha powder, a preparation the value of which long experience has confirmed.

SUBCLASS 4.—Medicines affecting the function of the kidneys and urinary organs.

Orders 1 and 2.—Diuretics, Lithontriptics.

Diuretics are medicines which cause an increase in the function of the kidneys, and consequently augment the quantity of the urine.

Lithontriptics are remedies which alter the quality of the urine and prevent the crystallization and deposit of the ingredients which form gravel and calculi.

Diuretics.

Sedative:
- Squill.
- Scoparium.
- Tobacco.
- Colchicum.

Stimulant:
- Juniper.
- Turpentine.
- Copaiba.
- Cantharides.
- Nitrite of ethyle.
- Alcohol.

The potash, soda, and lithia salts placed under lithontriptics.

Water.

Indirect Diuretics.

Hydragogue purgatives, as elaterium.
Cream of tartar.
Gamboge.
Digitalis.
Counter-irritation to loins.
Depletion from loins.

Lithontriptics.

Carbonate of lithia.
Citrate of lithia.
Carbonate of potash.
Bicarbonate of potash.
Citrate of potash.
Acetate of potash.
Bicarbonate of soda.
Phosphate of soda.
Borax.
Vichy water.
Other alkaline mineral waters.

Phosphoric acid.
Citric acid.
Benzoic acid.
Benzoate of ammonia.

Effects of Diuretics and Lithontriptics. It is difficult to separate the first two classes in the heading, because most of the medicines which alter the character of the urine influence likewise its secretion ; and on the other hand those drugs which stimulate the kidneys to increased action, in so doing materially affect its composition ; furthermore, there is another group of remedies

usually classed under the head of diuretics, which may in some degree influence the secretion of urine, but which are practically used on account of their action upon the mucous membrane of the urinary passages; these are formed into a separate order.

It will be observed that the class of diuretics is subdivided, and that the remedies in each subclass differ considerably from each other. In the first are substances which appear to act by their direct action on the renal organs, stimulating them to increased action in their passage through those organs. Many of the saline diuretics, as nitre, salts of potash, soda, and lithia, appear to act in this manner, as also certain volatile oils, as juniper, turpentine, alcohol, nitrite of ethyle, and cantharides.

In the second subclass, the action of the drugs seems to be of a very different character; digitalis, the principal medicine thus placed, acts as a diuretic, probably through its influence upon the circulation, and it is chiefly in cases of disease in which deficient secretion is due to the circulation being disturbed that it proves of value. Tobacco, if ever of service in such cases, probably causes diuresis in the same manner, as also colchicum, scoparium, and squill.

The salts of potash, soda, and lithia, are all of them diuretic, but it is found that lithia salts are more powerful in this respect than the corresponding salts of potash, and potash salts more so than those of soda.

Some of the stimulating diuretics, especially cantharides and turpentine, if given in too large doses, or too long persevered in, produce strangury and the presence of albumen and blood in the urine.

Indirect diuretics are in many cases more advantageously administered than the direct, as the kidneys are often unable to act from congestion or from pressure of fluid contained in the abdomen; and then the free unloading of the vessels by the exhibition of hydragogue purgatives, or local depletion, or the application of counter-irritation to the loins, will promote the secretion of the renal organs more than the mere presence of diuretics in the blood. Cream of tartar, if given as a hydragogue, acts first by unloading the blood-vessels, and also as a derivative, and subsequently as a direct diuretic, from the absorption of a part of the salt.

Lithontriptics are of at least two kinds; the first and most important group render the urine less acid or alkaline, and enable it to hold the uric acid and urates in solution, or even to dissolve these substances when already deposited. Lithia is a far more

powerful solvent than potash, and potash than soda. Free dilution of the urine by the exhibition of water in considerable quantities, and while fasting, is of much importance, as it aids greatly the power of the lithontriptic. It will be remembered that the alkaline salts with a vegetable acid are decomposed and render the urine equally alkaline with those in which the base is united with carbonic acid.

The second class consists of acid remedies, and these are used in cases where the urine is alkaline. Benzoic acid and benzoate of ammonia appear in the urine as hippuric acid. Benzoic acid is probably more potent in diminishing the alkaline state of urine than any of the other acids. The mineral acids, with the exception of phosphoric acid, cannot be given in sufficient quantities to produce much influence upon the reaction of the urinary secretion.

Therapeutic applications. *Diuretics* are employed for the following purposes :—

1. To cause an increased flow of urine when the renal secretion is deficient. The selection of the diuretic must depend on the cause of the diminished secretion. Sometimes a stimulant medicine is required, at other times one of a sedative character. In cases of dropsy these medicines are peculiarly indicated.

2. Diuretics are given with an idea of causing elimination of poisons from the blood ; and also of matters formed in disease.

3. Diuretics are also administered for the purpose of producing a large flow from the kidneys, so as to enable the secreted urine to hold in solution substances which would otherwise crystallise in the urinary passages and form gravel and calculi.

Lithontriptics are administered to alter the character of the urine in cases of gravel and calculus ; such of these medicines as cause an alkaline condition are indicated where there is a tendency to deposit either uric acid or some little soluble urate ; and those which make the urine more acid in cases of phosphatic deposits when an alkaline state of the secretion is present.

Order 3.—Medicines which act specially upon the mucous membrane of the urinary organs.

Pareira brava.
Uva ursi.
Buchu.
Benzoic acid.
Benzoate of ammonia.
Balsam of Peru.
} Acting chiefly on the bladder.

Copaiba.
Cubebs.
Turpentine.
} Acting chiefly on the urethra.

Effects of the above remedies. It is difficult to assign a name for the medicines in the above order, but still for practical purposes it is important that such a grouping should be made. These remedies certainly appear to produce a distinct and specific action upon the mucous membrane of the urinary passages; some act more upon the bladder itself, some on the urethra. In the case of benzoic acid and benzoate of ammonia, as well as of balsam of Peru, the benzoic and cinnamic acids become converted into hippuric acid, and alter the state of the urine, as well as of the mucous membrane, by rendering it more acid in reaction, and more stimulating in its properties.

Therapeutic applications. These remedies are used in disordered conditions of the bladder and urethra;—those affecting the bladder in chronic inflammation of the mucous membrane of that organ, often accompanied with alkaline urine; those influencing the urethra, in gonorrhœa and gleet.

SUBCLASS 5.—Medicines whose action is upon the generative organs.

Order 1.—Emmenagogues and Ecbolics.

Emmenagogues are remedies which are supposed to have the power of exciting the catamenial flow when this is suppressed from any cause; and ecbolics, substances which cause contraction of the uterus, and the expulsion of its contents.

Direct Emmenagogues.

Ergot.
Savine.
Rue.
Assafœtida.
Castor.
Aloes.
Colocynth.
Other strong purgatives.

Indirect Emmenagogues.

Ferruginous salts.

Ecbolics.

Ergot.
Digitalis.
Savine.
Borax.

Effects of Emmenagogues and Ecbolics. Emmenagogues can be well divided into two classes, those which directly affect the uterus, and those which act by removing the general state of system which prevents the manifestation of the catamenial function. The remedies termed direct emmenagogues produce the first effect; those which are called remote emmenagogues are of

a different kind : the first named, the ferruginous salts, act by restoring the blood when in an anæmic state ; the rest by stimulating the large bowel, and probably through this the uterus itself. In many cases a combination of direct and indirect emmenagogues is useful, as amenorrhœa and deficient menstruation are frequently combined.

The group of Ecbolics consists of substances acting especially on the uterus itself ; but strong purgatives are apt to excite the uterus to contract.

Therapeutic applications. Direct emmenagogues are indicated when the catamenial flow is diminished from a simple sluggishness of uterine action ; the remote, especially the ferruginous class, are useful in the majority of cases of amenorrhœa, for by far the most common cause of the affection is poverty of the blood. The combination of iron salts with some purgative acting on the rectum and colon, is in such cases most effectual, for a torpid state of uterus is soon produced by impoverished blood ; iron remedies the blood, and aloes stimulates indirectly the uterus.

Ecbolics are given when it is desired to cause expulsion of the uterine contents ; sometimes this is desirable in cases of disease. These remedies are often employed for less legitimate purposes.

Orders 2 and 3.—Aphrodisiacs and Anaphrodisiacs.

Aphrodisiacs are medicines which possess the power of exciting sexual feelings and the venereal function in either sex ; and anaphrodisiacs, those which diminish the same.

1. *Direct Aphrodisiacs.*

Nux vomica.
Strychnia.
Cantharides.
Phosphorus.
Indian hemp.
Opium in small doses.

2. *Indirect Aphrodisiacs.*

Blood tonics.
Nervine tonics.
Direct antispasmodics.

1. *Direct Anaphrodisiacs.*

Bromide of potassium.
Bromide of ammonium.
Hemlock (conium).
Camphor.

2. *Indirect Anaphrodisiacs.*

Alkaline medicines (the continued use of).
All vascular and nervine sedatives.

Effects of Aphrodisiacs and Anaphrodisiacs. The direct aphrodisiacs appear to act through their stimulant action upon the spinal cord ; the indirect by improving the tone of the system generally ;—of course one or other of these latter are indicated according to the peculiarities of the patient. Direct anaphrodisiacs on the other hand act as direct sedatives on the spinal

cord; the indirect are those which lower the tone of the general system. The members of the latter group are never administered except for purposes independent of their anaphrodisiac property.

Therapeutic applications. The uses of these remedies, and the indications for their employment, are sufficiently shown by their names.

SUBCLASS 6.—Medicines which act upon the eyes.

Order 1.—PUPIL DILATORS.
Order 2.—PUPIL CONTRACTORS.

Substances which either dilate or contract the pupil.

Pupil Dilators (Mydriatics).	*Pupil Contractors* (Myositics).
Belladonna.	Calabar bean.
Atropine.	Opium.
Stramonium.	Salts of morphia.
Henbane.	Some other alkaloids in opium.
	Resin of opium.

Effects of the above Substances. The substances in the above list which dilate the pupil, also paralyze the adjusting power of the eye. They act in the same manner whether applied on or near the eye itself, or taken internally. Those which contract the pupil also produce myopia, or short-sightedness, by causing spasm of the ciliary muscle. Calabar bean acts both when applied locally and after absorption from the stomach. Opium, on the contrary, has no influence when applied to the eye, but only after its absorption into the general system; its action is probably upon the third nerve, through the nervous centres.

Therapeutic applications. These substances are used by the ophthalmic surgeon. Atropine to dilate the pupil for purposes of examination, and to prevent adhesion of the iris in cases of iritis. Calabar bean is used to counteract the effects of atropine in the above-mentioned application of that drug, and occasionally for other purposes.

DIVISION II.

External remedies; or medicines which act locally, and are not employed to affect the constitution by becoming absorbed.

Order 1.—IRRITANTS.

Group 1. Rubefacients.
2. Epispastics, Vesicants or blistering agents.
3. Pustulants.

The substances included under the head of irritants all agree in causing irritation of the skin or other parts to which they are applied, but they differ considerably in the amount of irritation which they produce, and the peculiarities in their action are sufficient to cause them to be arranged into characteristic groups, a division not merely of scientific interest but of practical importance.

1. *Rubefacients.*

Free ammonia in the form of weak solution of ammonia.
Compound camphor liniment.
Ether, alcohol, and chloroform, when evaporation is prevented.
Mustard cataplasm.
Volatile oil of mustard.
Cajuput oil.
Oil of turpentine.
Mezereon.
Capsicum.
Iodine.
Iodide of lead.
Iodide of cadmium.

2. *Epispastics.*

Cantharides (blister plaster).
Ethereal solution of cantharides (blister liquid).
Cantharidine.
Glacial acetic acid.

3. *Pustulants.*

Croton oil.
Tartarated antimony.
Nitrate of silver (strong solution of).

Effects of Irritants. When an irritant is applied to the skin, the amount of action determines much the character of the effect: at first, redness of the skin is produced; if the action is greater, blistering takes place from the cuticle being separated, by the effusion of a serous fluid under the cuticle; and if still more intense, pustulation ensues from the true skin being more deeply implicated and matter thrown out. Some of the substances named in the list can be made to produce more than one of these effects; for example, ammonia, if applied in a very diluted state, causes merely redness; if stronger, blistering of the skin; and even pustulation is now and then caused by its long-continued application in a very concentrated form: the same remark applies to the glacial acetic acid. Tartar emetic and croton oil almost always lead to the production of pustules if any marked action is induced: cantharides, on the other hand, usually causes a full epispastic effect.

Therapeutic applications. The different kinds of irritants are employed to effect various ends.

1. They are employed as counter-irritants; that is, for the purpose of relieving inflammation or disordered action of internal parts by the derivative effect upon a less important part, the skin: all irritants act more or less in this manner.

2. Some irritants, namely epispastics, relieve not only by producing counter-irritation, but also by causing an effusion of

fluid from the vessels of the affected part or its neighbourhood; this effect is often of much value, and far above that of mere counter-irritation.

3. The pustulants induce a still deeper action, and are sometimes of greater value than vesicants, especially in the treatment of deep-seated and chronic affections.

4. Many of the irritants are used for their direct effect on diseased parts, as in skin affections of various kinds; and some of them, as the mercurial and iodine preparations, probably induce a specific effect as well as mere local irritation.

Order 2.—External or Local Sedatives.

External sedatives are substances which produce a direct sedative effect upon the part to which they are applied; some, the local anæsthetics, causing complete loss of sensibility.

Hydrocyanic acid.
Belladonna.
Atropia.
Opium.
Morphia salts.
Solution of subacetate of lead.
Acetate of lead.
Subnitrate of bismuth.
Creasote.
Carbolic acid.

Local anæsthetics.

Ether spray.
Ice.
Bisulphide of carbon.
Aconite.
Aconitia.
Veratria.

Effects of External Sedatives. Practically it may be said that all these substances act as sedatives upon the part to which they are applied, but in their mode of action they differ considerably; some, as hydrocyanic acid, aconite, and veratria, produce a direct sedative effect upon the nerves; some, as belladonna and atropia, probably effect their object through the vessels. The local anæsthetics act, some by contracting the vessels and stopping for a while the circulation, thus producing a diminution or complete loss of the power of sensation of the parts to which they are applied. For the advantage of the ether spray, the profession is indebted to Dr. Richardson.

Therapeutic Applications. These remedial agents are employed—

1. To relieve irritation and inflammatory action.

2. To allay neuralgic or other pain in the affected parts.

3. To produce a loss of sensation, and so allow operations to be performed without pain.

Order 3.—Emollients.

Substances which soften the part to which they are applied, and soothe and diminish irritation.

Warm water.

Starchy and Mucilaginous substances.

Flour.
Bread.
Oatmeal.
Linseed.
Gum.
Honey.
Figs.
Starch.
Collodion.

Oily and Fatty Substances, as

Linseed oil.
Almond oil.
Olive oil.
Lard.
Suet.
Wax.
Spermaceti.
Glycerine.

Albuminous and Gelatinous Substances.

Isinglass.
Gelatin.
White of egg.

Effects of Emollients. The action of these substances appears to be partly of a physical and partly of a physiological character, and need not be dwelt upon. When used internally, they affect the mucous membranes of the alimentary canal, being then commonly termed *Demulcents*.

Therapeutic applications. These remedial agents are used to soothe parts which are irritated or inflamed, and to shield them from the action of the air or any foreign influences.

Order 4.—Local Astringents and Styptics.

Substances which brace up or produce an astringent effect upon the parts to which they are applied; when used to arrest hæmorrhage they are called styptics.

Dilute sulphuric acid.
Tannic acid.
Gallic acid.
Nut galls.
Oak bark.
Catechu.
Kino.
Rhatany.
Matico.
Alum.
Lime water.

Subacetate of lead.
Acetate of lead.
Carbonate of lead.
Sulphate of zinc.
Acetate of zinc.
Oxide of zinc.
Sulphate of iron.
Perchloride of iron.

The application of cold, as ice, &c.

Effects of Local Astringents and Styptics.—The same as those of the general astringents; and, as will be seen by the list, the same substances are employed.

Therapeutic applications. These remedial agents are employed—

1. To arrest hæmorrhage by application to the part.

2. To check discharges, either from an increase of normal secretion, or diseased secretion ; often used in the form of injection to affect mucous membranes, as in leucorrhœa and gleet.

3. To give tone when applied to prolapsed parts.

4. To produce an alterative effect upon the skin in various forms of cutaneous disease.

Order 5.—Caustics and Escharotics.

Substances which destroy the parts with which they come in contact ; the stronger caustics produce an eschar, and are termed escharotics.

Sulphate of copper.	Acid nitrate of mercury.
Red oxide of mercury.	Arsenic.
Nitrate of silver.	Corrosive sublimate.
Chloride of antimony.	Chromic acid.
Chloride of zinc.	Bromine.
Glacial acetic acid.	Sulphuric acid.
Carbolic acid.	Caustic lime.
Hydrochloric acid.	Caustic soda.
Nitric acid.	Caustic potash.

Effects of Caustics and Escharotics. All the substances contained in the above list produce a chemical rather than a physiological action upon the parts to which they are applied. On dead animal tissues they act even more powerfully than on the living body. The effect of these substances, as will be seen by studying their chemical properties, differs considerably ; some act by their intense affinity for water, others by forming compounds with the albuminous principles of the tissues.

Therapeutic applications. These remedial agents are employed—

1. To destroy poison, as of serpents, rabid animals, and syphilis.

2. To remove exuberant and morbid growths, as in excessive granulations, polypi, and cancerous deposits ; also to improve the character of ulcerated surfaces.

3. To act on the healthy skin so as to form issues and to open abscesses.

DIVISION III.

Order 1.—Antidotes.

Antidotes are substances which counteract the injurious influence of poisons introduced into the body.

Antidotes may be divided into direct and indirect antidotes; the former neutralizing or destroying the injurious action of the poison on meeting it in the system; the latter counteracting the injurious physiological effects of the drug. The following is a list of some of the most important antidotes to the chief poisons.

Direct Antidotes.

Poisons.	*Antidotes.*
Acids	Magnesia, chalk, and dilute solutions of alkaline carbonates.
Alkalies and alkaline earths	Vinegar and water. Oil.
Alkaloids	Finely divided animal charcoal.
Antimony	Preparations containing tannin in solution, as decoction of cinchona.
Arsenic	None, but charcoal may be given, or magnesia, and hydrated peroxide of iron.
Barium salts	Soluble sulphates.
Chlorine	Ammonia. Magnesia.
Cyanides and hydrocyanic acid	Solution of chlorine. Mixed oxides of iron.
Iodine	Starch.
Lead salts	Sulphate of soda or magnesia.
Mercurial salts	White of egg.
Opium	Animal charcoal absorbs morphia, &c.
Silver, nitrate of	Chlorides of alkalies (common salt).
Zinc, sulphate of	Dilute solution of carbonate of soda.

Indirect Antidotes.

Substances which physiologically counteract the baneful influence of the respective poisons.

Order 2.—Disinfectants and Antiseptics.

Disinfectants are substances which destroy the specific contagia of disease, and remove disagreeable gases and odours by decomposing both them and the bodies from which they proceed.

In the British Pharmacopœia the following disinfectants are contained:—

Chlorine.
Iodine.
Bromine.
Chlorinated lime.
Chlorinated soda.
Permanganate of potash.
Sulphate of iron (proto-sulphate).
Charcoal.

Antiseptics are substances which prevent chemical change by destroying the *activity* of infecting matters, without of necessity

altering their chemical composition. In this restricted sense they have been named colytics (from κωλύειν, to prevent).

Antiseptics.

Carbolic acid.
Creasote.
Alcohol.
Sulphurous acid.
Sulphites of alkalies and earths.
Chloride of sodium.
Corrosive sublimate.
Perchloride of iron.
Chloride of zinc.
Sulphate of copper.
Arsenic.

Of the substances in the above list, many, as chloride of zinc, perchloride of iron, chloride of sodium, corrosive sublimate, arsenic, and sulphate of copper, have very little influence on animal poisons, but simply preserve organic matters from decomposition. Free sulphurous acid has the advantage of being not only an antiseptic but also a deodorizer.

The essential oils also possess some preservative powers.

APPENDIX.

TEST-SOLUTIONS

FOR QUANTITATIVE AND QUALITATIVE ANALYSES OF SUBSTANCES CONTAINED IN THE PHARMACOPŒIA;

WITH AN EXPLANATION OF THEIR MORE IMPORTANT APPLICATIONS.

SOLUTION OF ACETATE OF COPPER.

Prep. By digesting half an ounce of subacetate of copper in fine powder with one fluid ounce of acetic acid diluted with half a fluid ounce of water, at a temperature not exceeding 212°, with repeated stirring, till a dry residue is obtained. Then dissolving this in sufficient water to make the solution measure five ounces. In this process the subacetate, $2(C_2H_3O_2)Cu.CuO$, is made to assume another equivalent of acetic acid, and is thus converted into the acetate, $2(C_2H_3O_2)Cu$.

Use. It is used in the Pharmacopœia for detecting the presence of *butyric acid in valerianate of zinc*, the valerianate being often adulterated with the butyrate, to which a few drops of oil of valerian are added to simulate the odour of valerian. The suspected salt is first distilled with sulphuric acid, and the solution of acetate of copper added to the distillate; pure valerianic acid gives, under these circumstances, no precipitate, but if any butyric acid is present, a bluish-white precipitate of butyrate of copper is produced. The butyrate of copper is a sparingly soluble salt, and is represented by the formula $2(C_4H_7O_2)Cu$.

SOLUTION OF ACETATE OF POTASH.

Prep. Made by dissolving half an ounce of acetate of potash ($C_2H_3O_2K$) in five fluid ounces of distilled water.

Use. This solution is employed to *distinguish between tartaric and citric acids.* When added to a solution of citric acid no precipitate takes place, but with tartaric acid, the sparingly soluble bitartrate of potash is precipitated ($KHC_4H_4O_6$).

SOLUTION OF ACETATE OF SODA.

Prep. By dissolving half an ounce of acetate of soda ($C_2H_3O_2Na.3H_2O$) in five fluid ounces of distilled water.

Use. Employed in testing *Calcis Phosphas* (*quod vide*). The acetate of soda is added to the phosphate of lime dissolved in nitric acid; the latter is thus neutralized, and free acetic acid takes its place. On adding oxalate of ammonia or perchloride of iron, a white precipitate of oxalate of lime or phosphate of iron is thrown down; both these precipitates would have been dissolved by the nitric acid, whereas they are insoluble in acetic acid.

SOLUTION OF ALBUMEN.

Prep. The white of one egg is well triturated in a mortar with four ounces of distilled water, and filtered through clean tow, previously moistened with distilled water.

Use. This is used for testing *phosphoric acid.* The phosphoric acid, which is the tribasic variety (H_3PO_4), is not precipitated by albumen; this test distinguishes it from the monobasic phosphoric acid (HPO_3); both the monobasic and bibasic ($H_4P_2O_7$) varieties give white precipitates with nitrate of silver, but the latter does not precipitate albumen, while the former does. *Creasote* and *carbolic acid* both coagulate the solution of albumen, which property is given in the Pharmacopœia among their characteristics.

SOLUTION OF AMMONIO-NITRATE OF SILVER.

Prep. One quarter of an ounce of nitrate of silver in crystals ($AgNO_3$) is dissolved in eight fluid ounces of distilled water, and half an ounce or a sufficiency of solution of ammonia added so as nearly to redissolve the precipitate which is at first formed. The ammonio-nitrate of silver is represented by the formula ($AgNO_3.2NH_3$).

Use. This is directed to be used for testing *arsenious acid* and *phosphoric acid*, with the aqueous solutions of which it gives a yellow precipitate of arsenite and phosphate of silver, which are soluble in excess both of ammonia and nitric acid.

SOLUTION OF AMMONIO-SULPHATE OF COPPER.

Prep. By dissolving half an ounce of crystallized sulphate of copper in eight fluid ounces of distilled water, and adding solution of ammonia to the solution until the precipitate formed at

first is nearly dissolved, filtering and adding sufficient distilled water to the clear solution to make it measure ten fluid ounces.

The ammonio-sulphate of copper is represented by the formula ($CuSO_4.2NH_4.SO_4.6H_2O$).

Use. Ammonio-sulphate of copper may be employed in lieu of ammonio-nitrate of silver as a test for the presence of *arsenious acid.* It gives a green precipitate (Scheele's green) which is soluble in excess of ammonia.

SOLUTION OF AMMONIO-SULPHATE OF MAGNESIA.

Prep. By dissolving one ounce of sulphate of magnesia, and half an ounce of chloride of ammonium, in eight fluid ounces of distilled water, afterwards adding half a fluid ounce of solution of ammonia, and enough distilled water to make up the bulk to ten fluid ounces.

The composition of the ammonio-sulphate of magnesia is represented by the formula ($MgSO_4.2NH_4.SO_4.6H_2O$).

Use. The solution is used for testing *phosphate of ammonia.* When added to a solution of that salt, a crystalline precipitate of ammonio-magnesian phosphate is formed; this is also known as the triple phosphate, and has the composition ($Mg.NH_4.PO_4.6H_2O$); it is very sparingly soluble in pure water, and insoluble in water containing chloride of ammonium or ammonia, but readily soluble in acids. When dried and heated to redness, this salt yields 35·7 per cent. of magnesia, and 64·3 of phosphoric acid. According to the direction of the Pharmacopœia, twenty grains of phosphate of ammonia when precipitated by this test-solution, and the precipitate washed with solution of ammonia diluted with an equal bulk of water, should, when dried and heated to redness, leave a residue of 16·8 grains.

The solution is also made use of to determine the *presence of phosphoric acid in the phosphate of iron.* For this purpose the salt is dissolved in hydrochloric acid, tartaric acid and excess of ammonia added, and then the test-solution, when the ammonio-magnesian phosphate is precipitated. Ammonia would precipitate the iron if added alone, but with the tartaric acid a soluble compound, ammonio-tartrate of iron, is formed, and the iron is thus held in solution.

SOLUTION OF BORACIC ACID.

Prep. Made by dissolving fifty grains of boracic acid (H_3BO_3) in one fluid ounce of rectified spirit.

Use. It is used in the Pharmacopœia to test the presence of turmeric in rhubarb. Turmeric becomes of a brown colour when treated with the solution of boracic acid, whereas the colouring matter of rhubarb is unaffected by this reagent.

SOLUTION OF BROMINE.

Prep. A solution of ten minims of bromine in five fluid ounces of distilled water.

Use. This solution is employed in testing bromide of potassium, to determine whether any iodide be present. A few drops are added to a solution of the salt mixed with mucilage of starch: if any iodine be present in the bromide the blue iodide of starch is formed.

SOLUTION OF CARBONATE OF AMMONIA.

Prep. Made by dissolving half an ounce of carbonate of ammonia in ten fluid ounces of water.

Use. Used in testing the carbonate and oxide of zinc. These substances, dissolved in water by the aid of a little nitric acid, give a white precipitate (carbonate of zinc) with the solution of carbonate of ammonia, which is entirely soluble without colour in excess of the reagent. This test serves to distinguish zinc from alumina and the alkaline earths, including magnesia, &c.

SOLUTION OF CHLORIDE OF AMMONIUM.

Prep. By dissolving one ounce of chloride of ammonium in ten fluid ounces of distilled water.

Use. It is used as a test under the heads of Magnesia, Carbonate and Sulphate of Magnesia, and Chloride of Sodium.

The solution of chloride of ammonium with a little free ammonia is mixed with the solution of the substance to be tested, and phosphate of soda is afterwards added, when the magnesia present is precipitated in the form of the ammonio-magnesian phosphate. No precipitate of this salt will take place (except in a very concentrated solution of magnesia) unless chloride of ammonium be present. A solution of chloride of sodium when treated in a similar manner should give no precipitate, showing the absence of magnesia. The precipitates caused in a solution of magnesian salts by potash, soda, and ammonia, and by the carbonate of potash and soda, are all soluble in chloride of ammonium.

SOLUTION OF CHLORIDE OF BARIUM.

Prep. An ounce of chloride of barium, in crystals, dissolved in ten fluid ounces of water.

Use. Chloride of barium forms with sulphuric acid and the soluble sulphates a white precipitate of sulphate of barium, a very insoluble compound, scarcely acted upon even by boiling nitric acid. The solution of chloride of barium is used as a test for sulphuric acid and the sulphates, and for this purpose is applied to nearly all the inorganic substances in the list of the Materia Medica, and also to some of the organic.

SOLUTION OF CHLORIDE OF CALCIUM.

Prep. One ounce of chloride of calcium dissolved in ten fluid ounces of distilled water.

Use. This solution is used as a means of recognizing citric acid in citrate of potash. Citric acid forms with lime the citrate of lime, a salt which has the peculiarity of being soluble in cold water, but insoluble in hot, so that when the solution of calcium is added to the solution of the citrate of potash, no precipitate occurs until the solution is boiled, when a white precipitate separates, which is readily soluble in acetic acid. The production, with chloride of calcium, of a white precipitate of arseniate of lime ($CaHAsO_4$), soluble in nitric acid, is also given as one of the characteristic reactions of a solution of arseniate of soda.

SATURATED SOLUTION OF CHLORIDE OF CALCIUM.

Prep. Made by dissolving four ounces of chloride of calcium in five fluid ounces of distilled water.

Use. This solution, like the chloride of calcium itself, has a very strong absorbing power for water. It is used in the Pharmacopœia as a test for the purity of the spirits of nitrous ether. When one volume of the spirits of nitrous ether is agitated with two volumes of the solution of chloride of calcium, two per cent. by volume of nitrous ether separates and rises to the surface. In this case the water, &c., which are present are absorbed by the solution, and the pure nitrous ether separates.

SOLUTION OF CHLORIDE OF GOLD.

Prep. Made by dissolving, with the aid of heat, sixty grains of fine gold in thin laminæ, in a dilute nitro-hydrochloric acid, made by mixing one and a half fluid ounces of nitric acid, six fluid

ounces of hydrochloric acid, and four fluid ounces of distilled water; then adding an additional fluid ounce of hydrochloric acid and evaporating at a temperature not above 212° Fah., until acid vapours cease to be given off; and lastly, dissolving the terchloride of gold which remains in five fluid ounces of distilled water.

Use. This solution contains terchloride of gold ($AuCl_3$), and is employed for the purpose of distinguishing the alkaloid atropine, which forms with it a double salt, chloride of gold and atropine; crystallizing in yellow plumose needles.

SOLUTION OF CHLORIDE OF TIN.

Prep. By dissolving one ounce of granulated tin (prepared by fusing the metal and pouring it into cold water) in three fluid ounces of hydrochloric acid, diluted with one fluid ounce of distilled water, with a moderate heat, until gas ceases to be evolved, and subsequently adding sufficient distilled water to make up the bulk to five fluid ounces. The solution, together with the undissolved tin, should be transferred to a well-stoppered bottle.

Use. This is a solution of the protochloride of tin ($SnCl_2$). Protochloride of tin absorbs oxygen and chlorine very readily, and is a powerful deoxidizing agent. It reduces to the metallic state the salts of mercury, silver, gold, &c.; and the solution is often made use of for precipitating mercury from its combinations. It is used in the Pharmacopœia for this purpose. The ammoniated mercury boiled with the solution of chloride of tin becomes grey, and deposits globules of metallic mercury.

SOLUTION OF GELATINE.

Prep. Fifty grains of isinglass, cut into shreds, and five fluid ounces of distilled water, are mixed and digested for half an hour with repeated shaking on a water bath, and the solution filtered through clean tow moistened with distilled water.

Use. The solution is used to distinguish between gallic and tannic acid; the former gives no precipitate with gelatine, while the latter gives a yellowish-white one; it is also employed to detect tannic acid in a decoction of elm bark, with which it should afford a precipitate.

SOLUTION OF IODATE OF POTASH.

Prep. By rubbing together to a fine powder, fifty grains of iodine, and fifty grains of chlorate of potash, then pouring upon it half an ounce of distilled water with eight minims of nitric acid,

and digesting in a Florence flask with a gentle heat until the colour of the iodine disappears; then boiling for one minute, transferring the contents of the flask to a capsule, and evaporating to perfect dryness at 212°. The residue should be dissolved in ten ounces of distilled water and the filtered solution kept in a stoppered bottle. In this process, by the powerful oxidizing agency of the nitric acid and chlorate of potash upon the iodine, the iodate of potash is formed.

Use. Iodate of potash is used for ascertaining the freedom of acetic acid and glacial acetic acid from sulphurous acid. When added to acetic acid previously mixed with mucilage of starch, if no sulphurous acid be present, no change is produced; but if sulphurous acid be present, the iodate is decomposed, and iodide of potassium is formed, as represented in the following equation: ($KIO_3 + 3H_2SO_3 = KI + 3H_2SO_4$), and the iodine liberated, which gives rise to a blue colour with the starch.

SOLUTION OF IODIDE OF POTASSIUM.

Prep. Made by dissolving one ounce of iodide of potassium in ten fluid ounces of distilled water.

Use. The solution of iodide of potassium is used as a test for the presence of lead, in the oxide, the acetate, and the carbonate of that metal. The oxide (litharge) and the carbonate are dissolved in water, with the aid of a little nitric acid, the acetate in distilled water alone, and the solution of iodide of potassium is added; a bright yellow precipitate of iodide of lead is produced: it is precipitated at first as a yellow powder, sparingly soluble in cold, but more soluble in hot water, the solution, as it cools, depositing the iodide in beautiful yellow spangles.

SOLUTION OF OXALATE OF AMMONIA.

Prep. Made by dissolving half an ounce of oxalate of ammonia in a pint of water.

Use. The solution of oxalate of ammonia is used for detecting the presence of lime in solution. It forms, in very dilute neutral or alkaline solutions of the salts of lime, a precipitate of oxalate of lime, which is insoluble in acetic acid, but soluble in nitric and hydrochloric acid. It is applied for this purpose to test many of the Pharmacopœia substances—tartaric and citric acids, liquor ammoniæ fortior, creta præparata, calcis phosphas, calx, carbonate and citrate of lithia, sulphate of magnesia, and many other substances in the Materia Medica.

SOLUTION OF PERCHLORIDE OF PLATINUM.

Prep. By dissolving platinum in aqua regia with heat. A mixture of a fluid ounce of nitric acid with four fluid ounces of hydrochloric acid, and two fluid ounces of distilled water, are poured upon a quarter of an ounce of platinum foil in a small flask, and digested, more of the acids mixed in the same proportion being added if necessary until the metal is dissolved. The solution is transferred to a porcelain capsule, a fluid drachm of hydrochloric acid added, and the whole evaporated on a water bath until acid vapours cease to be given off. The residue is dissolved in five ounces of distilled water and preserved in a stoppered bottle.

Use. This solution is used for testing the presence and absence of potash in various substances; it forms with potash a double chloride ($2KCl.PtCl_4$), very sparingly soluble in water, insoluble in ether and alcohol; with soda, on the other hand, no precipitate is formed, and hence it is used to distinguish between the potash and soda compounds. With this view it is applied to test potash, sulphate of potash, bicarbonate and carbonate of potash, the chlorate, the citrate, the permanganate and the acid tartrate of potash, the bicarbonate and carbonate of soda, chloride of sodium, and liquor sodæ chloratæ. It is important to remember that it forms a double chloride with ammonium ($2NH_4Cl.PtCl_4$) as well as with potassium.

The solution of bichloride of platinum is also used as a test for the presence of nicotine in the distillate obtained by distilling tobacco leaves with solution of potash. It forms with that substance a yellow crystalline precipitate, a double chloride of platinum and nicotine.

SOLUTION OF PHOSPHATE OF SODA.

Prep. Made by dissolving one ounce of phosphate of soda, in crystals, in ten fluid ounces of distilled water.

Use. The solution is used under Magnesia, Carbonate and Sulphate of Magnesia, to test the presence of that base, by the formation of the ammonio-magnesian phosphate, as noticed under the solution of chloride of ammonium. Also under Carbonate of Lithia, the chloride of which is precipitated by the solution of phosphate of soda, as phosphate of lithia.

SOLUTION OF RED PRUSSIATE OF POTASH.

Prep. By dissolving a quarter of an ounce of ferridcyanide of potassium in five fluid ounces of water.

Use. This solution is used as a test for the ferrous salts, with which it forms a blue precipitate; with the ferric salts it gives no precipitate, and hence affords a means of distinguishing between the proto- and per-salts of iron.

SOLUTION OF SULPHATE OF INDIGO.

Prep. Made by digesting for an hour, with the aid of the heat of a water-bath, five grains of indigo in one fluid drachm of pure sulphuric acid; then pouring the solution into ten fluid ounces of sulphuric acid, and after thoroughly mixing by agitation, allowing any undissolved matter to subside, and decanting off the clear liquid for use.

Use. This solution, which contains the sulphate of indigo ($C_8H_5NO.SO_3$) (*see* Indigo), when in contact with free chlorine or bodies containing chlorine in a feeble state of combination, becomes decolorized, hence its value as a test. It is employed under Chlori Liquor, Sodæ Chloratæ Liquor, &c.

SOLUTION OF SULPHATE OF IRON.

Prep. Made by dissolving ten grains of granulated sulphate of iron in one fluid ounce of boiling distilled water. It should be recently prepared.

Use. This is a solution of the protosulphate of iron employed in testing for nitrates; in contact with nitric acid and oil of vitriol it becomes of a dark purple colour.

It is employed under Acidum Nitricum, Acidum Phosphoricum, Acidum Sulphuricum, Spiritus Ætheris Nitrosi, &c.

SOLUTION OF SULPHATE OF LIME.

Prep. Made by rubbing a quarter of an ounce of plaster of Paris (sulphate of lime, dried) in a porcelain mortar with two fluid ounces of distilled water, and then adding the milky fluid to eighteen fluid ounces of water, and after allowing the undissolved sulphate to subside, decanting off the clear solution for use.

Use. This solution gives rise to a precipitate (oxalate of lime) when treated with oxalic acid or a soluble oxalate; it is used under Acidum Tartaricum to acertain the absence of oxalic acid.

SOLUTION OF SULPHIDE OF AMMONIUM.

Prep. By passing a stream of sulphuretted hydrogen gas into three fluid ounces of solution of ammonia as long as the gas continues to be absorbed. Two ounces of solution of ammonia are then added, and the liquid kept in a green-glass stoppered bottle.

Use. The solution of sulphide of ammonium (NH_4HS) is used to precipitate various metals from solution. It is employed to determine the presence of zinc in the salts of that metal; it gives with them a white precipitate of sulphide of zinc, which is very characteristic. Sulphide of ammonium gives rise to no precipitate in neutral solutions containing arsenious and arsenic acid, but an orange-red precipitate with neutral solutions of antimony, soluble in excess of the reagent.

Salts of mercury, silver, lead, copper, bismuth, tin, gold, and platinum, are precipitated as brown or black sulphides by the solution of sulphide of ammonium. The precipitates formed with the protoxide of tin, and the peroxides of gold and platinum, are soluble in excess of the reagent; the sulphide of tin requires a large excess.

SULPHURETTED HYDROGEN GAS.

Sulphuretted hydrogen (SH_2), prepared by the action of sulphuric acid on sulphuret of iron, is also much used as a test for the metals. Sulphuretted hydrogen gives *yellow* precipitates in neutral solutions containing arsenious or arsenic acid, which are soluble in ammonia and sulphide of ammonium, but insoluble in excess of hydrochloric acid; it also yields a *yellow* precipitate in solutions of the persalts of tin; the precipitate is however soluble in hydrochloric acid. It gives brown or black precipitates in *acid solutions* of the following metallic bases:—proto- and per-salts of mercury, salts of silver, lead, copper, bismuth, protoxide of tin, gold, and platinum. The precipitate with the persalts of mercury is at first yellow, but becomes black with excess of sulphuretted hydrogen. Salts of the following metals (contained in the Pharmacopœia) are not precipitated by hydrosulphuric acid in *acid* solutions:—the proto- and per-salts of iron, oxide of zinc, and manganese.

SOLUTION OF TARTARIC ACID.

Prep. Made by dissolving an ounce of crystallized tartaric acid in eight fluid ounces of distilled water, and adding to it two fluid ounces of rectified spirit.

The spirit is employed on account of the liability of the watery solution of tartaric acid to become opaque from the formation of a vegetable growth.

Use. The solution of tartaric acid is used in the Pharmacopœia for the purpose of ascertaining the presence of potash; for if added in excess to any solution containing that base, a very insoluble

salt, the acid or bitartrate of potash, is thrown down. Again, tartaric acid prevents the precipitation of oxide of antimony when an acid solution of this metal is added to water.

It is employed under Albumen and Potassæ Acetas; also under Antimonii Terchloridi Liquor, and Antimonium Tartaratum.

SOLUTION OF YELLOW PRUSSIATE OF POTASH.

Prep. By dissolving a quarter of an ounce of ferrocyanide of potassium (crystals) in five fluid ounces of distilled water.

Use. Ferrocyanide of potassium forms insoluble precipitates with many of the metals, and is used as a test for their presence; the colour of the precipitate is sometimes sufficient to indicate the nature of the metal present in solution. Thus it gives a blue precipitate with the persalts of iron, a reddish-brown one with those of copper, and a white or nearly white precipitate with protosalts of iron, manganese, zinc, tin, cadmium, lead, bismuth, antimony, mercury, and silver.

In addition to these solutions, the volumetric solutions of *nitrate of silver* and of *iodine* are also made use of as test-solutions for qualitative analysis. *Nitrate of silver* is used as a test for hydrochloric acid and the chlorides, with which it forms a curdy white precipitate (chloride of silver), soluble in excess of ammonia, but insoluble in nitric acid;—for hydrocyanic acid and the cyanides, with which it forms a white cyanide of silver, entirely soluble in boiling nitric acid;—for tribasic phosphoric acid, with which it gives a yellow phosphate of silver, soluble in excess both of nitric acid and ammonia;—for arsenic acid, with which it gives a brick-red precipitate of arseniate of silver, soluble in excess of nitric acid and ammonia. It is also used as a test for the purity of rectified spirit. The *solution of iodine* is used as a test for starch in various substances, as in calumba, gamboge, catechu, scammony, flour of mustard, &c.

For the tinctures of *litmus* and *turmeric*, *see* Index.

VOLUMETRIC SOLUTIONS.

THE processes for volumetric estimations may be performed either with British or with metrical weights and measures, and the solutions are so arranged that they will be of the same strength, and the same indications will be obtained in using them, whichever system is employed, without the *necessity* of altering any of the figures by which the quantities of the substances tested or of the test solutions required in the process, are expressed.

According to the British system, the quantities of the substances to be tested are expressed in grains by weight, as also are the ingredients of which the test solutions are formed, whilst the quantities of the test solutions employed in testing are expressed in grain-measures,—the grain-measure being the volume of a grain of distilled water.

According to the metrical system, the quantities of the substances to be tested are expressed in grammes by weight, whilst the quantities of the test solutions employed in testing are expressed in cubic centimetres,—the cubic centimetre being the volume of a gramme of distilled water.

As the cubic centimetre bears the same relation to the gramme that the grain-measure bears to the grain, the one system may be substituted for the other with no difference in the results, excepting that, by the metrical system, all the quantities will be expressed in relation to a weight (the gramme) which is more than fifteen times as great as the British grain.

In practice it will be found convenient in substituting metrical for British weights and measures, to reduce the values of all the numbers to one-tenth, by moving the decimal points. The quantities indicated in the Pharmacopœia, which in grains and grain-measures can be conveniently used, would be found inconveniently large if the same numbers of grammes and cubic centimetres were employed.

The following apparatus is required in the preparation and use of these solutions.

For British weights and measures :—

1. A flask, which, when filled to a mark on the neck, contains exactly 10,000 grains of distilled water at 60°. The capacity of the flask is therefore 10,000 grain-measures.

2. A graduated cylindrical jar, which when filled to 0, holds 10,000 grains of distilled water, and is divided into 100 equal parts.

3. A burette, a graduated glass tube, which when filled to 0, holds 1000 grains of distilled water, and is divided into 100 equal parts. Each part therefore corresponds to ten grain-measures.

For metrical weights and measures :—

1. A glass flask, which, when filled to a mark on the neck, contains one litre, or 1000 cubic centimetres.

2. A graduated cylindrical jar, which, when filled to 0, contains one litre, and is divided into 100 equal parts.

3. A burette, a graduated tube, which, when filled to 0, holds 100 cubic centimetres, and is divided into 100 equal parts.

(One cubic centimetre is the volume of one gramme of distilled water at 4° C.* 1000 cubic centimetres equal one litre.)

Volumetric solutions, before being used, should be shaken, in order that they may be throughout of uniform strength. They should also be preserved in stoppered bottles. All measures should be made at 60°.

The following are the directions given in the Pharmacopœia for the preparation of the volumetric solutions of soda and oxalic acid.

VOLUMETRIC SOLUTION OF SODA.

(Hydrate of Soda, NaO,HO, or **NaHO**=40.)

(Take of solution of soda, a sufficiency ; distilled water, a sufficiency.) Fill the volumetric tube to 0 with the solution of soda, and drop this into sixty-three grains of purified oxalic acid dissolved in two fluid ounces of the water, until the acid is exactly neutralized, as indicated by litmus. Note the number of grain-measures (N) of the solution used, and having then taken 9000 grain-measures of the solution of soda, augment this quantity by the addition of distilled water, until it becomes $\frac{9000 \times 1000}{N}$

* It is customary to make the measurements with metrical apparatus at 60° Fah.

grain-measures. If, for example, N=930, the 9000 grain-measures of solution of soda should be diluted so as to become $\frac{9000 \times 1000}{930}$ =9,677 grain-measures.

The quantity of this solution which fills the volumetric tube to 0, contains forty grains, or one equivalent of hydrate of soda, (NaHO=40) and will therefore neutralize an equivalent in grains of any monobasic acid.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. One hundred cubic centimetres contain $\frac{1}{10}$th equivalent in grammes of hydrate of soda (four grammes) and will neutralize $\frac{1}{10}$th of an equivalent in grammes of an acid. This solution is employed in testing the acids of the Pharmacopœia, with the exception of the following: arsenious, sulphurous, phosphoric, tannic, gallic, benzoic, hydrocyanic, carbolic.

VOLUMETRIC SOLUTION OF OXALIC ACID.

(Oxalic acid crystallized, $2HO,C_4O_6+4HO=126$, or $H_2C_2O_4.2H_2O=126$.)

Take of

Purified oxalic acid in crystals, quite dry, but not effloresced	630 grains;
Distilled water	a sufficiency.

Put the oxalic acid into the 10,000 grain flask, fill the flask to about two-thirds of its bulk with water, allow the acid to dissolve, and then dilute the solution with more water until it has the exact bulk of 10,000 grain-measures. One thousand grain-measures of this solution contain half an equivalent in grains (sixty-three grains) of oxalic acid, and are therefore capable of neutralizing one equivalent in grains of any alkali or any alkaline carbonate.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. One hundred cubic centimetres contain $\frac{1}{20}$th of an equivalent in grammes (6·3 grammes) of oxalic acid, and will neutralize $\frac{1}{10}$th of an equivalent in grammes of any alkali.

This solution is employed in testing the following substances: Ammoniæ Carbonas, Borax, Liquor Ammoniæ, Liquor Calcis, Liquor Plumbi Subacetatis, Liquor Potassæ, Liquor Potassæ Efferv., Liquor Sodæ, Liquor Sodæ Efferv., Plumbi Acetas, Potassa Caustica, Potassæ Bicarbonas, Potassæ Carbonas, Potassæ Citras, Potassæ Tartras, Potassæ Tartras Acida, Soda Caustica, Soda Tartarata, Sodæ Carbonas and Bicarbonas.

VOLUMETRIC SOLUTION OF BICHROMATE OF POTASH.

(Bichromate of Potash, $KO,2CrO_3 = 147{\cdot}5$, or $K_2Cr_2O_7 = 295$.)

Take of

Bichromate of potash	147·5 grains;
Distilled water	a sufficiency.

Put the bichromate of potash into the 10,000 grain flask, and, having half filled the flask with water, allow the salt to dissolve; then dilute the solution with more water, until it has the exact bulk of 10,000 grain-measures. One thousand grain-measures of this solution contain 14·75 grains of the bichromate ($\frac{1}{10}$th of $KO,2CrO_3$, or $\frac{1}{20}$th of $K_2Cr_2O_7$, in grains), and when added to a solution of protosalt of iron acidulated with hydrochloric acid, are capable of converting 16·8 grains of iron ($\frac{1}{10}$th of 6Fe, or $\frac{1}{20}$th of 6**Fe**, in grains) from the state of protosalt to that of persalt.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. Thus 14·75 grammes of bichromate of potash should be made to form 1,000 cubic centimetres of solution. One hundred cubic centimetres of this solution contain 1·475 grammes of the bichromate of potash, and are capable of converting 1·68 grammes of iron from the state of protosalt to that of persalt.

This solution is used to determine the amount of a protosalt of iron present in the following preparations: Ferri Arsenias, Ferri Carbonas Saccharata, Ferri Phosphas, Ferri Oxidum Magneticum. When the bichromate is added to a solution of a protosalt of iron in hydrochloric acid, the proto- is converted into persalt, and by ascertaining the amount of the solution necessary to complete this change, the quantity of protosalt present can be estimated. The nature of the decompositions which occur may be represented by the following formula, $K_2Cr_2O_7 + 6FeO + 8HCl = 3(Fe_2O_3) + Cr_2Cl_6 + 2KCl + 4H_2O$. Two equivalents of chromic acid (Cr_2O_6) present in the bichromate, yield three equivalents of oxygen, which convert six equivalents of protoxide, 6(**FeO**), into three of peroxide, 3(Fe_2O_3). Consequently 147·5, the equivalent in grains of bichromate of potash, is capable of converting, and will therefore represent, six equivalents in grains of protoxide of iron; and one thousand grain-measures of the volumetric solution, containing 14·75 grains of the bichromate, will represent 16·8 or $\frac{1}{20}$th of six equivalents of iron (**Fe**). When all the iron is converted into a persalt, a drop of the solution will no longer strike a blue colour with ferridcyanide of potassium.

VOLUMETRIC SOLUTION OF HYPOSULPHITE OF SODA.

(Hyposulphite of Soda crystallized, $NaO,S_2O_2+5HO=124$, or $Na_2H_2S_2O_4.4H_2O=248$.)

(Take of hyposulphite of soda, in crystals, two hundred and eighty grains ; distilled water, a sufficiency.) Dissolve the hyposulphite of soda in 10,000 grain-measures of water. Fill a burette with this solution and drop it cautiously into 1000 grain-measures of the volumetric solution of iodine, until the brown colour is just discharged. Note the number of grain-measures (N) required to produce this effect ; then put 8000 grain-measures of the same solution into a graduated jar, and augment this quantity by the addition of distilled water until it amounts to $\frac{8000\times1000}{N}$ grain-measures. If, for example, (N)=950, the 8000 grain-measures of solution should be diluted to the bulk of $\frac{8000\times1000}{950}=8421$ grain-measures. 1000 grain-measures of this solution contain 24·8 grains of the hyposulphite, and therefore correspond to 12·7 grains of iodine.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$ of the numbers should be taken. 100 cubic centimetres of this solution contain 2·48 grammes of hyposulphite, and therefore correspond to 1·27 grammes of iodine.

This solution is employed for testing the following substances : Iodum, Calx Chlorata, Liquor Calcis Chloratæ, Liquor Chlori, Liquor Sodæ Chloratæ. In each case, except that of Iodum, a solution of iodide of potassium and hydrochloric acid are added to the substance, and the amount of iodine so liberated is indicated by the volumetric solution. When this solution is added to a liquid containing free iodine a decomposition takes place, which may be represented by the formula $2Na_2H_2S_2O_4+I_2=Na_2S_4O_6+2NaI+2H_2O$, iodide of sodium and tetrathionate of soda being formed, the solutions of which are devoid of colour. Hence, to decolorize one equivalent in grains of iodine, one equivalent in grains of the hyposulphite is required. Now 1,000 grain-measures of the volumetric solution contain 24·8 or $\frac{1}{10}$ of an equivalent in grains of the hyposulphite of soda, and will therefore represent 12·7 or $\frac{1}{10}$ of one equivalent in grains of iodine.

VOLUMETRIC SOLUTION OF IODINE.

(Iodine, I = 127, or I = 127.)

(Take of iodine, 127 grains ; iodide of potassium, 180 grains ; distilled water, a sufficiency.) Put the iodine and the iodide of potassium into the 10,000 grain flask, fill the flask to about two-thirds its bulk with distilled water, gently agitate until solution is complete, and then dilute the solution with more water until it has the exact volume of 10,000 grain-measures. 1000 grain-measures of this solution contain $\frac{1}{10}$ of an equivalent in grains (12·7 grains) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$ of the numbers should be taken. 100 cubic centimetres contain 1·27 grammes of iodine, and correspond to 0·17 grammes of sulphuretted hydrogen, 0·32 grammes of sulphurous, and 0·495 grammes of arsenious acid. It is dropped into the solution to be tested until free iodine begins to appear, and the number of measures added before this colour appears is carefully noted.

This solution is principally used for the quantitative estimation of sulphurous and arsenious acid, all the sulphurous acid being converted into sulphuric, and the arsenious into arsenic acid, before any free iodine appears. The following equation represents the decompositions which occur: $H_2SO_3+I_2+H_2O=H_2SO_4+2HI$; so that two equivalents of iodine are required to each equivalent of sulphurous acid before any free iodine appears, and two equivalents of iodine will correspond to one equivalent of the sulphurous acid, or 1000 grain-measures containing 12·7 grains of iodine will represent 3·2 grains of sulphurous acid. For the conversion of arsenious acid into arsenic, four equivalents of iodine will be required ($As_2O_3+2H_2O+2I_2=As_2O_5+4HI$). So that 1000 grain-measures of the volumetric solution will represent 4·95 grains of arsenious acid.

It is also used for the estimation of sulphuretted hydrogen, 1000 grain-measures of the solution representing 1·7 grains of sulphuretted hydrogen.

VOLUMETRIC SOLUTION OF NITRATE OF SILVER.

(Nitrate of Silver, $AgO,NO_5=170$, or $AgNO_3=170$.)

(Take of nitrate of silver, 170 grains ; distilled water, a sufficiency.) Put the nitrate of silver into the 10,000 grain flask, and,

having half filled the flask with water, allow the salt to dissolve; then dilute the solution with more water until it has the exact bulk of 10,000 grain-measures. The solution should be kept in an opaque stoppered bottle. 1000 grain-measures of this solution contain $\frac{1}{10}$ of an equivalent in grains of nitrate of silver (or 17 grains).

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$ of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{100}$ of an equivalent in grammes of nitrate of silver (or 1·7 grammes).

This solution is used in testing the following substances: Acidum Hydrocyanicum Dilutum, Potassii Bromidum, Sodæ Arsenias (dry). When nitrate of silver is added to a solution of hydrocyanic acid, to which an excess of soda has been added, it gives rise to the formation of a double salt, consisting of one equivalent of cyanide of sodium and one equivalent of cyanide of silver ($NaAgCy_2$) which is precipitated at first, but re-dissolved on agitation. When all the hydrocyanic acid is withdrawn in the formation of this double cyanide, nitrate of silver gives rise to a precipitate no longer soluble; the appearance of this permanent precipitate of oxide of silver is an indication that all the cyanogen is exhausted. The changes may be exhibited in the formula ($AgNO_3+2NaCy=NaNO_3+NaAgCy_2$), and when no more cyanide is present ($2AgNO_3+2NaHO=2NaNO_3+Ag_2O+H_2O$). Hence it will be seen that each equivalent of nitrate of silver represents two of hydrocyanic acid. So that 17 grains of nitrate of silver will correspond to 5·4 (2·7 × 2) grains of absolute hydrocyanic acid.

POSOLOGICAL TABLE

THE following List exhibits the doses of important remedial agents and their preparations as ordinarily prescribed for adults. When medicines are administered to young children or very aged persons some modification is required; and the annexed Table, by Gaubius, will serve somewhat as a guide for the regulation of the doses for patients of different ages:—

AGES.	PROPORTIONAL QUANTITIES.	DOSES.
For an adult	*suppose the dose to be* . . . . *One*	*or* 60 *grains.*
Under 1 year	will require only . . . . $\frac{1}{12}$	5 grains.
,, 2 years	,, ,, ... $\frac{1}{8}$	$7\frac{1}{2}$ grains.
,, 3 ,,	,, ,, ... $\frac{1}{6}$	10 grains.
,, 4 ,,	,, ,, ... $\frac{1}{4}$	15 grains.
,, 7 ,,	,, ,, ... $\frac{1}{3}$	20 grains.
,, 14 ,,	,, ,, ... $\frac{1}{2}$	30 grains.
,, 20 ,,	,, ,, ... $\frac{2}{3}$	40 grains.
Above 21 ,,	the full dose . . . . —	60 grains.
,, 65 ,,	the inverse gradation of the above.	

It should be borne in mind, that certain drugs, especially *opium*, must be administered with great care to children, and that *mercurials* can be taken for a long time by such subjects without the ordinary symptoms of mercurialization being produced. Besides age, other circumstances, such as sex, temperament, climate and custom, have great influence on the action of medicines.

Absinthium (in powder) . . . . 20 gr. to 40 gr.
Acetum . . . . . 1 fl. drm. to 2 fl. drm., diluted.
Acetum Scillæ . . . . . 15 min to 40 min.
Acidum Aceticum Dilutum . . . 1 fl. drm. to 2 fl. drm., freely diluted.

Acidum Arseniosum	$\frac{1}{60}$ gr. to $\frac{1}{24}$ gr. to $\frac{1}{12}$ gr.
Acidum Benzoicum	10 gr. to 15 gr.
Acidum Carbolicum	1 gr. to 3 gr.
Acidum Citricum	10 gr. to 30 gr.
Acidum Gallicum	2 gr. to 10 gr. or more.
Acidum Hydrochloricum Dilutum	10 min. to 30 min., freely diluted.
Acidum Hydrocyanicum Dilutum	2 min. to 8 min.
Acidum Nitricum	1 min. to 5 min.
Acidum Nitricum Dilutum	10 min. to 30 min.
Acidum Nitro-Hydrochloricum Dilutum	5 min. to 20 min., freely diluted.
Acidum Phosphoricum Dilutum	10 min. to 30 min., freely diluted.
Acidum Sulphuricum Dilutum	5 min. to 30 min.
Acidum Sulphuricum Aromaticum	5 min. to 30 min.
Acidum Sulphurosum	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Acidum Tannicum	2 gr. to 10 gr. or more
Acidum Tartaricum	10 gr. to 30 gr.
Aconitum (leaves)	2 gr. to 10 gr.
Æther	20 min. to 60 min.
Æther Aceticus	20 min. to 60 min.
Aloe Barbadensis (in powder)	2 gr. to 6 gr.
Aloe Socotrina (in powder)	2 gr. to 6 gr.
Alumen (as an astringent)	10 gr. to 20 gr.
Alumen (as a purgative)	30 gr. to 60 gr.
Ammoniacum (the gum resin)	10 gr. to 20 gr.
Ammoniæ Benzoas	10 gr. to 20 gr.
Ammoniæ Bicarbonas	10 gr. to 30 gr.
Ammoniæ Carbonas (as a stimulant)	3 gr. to 10 gr.
Ammoniæ Carbonas (as an emetic)	30 gr., freely diluted.
Ammonii Chloridum	5 gr. to 30 gr.
Ammoniæ Phosphas	5 gr. to 20 gr.
Ammonii Bromidum	2 gr. to 20 gr.
Antimonii Oxidum	1 gr. to 4 gr.
Antimonium Nigrum	1 gr. to 5 gr.
Antimonium Tartaratum (as a diaphoretic expectorant)	$\frac{1}{16}$ gr. to $\frac{1}{6}$ gr.
Antimonium Tartaratum (as a vascular depressant or sedative)	$\frac{1}{6}$ gr. to 2 gr.
Antimonium Tartaratum (as an emetic)	1 gr. to 3 gr.

Aquæ. The dose of those omitted is from	1 fl. oz. to 2 fl. oz.
Aqua Laurocerasi	5 min. to 30 min.
Areca	½ oz. to ¾ oz.
Argenti Nitras	⅙ gr. to ⅓ gr.
Argenti Oxidum	½ gr. to 2 gr.
Assafœtida (the gum resin)	5 gr. to 20 gr.
Aurum (in powder)	¼ gr. to 1 gr.
Auri Teroxidum	⅒ gr. and upwards.
Auri Terchloridum	1/20 gr. and upwards.
Auri et Sodii Chloridum	1/15 gr. and upwards.
Balsamum Peruvianum	10 min. to 15 min.
Balsamum Tolutanum	10 gr. to 20 gr.
Barii Chloridum	½ gr. to 2 gr.
Beberiæ Sulphas	1 gr. to 10 gr.
Benzoinum (the balsam)	10 gr. to 30 gr.
Bismuthi Carbonas	5 gr. to 20 gr.
Bismuthi Oxidum	5 gr. to 15 gr.
Bismuthi Subnitras	5 gr. to 20 gr.
Borax	5 gr. to 40 gr.
Bucco (powdered leaves)	20 gr. to 40 gr.
Calcii Chloridum	10 gr. to 20 gr.
Calcis Carbonas Precipitata	10 gr. to 60 gr.
Calcis Hypophosphis	5 gr. to 10 gr.
Calcis Phosphas	10 gr. to 20 gr.
Calomelas (as a purgative)	2 gr. to 5 gr.
Calomelas (as an alterative)	½ gr. to 1 gr., frequently repeated.
Calumba (in powder)	10 gr. to 20 gr.
Cambogia (the powdered resin).	1 gr. to 4 gr.
Camphora	1 gr. to 10 gr.
Canella (in powder)	15 gr. to 30 gr.
Capsicum (in powder)	½ gr. to 1 gr.
Carbo Animalis Purificatus	20 gr. to 60 gr.
Carbo Animalis Purificatus (as an antidote)	½ oz. to 2 oz.
Carbo Ligni	20 gr. to 60 gr.
Cardamomum (powdered Cardamoms)	5 gr. to 20 gr.
Caryophyllum (cloves in powder)	5 gr. to 20 gr.
Cascarilla (powdered bark)	10 gr. to 30 gr.
Cassia (the prepared pulp)	120 gr. and upwards.
Castoreum (in substance)	5 gr. to 10 gr.

Catechu (in powder).	10 gr. to 30 gr.
Cerevisiæ Fermentum	½ oz. to 1 oz.
Cerii Oxalas	1 gr. to 2 gr.
Chloral Hydras	5 gr. to 30 gr.
Chloroformum	3 min. to 10 min.
Cinchona (the powdered bark)	10 gr. to 60 gr.
Cinchoniæ Sulphas	1 gr. to 10 gr.
Cinchonidinæ Sulphas	1 gr. to 10 gr.
Cinchoniæ Hydrochloras	1 gr. to 10 gr.
Cinnamomum (powdered bark)	10 gr. to 30 gr.
Colchicum (the powdered corm)	2 gr. to 8 gr.
Colocynth (the powdered pulp)	2 gr. to 8 gr.
Confectio Opii	5 gr. to 20 gr.
Confectio Piperis	60 gr. to 120 gr.
Confectio Rosæ Caninæ	60 gr. or more.
Confectio Rosæ Gallicæ	60 gr. or more.
Confectio Scammonii	10 gr. to 30 gr., or more.
Confectio Sennæ	60 gr. to 120 gr.
Confectio Sulphuris	60 gr. to 120 gr.
Confectio Terebinthinæ	60 gr. to 120 gr.
Conii Folia	2 gr. to 8 gr.
Copaiba	½ fl. drm. to 1 fl. drm.
Copaibæ Oleum	5 min. to 20 min.
Coriandrum (the powdered fruit)	10 gr. to 30 gr.
Cortex Winteri	30 gr. to 60 gr.
Creosotum	1 min. to 3 min.
Creta Præparata	10 gr. to 60 gr.
Crocus (dried)	20 gr. upwards.
Cubeba (the powder)	30 gr. to 120 gr.
Cubebæ Oleum	5 min. to 20 min.
Cupri Sulphas (as an astringent or tonic)	¼ gr. to 2 gr.
Cupri Sulphas (as an emetic)	5 gr. to 10 gr.
Cusparia (in powder).	10 gr. to 40 gr.
Cusso	¼ oz. to ½ oz.
Decocta. Those not enumerated may be given in doses from	1 fl. oz. to 2 fl. oz.
Decoctum Aloes Compositum	½ fl. oz. to 2 fl. oz.
Decoctum Cydonii (*Lond.* 1851)	1 fl. oz. to 4 fl. oz.
Decoctum Sarsæ	2 fl. oz. to 10 fl. oz.
Decoctum Sarsæ Compositum	2 fl. oz. to 10 fl. oz.
Decoctum Scoparii	2 fl. oz. to 4 fl. oz.
Decoctum Taraxaci	2 fl. oz. to 4 fl. oz.

Decoctum Ulmi	2 fl. oz. to 4 fl. oz.
Digitalinum	$\frac{1}{60}$ gr. to $\frac{1}{30}$ gr.
Digitalis Folia	$\frac{1}{2}$ gr. to $1\frac{1}{2}$ gr.
Elaterium	$\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.
Ergota (the powdered ergot)	20 gr. to 30 gr.
Essentia Anisi	10 min. to 20 min.
Essentia Menthæ Piperitæ	10 min. to 20 min.
Extractum Aconiti (from juice)	1 gr. to 2 gr.
Extractum Aloes Barbadensis	2 gr. to 6 gr.
Extractum Aloes Socotrinæ	2 gr. to 6 gr.
Extractum Anthemidis	2 gr. to 10 gr.
Extractum Belæ Liquidum	1 fl. drm. to 2 fl. drm.
Extractum Belladonnæ	$\frac{1}{4}$ gr. to 1 gr.
Extractum Calumbæ	2 gr. to 10 gr.
Extractum Cannabis Indicæ	$\frac{1}{4}$ gr. to 1 gr.
Extractum Cinchonæ Flavæ Liquidum	10 min. to 30 min.
Extractum Colchici	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colchici Aceticum	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colocynthidis Compositum	3 gr. to 10 gr.
Extractum Conii	2 gr. to 6 gr.
Extractum Ergotæ Liquidum	10 min. to 30 min.
Extractum Filicis Liquidum	15 min. to 30 min.
Extractum Gentianæ	2 gr. to 10 gr.
Extractum Glycyrrhizæ	10 gr. to 30 gr.
Extractum Glycyrrhizæ Liquidum	60 min. to 120 min.
Extractum Hæmatoxyli	10 gr. to 30 gr.
Extractum Hyoscyami	5 gr. to 10 gr.
Extractum Jalapæ	5 gr. to 15 gr.
Extractum Krameriæ	5 gr. to 20 gr.
Extractum Lactucæ	5 gr. to 15 gr.
Extractum Lupuli	5 gr. to 15 gr.
Extractum Nucis Vomicæ	$\frac{1}{2}$ gr. to 2 gr.
Extractum Opii	$\frac{1}{2}$ gr. to 2 gr.
Extractum Opii Liquidum	10 min. to 40 min.
Extractum Papaveris	2 gr. to 5 gr.
Extractum Pareiræ	10 gr. to 20 gr.
Extractum Pareiræ Liquidum	$\frac{1}{2}$ fl. drm. to 2 fl. drm.
Extractum Physostigmatis	$\frac{1}{16}$ gr. to $\frac{1}{4}$ gr.
Extractum Quassiæ	3 gr. to 5 gr.
Extractum Rhei	5 gr. to 15 gr.
Extractum Sarsæ Liquidum	2 fl. drm. to 4 fl. drm.
Extractum Stramonii	$\frac{1}{4}$ gr. to $\frac{1}{2}$ gr.

Extractum Taraxaci	5 gr. to 30 gr.
Fel Bovinum (purif.)	5 gr. to 10 gr.
Ferri Arsenias	$\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.
Ferri Carbonas Saccharata	5 gr. to 20 gr.
Ferri et Ammoniæ Citras	5 gr. to 10 gr.
Ferri et Quiniæ Citras	5 gr. to 10 gr.
Ferri Iodidum	1 gr. to 5 gr.
Ferri Oxidum Magneticum	5 gr. to 10 gr.
Ferri Perchloridi Liquor	3 min. to 10 min.
Ferri Pernitratis Liquor	30 min. to 1 fl. drm.
Ferri Peroxidum	10 gr. to 60 gr. or more.
Ferri Peroxidum Humidum	$\frac{1}{4}$ oz. to $\frac{1}{2}$ oz.
Ferri Peroxidum Hydratum	5 gr. to 30 gr.
Ferri Phosphas	5 gr. to 10 gr.
Ferri Sulphas	1 gr. to 5 gr.
Ferri Sulphas Exsiccata	$\frac{1}{2}$ gr. to 3 gr.
Ferri Sulphas Granulata	1 gr. to 5 gr.
Ferrum Redactum	1 gr. to 5 gr.
Ferrum Tartaratum	5 gr. to 10 gr.
Filix (of the powdered root).	60 gr. to 120 gr.
Galbanum (the gum resin)	10 gr. to 30 gr.
Gentiana (in powder)	10 gr. to 30 gr.
Glycerinum	1 fl. drm. to 2 fl. drm.
Guaiacum (the powdered resin)	10 gr. to 30 gr.
Hydrargyrum cum Cretâ	3 gr. to 8 gr.
Hydrargyri Sulphuretum (for fumigation)	30 gr. and upwards.
Hydrargyri Iodidum Rubrum	$\frac{1}{16}$ gr. to $\frac{1}{4}$ gr.
Hydrargyri Iodidum Viride	1 gr. to 3 gr.
Hydrargyri Perchloridum	$\frac{1}{16}$ gr. to $\frac{1}{8}$ gr.
Hydrargyri Subchloridum	$\frac{1}{2}$ gr. to 5 gr.
Infusa. Those not enumerated may be given in doses from	1 fl. oz. to 2 fl. oz.
Infusum Anthemidis	1 fl. oz. to 4 fl. oz.
Infusum Buchu	1 fl. oz. to 4 fl. oz.
Infusum Caryophylli	1 fl. oz. to 4 fl. oz.
Infusum Cusso	4 fl. oz. to 8 fl. oz.
Infusum Digitalis	2 fl. drm. to 4 fl. drm.
Inula (in powder)	30 gr. to 60 gr.
Iodum	$\frac{1}{2}$ gr., gradually increased
Ipecacuanha (in powder, as an emetic)	15 gr. to 30 gr.
Ipecacuanha (in powder as an expectorant)	$\frac{1}{2}$ gr. to 2 gr.

Jalapa (powder)	10 gr. to 30 gr.
Jalapæ Resina	2 gr. to 5 gr.
Kamela	30 gr. to ¼ oz.
Kino (in powder)	10 gr. to 30 gr.
Krameria (in powder)	20 gr. to 60 gr.
Lactucarium	5 gr. to 30 gr.
Liquor Ammoniæ	10 min. to 30 min.
Liquor Ammoniæ Fortior.	3 min. to 10 min., freely diluted.
Liquor Ammoniæ Acetatis	2 fl. drm. to 6 fl. drm.
Liquor Ammoniæ Citratis	2 fl. drm. to 6 fl. drm.
Liquor Arsenicalis	2 min. to 8 min.
Liquor Arsenici et Hydrargyri Hydriodatis (Donovan's Solution)	10 min. to ½ fl. drm.
Liquor Arsenici Hydrochloricus	2 min. to 8 min.
Liquor Bismuthi et Ammoniæ Citratis	½ fl. drm. to 1 fl. drm.
Liquor Calcis	1 fl. oz. to 4 fl. oz.
Liquor Calcis Saccharatus	15 min. to 60 min.
Liquor Chlori	10 min. to 20 min.
Liquor Ferri Perchloridi	10 min. to 30 min.
Liquor Ferri Pernitratis	10 min. to 40 min.
Liquor Hydrargyri Perchloridi	½ fl. drm. to 2 fl. drm.
Liquor Lithiæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Magnesiæ Carbonatis	1 fl. oz. to 2 fl. oz.
Liquor Magnesiæ Citratis	5 fl. oz. to 10 fl. oz.
Liquor Morphiæ Acetatis	10 min. to 60 min.
Liquor Morphiæ Hydrochloratis	10 min. to 60 min.
Liquor Potassæ	15 min. to 60 min.
Liquor Potassæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Potassæ Permanganatis	2 fl. drm. to 4 fl. drm.
Liquor Sodæ	10 min. to 1 fl. drm.
Liquor Sodæ Arseniatis	5 min. to 10 min.
Liquor Sodæ Chloratæ	10 min. to 20 min.
Liquor Sodæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Strychniæ	5 min. to 10 min.
Lithiæ Carbonas	3 gr. to 6 gr.
Lithiæ Citras	5 gr. to 10 gr.
Lupulin	5 gr. to 10 gr.
Magnesia	10 gr. to 60 gr.
Magnesiæ Carbonas	10 gr. to 60 gr.
Magnesiæ Carbonas Levis	10 gr. to 60 gr.
Magnesiæ Sulphas	60 gr. to ½ oz. or more.

Manganesii Sulphas (as a purgative)	60 gr. to 120 gr.
Manna	60 gr. to 1 oz.
Mastiche (resin, in powder)	20 gr. to 40 gr.
Matico (in powder)	30 gr. to 60 gr.
Misturæ. Those omitted may be given in doses from	1 fl. oz. to 2 fl. oz.
Mistura Ammoniaci	½ fl. oz to 1 fl. oz.
Mistura Gentianæ	½ fl. oz. to 1 fl. oz.
Mistura Guaiaci	½ fl. oz. to 2 fl. oz.
Mistura Scammonii	½ fl. oz. to 2 fl. oz. (for a
Mistura Sennæ Composita	1 fl. oz. to 1½ fl. oz. [child).
Morphiæ Acetas	⅛ gr. to ½ gr.
Morphiæ Hydrochloras	⅛ gr. to ½ gr.
Moschus	5 gr. to 10 gr.
Mucilago Acaciæ	ad libitum.
Mucilago Tragacanthæ	1 fl. oz. and upwards.
Myristica (in powder)	5 gr. to 15 gr.
Myrrh (in powder)	10 gr. to 30 gr.
Nux Vomica (in powder)	1 gr. to 3 gr.
Olea. Those omitted may be given in doses from	1 min. to 5 min.
Oleum Amygdalæ	1 fl. drm. to ½ fl. oz.
Oleum Copaibæ	5 min. to 20 min.
Oleum Crotonis	⅓ min. to 1 min.
Oleum Cubebæ	5 min. to 20 min.
Oleum Juniperi	1 min. to 10 min.
Oleum Morrhuæ	1 fl. drm. to 8 fl. drm.
Oleum Olivæ	1 fl. drm. to 1 fl. oz.
Oleum Phosphoratum	5 min. to 10 min.
Oleum Ricini	1 fl. drm. to 8 fl. drm.
Oleum Terebinthinæ (as stimulant, and diuretic)	10 min. to 20 min.
Oleum Terebinthinæ (as an anthelmintic purgative)	2 fl. drm. to 6 fl. drm.
Opium (powdered)	½ gr. to 2 gr.
Oxymel	1 fl. drm to 2 fl. drm.
Oxymel Scillæ	½ fl. drm. to 1 fl. drm.
Pareira (in powder)	30 gr. to 60 gr.
Pepsin	2 gr. to 10 gr.
Phosphorus	⅟₄₀ gr. to ⅟₁₀ gr.
Pilulæ. The dose of those omitted is	5 gr. to 10 gr.

Pilula Ferri Carbonatis	5 gr. to 20 gr.
Pilula Ferri Iodidi	3 gr. to 8 gr.
Pilula Hydrargyri	3 gr. to 8 gr.
Pilula Phosphori	3 gr. to 6 gr.
Pilula Plumbi cum Opio	3 gr. to 5 gr.
Pilula Quiniæ	2 gr. to 10 gr.
Pilula Saponis Composita	3 gr. to 5 gr.
Pilula Scammonii Composita	5 gr. to 15 gr.
Pimenta (powder)	5 gr. to 20 gr.
Piper (nigrum)	5 gr. to 15 gr.
Piperina	1 gr. to 10 gr.
Plumbi Acetas	1 gr. to 4 gr.
Plumbi Iodidum	¼ gr. to 1 gr.
Podophyllum (in powder)	10 gr. to 20 gr.
Podophylli Resina (Podophylline)	¼ gr. to 1 gr.
Potassa Sulphurata	3 gr. to 6 gr., freely diluted.
Potassæ Acetas	10 gr. to 20 gr.
Potassæ Bicarbonas	10 gr. to 40 gr.
Potassæ Carbonas	10 gr. to 30 gr.
Potassæ Chloras	10 gr. to 30 gr.
Potassæ Citras	20 gr. to 60 gr.
Potassæ Nitras	10 gr. to 30 gr.
Potassæ Sulphas (as a purgative)	15 gr. to 60 gr.
Potassæ Tartras	60 gr. to ½ oz.
Potassæ Tartras Acida	20 gr. to 60 gr.
Potassii Bromidum	5 gr. to 30 gr.
Potassii Iodidum	2 gr. to 10 gr.
Pulvis Amygdalæ Compositus	60 gr. to 120 gr.
Pulvis Antimonialis	3 gr. to 10 gr.
Pulvis Aromaticus	10 gr. to 30 gr.
Pulvis Catechu Compositus	20 gr. to 40 gr.
Pulvis Cretæ Aromaticus	10 gr. to 60 gr.
Pulvis Cretæ Aromaticus cum Opio	10 gr. to 40 gr.
Pulvis Elaterii Compositus	½ gr. to 5 gr.
Pulvis Glycyrrhizæ Compositus	30 gr. to 60 gr.
Pulvis Ipecacuanhæ Compositus	5 gr. to 15 gr.
Pulvis Jalapæ Compositus	20 gr. to 60 gr.
Pulvis Kino Compositus	5 gr. to 20 gr.
Pulvis Opii Compositus	2 gr. to 5 gr.
Pulvis Rhei Compositus	20 gr. to 60 gr.
Pulvis Scammonii Compositus	10 gr. to 20 gr.
Pulvis Tragacanthæ Compositus	20 gr. to 60 gr.
Quassia (in powder)	10 gr. to 20 gr.

Quiniæ Sulphas	1 gr. to 10 gr.
Quiniæ Valerianas	1 gr. to 5 gr.
Rhei Radix	5 gr. to 20 gr.
Rhus Toxicodendron (powdered leaves)	½ gr. to 1 gr.
Ruta (powdered leaves)	20 gr. to 40 gr.
Sabinæ Cacumina	4 gr. to 10 gr.
Sagapenum (the gum resin)	10 gr. to 30 gr.
Santonica (worm seed)	10 gr. to 60 gr.
Santoninum (Santonin—crystallized)	2 gr. to 6 gr.
Sapo Durus, or Sapo Mollis (as antacids)	5 gr. to 20 gr.
Scammoniæ Resina	3 gr. to 8 gr.
Scammonium (gum resin in powder)	5 gr. to 10 gr.
Scilla	1 gr. to 3 gr.
Senega (in powder)	20 gr. to 60 gr.
Senna (powdered leaves)	30 gr. to 120 gr.
Serpentaria (in powder)	10 gr. to 20 gr.
Sinapis (as an emetic)	from a dessert to a table spoonful.
Soda Tartarata	¼ oz. to ½ oz.
Sodæ Acetas	20 gr. to 60 gr.
Sodæ Arsenias	1/16 gr. to ⅛ gr.
Sodæ Biboras	10 gr. to 60 gr.
Sodæ Bicarbonas	10 gr. to 60 gr.
Sodæ Carbonas	5 gr. to 30 gr.
Sodæ Carbonas Exsiccata	3 gr. to 10 gr.
Sodæ Citro-tartras Effervescens	60 gr. to ¼ oz.
Sodæ Hypophosphis	5 gr. to 10 gr.
Sodæ Phosphas	¼ oz. to 1 oz.
Sodæ Sulphas	¼ oz to 1 oz.
Sodæ Sulphis	20 gr. to 60 gr.
Sodæ Valerianas	1 gr. to 5 gr.
Spigelia (in powder)	60 gr. to 120 gr.
Spiritus Ætheris	30 min. to 90 min.
Spiritus Ætheris Nitrosi	30 min. to 2 fl. drm.
Spiritus Ammoniæ Aromaticus	30 min. to 1 fl. drm.
Spiritus Ammoniæ Fœtidus	½ fl. drm. to 1 fl. drm.
Spiritus Armoraciæ Compositus	1 fl. drm. to 2 fl. drm.
Spiritus Cajuputi	½ fl. drm. to 1 fl. drm.
Spiritus Camphoræ	10 min. to 30 min.
Spiritus Chloroformi (Chloric Ether)	20 min. to 60 min.
Spiritus Juniperi	30 min. to 1½ fl. drm.

Spiritus Lavandulæ	½ fl. drm. to 1 fl. drm.
Spiritus Menthæ Piperitæ	30 min. to 60 min.
Spiritus Myristicæ	30 min. to 60 min.
Spiritus Rosmarini	10 min. to 50 min.
Staphisagria	3 gr. to 10 gr.
Stramonium (the leaves powdered)	1 gr. upwards.
Strychnia	1/30 gr. to 1/12 gr.
Styrax Præparatus	5 gr. to 20 gr.
Succus Belladonnæ	5 min. to 15 min.
Succus Scoparii	1 fl. drm. to ½ fl. oz.
Succus Conii	30 min. to 60 min.
Succus Hyoscyami	30 min. to 60 min.
Succus Taraxaci	1 fl. drm. to 2 fl. drm.
Sulphide of Ammonium	3 min.
Sulphuris Iodidum	½ gr. to 2 gr.
Sulphur Præcipitatum	20 gr. to 1 drm.
Sulphur Sublimatum	20 gr. to 1 drm.
Sumbul (in powder)	20 gr. to 60 gr.
Syrupi. The dose of those omitted is	1 fl. drm.
Syrupus Chloral	30 min. to 2 fl. drm.
Syrupus Ferri Iodidi	½ fl. drm. to 1 fl. drm.
Syrupus Rhei	1 fl. drm. to 4 fl. drm.
Syrupus Scillæ	½ fl. drm. to 1 fl. drm.
Syrupus Sennæ	1 fl. drm. to 4 fl. drm.
Syrupus Violæ	½ fl. drm. to 2 fl. drm.
Tamarindus	½ oz. and upwards.
Tincturæ. The dose of those omitted is from	½ fl. drm. to 2 fl. drm.
Tinctura Aconiti	5 min. to 15 min.
Tinctura Actææ Racemosæ	30 min. to 60 min.
Tinctura Assafœtidæ	½ fl. drm. to 1 fl. drm.
Tinctura Belladonnæ	5 min. to 20 min.
Tinctura Benzoini Composita	½ fl. drm. to 1 fl. drm.
Tinctura Camphoræ Composita	15 min. to 1 fl. drm.
Tinctura Cannabis Indicæ	5 min. to 20 min.
Tinctura Cantharidis	5 min. to 20 min.
Tinctura Capsici	10 min. to 20 min.
Tinctura Castorei	½ fl. drm. to 1 fl. drm.
Tinctura Chloroformi Composita	20 min. to 60 min.
Tinctura Colchici Seminum	10 min. to 30 min.
Tinctura Conii	20 min. to 60 min.
Tinctura Digitalis	10 min. to 30 min.
Tinctura Ergotæ	10 min. to 1 fl. drm.

Tinctura Ferri Acetatis	5 min. to 30 min.
Tinctura Ferri Perchloridi	10 min. to 30 min.
Tinctura Guaiaci Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Hellebori (*Lond.* 1851)	30 min. to 1 fl. drm.
Tinctura Hyoscyami	½ fl. drm. to 1 fl. drm.
Tinctura Iodi	5 min. to 20 min.
Tinctura Laricis	15 min. to 30 min.
Tinctura Lobeliæ	10 min. to ½ fl. drm.
Tinctura Lobeliæ Ætherea	10 min. to ½ fl. drm.
Tinctura Myrrhæ.	½ fl. drm. to 1 fl. drm.
Tinctura Nucis Vomicæ	10 min. to 20 min.
Tinctura Opii	5 min. to 40 min.
Tinctura Opii Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Rhei (as a stomachic)	1 fl. drm. to 2 fl. drm.
Tinctura Rhei (as a purgative).	4 fl. drm. to 8 fl. drm.
Tinctura Sabinæ	20 min. to 1 fl. drm.
Tinctura Scillæ	10 min. to 30 min.
Tinctura Sennæ	1 fl. drm. to 4 fl. oz.
Tinctura Stramonii	10 min. to 30 min.
Tinctura Sumbul	10 min. to 30 min.
Tinctura Tolutana	20 min. to 40 min.
Tinctura Valerianæ Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Veratri Viridis	5 min. to 20 min.
Tinctura Zingiberis	15 min. to 1 fl. drm.
Tinctura Zingiberis Fortior	5 min. to 20 min.
Tormentilla (in powder)	20 gr. to 60 gr.
Tragacantha (powder)	20 gr. and upwards.
Trochisci. The dose of those omitted is from	*one* to *six*.
Trochisci Ipecacuanhæ	*one* to *three*.
Uva Ursæ (powdered leaves)	10 gr. to 30 gr.
Valeriana (in powder)	10 gr. to 30 gr.
Veratria (the alkaloid)	$\frac{1}{12}$ gr. to $\frac{1}{6}$ gr.
Veratrum Viride (powdered rhizome)	1 gr. to 3 gr.
Vinum Aloes	1 fl. drm. to 2 fl. drm.
Vinum Antimoniale (in febrile affections)	5 min. to 1 fl. drm. (?)
Vinum Antimoniale (as an emetic)	½ fl. oz. to 1 fl. oz.
Vinum Colchici	10 min. to 30 min.
Vinum Ferri	1 fl. drm. to 4 fl. drm.
Vinum Ferri Citratis	1 fl. drm. to 4 fl. drm.
Vinum Ipecacuanhæ (as an expectorant)	5 min. to 40 min

Vinum Ipecacuanhæ (as an emetic)	3 fl. drm. to 6 fl. drm.
Vinum Opii	10 min. to 40 min.
Vinum Quiniæ	½ fl. oz. to 1 fl. oz.
Vinum Rhei	1 drm. to 2 drm.
Vinum Veratri (*Lond.* 1851)	10 min. to 20 min.
Zinci Acetas	1 gr. to 2 gr.
Zinci Acetas (as an emetic)	10 gr. to 20 gr.
Zinci Carbonas	1 gr. to 5 gr. or more.
Zinci Chloridum	½ gr. to 1 gr. or 2 gr.
Zinci Oxidum	2 gr. to 10 gr.
Zinci Sulphas (as a tonic or astringent)	1 gr. to 3 gr.
Zinci Sulphas (as an emetic)	10 gr. to 30 gr.
Zinci Valerianas	1 gr. to 3 gr.
Zingiber (in powder)	10 gr. to 30 gr.

TABLE

SHOWING THE PROPORTIONS IN WHICH SOME OF THE MORE IMPORTANT DRUGS OF THE PHARMACOPŒIA ARE CONTAINED IN THE OFFICINAL PREPARATIONS.

ANTIMONY.

(TARTAR EMETIC.)

¼ gr. of tartarated antimony is contained in 1 fl. drm. of vinum antimoniale.

1 gr. of tartarated antimony is contained in 5 gr. of unguentum antimonii tartarati.

(OXIDE OF ANTIMONY.)

1 gr. of oxide of antimony is contained in 3 gr. of pulvis antimonialis.

ARSENIC.

(ARSENIOUS ACID, WHITE ARSENIC.)

$\frac{1}{24}$ gr. of arsenious acid is contained in 5 min. of liquor arsenicalis.

$\frac{1}{24}$ gr. of arsenious acid is contained in 5 min. of liquor arsenici hydrochloricus.

(ARSENIATE OF SODA.)

$\frac{1}{24}$ gr. of arseniate of soda (dried) is contained in 5 min. of liquor sodæ arseniatis.

MERCURY.

(METALLIC.)

1 gr. of mercury is contained in 3 gr. of hydrargyrum cum cretâ.

1 gr. of mercury is contained in 3 gr. of pilula hydrargyri.

1 gr. of mercury is contained in 2 gr. of unguentum hydrargyri.

(HYDRARGYRI PERCHLORIDUM.)

$\frac{1}{18}$ gr. of perchloride of mercury is contained in 1 fl. drm. of liquor hydrargyri perchloridi.

(HYDRARGYRI SUBCHLORIDUM, or CALOMEL.)

1 gr. of subchloride of mercury (calomel) is contained in 5 gr. of pilula hydrargyri subchloridi composita.

1 gr. of subchloride of mercury (calomel) is contained in about 6½ gr. of unguentum hydrargyri subchloridi.

ACONITE.

1 gr. of dried aconite root is contained in about 9 min. of tinctura aconiti.

ACONITIA.

8 gr. of aconitia are contained in one oz. of unguentum aconitiæ.

ATROPIA.

1 gr. of atropia is contained in 2 fl. drm. of liquor atropiæ.

1 gr. of sulphate of atropia in 2 fl. drm. of liquor atropiæ sulphatis.

8 gr. of atropia are contained in 1 oz. of unguentum atropiæ.

BELLADONNA.

1 gr. of dried belladonna is contained in about 22 min. of tinctura belladonnæ.

Each fluid part of linimentum belladonnæ contains the active portion of a solid part of the dried root.

CANNABIS INDICA.

1 gr. of alcoholic extract of Indian hemp is contained in about 22 min. of tinctura cannabis Indicæ.

CANTHARIDES.

1 gr. of cantharides is contained in about 88 min. of tinctura cantharidis.

COLCHICUM.

1 gr. of dried corm of colchicum is contained in about 5½ min. of vinum colchici.

1 gr. of colchicum seeds is contained in about 9 min. of tinctura colchici.

DIGITALIS.

1 gr. of dried leaves of digitalis is contained in about 9 min. of tinctura digitalis.

HEMLOCK.

1 gr. of hemlock fruit is contained in about 9 min. of tinctura conii.

IPECACUANHA.

1 gr. of ipecacuanha root is contained in about 22 min. of vinum ipecacuanhæ.

1 gr. of ipecacuanha root is contained in *twelve* morphia and ipecacuanha lozenges.

1 gr. of ipecacuanha root is contained in 4 ipecacuanha lozenges.

NUX VOMICA.

1 gr. of nux vomica seed is contained in about 11 min. of tinctura nucis vomicæ.

(Strychnia.)

1 gr. of strychnia is contained in 2 fl. drm. of liquor strychniæ.

OPIUM.

(Acetate of Morphia.)

¼ gr. of acetate of morphia is contained in 30 min. of liquor morphiæ acetatis.

(Hydrochlorate of Morphia.)

¼ gr. of hydrochlorate of morphia is contained in 30 min. of liquor morphiæ hydrochloratis.

¼ gr. of hydrochlorate of morphia is contained in *nine* morphia lozenges.

¼ gr. of hydrochlorate of morphia is contained in *nine* morphia and ipecacuanha lozenges.

½ gr. of hydrochlorate of morphia is contained in *each* morphia suppository.

(Opium dried sufficiently to be powdered.)

1 gr. of opium is contained in 14½ min. of tinctura opii.

1 gr. of opium is contained in 14½ min. of vinum opii.

1 gr. of opium is contained in ½ fl. oz. of tinctura camphoræ composita.

1 gr. of opium is contained in 96 min. of tinctura opii ammoniata.

1 gr. of opium is contained in 1 fl. oz. of enema opii.

1 gr. of opium is contained in 5 gr. of pilula saponis composita

1 gr. of opium is contained in 8 gr. of pilula plumbi cum opio.

1 gr. of opium is contained in 10 gr. of pulvis ipecacuanhæ compositus.

1 gr. of opium is contained in 20 gr. of pulvis kino compositus.

1 gr. of opium is contained in 40 gr. of pulvis cretæ aromaticus cum opio.

1 gr. of opium is contained in 10 gr. of pulvis opii compositus.

1 gr. of opium is contained in about 13½ gr. of unguentum gallæ cum opio.

1 gr. of opium is contained in *ten* opium lozenges.

1 gr. of opium equals about ½ gr. of extractum opii.

1 gr. of extract of opium is contained in 22 min. of extractum opii liquidum.

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